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PRACTICAL MECHANIC'S JOURNAL.

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APRIL, 1859—MARCH, 1860.

"Knowledge and thought are at once the delight and the prerogative of man; they are also a part of the wealth of nations, and frequently afford them an ample indemnification for the more sparing bestowal of natural riches.—HUMBOLDT'S COSMOS.

"Truths are not the better nor the worse for their obviousness or difficulty, but their value is to be measured by their usefulness and tendency."—JOHN LOCKE.

"There be three things which make a nation great and prosperous: a fertile soil, *busy workshops*, and easy conveyance of men and things from one place to another."—LORD BACON.

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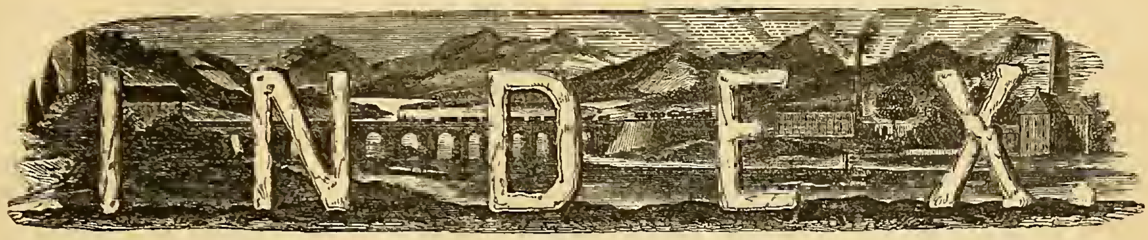
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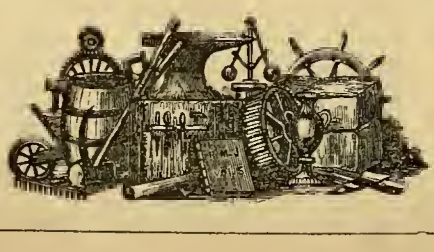

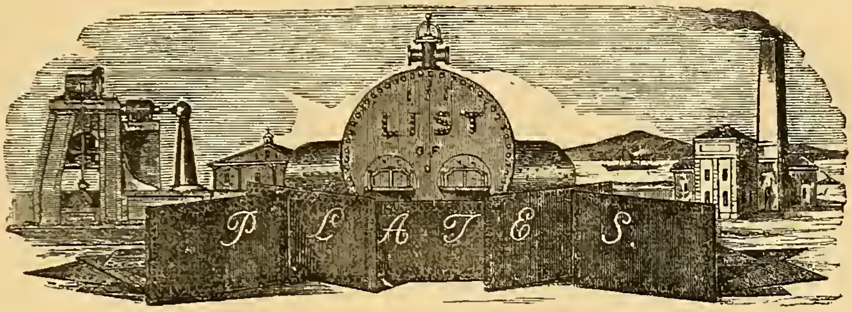

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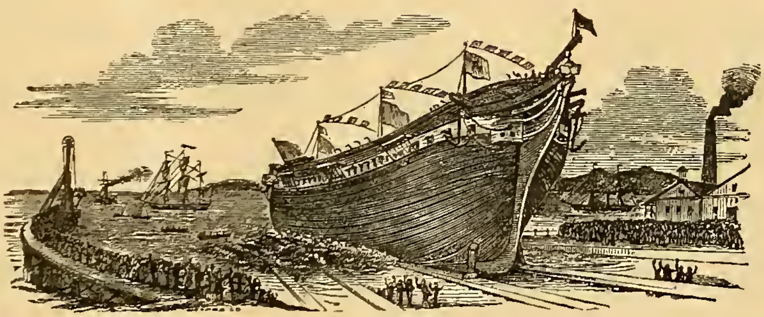
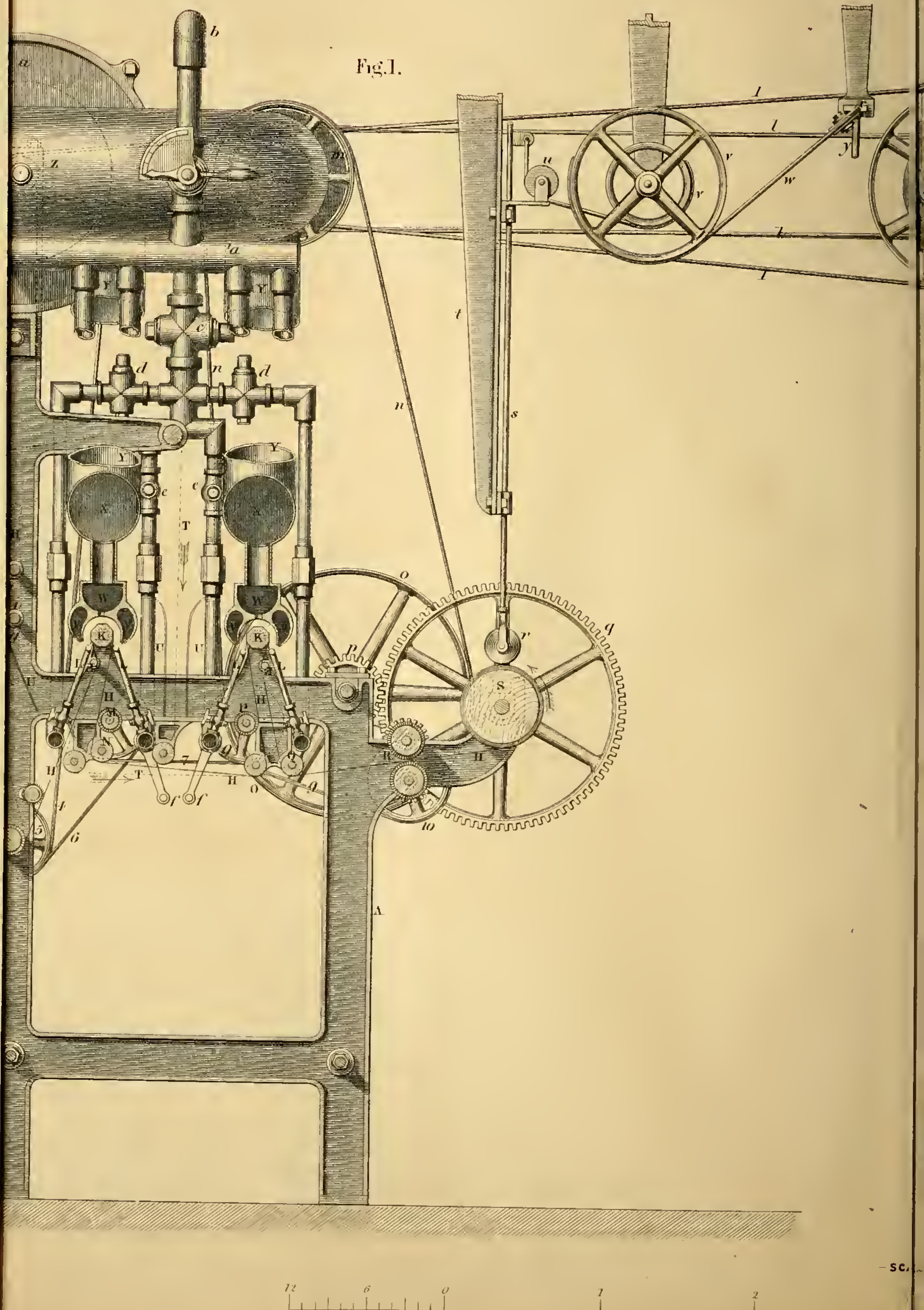


GAS SINGE

Mr JAMES

PAT

Fig.1.



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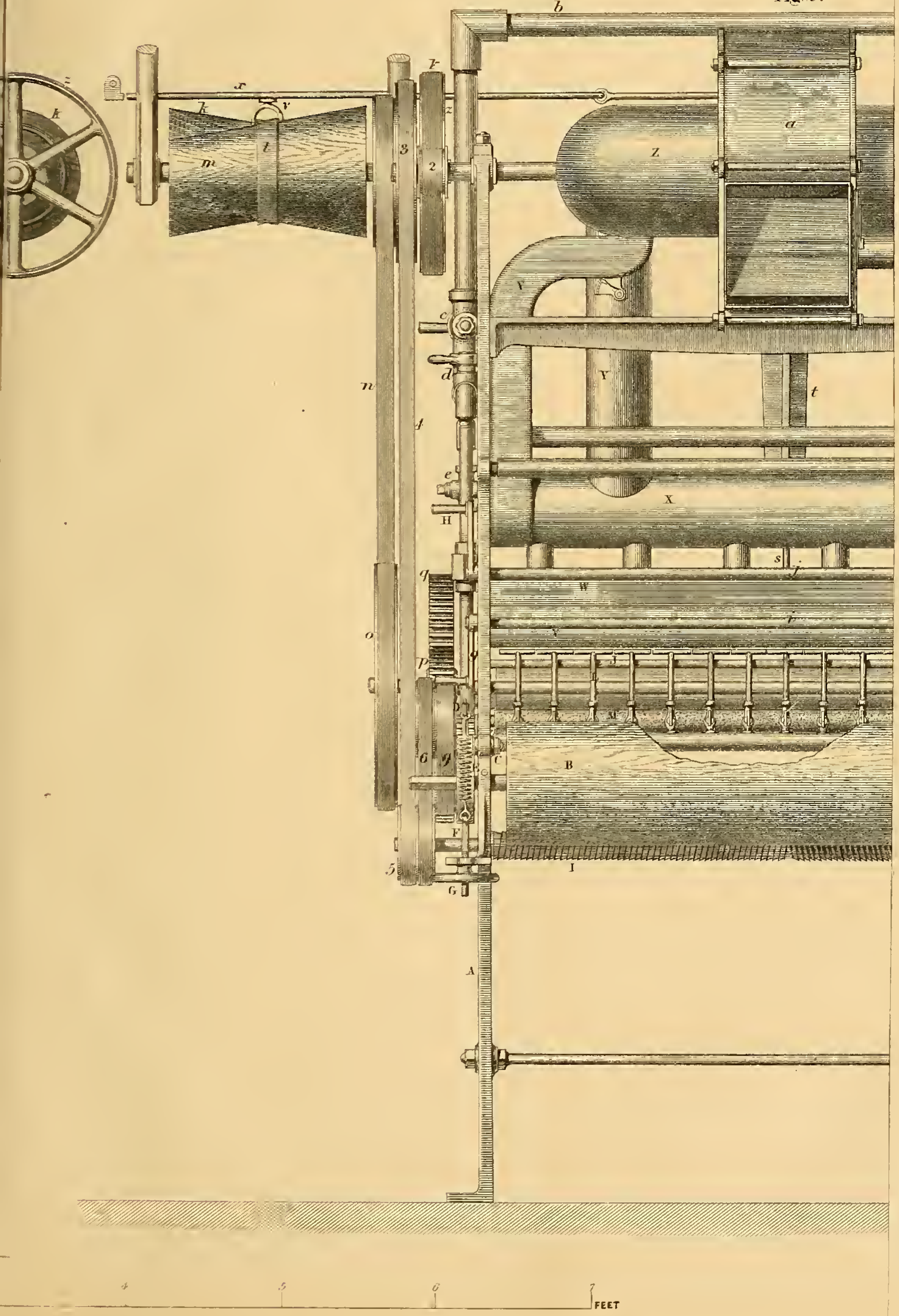

GAS SINGE MACHINE,

Mr JAMES[illegible] BELFAST.

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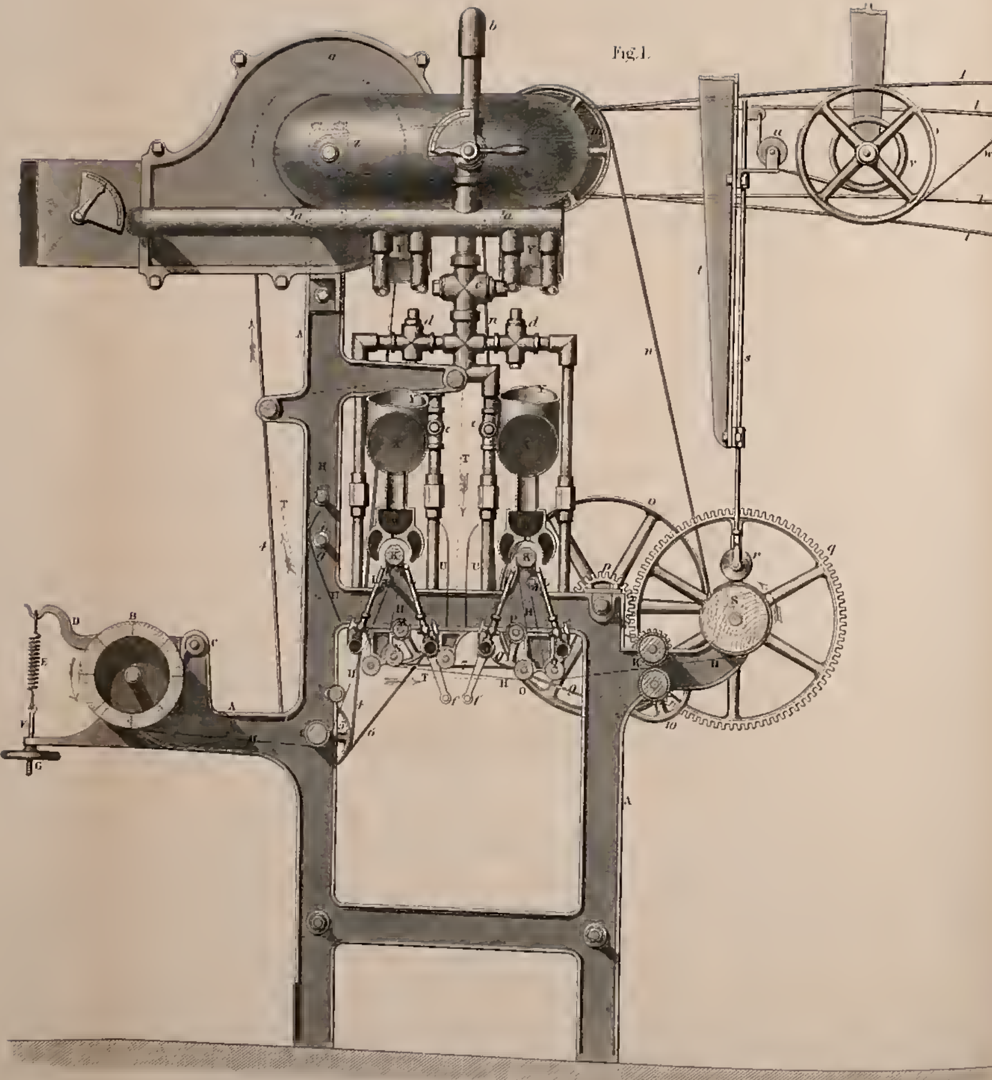
Fig. 1.



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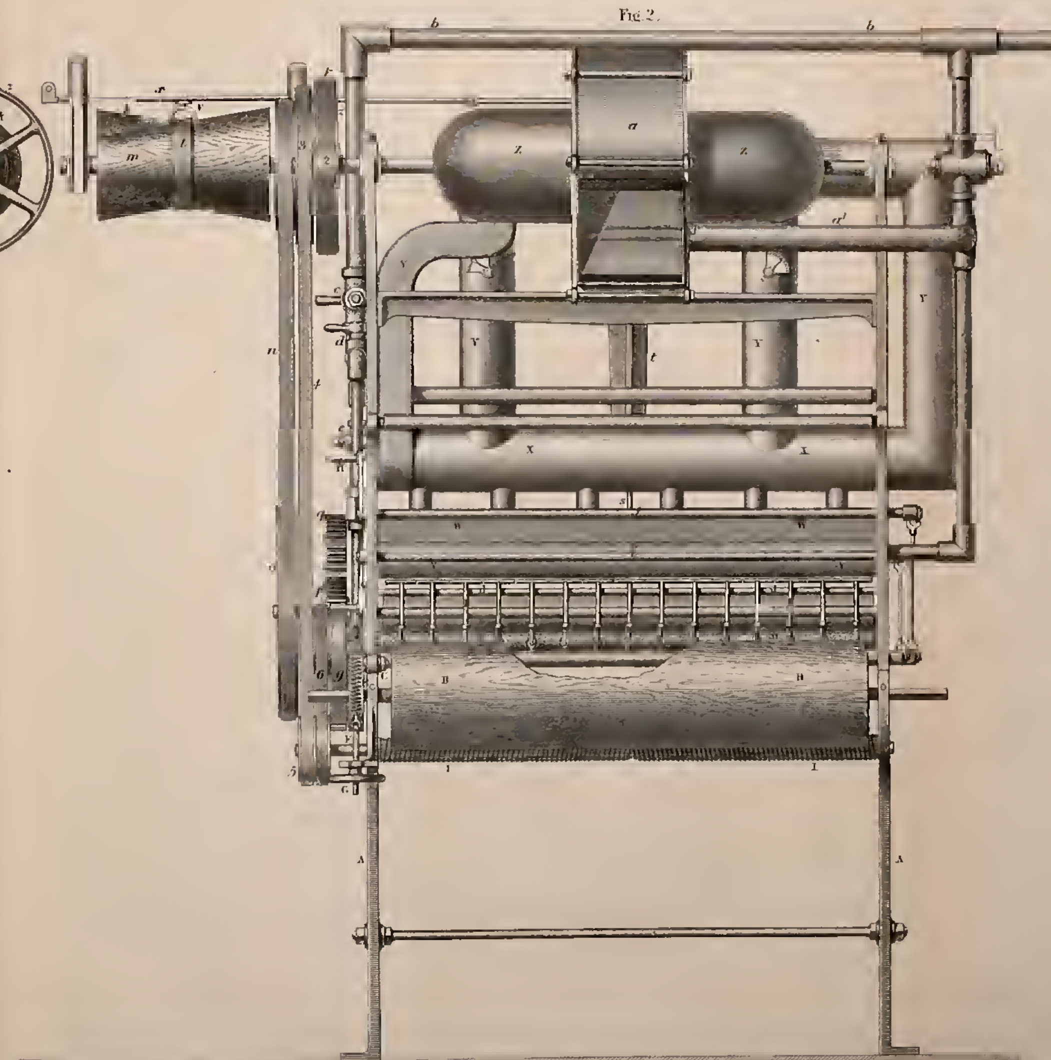

W. Johnson Patent Offices
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THE

PRACTICAL MECHANIC'S JOURNAL.

"The study of the annals of past DISCOVERIES will both add a new stimulus to useful exertion, and will assist in checking wild or barren schemes. In these matters idea begets idea, and the INVENTION of yesterday gives birth to the INVENTION of to-morrow. All the information which the INVENTOR can desire is now spread open before him: he learns what to do, and what to leave undone; and being placed at once upon the boundary line of DISCOVERY, he can go forward with great confidence and effect, and make fresh conquests for ART and SCIENCE."—QUARTERLY REVIEW.

"What an amount of ingenuity, thrown away on the pursuit of the PERPETUAL MOTION, might have been turned to better use, if the simplest laws of MECHANICS had been known and attended to, by the inventors of innumerable contrivances destined to that end."—HERSCHELL.

"The pleasure of learning the truths which PHILOSOPHY unfolds, is truly above all price."—BROUGHAM.

GAS SINGEING MACHINE FOR FINISHING TEXTILE FABRICS.—(*Illustrated by Plate* 236.)

By MR. JAMES COOKE, *Belfast.*

THE elegantly refined process of removing the loose filamentous particles from the surface of fine woven goods, yarns, and lace, has often been cited as a famous example of human ingenuity. And it certainly is a very striking instance of a most complete and effective end being gained by the simplest means; for the means, when duly examined, are of the simplest kind, although, to the casual observer, the machinery has a somewhat imposing effect; and its operation, in causing flimsy goods to rush through the body of a powerful gas flame, conveys anything but an impression that the gas singeing finisher is really putting a peculiarly improving touch to the productions of the loom, and not consuming them outright. Yet the process is based upon practical science of a high order—that inductive science, indeed, which has shown the laundress that a smoothing-iron which would scorch her delicate muslins, if allowed to remain stationary for ever so short a time upon their surface, is her most effective finishing instrument, when applied at a proper smoothing speed. From the same source, the cook has learnt that a blazing paper applied rapidly over the nude body of a fowl, at once takes off the minute feathery particles, which would be of such difficult removal in any other way; and this without injuring the skin.

The singeing process, as applied to manufacturing purposes, has undergone many modifications. The earliest device for the purpose was the heated copper plate, furnaces being employed to keep the plates at a red heat, whilst the goods were passed rapidly over and in actual contact with them. Oil and tallow lamps were then introduced; and it is a memorable fact that, in 1817, when Mr. Hall, of Nottingham, introduced the steady gas flame instead of the uncertain flame of oil, the matter became the subject of a judicial investigation, the result of which was the placing of a most important precedent of patent law in our books of reference. It was argued for the infringers of the patent that, seeing that flame, although from oil, had been used for singeing prior to the date of the patent, the use of gas flame could not form subject-matter for a valid patent. Mr. Hall, however, defeated his infringers, for the Court held that the adaptation of gas was really a new contrivance applied to a new object. The gas process is that now chiefly employed, although heated plates are largely used also.

During the past year, Mr. James Cooke, an extensive gas singer at Belfast—after devoting several years to the consideration of his subject—has introduced the gassing machinery which we are now about to describe. This machine is very elaborately detailed in our large plate, 236.

Fig. 1, on the plate, is a complete sectional side elevation of the machine; and fig. 2 is a corresponding front view.

The framing of the machine consists of a pair of cast-iron end standards, A, which are connected to each other by horizontal tie-bars of malleable iron. Each of the end standards, A, has extending outwards, in front of the machine, a bracket, the upwardly turned ends of which serve as bearings to receive the spindle of the beam or drum, B, upon which the several pieces or lengths of fabric to be singed are wound. A series of these beams or drums, B, is provided, upon which the fabrics to be treated are wound, so that as fast as one beam is exhausted, it is taken out of the machine and replaced by a full one. Prior to winding the unfinished goods upon the beams or drums, B, the surfaces of the fabrics are subjected to the action of cards and brushes, in order to raise the loose filaments, that they may be the more readily removed by the action of the flame, when passing through the gassing machine. The machine used for this purpose consists of a rectangular framing of iron or wood in which is fitted stationary and rotatory cards and brushes; two sets of these being arranged in the machine, so as to operate upon both sides of the cloth or fabric, as it passes through the machine to be wound upon the beam. The fabrics are passed between guide rollers, thence over the first card and brushing roller, the combined action of which raises the loose filaments and rough particles upon the face of the fabric, so that they may be more readily and effectually acted upon by the singeing flame to which they are subsequently subjected. The other side of the fabric is acted upon in like manner by the secondary card and brushing roller, from whence the fabric passes on to the beam at the further extremity of the machine. In filling these beams with the fabrics to be singed, a piece of calico or ordinary cloth is first wound upon the beam; to the extremity of this piece of cloth, technically termed a "leader," the end of the first piece of muslin, or other fabric to be singed, is sewn slightly. A predetermined number of pieces of fabric are then attached in succession, end to end, and lastly a second "leader." These "leaders" are of sufficient length to extend through the various convolutions which the fabric takes in passing through the singeing machine, and pass once or twice round the winding beams, so that the singeing operation takes effect upon the fabrics from end to end of the series of pieces. As the cloth beams are successively filled after the fabrics have undergone the carding and brushing operations, they are removed from the machine, in readiness for the singeing or finishing process.

The tension upon the fabric, as it is wound from the beam, B, is regulated by the frictional spring brake, D, one end of which is centred upon a stud, fitted to the upper extremity of the standard, C. To the front end of the spring brake, D, is attached one end of the helical spring, E; the other end of this spring is fastened to the pin, F, which passes through the bracket of the standard, A. The pin, F, has a screw thread cut on its lower end, and by means of the nut or hand wheel, G, the brake, D, may be caused to press with more or less force upon a metal collar, fitted on the end of the beam, B. The course of the fabric through the machine, while undergoing the operation of single singeing, is indicated by the line, H. The fabric passes under the smoothing roller, I, and upwards past the tension roller, J, and over the singeing roller, K, where it is subjected to the action of the first series of burners, L. Each of the singeing rollers, K, as arranged in this modification, have two series of burners, L, fitted one upon each side of the roller, and parallel thereto. The gas burners, L, and their supply pipes, are arranged so that they may be turned away from, or brought close up to, the singeing rollers. From the first singeing roller, K, the fabric, H, is carried past the first central burners, L, and downward, where it is brought in contact with the rotatory brush, M; from thence it passes under the tension roller, N, and backwards to the roller, O. From this roller the fabric passes upwards, past the revolving brush, P, to the second singeing roller, K, where it may, or may not, be again subjected to the action of the second series of gas burners, L. The fabric is carried downwards from the second singeing roller to a second tension roller, J, which extinguishes any sparks upon the surface; thence below the roller, Q, and between the rotatory brushes, R, which are more particularly required when both sides of the fabric have been singed, and away to the winding beam, S. The course of the fabric in the double singeing operation is indicated by the line, T; and from what has been hereinbefore stated, it may be readily traced from the beam, B, onwards to the winding-on beam, S. The flames from the gas burners are prevented from injuring the fabrics by the guards, U, the front one of which protects the fabric in its upward course, whilst those in the centre shield it from the flame in its downward passage. In this modification of the gassing machine, the air distributors, V, form a part of the cowl or chimney through which the unconsumed products of combustion are drawn by the action of the fan wheel. The air distributors, V, are supplied with a current of heated air, by means of a coil of pipe which is heated either by the waste steam from a steam engine, or by arranging the pipe in the flue of the furnace, or any other convenient means of heating the same. The stream of heated air as it flows from the mouths or longitudinal openings, at the lower part of the distributors, V, impinges upon the flames of the burning gas, and causes the flames to encircle, or nearly so, the singeing rollers, K, at the same time the temperature of the flame is greatly augmented. The unconsumed gas and products of combustion pass upwards through the longitudinal channels or openings made in the lower part of the chambers, W, which communicate, by means of a series of short vertical tubes, with the parallel horizontal chambers, X. These chambers, X, are connected by means of the pipes, Y, with the exhausting chambers, Z, from which the air is drawn by means of a fanner arranged in the casing, *a*. The two vertical pipes, Y, are each furnished with a throttle valve, and an external index, so that the valve may be set so as to increase or diminish the velocity of the draft, according to the nature of the work. The motion of the fanner causes the heated air and products of combustion to be drawn with great rapidity through the various tubes, whence they may be discharged through a pipe connected with the fan wheel casing, and carried outside the building. But it is preferred to convey this current of heated air, and unconsumed gas, by means of pipes connected with the casing, *a*, back again to the burners, L, causing it to pass through the air distributors, V; and in this manner dispensing with the current of heated air. There is fitted into the pipe, which conveys away the products of combustion, a throttle valve, so that the passage through may be entirely closed if required. Between the valve and the fan a pipe branches off laterally, which is carried backwards along the side of the machine; this pipe communicates by means of a cock or valve with the main gas pipe. From the air pipe four vertical tubes descend, which convey the combined stream of heated air and gas to the air distributors, whence it impinges upon the flame. The tap or valve fitted between the air pipe and the gas main affords the operator the means of admitting any desired quantity of gas to mix with the descending current of air. On the other hand, if the quantity of heated air is more than is required for the due combustion of the gas, a portion may be allowed to escape by partially opening the throttle valve in the pipe connected with the fanner. By means of this arrangement the consumption of gas is greatly economised, whilst the heating of the air is effected easily and without cost. The horizontal pipe, *b*, conveys the gas from the main, and it is this pipe which is put in connection with the heated air in the arrangement just described. The pipe, *b*, is carried downwards by the side of the machine, and has here fitted to it a tap, *c*, by which the gas can be wholly turned off. Below this tap is a four-way union piece, to the lateral passages of which are connected two taps, *d*, the pipes from which convey the gas to the front and back series of burners. The lower passage of the four-way union piece diverges into two angle pipes in which are fitted the taps, *e*; to these are screwed the pipes which convey the gas to the two central burners. As thus arranged, the gas may be readily shut off from the whole, or any one of the burners, or be instantly regulated with the utmost nicety, as required. The two central burners, L, are turned upon their axes by means of the handles, *f*, which are fast to the pipes carrying the burners. As the operator moves these handles to and fro, the burners may be brought into contact with the fabric, or moved therefrom. The two burners at the front and back of the machine are operated by means of the handles, *g* and *h*; these are fast to horizontal spindles, *i* and *j*, which extend across the machine, and are each connected to the moveable pipes of the burners by a lever and links, which cause the pipes to turn partially round when the handles, *g* and *h*, are moved to and fro. In this way the operator has complete control over the whole of the gas apparatus, while standing at one side of the machine. Motion is imparted to the moving parts of the gassing machine, from a steam engine or other prime mover—an endless band from which, gives motion to the cone pulley, *k*; the endless band, *l*, on this pulley, drives the cone pulley, *m*. The band, *n*, on the cone pulley, *m*, gives motion to the fast and loose pulley, *o*, the stud of which carries a pinion, *p*, that imparts motion to the wheel, *q*, on the spindle of the winding roller, S. As the winding roller increases in diameter with the fabric being wound upon it, it is necessary to cause the band, *l*, to move along the cone pulleys, so as to alter the taking-up speed. This is done by means of the roller, *r*, which rests upon the fabric on the beam, S; this roller is carried in the forked end of the rod, *s*, which traverses in a vertical direction, in eyes fitted in the pendant bracket, *t*. To the upper end of the rod, *s*, a band is fastened, which is carried under the pulley, *u*, and is made fast to the smaller circumference of the differential pulley, *v*. To the larger periphery of this pulley, a band, *w*, is attached; the other end of this band is connected to the rod, *x*, which carries the fork, *y*. As the roller, *r*, rises with the increasing diameter of the beam, S, the pulley, *v*, is drawn round so as to unwind the band, *w*, and thus moves the fork, *y*, and the band, *l;* thus causing the take-up motion to travel at a uniform speed, and equalise the progress of the fabrics through the machine. The spindle of the cone pulley, *k*, carries a pulley, *z*—the belt, 1, of which drives the small pulley, 2, on the spindle of the fan; on the end of which spindle is a pulley, 3. The endless belt, 4, on the pulley, 3, gives motion to the small pulley, 5, on the stretching or smoothing roller, I. The pulley, 5, also carries a band, 6, which drives the pulley on the first rotatory brush, M, and another pulley on this spindle carries a belt, 7, which drives the pulley, 8, on the second brush, P. Lastly, the spindle of the pulley, 8, carries a secondary pulley and belt, 9, which gives motion to the pulley, 10, on the spindle of one of the lower rotatory brushes, R, motion being given to the upper brush by pinions fast to their spindles. In this manner the fabric is drawn through the machine at a uniform speed, being singed upon one or both sides during its progress, and it is thereby finished in a very superior manner. With minor modifications, of course, this machinery may be readily adapted and applied to the singeing of muslins, lace, yarns, and other fabrics.

INVENTIONS AND PATENTS IN AMERICA.

It is curious to note how the necessity for mechanical and generally artificial aids to manual labour in the United States has led to the development of mechanical invention; and, as a necessary consequence, to patents. The government charges to an American citizen are exceedingly low, and the result is, that although many splendid examples of mechanical invention are thus brought out into practical use, many others are secured to their owners on grounds which, with us, would be regarded as very narrow and slender.

The following is a general tabulated statement of the work of the United States' Patent Office for 1858:—

Number of applications for patents during the year 1858,	5364
Number of patents granted (including designs, re-issues, and additional improvements),	3710
Number of caveats filed,	943
Number of applications for extensions of patents,	24
Number of patents extended,	20
Number of patents expired 31st December, 1858,	563

Of the patents granted there were—

To citizens of the United States,	3668
To subjects of Great Britain,	20
To subjects of the French Empire,	14
To subjects of other Foreign governments,	8
Total,	3710

This statement tells us one very significant tale, when it shows us that for 3668 patents granted to "citizens of the United States," there were but 20 granted to subjects of Great Britain The answer to this apparent riddle, of course, is to be found in that peculiarly significant fact, that whilst the United States Government gives a citizen a patent for 30 dollars, it makes a British subject pay 500 dollars for a similar privilege. Will the American Government never take the hint?

The patents issued to citizens of the United States were distributed among the several States and Territories, as follows:—

New York,	1075	Brought forward,	3451
Pennsylvania,	447	Mississippi,	31
Massachusetts,	438	Kentucky,	30
Ohio,	302	Alabama,	24
Connecticut,	211	California,	23
Illinois,	155	North Carolina,	22
New Jersey,	126	Georgia,	21
Maryland,	82	Tennessee,	19
Indiana,	82	South Carolina,	12
Virginia,	61	Texas,	10
Maine,	58	Delaware,	8
Michigan,	54	Florida,	4
Wisconsin,	54	Washington Territory,	4
District of Columbia,	52	Arkansas,	3
New Hampshire,	51	Minnesota,	2
Rhode Island,	48	Kansas Territory,	1
Missoura,	46	U. S. Navy,	2
Vermont,	42	U. S. Army,	1
Louisiana,	34		
Iowa,	33	Total,	3668

Of the 3710 patents thus issued, 561 were for inventions relating to agricultural implements and processes, of which 152 were for improvements in reaping and mowing machines; 42 were for improvements in cotton gins and dresses and in packing cotton; 164 for improvements in the steam engine; 198 for improvements in railroads, railroad cars, &c.; and 116 for improvements in the sewing machine. Since the issue of the first patent for the latter to J. J. Greenough, in 1842, 285 patents have been granted for improvements upon it.

It is now quite clear that the sewing machine is destined to play one of the most important parts ever played by any mechanical contrivance since the world began. As regards this department, the world will always remember, and accord the credit due to America for her share in the progress of this great arm of mechanics.

The following statement shows the comparative progress of patented inventions during a year, in the chief divisions of the patenting world:—

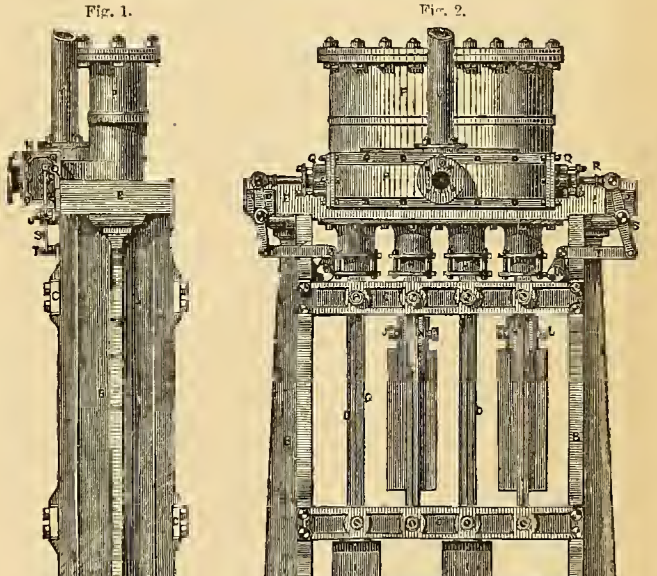
Country.	*Patents Granted in 12 months.*	*Population.*
France,	5820	35,781,628
United States,	3710	23,191,918
Great Britain (sealed),	1890	27,511,447
Belgium,	1406	4,426.202
Austria,	703	36,514,466
Sardinia,	171	4,368,972
Saxony,	107	1,828,732
Sweden,	64	3,482,541
Victoria (Australia),	53	410,766
Prussia,	49	16,923,721
Bavaria,	41	4,519,546
Netherlands,	39	3,203,232
Russia,	26	69,660,146
Hanover,	20	349,958

It is a fact as significant as it is deplorable, that of the 10,359 inventions shown to have been made abroad during the last twelve months, but forty-two have been patented in the United States.

In so progressive a country as America, the vitally objectionable feature of exorbitant charges to foreigners ought long since to have been cleared away. Let us hope that it soon will be erased from the statute books of that country.

DIRECT-ACTING STEAM QUARTZ STAMPER.

Fig. 1. Fig. 2.



The gold discoveries in Australia and California have brought a large amount of work to British engineers. The refractory quartz, in which the precious metal is found, in being worked up, makes heavy demands upon mechanical engineering aids, and the consequence is, that to this country have the bulk of the gold seekers come for multitudes of heavy and powerful crushers and stampers, washers, and amalgamating apparatus. Recently, Messrs. T. M. Tennant & Co., of Edinburgh, have devised, and introduced into our colonial possessions, a most effective direct-acting steam crusher of the multi-cylinder kind. The arrangement, in fact, resembles that of a compound steam hammer.

Fig. 1 of our engravings is an end elevation of the machinery, and fig. 2 is a corresponding front view. It consists of a massive sole plate, A, of cast-iron, which may be cast in one, or made of separate parts bolted together. At each end of the rectangular sole-plate is a vertical standard, B; the broad inner faces of the two standards being arranged parallel to each other. The front edges of the end standards have recesses, or indentations cast therein, in which are fitted the cast-iron transverse rails, C; these rails are firmly secured to the standards, B, by duplex bolts and nuts at the extremities of each rail. The framing of the machine is further strengthened by the vertical bars, D, which are bolted, at their upper and lower ends, to the transverse rails, C, so that the whole of the framing is rendered as rigid and substantial as possible. The standards, B, have fitted to their upper extremities the entablature, E, which serves to support the casting, F. This casting is of an elliptical figure, and is bored out internally, so as to form a series of four steam cylinders arranged longitudinally. The cylinders, F, are arranged with their piston rods, G, working through the inverted stuffing-boxes, H. To the lower extremity of each rod, G, a stamper or crushing tool, I, is secured thereto by bolts, J. These stampers, I, each consist of a rectangular mass of cast-iron, or cast-iron faced with steel at the lower end. The piston rod is fastened securely into this stamper or rectangular mass of metal by a cottar. At the top of the stamper is the crosshead, which is secured to the piston rod by the screws, K, which crosshead embraces the edges of the vertical standards, D, so that they also serve to guide the stampers in their ascent and descent, and keep them in a truly vertical position during the working of the machine. The stampers, I, descend into a trough or receptacle, L, in which the quartz or other mineral to be crushed is supplied at the back from hoppers placed for that purpose; this trough consists of a massive block of metal, on which the stamping operation is effected; the sides of this block are enclosed by metal plates, which form the trough. Into this trough there flows a constant stream of water, which carries off the pulp or crushed matter through the two front rectangular openings cast therein, which are covered with perforated sheet or wire-cloth, M. In this modification there are four stampers, I, which are raised alternately two and two, that is to say, the slide valves are arranged so, that while the steam is lifting two of the stampers, the other two are descending. The steam is admitted to the cylinders through the induction pipe, O, to the valve chest, P; each end of this valve chest is fitted with a cover and stuffing-box, Q, through which the rod, R, works. The inner end of each rod, R, is attached to two slide valves, which regulate the admission of the steam to their corresponding cylinders, F, so that two pistons are wrought from each end of the valve chest, P. The outer ends of the valve rods, R, are each attached to a lever, S, that is centred upon a stud bracket which is bolted to the entablature, E. The lower end of each lever, S, is fast to a link, T, by which it is connected to the crank, U, that works upon a stud projecting from a bracket cast upon the inner face of the standards, B. The cranks, U, may be caused to oscillate upon their centres, so as to control the admission and emission of the steam to the cylinders, by means of tappets actuated during some part of the ascent and descent of the outer stampers. A hand-lever may also be fitted to the cranks, so that the attendant may shut the steam off from either pair of cylinders at pleasure, and in this manner be enabled to operate or stop the action of either pair of stampers as required. The steam, after having performed its work in raising the pistons and their stampers, is allowed to escape through the exhaust passages into the eduction pipe, V, and from thence into the air, or to be applied to the heating of the water from which the steam is to be raised. The quartz or other mineral to be crushed is placed in the trough, L; the stampers are then put in motion by admitting the steam below the pistons, which raises the stampers; they are allowed to fall suddenly, by rapidly opening the exhaust passages, so that the stampers fall with great force and effect upon the mineral beneath. In this manner a large quantity of mineral may be quickly pulverised at an inconsiderable cost. As the crushing operation is completed, the reduced mineral flows from the trough through openings made for the purpose therein, and passes over bags of cloth, on which any gold that may escape through the sieves is deposited. The bulk of the gold will be found in the trough.

ARCHITECTURE.

Architecture is looking up. Wren's miserable towers of Westminster Abbey are beginning quite to shock general taste and feeling; while many erections, subsequently made in the metropolis alone, are now indicative of the total absence of architectural design which prevailed from the time of Wren to the time of Pugin. We name Pugin as pointing to an era, not on account of any great work performed by him, but as having been one of the best among the first who, by his writings, roused up attention to architectural requirement in that branch of design commonly called the Gothic, which was certainly the stimulus to the many manifestations recently made in various other branches, and which are now yearly giving additional lustre to the metropolis. The formation of a museum of architecture was a happy thought It has done and is doing its work nobly. For this we are indebted to the indefatig able energies and perseverance of one man, George Gilbert Scott, whose own skill and judgment in his art have repeatedly been brought to severe public test, and have uniformly demonstrated the justice with which his great works and restorations have been admired. This museum, consisting of many thousand examples of form, figure, and ornament in plaster, many models, and a multitude of photographs, is now one of the chief attractions to the Government Institution at South Kensington, in which, by the grace of the Committee of the Architectural Museum, it has, for some time past, been deposited. The long corridors and bays there devoted to the purpose are quite a sight in themselves, and show how much may be done even in a single department, when one talented and energetic man puts his shoulder to the wheel.

But a museum, however rich in its contents, is, after all, but a dry stick. To give it life it must have the intelligent eye upon it and the intelligent mind. If you do not yourself approach it with sympathy, it can excite none in you; or, if any, only that of the very lowest kind. Go to it with an understanding mind; look at with all the centuries and all their forms—fossil and recent—surrounding it; look at it with the loving eye which has acquired a brotherhood with fair forms, and the dry stick becomes not only a living but a growing tree. We feel that with all that has been done there must still be much to do. The increased power of appreciation hankers after increased power of expression. A new style is asked for, is looked for; soon it will be imperatively demanded, and then, no doubt, we shall have it. It may, and probably will, be a long time first, for such things are not called forth and come into existence at call. They are the growth of time and of universal thought. They do not show so much what the age is in which they are produced, as what the age immediately preceding has been. They show the results of long discipline. Let us not so much admire the very age of Pericles as the loving labours, almost altogether ignored, of the time before. How many were the struggles and the disappointments before a Phideas arose and embodied, for ever, in the ever wandering marble, the ideas of the sculptor then reached to their climax. So it must have been with architecture. Never believe that the Corinthian column flashed forth an isolated thought, like Minerva from the brain of Jupiter. We must, indeed, believe quite the contrary. That column *grew* as assuredly as did the Acanthus plant from which the legend asserts it to have sprung. Hence we must bring to the objects in a museum some understanding to appreciate their significance, and this necessity is the precursor of no end of pleasures in contemplating the mere plaster of which the objects are composed. In the first place, we get rid entirely of all foreign associations of ideas with which we cannot but be influenced in regarding the object *in situ*. This throws us back upon abstract art. As we become proficient in this abstraction, which involves some learning, we find, as we progress in this learning, more and more of the objects in the museum becoming interesting to us, until no single object can be pointed out which does not keep us long before it contemplating its history and status, thus opening before us a large volume in which we read of the past and future.

Some such train of ideas as the above, no doubt, originated the courses of lectures which are in process of delivery on subjects connected with architecture by some of the first men of the day. The committee have had their reward. For we have observed, and on inquiry find it to be true, that since these lectures there have been many more visitors to this department of the South Kensington Institution than there were before; and not only so, but that visitors have remained stationary before objects for a longer time. These have doubtless been, for the most part, the hearers of the lectures, but, to a certain extent, these visitors may illustrate the spread of a taste for the true in architecture which is becoming prevalent.

The first oration—for we can scarcely call it a lecture—was delivered by A. J. B. Beresford Hope, Esq., M.P., on the Common Sense of Art. Mr. Hope entered upon the subject in his usually irresistibly persuasive manner, and drew down, throughout, the repeated applause of his large audience, and, what is more, produced the expression of that sentiment of sympathy, which we have got to imitate from the French, in what is called "sensation." He observed that we had often found and acknowledged what might be called the prose of art, and also what might be called the poetry of art, but had not given due attention to that which was superior to both—the common sense of art. He attempted to show the principles, upon following which, a new style may reasonably be hoped for. He considered the type must be Teutonic. The art of the future ought to be founded on the Gothic. Each country had founded its own Gothic, and when it rested in a certain style, it began to degenerate. It had thus done in England. If the last style of the Gothic were to be the foundation, it would be the perpendicular of Henry the Eighth. There can be no stationary school of Gothic, but eclectic it may be. The whole of Gothic architecture had been progressive, founded upon eclecticism. He then referred to the different parties, with regard to the Gothic, and attempted to prove that the desired new style must be eclectic through progression from every thing collected. In endeavouring to contribute but one stone to the eclection of the future, he successively gave his opinion as to the leading principles which must be borne in mind and no way controverted. He spoke of the design with reference to its horizontality, its verticality, and its continuity, and remarked that he considered the florid decorated as the sinking of the Gothic. He made some observations on colour and on the laws of cornice, and, after some remarks on common sense in painting and sculpture, he concluded with observing that, in all attempts to originate a new style of architecture, we must look neither to the old school nor to the new school, but to common sense.

William Burges, Esq., followed, on "The Conventional Ornament of the Thirteenth Century," in a very able written discourse, but which lost much of its force by the necessity of a constant reference to drawings and diagrams. He alluded to square and diamond and scroll work, in general, exhibiting their differences of treatment from the time of the Anglo-Saxons down to the seventeenth century, in all of which the influence of these forms, as forming or suggesting the foundation of ornament, was carefully and artistically exhibited. It is oftener the case than otherwise, that written lectures are far better than *impromptu* discourses; but it is trite to say that all lecturers, who depend solely upon what they have written, lose very much influence with their audience, and the audience itself often loses much valuable instruction.

Frederick P. Cockerell, Esq., afterwards delivered a very interesting lecture on "The Painting of the Ancients, with reference to Architecture." He began by observing that colour was not considered indispensable among the ancients, although it, perhaps, may be said to have formed their rule. Where it was used, there was always a great distinction made between the outside and the inside of a building. Polychromy now is the question of the day. But we should be careful not to introduce it here, where it is not so adapted as in other countries. The warm, sunny South and East are the natural region of colour. The North is the natural region of the absence of colour, or rather of neutrality. We should follow nature, not by imitation, but by analogy. There seems, however, to be no possibility of attaining to a satisfactory theory on the subject. In Egyptian art, it appears to have been considered that every thing should have colour. The lotus, the papyrus, and the palm alone were conventionalised as ornamental decoration, and colour given to all. These conventionalisms were excellent, but, as regarded colour, there was no gradation. In Greek art, traces of colour had been found in the later temples of Sicily, also in the temple of Ægina, where it is seen to have been enriched in some places with gold. But there is no evidence of the flats or the pillars having been painted. The distinguished lecturer then adverted to the great advantage which attended the judicious application of colour in enabling us to distinguish half tones. He made some observations on the temple at Halicarnassus, and on the conflicting opinions entertained respecting the painting of the Parthenon at Athens, and other great works. Even the extreme of these opinions points to a very sparing use of colour by the Greeks. The beautiful material (Parian marble), which is assumed by some to have been painted, was considered by the lecturer as an evidence in itself against the fact. He thought it probable, however, that some dye might have been used to tone down the glaring white which these beautiful temples must have shown. He also thought that the colour which had been found on portions of these temples had been affixed in later ages. Where colour is used by us, it ought to be used very sparingly. He alluded to the beautiful tiles of Minton & Co., and to the different coloured stones capable of being employed in exterior construction, and at the same time to coloured decoration. With reference to interiors, he considered the Greeks generally employed colour in them, and remarked upon the beautiful internal paintings of Pompeii which had been so curiously preserved for observation. In some of the interiors of Pompeii, he thought, the art had attained almost perfection. He enjoined the disuse of pictures in golden frames, as we usually have them, as greatly, in appearance, diminishing the good or noble proportions of rooms, where they really exist, and strongly recommended our pictures to be inclosed in panels, forming part of the architecture of the apartment.

John G. Crace, Esq., whose lecture had been anticipated with delight, his consummate taste in internal decoration being now known in all countries where internal decoration is regarded, gratified a very large audience with a careful and elaborate essay on the "Application of Art in Manufactures." He did not intend to treat on the general application of art so much as on its particular application to purposes in which architecture is more or less connected with it. And this is the more necessary to be known, now that art is receiving a noble restoration. Although we see some brilliant examples of artists in the present day, the confused knowledge of the generality of them is really the origin of all the solecisms before us and around us. Mr. Crace referred to the small wages paid to the artist by the manufacturer, as one reason why art is, in some manufactures, so low. Instead of paying a good and just price for adequate skill, they paid small prices for inferior patterns, and seemed to act upon the principle of making those patterns which happened to succeed pay for those which fail. He passed a high eulogium upon Pugin, as one of the leaders in the true and only direction, and then entered upon a critical review of art, as exhibited in specialties, as in woven fabrics, paperhangings, earthenware, glass, iron, and brass work and furniture. With regard to woven fabrics, he considered, and laid it down as a rule never to be departed from, that the fabric should be the fundamental element of the design. Silk, worsted, cotton, have each to be appropriately ornamented. What will do for one, will not do for either of the others. With respect to earthenware, he remarked (and we trust the hint will not be thrown out in vain) that a book of the outlines of Greek pottery, and of the ornaments upon it, is much wanted. As to glass, he stated that the celebrated crystal fountain in the Great Exhibition, and now at Sydenham, was a complete failure as regarded the elimination of the prismatic colours. The principle of its construction and workmanship, in this respect, had, however, been conquered, and better works had been produced. After many other useful observations, and amusing exhibitions of gross delinquencies in the forms of art, Mr. Crace urged the importance, first and last, of a true study of nature, and concluded by observing that if we did this, in whatever form we are called to exercise artistic skill, in the objects to which his lecture applied, we should always find that the useful and the beautiful are never apart.

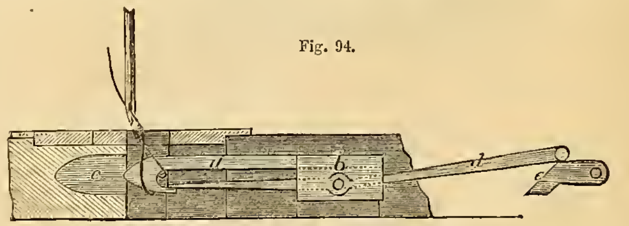
THE HISTORY OF THE SEWING MACHINE.

ARTICLE XIII.

There is nothing very striking in the general arrangement of the machine whereby this stitch is produced. It is composed of the usual table or platform upon which the articles to be sewn are laid, with an overhanging bracket, carrying the vertical needle slide and mechanism. The needle itself is slightly modified in form, as will be seen on referring to the detached elevation given at fig. 93. It is formed with the eye near its point, as in other sewing machines, but just above the eye it is crooked, as shown in the cut, for the purpose of keeping the loop well open for the entrance therein of the looper, the thread of the needle being extended across the crook or bow, after the manner described in Fisher and Gibbons' specification previously referred to by us. As the needle is carried down, towards the end of its downward motion the bulge formed by the crook comes in contact with an adjustable surface beneath the bed plate, which has the effect of forcing the needle sideways until the part below the crook is brought into contact with a gauge plate, also conveniently placed beneath the bed plate. The face of the adjustable surface is grooved, so as to hold the needle steady, and prevent all lateral motion when once in its place. By these means the needle, however flexible, is at the end of its downward motion always brought to its proper position, and held firmly therein, during the next succeeding operation in the process of forming the stitch. The needle having passed through the cloth, and carried with it its thread, which stretches across the crook or bend, the point or nose of the looper, A, (fig. 94), enters the space between the body of the thread and the needle at the crook. This looper is attached to a carrier, B, which slides horizontally below the table, and is actuated by a cam on a cam-shaft beneath the machine. The looper works in a groove, C, in the table, and at right angles, or nearly so, to the motion of the needle. That face of the looper next to the needle is slightly convex in its vertical section, so as to fit the concave portion of the crook or bend of the needle, and the side of the groove against which it works is of corresponding form. The point

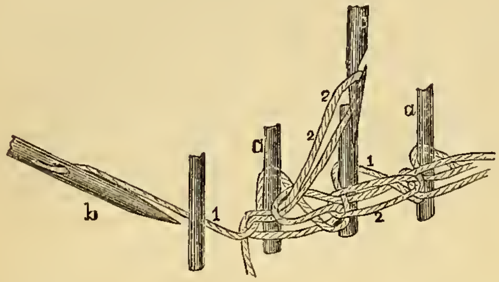
Fig. 93.

Fig. 94.



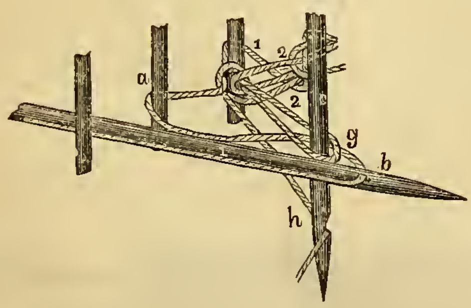
of the looper is lancet shaped, and is hooked or barbed, as shown in the cut. The moment the barb passes the needle, the needle begins to rise, thereby drawing the thread into the recess of the looper, or within the barb, and then as the looper is moved back the thread is drawn out to form a loop. The looper then pauses for a time whilst the needle completes its upward movement, the thread being drawn tight by a spring in the upper part of the machine, which draws the previous loop tight, this being aided by the needle carrier coming in contact with the spring and forcing it upwards by a positive movement. The moment the needle has completed its upward movement, the looper is re-started to complete its back movement, for the purpose of drawing out the thread and extending its loop; and as the thread which passes round the looper is held above by the tension of the thread, and also in the cloth forming the previous stitch, this back movement draws the thread tight in the

Fig. 95.



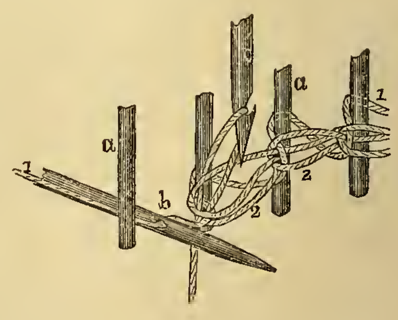
cloth, and is equivalent to pulling on the single thread which forms the stitch on the face of the cloth, because the thread on the other side yields to the downward motion of the needle. A small lever, D, is connected by a pin with the body of the looper, and when the forward end of this lever is pushed down, as shown in fig. 94, the looper is entirely closed, and has an eye instead of a recess, the end of the lever being made to fit in a suitable recess inside the barb to leave the lower edge smooth, and even so as not to catch on the thread; but when the end of the lever is thrown up to the top of the recess, then the barb is open and free to receive the thread to form a loop. When the looper is in its back position, the thread forming the loop lies in the hollow of the looper, and extends thence diagonally on each side to the cloth, and as the looper is drawn back the thread forming the loop is drawn between the inner face of the looper and a piece of cloth or its equivalent attached to the side of the groove. So that when the looper is pushed forward to form another loop, the previously formed loop is held back by the friction against the piece of cloth, so that the lever, D, slides into the succeeding loop, and as the looper is drawn back with the thread forming the second loop in the forward part of the recess, the forward end of the lever, D, which is then within the previous loop, is pushed down into the barb to close the recess; so that the previously formed loop may be liberated and drawn off from the looper by its continued back motion and the tension on the thread as the needle continues its upward movement. It thus follows that as the first formed loop is liberated over the one last formed, the concatenation of the stitches is effected with the previous stitch. An incline, E, is used for opening or closing the looper, the incline being hinged at one end for rising when the looper makes a forward stroke, so that the end of the lever, D, will pass under the incline without being interfered with. The feed of the cloth is derived from a presser foot, which is roughened on its under surface, and is raised from the cloth by a suitable cam after the needle has

Fig. 96.



entered the cloth, so that the cloth may yield to the crook of the needle during its downward motion, and to admit of changing the position of the cloth to give the required direction to the seam whilst the needle is in the cloth and before it begins to rise; so that the cloth can turn on the needle as its centre, which greatly facilitates the making of a seam in any line or curve, as required. Whilst the presser foot is thus held up from the face of the cloth, it is pushed back the distance of a stitch by the action of a spring against the upper end of a lever to which the foot is attached, the range of feed being regulated by an adjusting screw. The cam which elevates the presser foot then permits it to be forced down on to the cloth again by the tension of a helical spring, in which position it remains until the needle is drawn out. The forward feed motion is given to the presser foot so as to push the cloth along by a pin on the periphery of a wheel, which strikes a cranked arm in connection with the upper part of the presser foot lever, and so moves it forward the extent of one stitch at a time. The needle with its crook should make its upward movement whilst the presser foot is down on the cloth, since at that time the foot is furthest removed from the needle, and therefore the flexibility of the cloth and elasticity of the needle will combine to allow of the easy passage through the cloth of the crook or bent portion of the needle, without any positive shogging motion being imparted to the latter. The patentee also proposes to use a shuttle with the peculiar form of needle last described. The stitch we last illustrated, although possessing the advantages of being produced with greater certainty in the machine, is after all nothing more in substance than the ordinary one-thread chain or tambour stitch under a different aspect, and is equally liable to be entirely ripped out on one of the thread ends becoming unfastened. Mr. Newton describes, however, another stitch and mode of producing the seam, composed of two interlooped, indeed we may say *interlocked* threads. In this stitch, instead of alternately looping one thread round the other, the looper carrying the filling thread, which we shall call thead No. 2, is passed through between the needle and No. 1 thread; a second loop is then formed with No. 2 thread, which loop is carried back through the loop of the needle or No. 1 thread, and also through the first formed loop of No. 2 thread, thereby completely tying the second thread round the first one. The diagrams, figs. 95, 96, and 97, show the nature and mode of producing this improved stitch. A, is a series of pins in lieu of the cloth; B, the needle with its thread 1; and C, the looper with its thread 2. The looper, C, first forms a loop F, fig. 95, from the thread 2, and the needle, B, then carries its thread 1 through the cloth so as to form a loop, G, fig. 96, through which the looper, C, passes, by entering between the needle and its thread as shown in fig. 96. The looper then catches thread 2 again, below the needle thread 1, and forms a loop, H. In this position the thread 1, forming the needle loop, G, lies between the two loops, F and H, of thread 2. The looper is then drawn back and pulls the loop, H, through the loop, G, and therefore round the thread 1, and thence through the loop, F, of thread 2, which is thus liberated. The needle and looper are drawn back simultaneously, by which the tie is completed and the stitch tightened, as in fig. 97. From this it will be seen that the thread 2, doubled, is passed through the previously formed loop, and is thus gripped and held whilst the thread 1 is completely embraced by the thread 2. The sewing when completed presents on one side the appearance of "stitching" with a single thread by hand, and on the other three threads are shown, lying smooth and flat, side by side, and admirably adapted to ornamental embroidery. As the three threads lie flat and smooth, the whole of them must be worn through at once before the stitching can be ripped out. As the machinery for producing the stitch last referred to is of a very complex nature, we trust that our readers will be contented with our outline of the general nature of the apparatus employed, without attempting to enter into details, more especially as we have already been compelled to devote a large amount of our space to the elucidation of this invention. To be brief, then, this part of the invention consists in combining with an eye-pointed needle for carrying one thread through the cloth, and with a looping apparatus for forming the needle-thread into a loop, an apparatus for carrying the second thread within the reach of the looping apparatus; so that the said thread may be formed into loops on each side of the needle-thread—the looping apparatus being so constituted as to draw the loop last formed with the second thread through the loop of the needle-thread and the previously formed loop of the second thread. The requisite feed motion is obtained by giving a lateral motion to the needle in one direction after it has entered the cloth, and a back motion after it has been withdrawn, in combination with a vertical motion imparted to the presser foot; so that the cloth may be free to be turned on the needle to give the required direction to the seam, and to be moved forward by the lateral motion of the needle, and then held down firmly to the table during the formation of the stitch and the withdrawing of the needle.

fig. 97.



LAW REPORTS OF PATENT CASES.

Sewing Machines: Thomas *v.* Baker and Darling.—In Chancery. Appeal before the Lords Justices.—This was an appeal from a decree made by the Vice-Chancellor Stuart on the 20th April, 1858, making perpetual an injunction granted by the Vice-Chancellor Wood, on the 14th July, 1857, to restrain the defendants from importing into England, and selling, using, offering, or exposing for sale, sewing machines working or operating with or by means of the use or adaptation of a grooved needle with an eye near its point, or the use or adaptation of a lever to actuate a needle fixed directly or through the intervention of a slide to a needle, or with or by means of the adaptation or use of a cam, or an incline with a cam surface on a rotatory axis to actuate such lever, or with or by means of the use or adaptation of two plates or surfaces having a hole through each, between which plates or surfaces the fabric operated upon is held together when the needle is passing through and through between the fabrics under operation and the plates; or otherwise constructed, contrived, or arranged in imitation or resemblance of the machinery the subject of the plaintiff's patent of the 1st December, 1846, for improvements in machinery for sewing or stitching various fabrics. This suit was one of the many legal and equitable proceedings instituted by Mr. Thomas, in 1857, for the purpose of sustaining his patent. So confident was he in the validity of his patent and its capability of undergoing judicial investigation, and probably with a view to create a *panic* among makers and users of sewing machines, that he filed several bills in Chancery, and brought several actions at law against manufacturers and importers and users of sewing machines. The determination manifested by these proceedings had the effect of intimidating many, who readily paid Mr. Thomas large sums for royalties. However, there were some of his opponents who considered that he had, by his own specification, endeavoured to secure to himself an undue monopoly in the manufacture of sewing machines—that he was claiming, as of *his own* invention, part of the subject of Messrs. Fisher and Gibbons' patent of 1844, and that the exercise by him of his alleged invention involved an infringement of that of Messrs. Fisher and Gibbons'; and they were determined to resist the proceedings adopted, and obtain a decision of the validity or invalidity of Mr. Thomas' specification.

One of the persons against whom Mr. Thomas brought an action at law was Mr. George Waide Reynolds, who, it was alleged, had used sewing machines manufactured by the firm of Grover, Baker, & Co., manufacturers of sewing machines at Boston, in the United States of America, and importers of them into England, where they sold them. Mr. Reynolds appeared and pleaded to the action; and in his notice of objections set forth as evidence of prior publication of part of Mr. Thomas' alleged invention (amongst others) the specification of Fisher and Gibbons' invention; and on the trial the counsel of Mr. Reynolds contended that Fisher and Gibbons' specification disclosed the subject-matter of the second claim made by Mr. Thomas in his specification, but the presiding judge (Lord Campbell, C. J.) was of a contrary opinion, and a verdict was found for Mr. Thomas. Although Mr. Reynolds was strongly advised to have the question of the validity or invalidity of Mr. Thomas' specification determined before a higher tribunal, he was indisposed to do so, and the result was that the proceedings in that action terminated in Mr. Thomas' favour. No sooner had Thomas obtained this advantage against Reynolds than he filed his bill in this suit against the defendants, Baker and Darling, and prayed for an injunction in terms before mentioned. The plaintiff alleged in his bill that the defendants had imported into England, and sold there, sewing machines, in violation of his patented invention of 1st December, 1846; and also that he had, in an action at law against George Waide Reynolds, established the legal validity of his said letters patent, and gave the defendants notice of motion for the before-mentioned injunction. The defendants filed affidavits in opposition to the motion; and contended before the Vice-Chancellor that the machines they had imported and sold were substantially different to those made according to the plaintiff's alleged invention, and also that the plaintiff's specification was void, by reason of its claiming the application of a needle in combination with a shuttle, which was anticipated by Fisher and Gibbons in their patent of 1844. However, the Vice-Chancellor Wood was of opinion that the validity of the plaintiff's specification had been well established in the action against Reynolds, and he made an order for the injunction, and the injunction issued accordingly. On the 20th April, 1858, the plaintiff moved for a decree, and the Vice-Chancellor Stuart (to whose court the cause had been transferred) made the decree now appealed against. In support of the last-mentioned motion, the plaintiff filed further affidavits, in which he stated that since obtaining the injunction against the defendants he had commenced an action at law against Daniel Foxwell for making and selling machines substantially the same as those manufactured by the defendants, Baker and Darling, and that the action had been tried, and a verdict given for the plaintiff on all the issues raised in that action.

Since the making of the decree, in April, 1858, the Exchequer Chamber has declared, in the action of Thomas *v.* Foxwell, that the plaintiff's patent was invalid by reason of the claim which he made for the application of a needle combined with a shuttle, forming part of the patent of Fisher and Gibbons, of 1844. Upon the appeal being called on, the plaintiff submitted that his bill should be dismissed, but without costs; and the Lords Justices concurring in that course, made an order accordingly.—The counsel for the defendant were Mr. Karslake and Mr. Lawson, instructed by Mr. J. Henry Johnson, of Lincoln's Inn Fields and Glasgow. The plaintiff's counsel were Mr. Glasse and Mr. Fooks.

Sewing Machines: Thomas *v.* Foxwell.—In our last volume, page 106, we gave a report of the judgment of the Court of Queen's Bench in this action, brought by Mr. Thomas against Mr. Foxwell, for an alleged infringement of his patent dated 1st December, 1846. In consequence of this decision, on 29th July, 1858, Mr. Thomas obtained leave to enter a *second* disclaimer, thereby reducing his claim for invention to the general arrangement of machinery described in his specification, and shown in sheet 1 of his drawings; and also the arrangement of parts for actuating the needle, as shown in sheet 2 of his drawings. The plaintiff being dissatisfied with the judgment of the Queen's Bench, took proceedings in error, and the Court of Error, after hearing the arguments of counsel for the plaintiff, delivered judgment affirming that of the court below. The question decided was one of construction of specifications. Fisher & Gibbons, in the specification of their patent, dated 7th December, 1844, describe a machine in which a shuttle is used for carrying a thread, or gimp, or a cord, which is sewn on in pattern by means of a needle—the shuttle passing through and through at the head of the needle, so as to pass between the thread of the needle and the needle itself each time the needle passes up through the fabric. Thomas, in the specification of his patent, dated 1st December, 1846, describes a *peculiarly constructed needle* which he uses with a shuttle, and he claimed the application of *a* shuttle in combination with *a* needle, as shown in sheet 1 of his drawings. The Lord Chief Baron, in delivering judgment, expressed his opinion that the combination in the plaintiff's second claim went beyond the mere use stated in fig. 1, sheet 1, of the drawings. The plaintiff claimed the application, not of *the* shuttle in combination with *the* needle, as shown in sheet 1 of the drawings; but the application of *a* shuttle in combination with *a* needle. His lordship quite agreed with the Court of Queen's Bench, that the reference to sheet 1 was merely meant by way of *example*, as would appear from other parts of the specification; so that sheet 1 was not the *entire thing*—it was merely *one* arrangement out of a *great many*. His lordship was therefore of opinion that, upon the construction of the plaintiff's specification, *a* needle and *a* shuttle do not mean merely *the* needle and *the* shuttle described in sheet 1 of his drawings, but that they extend to *other* needles and *other* shuttles. Moreover, that which appeared at the end of the plaintiff's second claim, seemed to his lordship to make this more clear. The plaintiff claimed *a* needle and *a* shuttle, as shown in sheet 1, which his lordship was of opinion was for example; but the plaintiff claimed them, *whatever might be the means employed for working such needle and shuttle when employed together.* Unless, therefore, there were no possible means of working a needle and shuttle, either generally, or even the specified and described needle and shuttle mentioned in sheet 1 of the plaintiff's drawings, the patent could not be sustained. After referring to the plaintiff's first disclaimer, which recites that it had been brought to the plaintiff's knowledge that previous to the granting of his patent, a machine had been described in the specification of a patent granted to Messrs. Fisher & Gibbons, on 7th December, 1844, wherein a series of needles were arranged to act simultaneously together with a like number of shuttles, for the purpose of ornamenting fabrics; but that the plaintiff could not ascertain that such machine was ever put in practice, and that he believed it to be incapable of being worked usefully, his lordship observed that it was very odd that a patent, which was specified as far back as December, 1844, should only have come to the plaintiff's knowledge since he obtained his own patent and enrolled his own specification, and asked why a man should traduce another man's invention quite unnecessarily, and expressed a strong disapproval of that mode of speaking of another invention. His lordship then stated that it appeared to him that the judgment of the Court of Queen's Bench was right, and that it must be affirmed. Justices Williams, Crowder, and Willis, and Baron Bramwell, concurred.

Woollen Manufacture: Brook and Another *v* Aston.—Exchequer Chamber. Before Cockburn, C. J.; Williams, Crowder, and Willes, J. J.; Bramwell, Watson, and Channell, B. B. This cause was tried at the Middlesex sittings after Trinity term, 1857, before Lord Campbell, C. J., and a special jury, when a verdict was found for the plaintiffs upon all the issues—leave being reserved to the defendant to move. (The trial of this cause is fully reported at p. 136, vol. ii., second series, of the *Practical Mechanic's Journal.*) Subsequently a rule *nisi* was obtained to set aside the verdict, and to enter a verdict for the defendant, or a nonsuit, on the grounds "that the facts proved and admitted at the trial showed that the patent (for the infringement of which this action was brought) was invalid in this—that the alleged invention was not new, nor was it a subject-matter for which a patent could by law be granted; nor were the plaintiffs the first and true inventors thereof; and that the facts proved and admitted showed that the alleged invention was but a new use of an old invention." On the argument of this rule before the Court below, that Court made it absolute to enter a nonsuit. Against that decision the plaintiffs now appealed. Counsel having been heard on both sides, the Court said that they were to compare the two specifications of 1854 and 1856, to see whether the second involved an infringement of the first: and having done so, they were of opinion that the second included every portion of that which was the subject of the first, and involved an infringement of it. With reference to the sizing process mentioned in the first specification, but omitted in the second, the Court did not think it an essential part of the first invention. All that the first patent appeared to do was to provide for sizing "as in common use." The first patent, no doubt, was intended to apply to articles already sized, or to be sized in the course of the process, and the object was, as stated in the specification, to give a smoothness and glacé effect, and to be applied to *cotton and linen yarns*. Then the later patent applies the same process to *wool and hair*, which are not to be sized, and do not require a glacé appearance, which would spoil them. The question to be determined was, whether the plaintiff could take the first process, as applied to cotton and linen yarns sized, and apply it to woollen yarns unsized. The machinery was the same, the *modus operandi* the same, and the result the same; in short, the two patents were identical, except that one is to be applied to cotton and linen and the other to wool and hair. This being so, the Court were of opinion that the second did not contain the subject of a valid patent, and affirmed the judgment of the Court below.

Rolling and Tinning Steel made of Puddled Steel: Spence's Patent.—This was an application to the Lord Chancellor to affix the great seal to a patent. The invention was stated to consist in applying the processes of "rolling" and "tinning" to thin steel plates made of "puddled steel." The processes of rolling and tinning, as applied to iron, were admitted to be old. It was also alleged that before the application for the patent, the processes of rolling and tinning—which in this case were applied without any variation from the mode of application to iron already known—had been publicly used for rolling and tinning plates made from steel, prepared by a peculiar process called "Mushet's Process," which was different from the process of preparing steel in the "puddling" furnace; and it was proved that steel prepared in the puddling furnace had been *rolled* into thin plates by a particular manufacturer, but not for the public market, though without any special secrecy; but such plates had not been *tinned* before the application for this patent. The simple question, therefore, was whether a patent ought to be granted for applying the processes of *rolling* and *tinning* to *steel* produced by the *puddling process*. Counsel having been heard, the Lord Chancellor said that when it was clear that a patent would be void, he would refuse to affix the great seal; but unless the case was free from doubt, he could not refuse the patent. In this case there was a question whether the invention was properly subject-matter for a patent; but should it not be, there would be a complete remedy at law;—on the other hand, if the invention should be a proper subject for a patent, by refusing the seal the inventor would be without remedy, and therefore his lordship considered that he ought not to decide the question raised, and ordered the patent to be sealed.

Churns: Griffiths *v.* Turner.—This was a motion in the Vice-Chancellor's Court, for an injunction to restrain the defendant from infringing the plaintiff's right in respect of a whisk and churn, which had been exhibited at various agricultural meetings in the course of last year, and of which Mr. Kent, the patentee of the rotary knife-cleaning machines, was the sole licensee. It was urged that this was a case in which the question would be better tried by a jury summoned before this court than in the ordinary way at law. The Vice-Chancellor said that the delay which had taken place was such as to disentitle the plaintiff to the interlocutory injunction. It did not appear that this was a case contemplated by the Act of last session, which provided for the summoning a jury before this court when in any suit a question of fact was raised. Now, the action in this patent case was not an action to try a question of fact raised in a suit, but an action to determine the legal right, and to such an action the suit was merely auxiliary. The trial would therefore take place at law, under the ordinary order, directing the motion to stand over, plaintiff undertaking to try an action at law.

NEW MUREXIDE PROCESS FOR DYEING WOOL.

For a long time past, chemists and dyers have directed a large amount of attention to the dyeing of wool by murexide; but the processes in most cases have only resulted in the production of a dye by murexide on wool, by the imbibing of the same mordanted, or not mordanted by a solution of alloxane or of alloxantine; or of a mixture of these two substances by afterwards submitting it to a temperature more or less elevated by exposing it to the action of the sun's rays, or to the action of ammoniacal gases and then to the action of heat. In either case, the wool is found to be more or less properly dyed by the murexide, but there is still much wanting to perfect the operation.

MM. Steinbach, Kœchlin, & Co., in reserving to themselves the right of making murexide in crystals, have specified that a solution of alloxane, suitably saturated with ammonia, is more suitable for producing murexide on wool, silk, or cotton, whilst they are thus able to dispense with the use of a high temperature.

By the new process, the present inventor dispenses with the use of the solution of alloxane or alloxantine, the elevation of temperature, and the employment of ammoniacal vapours, and he has arrived at a system of dyeing the wool in a watery solution of murexide, after a previous mordanting process. The following is the process proposed to be adopted:—After having deprived the wool to be dyed of all fatty matter which it may contain, it is boiled for about one hour in an acidulated bath, using by preference tartaric acid, citric acid, oxalic acid, or any other acid of a like nature. A tin mordant, such as is usually employed in dyeing, will produce nearly the same result. After undergoing one or other of these processes, the wool is fit for dyeing. For this purpose it is steeped in a solution of murexide in cold water, although the application of a gentle heat would not be prejudicial. After remaining one or more hours, the wool is found to have assumed a beautiful amaranth colour. By means of a brightening process in a solution of bichloride of mercury, or any other soluble salt of mercury, the amaranth colour will be changed to a bright crimson, or to other shades, according to the mordants employed in the brightening process. The inventor is enabled, by this system, not only to dye wool in all shades by murexide, but also to dye by murexide all woollen fabrics *previously printed*, in patterns of all colours—a result hitherto attained with great difficulty, and always by mordant—the object of such operation being the removal from the wool of its alkalinity. These processes permit of a more extended application in mordanting before dyeing, of all the acids, or acidulated salts, the acidity of which is suitable for producing this effect, and to render the wool thereby slightly acid, and consequently fit to receive the murexide dye.

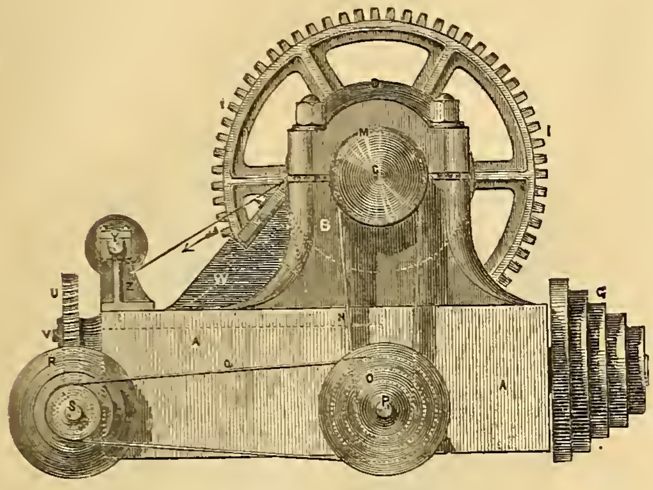
WIMSHURST'S SYSTEM OF CUTTING OR TURNING METAL-FOIL AND SHEET-METAL.

The peculiar ingenuity of this very novel process, the invention of Mr. H. W. Wimshurst of the Assam Tea Company, will be comprehended at once when it is shown that by it sheet metals of various thicknesses are actually turned off a cylinder of solid metal, just as a wood turner takes off a shaving, instead of rolling them down from ingots by the slow and expensive arrangement of a series of rolls, as universally practised hitherto. The first view of this idea of shaving off a sheet of metal by a process which is really that of planing round a cylinder, does not convey a very strong impression of practical success, as it strikes the observer that the turning action must necessarily result in disintegrated slices, or, at any rate, in shavings of an irregular and snarled or snirped-up form. We have, however, before us some very fair examples, both of foil and stout sheet metal, produced by the new process; and although these are early productions, turned out by imperfect machinery, they are good enough to show that the system is practicable, and gives fair promise of becoming a sound branch of manufacture.

The first process of the new manufacture consists in placing a mould in two halves, round a tubular mandril, which is centred in a species of lathe. The metal to be cut is then cast round the mandril, a stream of water being made to circulate through its centre, so as to keep the journals cool, and cause the solidification of the fused metal to take place from the centre, outwards, and thus insure a better casting. The mould is then removed, and a knife or cutter, of a length equal to that of the cylinder, is gradually brought up to it, just as in ordinary self-acting metal turning.

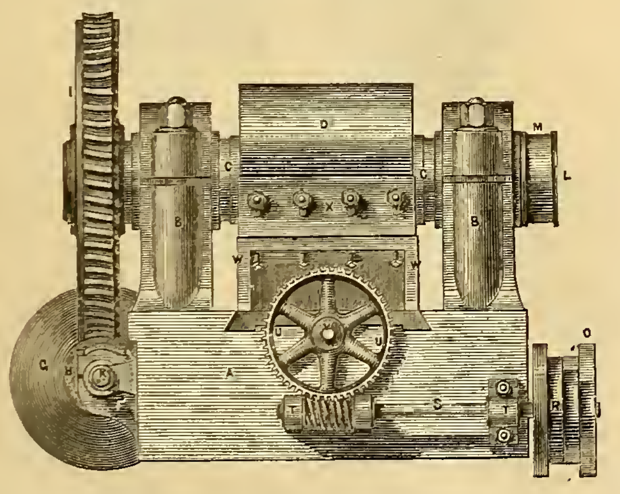
Fig. 1 of our engravings represents an end elevation of the machine used for the purpose. Fig. 2 is a corresponding front elevation of the machine. At A is a cast-iron bed-plate, having two strong parallel vertical bearing standards, B, cast upon it, to carry the mandril, C, on which the cylinder, D, of lead, tin, or composition metal is cast. A slow rotatory motion is imparted to the cylinder under operation, by the horizontal driving shaft, E, working in bearings, F, cast on the side of the main bed-plate, and which shaft carries a belt cone pulley, G, and worm, H, in gear with a worm wheel, I, on one end of the mandril. To prevent back lash, which would materially interfere with the regularity of the work, provision is made for the longitudinal adjustment of the spindle of the worm, H, by the end adjusting screw, K. The mandril, C, is extended beyond its bearing at the opposite end to that which carries the large worm wheel, so as to form a pulley, M. This pulley imparts motion, by means of a belt, N, to a cone pulley, O, keyed on the shaft, P, which works in suitable bearings in the opposite sides of the bed-plate, and is parallel to the axis of the cylinder, C. This cone pulley gives

Fig. 1.



motion by means of a belt, Q, to the cone pulley, R, fast on end of the shaft, S, which works in bearings, T, cast on the front side of the bed-plate. This shaft carries an endless screw or worm, which gears into and drives the worm wheel, U, fast on one end of a threaded screw spindle, V, which works through a fixed nut in the under side of the slide, W, suitable adjustments being adopted for preventing back lash of the slide, W. This slide works accurately in grooves made for that purpose in the surface of the bed-plate, and it carries the cutting tool, X; such tool being so fitted to the slide by means of slots and screw bolts, as to be readily

Fig. 2.



adjusted in its position on the slide. It is obvious that the rotation of the mandril will cause the slide, W, with its cutting tool, to advance constantly towards the centre of the cylinder, and that the knife will thereby produce a continuous shaving or sheet of metal. When found requisite, a stream of water or other lubricant may be kept flowing over the cutting tool, but in most cases this will not be necessary. As the cutting edge extends along the entire length of the metal cylinder, D, and is adjusted so as to be perfectly parallel to the axis of such cylinder, it follows that a continuous sheet of metal will be turned off from the cylinder, D, the thickness of such sheet depending upon the advance made by the cutting tool during each revolution of the cylinder under treatment. Thus by suitably adjusting the belts, N and Q, on their respective cone pulleys, the advance of the knife may be accelerated or retarded; in the first case producing a comparatively thick sheet or foil, and in the second case a thinner one. The continuous sheet or foil, as fast as it is cut, is received on to the collecting spindle, Y, which is carried in bearings in the brackets, Z, and driven either by the machine itself or by the attendant. If found desirable, a pair of frictional drawing rollers may be employed for the purpose of drawing the sheet, or releasing it from contact with the cutting edge of the knife as fast as it is cut from the cylinder or block; such frictional drawing rollers, with the sheet or foil passing between them, being held together by springs and actuated by the machine itself, through the intervention of regulating frictional gear.

The inventor has also suggested that right line planing may also be adopted for the production of foil or sheet-metal. In such case, a rectangular block of the metal would be placed on the table of an ordinary metal planing machine, and the effect of the stationary cutting knife would be similar to that described as arising from the turning action, except that the planed sheets would be restricted in dimensions to the length and breadth of the blocks.

Although for a vast number of purposes the foil, as cut, is quite fit for use without further treatment, it is a question whether rolling, either as it comes from the knife, or by a distinct and subsequent process, would not be advantageous, in as far as putting a fine surface on the metal is concerned. No doubt its external face might be improved in this way; but enough has already been accomplished to show that with perfected machinery good sheet and foil will be produced simply by the cutting action. The market price of ordinary rolled lead-foil—simple as the process is—is about twice that of the lead from which it is manufactured; so that here is a large margin for economical gain by the new process. The Assam Tea Company have looked at the matter in this light, and they have adopted the system for the manufacture of all the lead-foil they use in packing tea, the foil being made in this country, and sent abroad for re-export in the packages. The Assam Company alone expend between £2000 and £3000 a-year on foil. The whole of the lead-foil used by Indian tea growers is made here; but the Chinese growers use foil made on the spot by a very laborious and unmechanical process, as any one may see who inspects the texture of a Chinese tea-chest lining. About 4000 tons of pig lead are annually exported from this country to China for use there in this manufacture. This peculiar manufacture is already very large, as, in addition to the vast consumption by tea growers, enormous quantities of foil are now used by bottle capsule makers, and by dealers in delicate articles, which can alone be conveniently and effectually preserved by a metallic wrapping of this nature. Mr. Wimshurst's invention must necessarily widen the trade very much, if it succeeds in developing the promised economy of one-third of the manufacturing cost.

ENGRAVING AND DAMASKEENING.

Mons. Negre has communicated to the Paris Academy of Sciences the following process, applicable to engraving and damaskeening. He spreads over a metallic plate a coat or layer of sensitive varnish, composed either of a mixture of gelatine and bichromate of potash, or of bitumen dissolved in benzole. This layer of varnish is afterwards exposed to the light with a negative stereotype, or an ordinary positive proof, according as it is proposed to obtain a plate engraved; so as to produce a copperplate impression or a typographic impression. Those portions of the layer of varnish which have been preserved from the action of the light are afterwards removed by means of a solvent composed of oil of naphtha or petroleum, or of benzole. For gelatine or gums, water alone may be used as a solvent. Considering then the heliographic image formed of one of these organic matters as simple reserve or isolating varnish, a deposit of some metal less oxidisable than the metal of the plate is effected by the electrotype process upon the parts which have been left exposed by the solvents. On zinc, iron, and steel plates, the depositing metal employed may be either copper, silver, gold, &c. On copper and its alloys, on silver, tin, &c., gold deposits may be used.

The *heliographic* image formed by the impressed organic matter having been removed by an essence, benzole, or by friction, an image will remain on the plate formed on the one part by the exposed metal, and on the other part by a layer of different metal deposited by the battery. The action of the varnish is restricted, therefore, in this operation, to the reproduction of the heliographic image, since it disappears from the plate; and it is the deposited layer of gold which replaces it, and preserves from the acid those portions of the plate which should remain in relief. For biting the parts not preserved by the galvanic deposit, the author uses an acid diluted with water, which has not any action upon the deposited metal; or a galvanic current. For zinc, iron, and steel, he uses sulphuric acid, if the protecting metal be silver or copper, and he employs nitric acid for steel, copper, silver, &c., if the protecting metal be gold. The metal to be etched is plunged as an anode into a neutral solution of some soluble salt of this metal, or of another metal of a like nature. A proof in greasy ink, of a heliographic plate already engraved, or of a photographic impression on lithographic stone or zinc, and transferred on to metal, produces, when treated like the heliographic reserve, plates engraved either in relief or intaglio.

SIMULTANEOUS PRINTING IN TWO COLOURS.

The simultaneous typographical printing in two colours has been most ingeniously accomplished, on the Continent, by M. Godenne. To obtain the result indicated by M. Godenne, the whole of the pages of a sheet of any size are stereotyped The words to be printed in red (*this applies to liturgical impressions in red and black*) are removed, and the place is perforated or cut out in the stereotype plate. These same words are adjusted or set in another "forme" in blank (quadrats, &c.) of an even height of 5-8ths of an inch. The thickness of the stereotypes is about 1 4th of an inch, which added to the 5-8ths, the height of the quadrats, &c., makes 7-8ths, which is the usual height of printing type. Now, on placing the perforated stereotypes upon the red form, the words in moveable type to be printed in red will be found in their respective lines, and even with the lines and words of the stereotypes which require to be printed in black. The stereotypes are fixed to the bars of the upper frame, by means of small copper plates secured in the middle by a rivet. These plates, when turned across the bars, maintain the stereotypes in a groove. The thickness of this frame is about 3 8ths of an inch. The bars which cross it and support the stereotypes, approach towards or recede from each other at will, by means of two notched blades or racks about 1-16th of an inch thick, fixed upon two sides of the frame. The bars are furnished at their extremities with teeth, fitting into the said blades, and are secured on the frame by the aid of a small hook, the total thickness of which is about 1-16th in. below the face of the letters. In the four corners of the frame are made holes, corresponding to four pins fixed to the carriage of the press, and serving to fix the upper frame to the lower one. By this means the red words are always in their proper position as regards the black words. From the two sides of the upper frame project two lugs, also perforated, the holes corresponding to pins carried on the moveable bars of the press, and which, during the operation of inking the two colours, are elevated about 6 or 8 inches by means of four levers. These pins thus introduced into the holes, maintain the stereotype and its frame perfectly steady and immoveable during the passage of the inking rollers over the formes.

MECHANIC'S LIBRARY.

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RECENT PATENTS.

MOULDING.

James Walker, *Glasgow.—Patent dated August* 7, 1858.

The improvements specified under these letters patent relate to what are technically known by moulders as collapsable core-bars, such as are used for shaping the interior surfaces of pipes and other tubular or hollow articles. The practical object attained by such core-bars is the slight variation in the diameter of the bars, to the effect that whilst the bars may be set with facility to the actual diameter required in the moulding action, their diameter may be at once mechanically reduced to facilitate their withdrawal after the casting has been made. The main shell or barrel of a core-bar of this kind, consists of a thin cast-iron pipe or tubular cylinder, slotted or cut through longitudinally from end to end. Each lip or edge of this slot is cast or formed with a longitudinal thickened portion projecting interiorly, to form the bearing edge surfaces for the action of a series of flat double incline or wedge pieces of metal, by the action of which, the necessary expansion of the core-bar cylinder is produced.

Fig. 1 of the subjoined engravings is an elevation of one arrangement of the improved collapsable core-bar. Fig. 2 is a longitudinal section of the core-bar. Fig 3 is a plan of the top of the core-bar. The main portion, or shell, E, of the core-bar consists of a comparatively thin cylinder of perforated cast-iron, which is made with a longitudinal slot or opening, F, that extends throughout its length. At regular intervals, along the opening, F, and adjacent to each margin, projections, G, are cast or otherwise formed on the interior of the shell, E. These projecting parts, G, are of an elliptical figure in their longitudinal outline, and they form bearing surfaces for distending the shell, E, of the core-bar, as hereinafter described. To prevent the distortion of the shell from this distending action, a flat bar of metal, H, extends throughout the length of the shell, E, and is riveted or otherwise secured thereto; the bar, H, is

Fig. 1. Fig. 2.

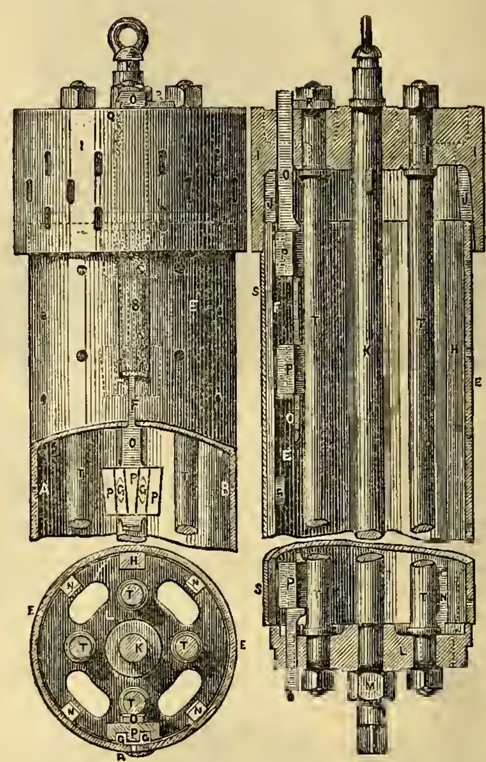


Fig. 3.

arranged diametrically opposite to the longitudinal opening, F. The upper extremity of the shell, E, fits into the lower end of the cast-iron faucet piece or cap, I, of the core-bar. This faucet piece, I, rests upon the shell, E, by its inwardly projecting fins, J, which are cast on the interior of the faucet piece, and come in contact with the upper edge of the shell, E, when it is placed thereon. The metal disc which forms the upper part of the faucet piece or cap, I, is cast with openings formed therein, as shown in the plan, fig. 3. Through the central aperture in the disc of the faucet piece is passed a central rod or bar, K. The upper extremity of the central bar, K, is formed into an eye, as shown in figs. 1 and 2, and its lower end passes through the metal disc, L, which forms a base to the shell, E. The central bar, K, rests upon the disc of the faucet piece, I, by means of a collar which is formed on the upper portion of the bar; a key is passed through the bar on the under side of the upper disc, by which the two parts are attached to each other. The lower end of the bar, K, is passed through a central aperture in the disc, L, and near the extremity a screw thread is cut in the bar, to which the nut, M, is adapted; by screwing this nut upwards, the several parts are securely attached to each other. The bottom disc, L, of the core bar is made with a vertical rim on its upper face, into which the downwardly projecting fins, N, that are cast on the shell, E, fit. The interior of this rim, as well as that of the cylindrical portion of the faucet piece, I, are made to a predetermined size, and serve to limit the distension of the cylinder, E. The main cylinder or shell, E, is caused to expand by means of the wedge bar, O, which in this modification is a flat bar of metal, having projecting wedge pieces, P, cast or otherwise formed thereon. The wedge pieces, P, are formed on the bar, O, at regular intervals apart, corresponding to the distance between the elliptical projections, G. Upon the face of these wedge pieces, P, or that part which is brought in contact with the projections, G, longitudinal grooves are formed; the width of these grooves corresponds to the diameter of the central part of the projecting parts, G, on the shell, E. At the parts where these wedge pieces, P, are formed the bar is thickened a little at the back, so as to obtain a firm bearing against the central bar, K, when the shell or cylinder, E, is expanded. The upper and lower ends of the wedge bar, O, pass through apertures made for the purpose in the faucet piece, I, and the bottom disc, L. The notches or serrations, Q, formed in the upper extremity, are for the purpose of raising the bar with facility. When setting up the core bar for use, the bar, O, is lowered, so that the central wedge-shaped projections, P, between the parallel grooves, pass down between the elliptical projections, G. The bar, O, is forced downwards by means of a lever, one end of which is inserted in the eye of the central bar, K: between the lever and the collar formed on the bar, K, a serrated or stepped piece or bar of metal is inserted. The lever is then depressed, which forces the bar, O, downwards; this action causes the wedges, P, to drive the projections, G, further apart, causing the shell, E, to expand. The serrated bar is then pushed further under the lever, so as to bring its heel upon a higher portion of the fulcrum, and the bar, O, is still further depressed. This operation occupies but little time, and is repeated for three or four or more times, until the desired amount of expansion of the main cylinder or shell, E, is obtained, which is limited by the internal diameter of the faucet piece, I, and the rim of the disc, L. When the wedge bar, O, is depressed to the full extent, the end of the rotating catch, R, which revolves on the bar, K, is brought over the upper extremity of the bar, O, in order to retain it in its place during the casting operation. The longitudinal opening, F, in the shell or cylinder, E, is covered externally by a thin and narrow strip of metal, S, which is fastened by screws or other means to one side of the opening, F. After the casting operation is effected, and it is desired to release the core bar, it is caused to contract, by raising the wedge bar, O. The contraction of the core bar is mechanically effected by the compressive action of the outer projecting parts of the wedge pieces, P, which serve to draw the projections, G, closer to each other as the bar is raised. The catch, R, is turned aside, and the flattened end of a crowbar or lever is put under the upper notch or tooth, Q, and by the depression of the lever the bar is raised to a certain extent. This operation is repeated with the next notch or tooth until the bar is raised so that the wedge pieces, P, are clear of the projections, G, upon which the cylinder, F, naturally assumes its normal condition, and is altogether free of the casting around it.

Core bars arranged according to these improvements are simple in construction, may be readily adjusted and used by the moulder, and are adapted to facilitate greatly his labour, and produce better and more perfect castings at a reduced cost.

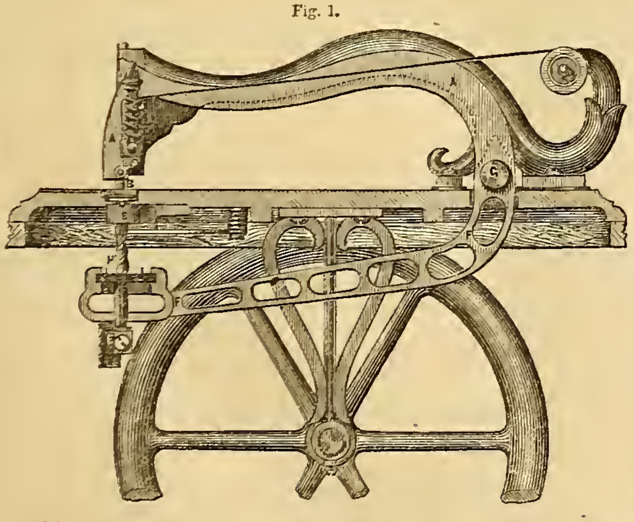
SEWING MACHINES.

J. H. Johnson, *London and Glasgow*, (*communication.*)
Patent dated April 17, 1858.

This invention relates to certain improvements in, and modifications of various parts of sewing machines, whereby a more efficient action, combined with greater economy of construction, is obtained.

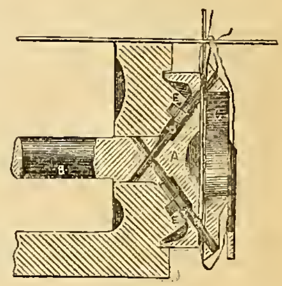
Fig. 1 of the accompanying engravings represents a side elevation of a complete sewing machine, and fig. 2 is an elevation of the apparatus employed for driving or actuating a curved needle. The machine repre-

Fig. 1.



sented is of that variety which produces a double chain-stitch with two threads; but the present improvements are applicable to other varieties of sewing machines. The curved or crooked needle, referred to in this specification, is not a needle in the usual acceptation of that term, as it does not pierce the cloth, but performs two functions:—1st, causing a pirn of thread to be formed around another needle; and 2nd, putting a thread through a loop formed by another needle. The machine, fig. 1, forms the stitch known to the trade as the "Grover and Baker stitch." This machine is provided with a needle arm, A, which carries the needle, B, and with proper spool-holders, tension apparatus, feed and drawing mechanism. C is a crooked needle, which, while sewing, vibrates through certain arcs at proper times, and pauses or rests at determined intervals for such a period as may be necessary. This needle is mounted upon one end of an irregular spiral shaft or spindle, D, supported at the top and bottom in suitable bearings, E, so that it is free to vibrate or rock therein. This shaft or spindle, D, at or near the centre of its length, is formed with a double-threaded screw, D, the threads terminating or gradually running into flat surfaces whose planes are parallel, or nearly so, to the axis of the shaft or spindle. These flat surfaces are shown at E. In close proximity to this shaft works a vibrating or reciprocating driver, F, mounted, in the present instance, on a centre, G, and receiving motion in any convenient manner from the driving shaft of the machine. This driver carries one or more springs, G, which embrace the flat or spiral portions of the shaft or spindle, D, according to the different positions of the driver.

Fig. 2.



When the driver is at one end of the shaft or spindle, D, and commencing to rise, it holds the spindle at rest so long as the springs or driving surface, G, rest against the flat sides of the spindle; but when the springs reach the spiral, they cause the spindle to turn until they arrive at the flat surface or surfaces at the other end of the spindle, when they will stop its revolution and hold it at rest until the driver, by reciprocating in the opposite direction, again brings the springs in contact with the screwed or spiral portions of the shaft or spindle. The shafts or spindles may be vibrated through any required arc, by using a proper number of turns or parts of a turn of the screw-threads of the spiral; its velocity of vibration will also depend upon the pitch of the thread and the speed of the driver, and the time and period of its rest depends upon the location of the flat or straight pieces, and their length as compared with the velocity of the driver. The driver may have a proper actuating surface formed upon or attached to it, thus dispensing with springs; but by using springs, the jar occasioned by the driver striking the screw parts of the spindle on leaving the flat surfaces will be diminished. The best arrangement consists in letting several pieces of watch or clock springs into an opening in the driver, and in order to diminish the noise and rattle of these springs, pieces of raw hide or leather, or similar material, are interposed between them for that purpose. The springs are made to embrace the spindle, and are slotted out for that purpose, merely resting in slots in the driver, being free to slide at right angles to the shaft, or nearly so. This arrangement is found to be the best, as either the driving arm or the shaft itself may get materially out of adjustment without affecting the proper action of the machine, since the springs will accommodate themselves to any moderate amount of deviation of either shaft or driver from their original adjusted position. In the engravings, the driver is shown as making part of an arm which vibrates on a centre, but it may be attached, supported, and moved in any convenient manner, so long as the actuating surface, whatever it may be, moves to and fro to a proper distance on both sides of the spindle that carries the curved needle. The crooked or curved needle being firmly secured to the spindle, partakes of all its movements and pauses; and the precise duty that such needle is required to perform in order to the successful action of the machine, will, as before referred to, govern the precise shape of the flattened and screwed spindle, and the speed and length of vibration of the actuating surfaces of the driver.

The second portion of this invention has reference to an improved construction and arrangement of presser foot, and mode of elevating and depressing the same, for holding down the cloth. This improvement consists in combining a spring with a bar attached to, or making part of the slide, and resting upon a cam or bent lever having a constantly changing fulcrum, such cam or bent lever being altogether unconnected with the bar and slide carrying the presser foot, but simply held in in contact and in working position therewith by the pressure of the spring. The cam or bent lever works in a guiding slot or groove on the top of the fixed bracket carrying the slide, or the thickness of the bar may be increased, for the purpose of preventing lateral displacement of the cam or bent lever. The spring is contained within a recess in the front of the fixed bracket, and bears at one end against the top of the recess, whilst its other end rests upon a bracket formed out of the body of the slide by making three cuts therein, and turning back this tongue of metal into a position at right angles to the back of the slide, which tongue forms the projecting bracket for the spring to rest upon. This is a much more simple mode of forming and actuating the slide than those hitherto employed.

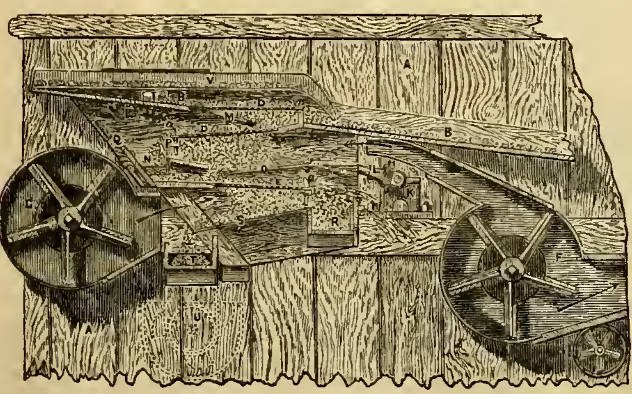
The third part of this invention relates to an improved mode of mounting and guiding the straight needles of sewing machines, whereby greater steadiness and precision of movement of the needle is obtained, with greater economy of construction; and the oil employed for lubricating the needle slide is effectually prevented from being accidentally thrown upon, or brought into contact with the work, as is frequently the case in existing sewing machines where a straight needle and slide are employed. The improvement consists in attaching the straight needle to a hollow cylinder or stem, closed at its lower end, in the hollow of which is fitted to work accurately and freely a fixed rod or plunger, serving as the guide for the hollow needle-holder or slide; the upper end of the hollow needle-holder is expanded slightly, for the purpose of receiving oil or other lubricating material, one or more grooves, channels, or passages being cut or drilled in the rod or plunger to allow the oil to enter between the rubbing surfaces, and to permit the ingress and egress of air into and from the bottom of the cylinder in the process of working. As the oil is thus contained inside the cylinder, there is no possibility of its coming into contact with the work, whilst greater length of bearing is obtained for the needle slide, which consequently works with greater steadiness. The cylindrical slide is actuated by a vibrating arm connected therewith by a slot and pin or their equivalents.

The fourth head consists in suspending a rotating shuttle of a discoidal form on the axis of the driver, by means of pins working into corresponding holes near its circumference, in such a manner that each pin in rotation will slide back out of contact with the shuttle when passing near the point at which the needle enters, so as to give room for the loop to pass over the shuttle, whilst the other pins hold and drive the shuttle. Fig. 3 is a section of this apparatus complete. A is the driver, which has a number of holes passing at an angle of 60 degrees through the centre of the shaft, B, within which slide the pins, D. Each pin has a shed, E, fastened near its centre by a small set screw. The inner face of the driver has a recess turned out so as to afford space for the play of the studs, E. The under flat faces of the studs bear on the bottom of the recess, in order to prevent the pins, D, from turning in their holes. The holes in the shuttle, C, correspond exactly with those in the driver, so that the pins may slide into them, and, by reason of their oblique positions, hold the shuttle perfectly steady. The groove of the stationary cam is so shaped that each pin, as the driver rotates, will be drawn out from its hole in the shuttle when it reaches the upper position near the vertical needle, in order not to interfere with the loop and needle; but so soon as it has passed, it will be forced back again into its place in the shuttle—one of the several pins being constantly sliding either out or in. By this arrangement of driving mechanism, the resistance, friction, and wear of a shuttle running on its circumference within a race or bed-plate is avoided, and the shuttle is kept dry; that is, free from oil, where it comes in contact with the thread, as no lubrication of the edge of the shuttle will be requisite.

THRASHING MACHINES.

William Tasker, *Andover.—Patent dated July* 19, 1858.

In spite of the numerous patents that have been taken out for thrashing machines, that highly useful labour-saving implement is by no means considered to have arrived at the ultimatum of perfection. One of the most recent improvements we have here engraved; the figure represents

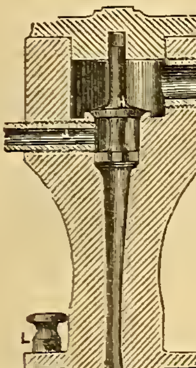


a longitudinal vertical section of that portion of a combined thrashing machine to which the patentee's improvements are applicable. A is the ordinary framing and casing of the machine, and B, the caving board, having the improvements attached thereto. These improvements consist in fitting a riddle, C, into the bottom of the caving board at or near the upper end thereof, beneath which riddle are disposed two other inclined riddles, D and E, which effectually screen the grain from all small seeds and grits. The inclinations of these latter riddles are made adjustable by set screws passing through the curved slots, *a a*, and secured to each side of each riddle. F and G are fan-blowers for winnowing the grain as it falls through the several riddles. The action of this screening and winnowing apparatus is as follows:—The corn, chaff, &c., when thrashed and separated from the straw, is passed through riddles fixed before, and comes in contact with, the first blower, F, as in most other steam power combined thrashing machines, and falls into the barley horner, H, or otherwise, such horner, when employed, being fixed underneath the blower. On leaving the "horner," the corn is elevated by an ordinary elevator to the top of the machine, and discharged into the inclined spout or shoot, I, which opens into the upper part of the caving board, B, such board receiving its shaking or vibratory motion from the crank, K, and connecting rod, L. The corn is now shaken gradually down the caving board, and made to traverse over the riddle, C, fitted therein, which effectually separates the "husseys" or tops of the ears from the corn, and passes them over the riddle and down the caving board to the first blowing apparatus, F, to be sifted and blown again. The corn or grain, after passing through the riddle, falls on to and traverses over the inclined plate, M, whence it falls on to the riddle, D, against the under side of which a blast of air is directed by the blower, F, which also supplies the requisite blast for the first winnowing or blowing apparatus. The refuse, or that which passes over the edge of the riddle, D, falls into a transverse inclined spout, N, fitted with a wire bottom, which spout directs such refuse into a sack, and any corn that may be with such refuse falls through the wire bottom and on to the riddle, E, to be again submitted to the blowing apparatus. The grain which falls through the riddle, D, is caught by the second iron plate, O, and is winnowed as it falls by the blast from the blower, F, the chaff being carried off at P. An adjustable slide, Q, prevents the grain from being carried over with the chaff. From the plate, O, the grain falls on to the third riddle, E, which will remove the remainder of the foreign matter which is shaken over the edge of the riddle into the inclined transverse spout, R, and is thereby directed into a sack placed under the machine for that purpose. The grain which falls through the riddle, E, is again winnowed by the blower, G, and after passing down the plate, S, is shaken into the transverse inclined spout, T, also fitted with a wire bottom, for the purpose of removing the small seeds from the grain before it passes into the elevator box, U. From this box the grain is elevated to the top of the machine, and delivered into a cylindrical screen outside the machine, which separates the grain into different samples for market. The refuse matter separated by the several riddles, with any seeds or grain which it may contain, is again passed through the machine with the newly-thrashed corn, chaff, &c., the whole passing down the iron plate, V, on the caving board, which plate carries them over the riddle, C, and keeps them separate from the grain which enters the caving board by the spout, I, until they have first passed through the "horner" and first blowing apparatus, after which they are elevated and passed through the several riddles hereinbefore referred to. The whole of this apparatus, with the exception of the blowers, is attached to the caving or receiving board, and is of a cheap and simple construction, facility being afforded for adjusting, receiving, and changing the riddles, whilst the different parts of the machine are so arranged as to enable it to be drawn from place to place without detaching any portion of it or removing a single strap.

FEED APPARATUS FOR BOILERS.

H. J. Giffard, *Paris.—Patent dated July* 23, 1858.

The patentee's improvements relate to a peculiar arrangement of apparatus for supplying the feed-water, or other liquid, to steam or other boilers, and for raising and forcing fluids generally. According to this invention, the impulsive force of a steam jet or blast is made to raise and force the fluid required. For this purpose an apparatus of a peculiar construction, but having no working or moving parts, is employed. This apparatus consists of a steam-jet or injection pipe, which receives the steam from the boiler and directs it in a continuous jet into a small passage, the lower end or mouth of which is expanded sufficiently to admit of the entrance of a stream of water, which, by surrounding the steam-jet pipe, forms an annular jet of water with the steam jet in the centre; the supply water is drawn from a well or tank in any convenient situation. Our illustrative engraving represents a vertical section of a simple arrangement of the apparatus, which may be modified and varied in many ways. B is the steam-jet pipe which is fitted with a contracted nozzle, A, and receives the steam direct from the boiler and discharges it in the form of a continuous jet into a species of small chimney, C; this chimney is expanded at the bottom so as to admit of the free passage of an annular jet of water, which is drawn up through the pipe, D, by the action of the steam-jet in the chimney, C, from the hot well or other supply reservoir, and is thus brought into immediate contact with the steam, which transmits an impulse to it and simultaneously raises its temperature. Thus there will issue from the chimney into the air a jet of water only more or less heated. A short distance above the chimney, C, is a double mouth-piece, E, the lower extremity of which is gradually contracted inwards, so as to unite or collect in one compact vein the liquid jet which issues from the mouth of the chimney, C, in a more or less broken or scattered state; whilst the upper portion of the mouth-piece is expanded gradually, so as to cause the jet to lose gradually, and without shock to the liquid, the speed which it has attained; so that it may arrive at the upper portion of the apparatus at a pressure at least equal to that of the boiler, without possessing any notable speed, and consequently without loss of "vis viva." Above the expanded mouth-piece, E, or at any other convenient part of the apparatus, is fitted a small valve, H, the object of which is to prevent the escape of water from the boiler when the apparatus is not at work. Above this valve, H, is the pipe which conducts the feed-water to the boiler. Below the valve, H, is a branch pipe, J, furnished with a stop-cock, upon which pipe a manometer or pressure-gauge may be fitted when required for experiment. The delivery and the suitable proportion of water to be injected in relation to the power of the steam-jet, and to the smallest diameter of the double mouth-piece, E, is adjusted or regulated by means of the regulating screw, K, the effect of which is to increase or diminish the distance between the nozzle, A, and the lower end of the chimney, C, and thereby enlarging or contracting the annular jet of water. Or the regulation may be made by the apparatus itself; for this purpose the nozzle is moveable, and free to slide within a box, being guided at the upper end by a guiding diaphragm, and at the lower extremity by three or four radial arms. The lower aperture of the apparatus is closed by an easy working packing. The steam pressure acting upon this apparatus causes a helical or other spring to be more or less compressed—such spring being adjusted to suit the pressure of the steam employed, and the size of the annular jet of water at the entrance to the chimney. Below the atmospheric pressure, water can condense steam only when its temperature is below 100° Centigrade, in case the initial temperature of the water in the hot well or reservoir or tender (when applied to locomotive engines) should be too high, which cannot always be avoided. To condense the entire quantity of steam issuing from the nozzle, it would be requisite to divide the actuating steam-jet into two parts, as shown in our illustration. The lower portion acting as described, draws up the water and imparts to it only a part of the necessary speed; whilst the second jet or portion arriving by the pipe, G, and having its annular sectional form regulated by the screw, L, imparts to the vein or jet a fresh impulse in the direction of the mouth-piece, F. Now, with this portion of pressure above the pressure of the atmosphere, the water will condense the fresh amount of steam, which then no longer acts, except with the difference of the total pressure already required, and would thus be introduced into the boiler under the most favourable conditions.



BOILERS AND VALVULAR APPARATUS.

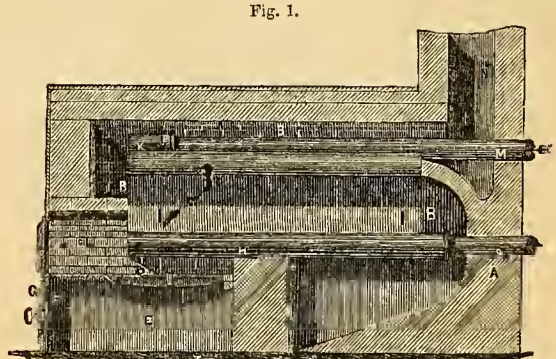
John Meiklejohn, *Dalkeith.—Patent dated June* 3, 1858.

The arrangement of boilers for heating horticultural buildings has from time to time been made the subject of letters patent by the more ingenious of that comparatively limited class of engineers who devote their attention to the effective heating of "stoves," green-houses, and other places specially appropriated to the rearing and nursing of horticultural pets. Among the foremost of this class stands Mr. Meiklejohn, of Dalkeith, to whose most recent production in this way we now direct the attention of the reader.

This invention relates, firstly, to the arrangement and construction of boilers which are more particularly applicable to the heating of horticultural buildings, and for other similar purposes. Secondly, to the arrangement and construction of valves for regulating the flow of water to or from the boiler. Under one arrangement the boiler consists of four tubular water spaces united by a web of a cruciform figure; two of the tubular water spaces are arranged in one plane parallel to each other, and two above. From each of the lower pipes a thin web or water-way springs in a diagonal direction, and these meet each other above the plane of the pipes; from this point the web diverges, and is bounded by the two upper horizontal pipes. The upper pipes are closed at both ends, but at the front part of the boiler are united by an arch pipe, in which are two sockets, to receive the ends of the outlet water pipes. The boiler is set in the brickwork of the heating furnace, with the two lower pipes resting upon the inner walls, the diagonal cruciform web extending upwards, its lower face being directly over the fire—the union pipe of the upper water-ways being directly under the crown of the brickwork. The water flows in at the back part of the boiler through the lower pipes, and thence through the cruciform web to the upper pipes, and through the arched water way to the outlet pipes. The heated gascous matters pass along the lower face of the web, round the backward end, and thence along its lateral faces by the side flues; at the front part of the furnace the heated matters pass over the upper face of the web, and here come in contact also with the upper water spaces and outlet pipes. In this manner the whole of the heat arising from the burning fuel is imparted to the boiler before the heated matters reach the chimney: this is owing to the extensive surface they are caused to pass over on their way to the chimney. In arranging valves for controlling the flow of water from these boilers, and for other similar purposes, one modification consists of a vertical valve chamber, which also serves as an expansion box; in this cylindrical chamber is fitted a ring of metal, the face of which forms the valve seating. The valve is simply a disc of brass which rests upon the seating, the two faces being ground together to ensure an accurate fit. The back or top part of the valve is continued upwards, and terminates in a ring, or other contrivance, by which it may be readily lifted off the seating, and supported at any required height above it. The inlet or supply pipe enters the lower part of the valve chamber, and the outlet just above the valve. When the water passage is to be opened, the valve is raised by the ring, and supported by a cross piece above it, and fitted in the upper part of the valve chamber, which is enclosed by a suitable lid or cover. Valves arranged in this manner are simple in construction, very readily cleaned, and effective in maintaining the tubular passage watertight.

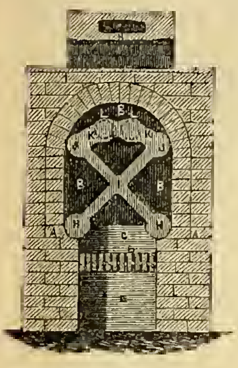
Fig. 1 of the subjoined engravings is a longitudinal and partially sectional modification of the improved boiler. Fig. 2 is a transverse sectional view, corresponding to fig. 1. The enclosing brickwork, A, which forms the furnace, is built up to form internally an oblong arched chamber, B. The side walls of the chamber, B, are curved inwards at the lower part, and upon these parallel ledges the lower parts of the boiler rest. The furnace, C, extends forward in front of the boiler, and is arched over at the upper part: the furnace bars, D, being arranged in the usual manner, extending backwards beneath the boiler. The opening to the ashpit, E, is closed by a door, F, which has openings made in

Fig. 1.



it; these apertures are partially or wholly closed by the rotatory plate, G, which is actuated by a handle in front. By opening or closing the apertures in the door, F, the combustion of the fuel in the furnace may be increased or checked at pleasure. The boiler in which the water is heated consists of four tubular water-ways disposed in two horizontal planes these tubular water-ways being united by a web or narrow water space of a cruciform figure. The lower duplex tubular water-ways, H, rest upon the curved ledges of the chamber, B, and from each of the pipes, H, the hollow web, I, extends upwards in an angular and converging direction, the junction of the lower surface of the web being somewhat below the centre of the chamber, B. From this central part of the boiler the web, I, again diverges until its junction with the upper duplex tubular water-ways, J, which are parallel with the lower water-ways, H. The chamber, B, is built to correspond to the width asunder of the water-ways, H and J, the latter of which rests against the side walls of the chamber. The upper water-ways, J, are united at the front end of the boiler by the union pipe, K, on the back part of which are cast or otherwise connected the two sockets, L, which receive the ends of the pipes, M. These pipes are carried backwards below the crown of the arch that forms the upper part of the chamber, B, so that they receive the heat of the gaseous and non-combustible matters ere they escape into the chimney, N. The lower water-ways, H, at the backward end of the boiler, extend out beyond the web, I, forming two sockets, which receive the ends of the pipes, O, the other extremities of these pipes being made to communicate with the pipes, M, the two series being carried round the building to be heated, so as to form a circuitous route for the circulation of the heated water. The water to be heated passes along the pipes, O, and water-ways, H, rises upwards through the cruciform web, I, and into the upper water-ways, J. From these water-ways the heated water passes through the union pipe, K, and along the pipes, M, which are continued outwards, and carried round the building to be heated and back by the pipes, O, into the boiler. In this improved boiler the surface of metal exposed to the action of the heat is very extensive: the burning fuel first acts upon the under surface of the web, I, whilst the flame and gaseous matters pass along to the backward end of the boiler. At this part the brickwork is so built that the flame and gaseous matters are caused to return along the space between the sides of the web, I, and the chamber, B, to the front end of the furnace. Finally, the heated air and smoke return along the crown of the arch to the back part of the chamber, and thence into the chimney, N. During this circuitous route over the surface of the boiler, the heat arising from the burning fuel is wholly, or nearly so, absorbed by the metal of the boiler and the water circulating through it. The boiler may be made either of cast or wrought iron, and may be used for raising steam as well as heating water; in this case the two pipes, M, may be united after passing out beyond the chamber, B, and the steam be conveyed by a single pipe to the engine, or applied to any other purpose where such an agent is required.

Fig. 2.



The patentee also shows in the drawings appended to his specification an improved valvular apparatus for controlling the passage of water to or from the boiler. The valve box is closed at its lower end, and it has two or more laterally projecting sockets which receive respectively the ends of the inlet and outlet pipes. The valve box is cast with an internal ring or flange, on which a brass valve ring rests, which is fixed in its place by plugging it round with white lead. The upper part of the valve box forms a socket to receive the lower end of a tubular piece, in which is cast an internal flange. The face of the valve ring is ground in a lathe, and to it is fitted a correspondingly ground plug or valve, by preference made of cast iron, faced with a ring of brass. Upon the back of this valve is a stem, which extends upwards in a vertical direction, and terminates in a ring for the convenience of lifting it from the valve seat or ring. The water flows in by the inlet pipe, and upwards through the valve ring, when the valve is raised, and thence away by the outlet pipe. The valve box, as thus arranged, answers also the purpose of an expansion box when heated water is passed through the pipes, and acts as a safety vessel to prevent accidents arising from the expansion of the water by heat.

LEATHER CLOTH.

J. H. Johnson, *London and Glasgow*, (A. Pellet, *Paris.*) *Patent dated March* 8, 1858.

The manufacture of that recently introduced and most useful material known as "leather cloth," has extended into a large and important trade. Mr. Pellet's improvements have reference to an improved system or mode of decorating or ornamenting leather cloths, whereby the cloth so decorated will wear much better than those ornamented in the ordinary manner, as the cracking or separation of the ornamented portions from the surface of the body-fabric, when subjected to friction from constant use, is altogether prevented. In carrying out this invention, the leather cloth to be ornamented has the desired figures or devices painted or laid upon its face, either by the aid of block-printing or by passing it between suitably engraved cylinders, or in any other convenient manner, such figures or devices being printed in colours or in metallic foil, such as gold or silver leaf, and always by the aid of an oil-vehicle or "mordant." It is important that the ornamentation or decoration should be so applied as to lie as flat as possible upon the general surface of the fabric, since parts that are raised in relief are very liable to be injured by friction, and present a difficulty in the subsequent calendering process to which the fabric so ornamented is to be subjected. After the figures or devices have been painted or laid upon the fabric, the entire surface is varnished, and the fabric is passed through a pair of calendering or pressing rollers, for the purpose of fixing the ornamented portions permanently upon the fabric, whereby such ornamented portions become embodied with the fabric, and are not liable to be separated therefrom by cracking or pealing off when in use. The essential feature of this invention, therefore, is the rendering of ornamental designs on leather cloths permanent by the successive operations of varnishing and calendering or pressing between rollers. Patterns of all kinds may be treated according to this invention. Painting by hand may also be adopted in applying the designs to the fabrics, so long as the subsequent operations of varnishing and rolling be employed. Leather cloth so ornamented will be found to be well adapted to the decoration of theatres, and interiors generally of public buildings or private houses, and may be employed in saddle making, in the manufacture of coverings for the head and feet—such as caps and fancy shoes and slippers—coverings for furniture, and a variety of other purposes both useful and ornamental.

SIGNAL LANTERNS.

J. H. Johnson, *London and Glasgow* (Hector L. Stevens, *Washington, U. S.*)—*Patent dated November* 23, 1857.

This invention relates to a peculiar construction and arrangement of the glasses or lenses of ships' lanterns, whereby the general course of a ship may be defined by the aid of a single lantern, in place of requiring three lanterns, as is usually the case. The improved lantern may be fitted with dioptric, plain glass, or round lenses, as may be found most desirable, and is intended to be carried at the bowsprit cap. If the dioptric lens be used, the lamp will require to be slung in gimbals, for the purpose of maintaining it in a constantly perpendicular position during the motion of the ship. Fig. 1 of the subjoined figures represents a front elevation of the improved lantern complete, and fig. 2 is a corresponding sectional plan of the coloured glass screens and the back of the lantern A and B represent respectively the green and red coloured glass screens, the green being on the "starboard" side, and the red on the "port" or "larboard" side, each screen extending over about 90° of the circle. They are separated by the white one, C, of about 45°, which should face directly ahead or in the direction of the vessel's course. By the use of these coloured glass screens the general course of a vessel may be defined by one lantern in place of requiring three, as in the case of steamers according to *regulation*. Thus, if the view be from within two points of abaft the port beam to two points of ahead, a *red* light will be shown by the lantern; and if from two points on the port bow to two points on the starboard bow, a *white* light is seen and from two points on the starboard bow to two points abaft, the brown or *green* light is shown.

Fig. 1.

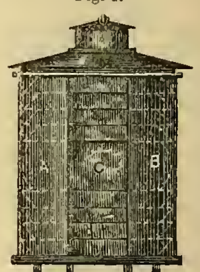


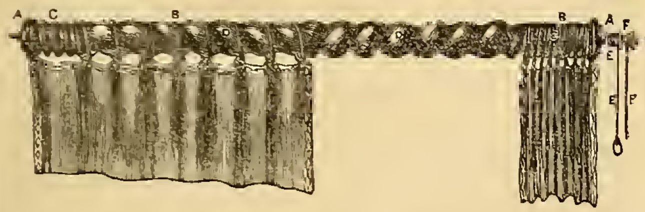
Fig. 2.

It is obvious that the extra screens might be dispensed with provided the lenses or the plain glass of the lantern be made of the required different colours, the same result of three lanterns in one being equally obtained.

CURTAIN RODS.

J. H. Johnson, *London and Glasgow* (J. A. Pelosse)—*Patent dat ed May* 22, 1858.

The curtain rod, according to this invention, has spiral grooves or channels formed upon it, and may be made to rotate upon its longitudinal axis by means of a barrel or barrels, having cords wound round them in opposite directions, so that on pulling one or other of the cords the rod will rotate in either direction required. The curtain rings are each contained in a separate groove or channel of the series formed by the spiral, so that on turning the rod they will run along its surface in either direction according to the direction in which the rod is rotated. The spirals are made of a finer pitch at the opposite ends of the rod, so as to gather the curtains into close folds on each side of the window where double curtains are used, and in this case the two halves of the rod must have their spirals made in opposite directions, thus forming right and left-handed screws. For single curtains one screw or spiral only is required, which must nevertheless be of a finer pitch at the commencement for gathering the curtain closely together at the end. The annexed engraving represents in elevation a curtain rod of the improved con-

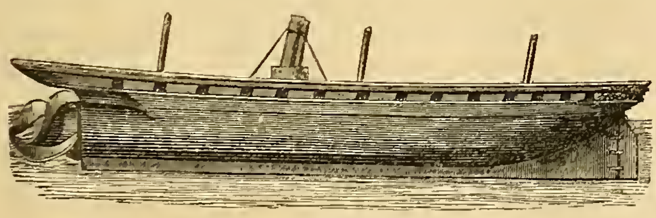


struction. A is the rod, on the right-hand end of which the curtain rings, B, are represented in the small spirals, C, as is the case when the curtain is not extended or opened out. On the left-hand side the rings, B, are represented in the large spirals, D, as they will be when the curtain is drawn out. The cord, E, serves to turn the curtain rod in either direction, for which purpose it is coiled or wound round the groove or pulley, G, and one end hangs down from each side. The same effect may be obtained by the aid of two cords coiled round two grooves or pulleys, but any other simple method may be adopted for effecting the rotation of the curtain rods. Two supports, H, which may be ornamented to any desired extent, receive the ends or journals of the rod, and conceal the pulleys employed for rotating it. These supports are fixed against the wall of the apartment. A rod for a single curtain would be precisely similar to the one shown for double curtains, with the exception that one series of spirals would extend along the entire length of the rod, in place of a right and left hand spiral being formed at each end.

STEAM-SHIP PROPULSION.

John Honeyman, *Glasgow.—Patent dated February* 4, 1859.

Mr. Honeyman's invention relates to a new form of vessel, expressly suited for being propelled by a screw in the bow, as shown in our engraving. The lower part of the hull, that is to say, the portion that is below the water line, is not contracted and narrowed into a wedge-like form, but is built of a cylindrical figure, the width of which corresponds to the width of beam at the upper part of the hull. This enlarged portion of the hull extends from the bow of the vessel backwards nearly to the stern, where it is hollowed in so as to form a concavity or recess at the parts adjacent to the stern post. The enlarged part of the hull is made of uniform width, from the stern backwards, until it curves away inwards to the stern post; or in lieu of making the sides straight and parallel to each other, they may be made gradually narrower as they approach the inwardly curved part at the stern. The cylindrical portion of the hull projects well out at the stern, where it is enclosed by



metal plates or timber, so as to form a flat vertical surface. At this part a screw propeller is fitted, the driving shaft of which is carried through the end disc of the cylindrical part. The screw propeller consists of a conically shaped drum, having vanes or blades extending backwards in a curved direction from the apex of the cone to the base. The disc which forms the base of the cone is made to correspond in diameter to that which encloses the cylindrical part of the hull, the apex of the cone forming the outward termination of the lower part of the hull. The driving shaft passes through the central line of the cone, to which it is keyed or otherwise secured, and is carried thence inside the hull, and connected to the engine or other prime mover. When this propeller is put in motion, its conical figure causes it to pass through the water with great facility, the water that is moved aside by its action glides smoothly and without obstruction along the sides of the hull, until it arrives at the concave part near the stern, where it closes in, and, by its reaction on the hollow portion of the hull, assists the onward progress of the vessel, by which an increase of speed is obtained.

REGISTERED DESIGN.

PORTMANTEAUS.

Registered for Mr. Edwin Parker, *Hanover House, Montpellier, Cheltenham.*

Of late years considerable ingenuity has been shown in improving the arrangement of travelling trunks, leather bags, and portmanteaus, a matter of no small importance to those who travel;—and who does not,

Fig. 1.

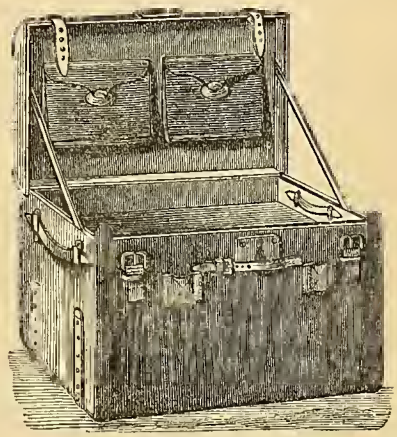
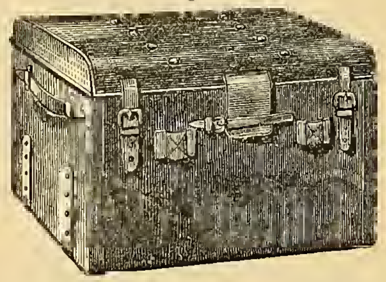
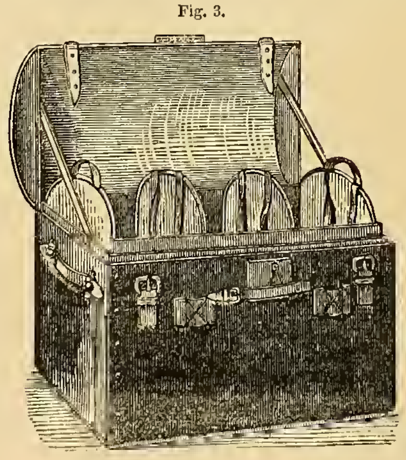


Fig. 2.



in these days of rapid communication? We have engraved two of Mr. Parker's improved portmanteaus. Figs. 1 and 2 represent the gentle-

Fig. 3.



man's portmanteau. The interior of these trunks are fitted to contain, in separate and conveniently accessible compartments, all the requisites of a gentleman's wardrobe and travelling appurtenances. Fig. 3 represents the improved arrangement of the portmanteau for the use of ladies, in which a corresponding careful attention has been paid to meet all the requirements of the user.

REVIEWS OF NEW BOOKS.

Papers on Mechanical Subjects. By Joseph Whitworth, F.R.S. 8vo. Pp. 183. Lithographs. London: Longmans. 1858.

This volume may be characterised as a sort of practical note-book, presenting in a collected and most convenient form the results of some of the work accomplished since 1840 by one of the most accomplished practical mechanics of modern times. It embraces Mr. Whitworth's well known "Papers on Plane Metallic Surfaces, or True Planes," in which he first drew direct attention to the important mechanical process of really trueing a surface, at the Glasgow meeting of the British Association; his "Uniform System of Screw Threads," given in the year following at the Institution of Civil Engineers; his "Address before the Institution of Mechanical Engineers," at Glasgow, in 1856; his paper "On Standard Decimal Measures of Length," at the Manchester meeting of the Institution of Mechanical Engineers in 1857; his results of practice with "Rifled Fire-Arms;" and his official report to Government ou the "New York Industrial Exhibition of 1853."

Much, of course, of what is in this volume has long ago passed into the category of standard mechanical information, and has already had its due effect in fundamentally improving our workshop practice. But there is nothing like a good reliable book of reference on subjects of daily practice, as this is; and we are therefore glad to be able to tell our readers that they have now within their reach a compact volume to which they may satisfactorily turn for information as they want it; information, too, on points of mechanical practice to which the author—than whom there is no living mechanical engineer better qualified for the task—has devoted so large a portion of his life, and in dealing with which he has achieved such brilliant results.

The economical obtainment of a really true plane surface—a uniform pitch and proportion of screw threads, as affecting, perhaps, the most necessary detail involved in mechanical structures—and a satisfactory arrangement of standard decimal measures of length, are now seen to be of the utmost practical value in all mechanical pursuits; and the country may congratulate itself that it possesses a man whose clear, far sight perceived at so early a period the necessity of the measures which he has since followed out with such perfect success.

Elements of Geometry and Mensuration; with easy Exercises, designed for Schools and Adult Classes. Part I. Geometry as a Science; Part II. Geometry as an Art; and Part III. Geometry combined with Arithmetic (Mensuration). By Thomas Lund, B.D. Small 8vo. Pp. 362. London: Longmans. 1854-59.

When the first portion of this very sensible and most useful work appeared in 1854, we expressed a particularly favourable opinion upon it,* and we have to regret that the year 1859 has well commenced before we have been able to report upon the other two parts which make up the sum of the author's scheme. Mr. Lund has looked at his subject with the maturedly reflective eye of a man, who, having encountered the removeable difficulties of the young student, in his own boyhood, has the will, and it may be added, the courage, to attempt to remove them. He has, therefore, proposed to himself to frame a work which should "neither terrify by its size, nor repel, as Euclid does, by a studied avoidance of all practical illustration." He therefore begins with "Geometry as a Science;" thence he naturally goes to "Geometry as an Art;" and equally naturally and properly ends with Mensuration, as it ought to be, or "Geometry combined with Arithmetic."

Hitherto it has been too much the fashion to teach the science to one class, and the art to another; so that whilst university students cared little for the art, commercial pupils cared less for the science. All this is so clearly and evidently wrong—so marring to the efforts both of theoretical and practical men, and consequently so retarding in its operation upon that select and valuable class of men who combine thoughtful theory with energetic practice, that it requires but a fair grappling with the matter to insure a different state of things. What effect Mr. Lund's work will have in this way, of course remains to be seen *Natura non agit per saltum*;—and great and lasting changes and improvements do not usually shock us with their suddenness; but an author who, in giving us geometry really as an art, never supposes the fingers to work without the head, may be said to have worked as such an author ought to do.

* *Practical Mechanic's Journal*, vol. vii., p. 111.

In bringing out the concluding part of the series, the author has had the assistance of the Rev F. Calder, master of the Chesterfield grammar school, who has rendered most valuable help in designing the exercises with which this work is so copiously illustrated. This section of the work is furnished very fully with engravings of the instruments necessary for the practice of what it teaches, thus very greatly enhancing its value in the hands of those who, in their practice, will be content to look back to the guiding finger of science.

Engineering Precedents for Steam Machinery; embracing the Performances of Steamships, Experiments with Propelling Instruments, Condensers, and Boilers. By B. F. Isherwood. 8vo. Pp. 127. Lithographs. New York: H. Baillière. 1859.

The author of this useful volume has long been favourably known as the chief engineer of the United States navy, and he has a right to be heard when he chooses to come forward to give us "Engineering Precedents." His subject matter embraces British gun-boats in China; the despatch screw-steamer *Lynx;* the screw-steamers *Sydney*, *Ireland*, and *Scotland;* the British war steamship *Conflict;* and comparative experiments with the screw and paddle-wheel, as applied to the United States steamers *Spencer* and *M'Lane*.

The gun-boats used by us in China were some of those originally constructed for the attack on Cronstadt; and as the author had the opportunity of examining them both in dock and at sea, when in active service, he has well prepared himself for putting his notes upon them into the form of "engineering precedents." These gun-boats were of three classes—of 40, 60, and 80 horses' power, respectively. They were fitted with machinery by Maudslay and Penn; and the author is careful to point out the exact peculiarities, not only of each size and build, but also the results as regards the corresponding work of the different makers—teaching a very useful lesson in a new fashion.

The *Lynx*, third-class despatch screw-steamer, built in 1854, furnishes the author with an equally good subject for a "precedent;" and in his examination of the *Conflict*, British war screw-steamer, he gives us some very valuable deductions from experiments tried with various screws. The same observation applies to his comparison of the *Lopez*, screw, and the paddle-wheel, *M'Lane*. The chief merit, however, of the volume, lies more in the fact that the author has got together a carefully observed collection of engineering facts, than in the deductions arising from them. Here are indeed records which everybody may examine with advantage, and upon which everybody may form a tolerably clear opinion with benefit to his practice. The series of "precedents" is proposed to be continued. We hope it may.

The Problem of Squaring the Circle Solved; or the True Circumference and Area of the Circle Discovered. By James Smith. 8vo. Pp. 37. Wood Engravings. London: Longmans. 1859.

Why the circle should be squared, we never could conceive. However, as Mr. James Smith, "of Barkeley House, Seaforth, near Liverpool," has devoted a pamphlet to the consideration of the question, we must find room for a notice of his effort. He describes with great, and certainly unnecessary, minuteness, the progress of his experimental examination of the subject, detailing his repetition of the old test of cutting out square and circular areas in card board, reminding us of the dispute as to the relative sizes of two countries, which was settled by mutilating a map with a similar view. This final "squaring of the circle" results in this, that "the ratio between the area of a square whose side is unity, and the area of a circle whose diameter is unity, is as 64 to 50. The circumference of the circle whose diameter is unity is 3·125, and its area, ·78125."

Those who take the trouble to read this curiosity, may form different opinions both as to the mathematical theory educed, and the practical value of the result; but there can be no doubt, we think, that what we have just quoted is very bad grammar. Mr. Smith points out various advantages as likely to result from his discovery; but we fear that his "first literary production" will hardly produce the fruit which he expects.

J. Tylor and Son's Illustrated Catalogue of Plumbers' Brass Foundry. 8vo. Pp. 144. Wood Engravings. Index to the same. 8vo. Pp. 28. Warwick Lane, London. 1858.

These trade works have a real claim to a place in scientific literature. They deal with their peculiar branch of applied science in a directly practical manner, and they are certainly models, no less of amplitude of detail, than of convenient and well considered arrangement. The contents are of a bewilderingly multifarious nature, embracing:—Baths and bath apparatus; high-pressure work; pan and valve closets and closet work; pumps and pump work; well engines; cocks; beer engines; plumbers' brass work; plumbers' tools; steam fittings; gas cocks; fire engines; hose pipe and screws; garden engines; garden syringes: hydrostatic presses; copper vanes, and perforated zinc. This wide selection of articles is most copiously illustrated with very good wood engravings, every article being numbered for easy reference, by means of the separate index catalogue. The title page has an engraving of the quaint-looking front of the works in Warwick Lane, which forms an architectural study in itself. We should be glad to see more of such well executed catalogues, as, if really produced with care, they form a tolerably correct index of the progress of practical mechanical engineering.

Sketch of the Civil Engineering of North America. By David Stevenson, F.R.S.E. Second Edition. 8vo. Pp. 218. Lithographs. London: Weale. 1859.

Mr. Stevenson's observations on the civil engineering of North America have done good service in their time. They were made twenty-two years ago, and were shortly afterwards published in the form which we have ourselves previously noticed. The author was one of the earliest of British engineers to notice, and to take the trouble of publishing in a connected form, some of the giant works which have been carried out by engineers of the United States; and even at this late date he finds, on considering the subject, notwithstanding United States engineering has progressed so largely, that the 1600 miles of railway in use in 1837 have grown into nearly 27,000 miles in 1859, yet the original engineering principles of the country are still applicable, and their example still capable of being judiciously followed, elsewhere. The bulk of the volume is accordingly a repetition of the original matter. It is interspersed, certainly, with much that is of more modern date, and the section on light-houses has been entirely re-written.

For the information of those who may have forgotten the original work, we may add that the volume now before us contains articles on harbours; lake navigation; river navigation; steam navigation; fuel and materials; canals; roads; bridges; railways; water works; house moving; Lowell manufactories; and lighthouses.

Mr. Weale has suggested that the volume might reasonably be styled a "Sketch of Engineering Practice, applicable in New Countries," and in this we quite agree with him. It is pre-eminently such a guide as an engineer should have when he ventures over unbroken ground for the exercise of his profession. We wish, however, that the matter had been rendered more directly accessible, by the addition of an alphabetical index to the contents. Such an aid is always essentially necessary in works of the kind.

Who Invented the Locomotive Engine? with a Review of Smiles' Life of Stephenson. By Oswald Dodd Hedley. 8vo. Pp. 92. Wood Engravings. London: Ward and Lock. 1858.

Mr. Hedley's book, which certainly adds something to the history of the locomotive engine, is intended mainly as a reply to Mr. Smiles' life of George Stephenson, which we reviewed a short time back. Mr. Hedley thinks that Mr. Smiles' book "abounds with distorted facts, and gross misrepresentations," and he now comes forward, and we cannot find fault with him for doing so, to do battle on behalf of his father, Mr. William Hedley, as the real inventor of the locomotive engine. The author goes back to the year 1805, when his father was appointed mining engineer at the Wylam Colliery, being then twenty-six years of age; and he certainly makes out a fair case to show that Mr. William Hedley was really the first practical demonstrator of the possibility of working traction locomotives by the simple adhesion of the plain wheel to the plain edge rail. This portion of the book reads as a new contribution to the history of the locomotive, and it is well worth examination. The author corrects many of Mr. Smiles' errors, by evidence which cannot be mistaken or misconstrued, and he is quite right in doing so. But after all, it is impossible to overlook the fact that all great and lasting inventions are the production of many minds working, distinctly it may be, towards a common object. One thing leads to another, and it is hard, perhaps in most cases impossible, to say where one man's work ends, and that of another begins. If one doubts this, let him turn to the consideration of any important subject which he may fancy, and he will be sure to agree with us. It is the fashion of biographers to give an inordinate elevation to their heroes, and Mr. Smiles was no exception to this leading rule. It is perhaps a generous error to treat great men in this way. But justice must be done, and biography, to be of any value, must not be otherwise managed. Mr. Smiles has written a long, and in some respects a good book, on a pet subject. Mr. Hedley has written a short one, to show that one, at least, of his leading points was a mistake; and Mr. Hedley was quite right in doing so.

Railways in Turkey: Remarks upon the Practicability and Advantage of Railway Communication in European and Asiatic Turkey. By Sir Macdonald Stephenson. 8vo. Pp. 96. Maps. London: Weale. 1859.

For the success of British engineering abroad, we have been largely indebted to Sir Macdonald Stephenson, and we are now glad to hear what so eminent an authority has got to say on the subject with which he must necessarily be so well acquainted. The elaborated report before us, arose out of the fact that the directors of the Ottoman Railway, from Smyrna to Aidin, entrusted Sir Macdonald with the inspection of the works in progress. He accordingly visited Smyrna and Constantinople, and has produced as the result, not merely a report on his special charge, but a practical dissertation upon the value of railways in Turkey. He shows how fine a field is there open for the railway maker, and what advantages this means of communication must confer upon the Ottoman territory. Smyrna, with her population of 160,000, and with one of the finest harbours in the world, and an annual value of exports and imports of £5,000,000, has to depend for her inland traffic entirely upon camels and mules. Between Aidin and Smyrna there are employed 10,000 camels and 500 mules, at a cost of more than £400,000 a-year; and, independent of these, there are at least 20,000 camels employed on various routes in conveying produce from the interior to the sea. Aidin has a population of 30,000, and a surrounding population of 75,000. What railways will do in that country, may be summed up in the fact that, with a population of a million interested in the railways from Smyrna to Afyon, Kara, Hissar—with a climate so splendid—the means of transport is the sole limit to production.

The author lays before us a vast quantity of statistical matter on the subject, and illustrates his remarks by means of an excellent map of Turkey, on a very large scale, and a sketch map of the country showing the railway communication between Europe and Asia. The book is not more valuable in an engineering than in a commercial sense, and the author deserves well of us for his care in producing it.

Progress in Agriculture. By "Sigma." Duodecimo. Pp. 56. Wood Engravings. London: Ridgway, Piccadilly. 1859.

This is a new and improved edition of the little pocket agricultural work which we noticed last month. We are gratified by learning from it that the author's ingenious and compact implements are rapidly growing in favour with agricultural men.

Scientific Englishman; the Advocate of Industry, and Journal of Scientific, Mechanical, and other Improvements. No. I. Square Folio. Wood Engravings. Pp. 16. London: Holt, 300 Strand. 1859.

This is a new weekly mechanical publication in the newspaper form, and as far as No. I. can guide us, it seems to be fairly managed. It was perhaps not particularly well judged to put in the "Winan's Cigar Steamer" as the leading illustration, seeing that it possesses neither novelty nor, as we believe, practical value. The illustrations are good, and the paper and print very respectable; and as far as a periodical of the newspaper genus can really discuss scientific matters, it apparently acts up to its assumed position.

CORRESPONDENCE.

BREECH-LOADING CANNON.

Having devoted twelve years to the construction of experimental breech-loading cannon, I venture to observe that it was not considered necessary or expedient, for some years past, to bring before the public the fact that all the largest of our cannon, and those now in actual use, could at small relative cost be converted into practically serviceable breech-loading cannon, for projecting the elongated percussion shells, &c., &c. However, it now appears the duty of an Englishman to endeavour, through the medium of the press, to give a timely intimation that other possible, and relatively more economical adaptations, as weapons of war, actually exist.

It appears necessary to subject to the test of experience on the largest scale, the normal merits of cannon converted by the plan proposed, when fifteen thousand of the largest of our ship guns, and those used in permanent fortifications, can in a reasonable time, and at a small cost, be made available by a very simple arrangement of parts, not liable to derangement, and uniting, at the same time, rapidity of loading, with accuracy of fire, and safety during every discharge, under all the conditions of actual warfare, and subjected to trials during all the various changes, from intense frost, fog, wet, heat, high wind, darkness, and indeed every incidental variety of atmospheric influence, and worked with ease by few hands and ordinary talent.

The novelty to the public of breech-loading rifled cannon is by no means a novelty, as the pages of the *Practical Mechanic's Journal* can attest for many years past; but the fact of certain encouragement having at last been awarded, has, to all appearance, produced quite a sensation, just because it is a step in the right direction, and as such meets with the uniform approbation of all classes.

It ought not, however, to be lost sight of, that within the past twenty years, many individuals, in different countries, have with various degrees of success, constructed breech-loading rifled cannon, but a series of critical examinations of such constructions, after trials, have made the defects of each tolerably obvious.

In common with the expressed opinion of experienced military officers, I venture to state that it would not be expedient to enter upon the construction, on a large scale, of the particular breech-loading cannon, now in the hands of the Government, even with all its presumed advantages, simply because many of the known defects involved in such constructions have not yet been enumerated, or developed in a tangible shape. But the ugly facts must come out, in the long run, more particularly if it should be considered as a settled thing by those temporarily in office, that the method now in their possession is the "final" arrangement of the principles; or the most economical in a present or ultimate point of view as a weapon of war. With respect to the elongated projectiles, the success of the whole recent triumph has been, and was entirely determined by the construction and peculiarities of the special projectile used, and for small guns it has for years past been found to answer, so as to take the rifling of the cannon with lead.

But a distinct construction of projectile, with even less friction, and uniting certainty of action, is in existence, which is quite impossible to lead the gun, and which can be applied to elongated projectiles of ten inches (or more) in diameter, producing remarkable efficiency when discharged from rifled cannon.

It is also respectfully urged, that the success of a certain form or condition of projectile, must not (or ought not to) determine the unknown or presumed advantages of a merely novel arrangement of some parts of the breech of a cannon. The two conditions and ideas must be kept distinct, not one substituted for the other.

In conclusion, it may not be too late for any scientific body to trace to their true sources the causes of failure, and more especially the true sources of success of any breech-loading cannon, or to attribute in like manner a full share of the success to the kind of projectile used, in contradistinction to the rifled cannon itself.

Consequently it suggests economy to convert old cannon into rifled and breech-loading weapons of war, the weight being an advantage.

An Englishman.

Fair View, Cheltenham, March 9, 1859.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL INSTITUTION.

January 28, 1859.

"On the electrical discharge, and its stratified appearance in rarefied media," by Mr. W. R. Grove.

February 25, 1859.

"On Schönbein's ozone and antozone," by Professor Faraday.

Ozone has already been before the members of the Royal Institution on two occasions: on the 13th June, 1851, when Schönbein's early views of it were given, and on the 10th June, 1853, when the results of MM. Frémy and E. Becquerel, obtained by passing the electric spark through dry oxygen, were described; and also the opinion of Schönbein respecting the entrance of ozone as such (and not as simple oxygen) into combination. Since then, Schönbein has been led to the belief that oxygen can exist in a third state, as far removed by its properties from ordinary oxygen in the one direction as ozone is in the other; and therefore, in a certain sense, antagonistic to ozone. This substance he names *antozone*, and believes that it also enters into combination, retaining, for the time, its special properties. Hence there is not merely ozone and antozone, but also ozonide and antozonide compounds. Thus, permanganic acid, chromic acid, peroxides of manganese, lead, cobalt, nickel, bismuth, silver, &c., form a list of bodies containing more or less of ozone in combination; and the characters of ozone, and of these bodies because of the ozone in them, is that they are electro-negative to the antozonides, *i. e.*, as copper to zinc; they evolve chlorine from chlorides; they cannot generate peroxide of hydrogen; and they render blue the precipitated tincture of guaiacum. On the other hand, oxywater and the peroxides of potassium, sodium, barium, strontium, and calcium, form a list of substances containing antozone. These bodies are electro-positive to the former; they cannot evolve chlorine from hydro-chloric acid, or the chlorides; they evolve the peroxide of hydrogen when treated either by oxy-acids or even the hydro-chloric acid, and they not only do not render blue the white precipitated guaiacum, but they restore that which has been rendered blue by ozone to the white or colourless condition. Now, when two ozonides or two antozonides are put together, with the addition of water or an indifferent acid, they mingle but do not act on each other; but if one body from each list be associated in like manner, they mutually act, oxygen is evolved from both, and ordinary oxygen is set free; or rather, as Schönbein believes, ozone separates from one body and antozone from the other; and these uniting, produce the intermediate or neutral oxygen. Thénard, who discovered the peroxide of hydrogen, showed that the peroxide of silver, when brought into contact with it, not only caused the separation of part of the oxygen of the fluid, but also itself lost oxygen, that element leaving both bodies and appearing in the gaseous state. This experiment, with others of a like nature, and many new ones, were referred to and made in illustration of Schönbein's views. As to the independent existence of oxygen in these two new and antithetical states, ozone has been so obtained, *i. e.*, out of combination, and independent of any other body; but antozone has not as yet afforded this proof of its possible separate condition. Oxywater is the compound in which it seems nearest to a free condition. As Schönbein's view includes the idea that oxygen in these two states can retain their peculiar. properties when out of combination, and have them conferred otherwise than by combination, and as ozone does fulfil these conditions and does exist in the independent state, so it is important that antozone should be pursued by experiment until it gives a like result.

In relation to this subject, the view of Mr. Brodie should be referred to, respecting the condition of certain elements at the *moment* of chemical change, on which he published a paper in the Phil. Trans. for 1850, p. 759, and another in the Chemical Society's Journal in 1855. He assumed oxygen as capable of existing in two states—the particles being polarised to each other by the action of associated particles, and for the moment in the relation of oxygen and hydrogen to each other. He also made many numerical experiments for the purpose of obtaining the equivalent action of the oxygens assumed to be in these opposed polar states.

SOCIETY OF ARTS.

February 23, 1859.

"On the Society of Arts Union of Institutes, and the examinations connected therewith," by Mr. Harry Chester.

"On the library, books, and binding, particularly with reference to their preservation and restoration," by Mr. John Leighton.

"On colouring sculpture," by Professor Westmacott, R.A.—The author stated that the study of the finest productions in the highest walks of the arts of design had led to the establishment of certain fixed principles, upon which the judgment of ages had determined that each art could alone be safely practised. In the imitative arts of painting and sculpture, especially, the proper limits of each had been well and carefully defined. Those who advocated the painting of statues, however, appeared to do so principally on the ground that it was frequently done in ancient times, but this did not, in his opinion, prove the propriety of its being done in the present day. It might, moreover, be questioned whether the practice was originated by any of the great masters of sculpture. It might be laid down as a distinct rule that the legitimate province of sculpture was to represent by *form*, and that what was not represented by *form* did not come under the true definition of sculpture. Sculpture, when employed in architecture, lost its distinctive or special character. After examining quotations from classic authors, as to the use of colour by the ancients, he concluded by making some general remarks upon the importance of not allowing the art of sculpture to degenerate into a possible means of corruption.

March 9, 1859.

"On the Cape Colony: its products and resources," by Mr. W. Hawes.

March 16, 1859.

"On trade marks," by Professor Leone Levi.

Annual Exhibition.—The eleventh annual exhibition of recent inventions opens at the Society's House on the 25th April. Articles intended for exhibition, must be forwarded, carriage paid, on the 7th, 8th, and 9th of April—with a short and clear description.

INSTITUTION OF CIVIL ENGINEERS.

February 15, 1859.

Discussion on Mr. Jameson's paper on Du Tremblay's combined vapour engine.—After the meeting, Mr. Denison, Q.C., exhibited a small crab or winch capable of lifting half a ton with a single pulley, although light enough to be carried in one hand. Several members stated that it had long been known.

February 22, 1859.

Some specimens of timber, recently imported from the north-west coast of America, were exhibited by Mr. G. R. Burnell. It was observed, that the quality and dimensions of this timber, which came from near Vancouver's Island, and the district bordering upon British Columbia and California, appeared to justify rather more than the passing notices hitherto given in the technical journals of the metropolis.

There were now lying in the Commercial Docks between fifty and sixty logs of this timber, upwards of 100 feet in length, and measuring at least 22 inches on a side. There was one log in particular, which was 129 feet long, die square, perfectly straight and sound, apparently free from dead knots, or shakes, and measuring 39½ inches on the side, at the middle of its length. At the butt end it was nearly 4 feet square, and at the taper end it was about 2 feet 4 inches square; and it contained 1302 cubic feet, or upwards of twenty-six loads.

No experiments had been made on the specific gravity, or on the strength of this timber; but from the manner in which it floated, it would appear that its specific gravity was about the same as that of yellow pine. The strength would appear to be equal to that of the best crown Memel, if an opinion might be formed from the way in which some planks had been bent, and the conditions of elasticity indicated under such circumstances.

For bridge-building, roofing, and scaffolding purposes, it was suggested that this north-western American fir would be of great value, on account of its length, and its remarkably uniform character. Some light spars of the same kind of wood, about 119 feet long, and 15 inches diameter at the butt end, had also been imported from the same coast. The price of the very long spars was, at present, about six shillings per foot cubic; this was high, but no doubt it would hereafter be diminished. The price of ordinary lengths was nearly the same per foot cube as that of the best crown Memel deals. Attention was directed to the number and closeness of the annular rings, which indicated that the trees were of slow growth; and it was thence inferred that the wood would probably be durable.

March 1, 1859.

"On the co-efficients of elasticity and of rupture, in wrought iron, in relation to the volume of the metallic mass, its metallurgic treatment, and the axial direction of its constituent crystals," by Mr. R. Mallet.

March 8, 1859.

Discussion on Mr. Mallet's paper.

March 15, 1859.

"Account of experiments upon elliptical cast-iron arches," by Mr. T. F. Choppé.

INSTITUTION OF MECHANICAL ENGINEERS.

August 25, 1858.

"On the improvements and progress in working and ventilating of coal mines in the Newcastle-on-Tyne district, within the last fifty years," by Mr. Nicholas Wood.

"On some applications of the copying or transfer principle in the production of wooden articles," by Mr. John Anderson.

"On improvements in pump valves," by Mr. John Hosking.

"On the locomotive engine shed and turn-tables of the Gateshead Station," by Mr. Edward Fletcher.

ROYAL SOCIETY.

February 3, 1859.

"On platinised graphite batteries," by C. V. Walker, Esq. Specimens of the plates in use for the batteries on the South-Eastern Railway were exhibited.

"On the aquiferous and oviductal systems in the lamellibranchiate molluscs," by Dr. Rolleston.

February 10, 1859.

"Experiments on the action of force upon the respiration," by Dr. E. Smith.

February 24, 1859.

"Researches on the phosphorus bases," by Dr. Hofmann.

"On the different types in the microscopic structure of the skeleton of osseous fishes," by Professor Kölliker.

"On the physical phenomena of glaciers," by Dr. Tyndall. This paper was illustrated by numerous diagrams and experiments relating to the stratification of ice.

March 3, 1859.

"On an experiment, in which the stratifications in electrical discharges are destroyed, by an interruption of the secondary circuit," by Mr. J. P. Gassiot.

"Researches on organo-metallic bodies," by Dr. Frankland.

CHEMICAL SOCIETY.

February 3, 1859.

"On the constitution of lactic acid," by Professor Kolbe.

February 17, 1859.

"On the composition of the animal portion of our food, and on its relations to bread," by Dr. Gilbert. The general conclusions were, that only a small proportion of the increase of a fattening animal was composed of nitrogenous matter; that from 5 to 10 per cent. only of the nitrogenous matter of the food was stored up in the body of the animal; but that the amount of fat stored up was frequently greater than the amount supplied in the food, despite the loss incurred in the maintenance of the respiratory function. Hence the comparative values of fattening foods were proportional rather to the amounts of respiratory than of assumed flesh-forming constituents. It was calculated that in those portions of the carcases of oxen actually consumed as human food, the amount of dry fat was from two to three times as great as the amount of dry nitrogenous matter, and in the eaten portions of the carcases of sheep and pigs, more than four times as great. By substituting for the above proportions of fat their respiratory equivalents in starch, so as to allow of a comparison between meat and bread, the ratios become 6 or 7 to 1, and 11 to 1 respectively. From the independent determinations of Messrs. Lawes and Gilbert, Dr. F. Watson, and Dr. Odling, it appeared that in wheat-bread the rates of starchy to nitrogenous matter was as 6 or 7 to 1; so that in bread the proportion of assumed flesh-forming constituents to respiratory constituents was greater than in the eaten portions of sheep and pigs, and quite equal to that of the eaten portions of oxen; a conclusion altogether opposed to the prevalent notions on the subject.

ASSOCIATION OF FOREMEN ENGINEERS.

March 5, 1859.

This was the usual monthly meeting, when several new members were elected. Mr. Joseph Newton of the Royal Mint, the newly appointed president, read his inaugural paper, "On the influence of mechanical science and mechanical men upon the age in which we live." He commenced with a retrospect of the progress—the rapid progress of mechanical invention, from the dawn of the nineteenth century to its meridian to-day. The infinite and ever increasing resources, of a mechanical kind, for the abolition of manual labour, were remarked upon, whilst the whole field of scientific research which England—from her peculiar geological formation, and her rich mineral stores—presents, was examined into, and favourable deductions made as to future national prosperity.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

February 22, 1859.

Mr. Baxendell directed the attention of the meeting to the consideration of a fine group of spots on the sun; and the chairman, Mr. Hopkins, urged photographers to try to obtain good images of the sun, and thus to make regular observations of the sun's surface.

Mr. Curtis showed that the rain fall at Manchester, in 1858, was only 30·53 inches, against an average for the last 64 years of 35·562. We may congratulate the great workshop on becoming drier.

"On some indications of law in the grouping of unexplained cosmical phenomena," by Mr. Thomas Carrick.

GEOLOGISTS' ASSOCIATION.

March 8, 1859.

This was the ordinary monthly meeting, in the lecture room of St. Martin's Hall, London—the Rev. Thomas Wiltshire, M.A., F.G.S., President, in the chair. The most important business, as far as the immediate interests of the association are concerned, was the election of the very large number of forty-four new members. The paper of the evening was "On the application of Mineralogy to Geology," by Professor Tennant, F.G.S.

ROYAL SCOTTISH SOCIETY OF ARTS.

March 14, 1859.

"On a mode of preventing fire on ship-board," by Mr. Robert Thoms, Dundee.

MONTHLY NOTES.

MARINE MEMORANDA.

Large screw colliers are at present being built on the Tyne, which, if they are kept employed in the London coal trade, cannot but produce important results in the delivery and price of Tyne coals in the London market. The first of those vessels, the *Edward Hawkins*, left the Tyne for London on a recent Thursday, delivered 1,200 tons of coals, and was back in the Tyne by Monday, at noon. This cargo was the second, or 2,400 tons of coals delivered in London in one week. 1,200 tons of coals were delivered in one day in the Victoria London Dock, by hydrostatic machinery, erected by Messrs. Armstrong and Co.

Experiments have lately been tried at Portsmouth, upon a life boat, designed by Mr. G. Turner, assistant master shipwright at Devonport Dockyard. The boat has been built to the order of Miss Burdett Coutts, for presentation to the Margate boatmen. She is built of English elm, and copper fastened. Extra buoyancy is obtained by means of air cases placed 13 inches above the keelson, and divided into compartments partly filled with cork. A bed of cork is fixed throughout the whole surface of the boat, under and behind the air cases. For righting the boat, in the event of her being capsized, a sheer of two feet is given with raised air cases lined with cork at the head and stern, a passage of 18 inches' width being kept in the centre for the steersman to stand, who steers with a sweep oar. She frees herself of water by means of open tubes, nine on each side of her keel, placed fore and aft, and so effectually do these act that with the water reaching nearly to the boat's gunwale, she frees herself in about 15 seconds. With 40 men standing on her gunwale she took in scarcely any water. The following are the chief particulars of the boat's construction:—Length extreme, 30ft.; breadth, 6ft. 6in.; depth, 3ft. 3½in.; extra buoyancy, cork and air, 4 tons; internal capacity, 4 tons; ballast iron hand to keel, 4½ cwt.; draught of water with 26 men, 1 foot 7 in.

The use of factitious steel plates in shipbuilding is gradually extending in a satisfactory manner. Messrs. Charles Mitchell & Co., of Walker, Newcastle, have just launched a steel vessel 225 feet long, 30 feet beam, and 7 feet deep—the first of a flotilla of river boats for India—contracted for in conjunction with Messrs. R. Stephenson & Co., the engineers. This is, we believe, the heaviest experiment of the new plates yet made.

The first sailings for the season of the Peterhead whalers, which have just taken place, included the *Mazinthien*, *Elena*, *Intrepid*, *Kate*, *Xanthus*, *Victor*, *Fairy*, *North of Scotland*, and *Resolution*. The number of vessels which are going to the Northern Fisheries this year is as follows :—Peterhead, 28 ; Fraserburgh, 6 ; Aberdeen, 5 ; Dundee, 6 ; Kirkealdy, 3 ; Bo'ness, 1 ; Newcastle-on-Tyne, 2 ; and Hull, 12—in all 63.

Messrs. Bailey and Leetham, of Hull, have also dispatched from that port two fine screw steamers to the Greenland seal fishery. These are the *Labuan*, of 1,000 tons, and the *Corkscrew*, of 400 tons. The *Labuan* carried out 800 tons of stores and provisions, and the *Corkscrew* 400 tons. The complement of men on board the two amounts to a hundred.

The Commissioners on Harbours of Refuge propose that harbours shall be constructed at Wiek, Peterhead, Carlingford, Waterford, Douglas (Isle of Man), St. Ive's, Padstow, Tyne River, Hartlepool, and Filey. The amount of grant proposed for these harbours is altogether L.2,365,000, greater by L.365,000 than the sum proposed by the select committee. The annual vote on account of these harbours ought not, think the learned commissioners, to be restricted to less than L.250,000 per annum. The gross sum of L.1,625,000 would be raised locally:—viz., L.125,000 at Wiek; L.200,000 at Peterhead ; L.50,000 at Douglas; L.750,000 in the Tyne, by the Tyne Commission ; and L.500,000 at Hartlepool.

Messrs. Fyfe, of Fairlie, in the Frith of Clyde, the well-known, or rather famous yacht builders, have now on hand no fewer than ten of the craft with the excellent performances of which their name is so closely connected. These yachts are all building to order The largest is a schooner of 75 tons. Of the cutters, the two largest are of 35 and 25 tons.

"The Northfleet Docks and London Quays Company" is the title of a scheme just started on the Thames, for the purpose of increasing the dry and wet dock accommodation of the river. There are no dry docks on the Thames belonging to any of the existing dock companies; whilst Liverpool has eighteen dry docks, and there are others across the Mersey at Birkenhead. These can take in vessels of the largest size, such as cannot be accommodated at all in the Thames. The works are estimated to cost £2,000,000. It is a curious fact, that whilst the port of London pays annually nearly £5,000,000 more duty than all the other ports of the kingdom put together, very little increase in dock accommodation has taken place for thirty years.

The Jarron Docks, on the Tyne, have just been opened. They are the largest in the north of England, being capable of accommodating 500 sail at once. Extensive and perfect arrangements have been made for the shipment of coals. It is estimated that 10,000 tons of coals can be put on board vessels in one day in these docks. They will afford great relief to the harbour of Shields by making the tiers lighter, and the navigation of the river easier. The present shipping staiths now used by the company in Shields harbour will be given up. Last year about 1,267,000 tons of Durham coals were shipped from South Shields.

The value of the fine natural harbour of Lamlash, in the Island of Arran, was clearly shown the other day, when it accommodated 160 vessels, which were detained, or driven back by the strong south-west winds. The bay of Lamlash is most admirably sheltered on three sides by the high ground of the island itself, and on the fourth by the small but lofty Holy Island, which closes it in, leaving a fine entrance on each side, with great depth of water. It is a pity that Arran is allowed to remain in such a state of comparative waste as the Dukes of Hamilton have always most supinely permitted.

There are now lying idle in the port of New York, the following steamers :—*Arial*, *Adriatic*, *Baltic*, *Daniel Webster*, *Ericsson*, *Falcon*, *Georgia*, *Josephine*, *North*, *Star*, *Northern Light*, *Ohio*, *Ocean Queen*, *Victoria*, *Vanderbilt*, *St. Louis*, and *Star of the West*, not one of which has been employed during the winter, or is likely to be. The *America* and *Canada*, now known as the *Coatzacoalco* and *Mississippi*, are undergoing repairs previous to being placed on the route between New Orleans and Minititlan, the terminus on the Atlantic of the Tehuantepec route. The three ships of the Vanderbilt line to Europe will probably resume their trips next spring. The *Northern Light* and *Star of the West* will sail shortly for the Isthmus. The *Ocean Queen* is understood to be getting ready for the Pacific.

Crispin's Mode of Constructing Vessels.—Mr. W. H. Crispin, of the Smelting Works, Marshgate Lane, Stratford, Essex, has recently proposed a new mode of constructing ships of iron and wood combined. The hulls of such ships are of iron, somewhat thinner than usual, and this is covered both externally and internally with wooden planking, bolted completely through the iron and wood, and so arranged as to break joint, and thus add to the strength of the vessel. The external and internal wood-work should be caulked, in order effectually to prevent leakage. In some cases, it may be desirable to place the external planking in the ordinary horizontal manner, and to arrange the internal planking diagonally ; and where great strength is required, as in ships of war, the series of wood and iron and wood may be duplicated or tripled . The hull thus constructed admits of being sheathed with copper or other sheathing metal, and thus obviating one of the great objections to iron ships ; whilst, in the case of ships of war, the arrangement of wood and iron, in accordance with this invention, will prevent the disastrous consequences occasioned by the fragments of iron, when ships, built entirely of that material, are struck by shot; at the same time, much greater facility being afforded for repairing the shot holes. The deck of the ship or vessel may be constructed upon the same principles as the hull, in which case it may be desirable to place the lower or under planking transversely, or across the ship.

Steam-Ship Performance.—The British Association, at its meeting at Leeds, appointed a committee to call the attention of proprietors of steam-vessels to the "great importance of adopting a general and uniform system of recording facts of performance of steam-vessels at sea under all circumstances, and to report to the Association at its next meeting; and this committee has now issued a form of return for the purpose of obtaining satisfactory practical information on the subject. The return is intended to contain such particulars of the trials in smooth water at the measured mile as it is usual to obtain for the satisfaction of the designer of the vessel and the builder of the engines; and the committee are aware that such particulars are usually confined to the knowledge alone of those persons. It is, however, well known that information respecting these trial performances constantly appears in the newspapers, and that, not being authentic, and seldom furnishing all the requisite data, very erroneous conclusions are liable to be drawn from such statements. The committee believe that authenticated facts, recorded in the form proposed, would materially aid the scientific naval architect and the practical shipbuilder, together with the engineer, in determining many elements which are at present held as opinions only, and about which considerable differences prevail. The object of the committee is to make public such recorded facts through the medium of the Association, and being accessible to the public in that manner, to bring the greatest amount of science to the solution of the difficulties now existing to the scientific improvement of the forms of vessels and the qualities of marine engines. They will especially endeavour to guard against information so furnished to them being used in any other way, and they look for the co-operation of members of the Yacht Club having steam yachts, of shipowners, as well as builders and engineers. The return of particulars of performance at sea will afford the means of making such comparisons with smooth water performances as cannot fail to throw light upon qualities of vessels, which as yet are matter of speculation only. The chairman of the committee is Vice-Admiral Moorsom, and the secretary, Mr. Henry Wright, the head-quarters being 11 Buckingham Street, Adelphi, London.

Suffield's Marine Engine-Room Telegraph.—Mr. T. Suffield, of the Brass Works, Bermondsey, has recently introduced a new telegraph for use on ship-board, and in communicating between the captain on deck and his engineer below. The Admiralty have had one fitted on board the *Cressy*, war steamer, Capt. Halsted, in which situation it has been tested in competition with other schemes of a like nature. When tried whilst the *Cressy* lay at anchor at Sheerness, the results were so satisfactory as to induce Capt. Halsted to go out to sea, when, after manœuvering and going out, he pronounced the invention to be perfectly successful.

Statistics of Shipping.—There are at present 1824 steam vessels registered in this country, of which fully two-thirds, or 1368, are registered in England, nearly one-sixth, or 294, in Scotland, and one-twelfth, or 151, in Ireland. These 1824 steam vessels have a tonnage of fully 417,000 tons, of which 296,000 tons belong to England, 81,000 to Scotland, and 39,000 tons to Ireland. The steam vessels with the highest tonnage are the *Atrato*, of London, belonging to the Royal Mail Steam Packet Co., built, in 1853, of iron, 3367 tons gross, 750 horse-power, 336½ feet long, 40¾ feet broad, and 33½ feet deep in hold ; and the *Persia*, of Glasgow, belonging to Messrs. Burns and others, built, in 1856, of iron, 3300 tons gross, 900 horse-power, 376 feet long, 45 feet broad, and 30 feet deep in hold. Of these 1824 steam vessels, 677, being fully one-third, are under 50 tons each, including such small crafts as the *Disowned*, of London, 4 tons. 929, or fully a half of these steamers are built of iron, and 552 of them are screws. Besides these there are registered in the colonies 308 steam vessels, with a tonnage of 36,000—making an aggregate, for the United Kingdom and its colonies, of 2132 steam vessels, and 454,000 tons. According to the Parliamentary return, the oldest steamer is represented to be the *City of Baltimore*, said to have been built in 1810 ; but this is doubtless a mistake, and her owner will certainly think it no compliment to have her put down as perhaps 40 years older than she is. This honour of age must therefore be reserved for the *Industry* of Glasgow, built in 1814, and belonging to Mr. John N. Kidston and others.

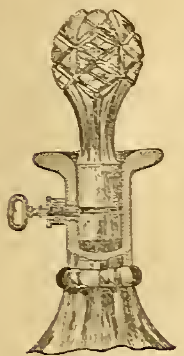
But the sailing vessels of our mercantile navy vastly preponderate in number and tonnage over the steam vessels. Altogether there are 25,273 sailing vessels registered in this country, of which 19,117 belong to England, 3214 to Scotland, 2075 to Ireland, and 867 to the Channel Islands and Isle of Man. 9525, being more than a third, of these sailing vessels are under 50 tons each. The entire tonnage of the sailing vessels amounts to 4,141,000 tons, of which 3,298,000 belong to England, 559,000 to Scotland, 218,000 to Ireland, and 66,000 to the Isle of Man and Channel Islands. To these have to be added 9683 sailing vessels registered in the colonies, with a tonnage of 937,000 tons—making an aggregate for the British Empire of 34,956 sailing vessels, with fully 5,000,000 tons. Belonging to this country and its colonies there are thus 37,088 sailing and steam vessels, with a tonnage of 5,532,000.

During last year 1014 vessels were built in England, 225 in Scotland, 39 in Ireland, 46 in the Islands of Guernsey, Jersey, and Man, and 721 in British possessions abroad, being 2045 in all, with an aggregate of 423,000 tons, and 74 vessels, of 27,000 tons, were purhased for this country ; so that our shipping was increased by 2119 vessels, and 450,000 tons. From this, however, has to be deducted 662 vessels wrecked, 79 broken up, and 90 sold to foreigners during last year ; making 831 in all of 195,000 tons. After deducting these, there is still left an actual increase of 1288 vessels, and 255,000 tons. The previous increase was 320 vessels in 1856, 344 in 1855, and 1038 in 1854.

Compared with our 37,000 vessels, and five and a half millions tonnage, the shipping of every other country in Europe is comparatively small. Spain has only 5175 merchant vessels, with a tonnage of only 350,000, or about one-sixteenth of the British. Austria has but 3393 vessels, with a tonnage of 323,000. Sardinia has only 3174 vessels, with a tonnage of 178,000.

The number of persons employed in navigating our vessels amounts to 287,353, forming an excellent body of reserve should it be necessary for our navy to come into collision with any foreign power.

Spring-Lock Decanter.—Messrs Stevens and Fitch, of Great Queen Street, Lincoln's Inn Fields, London, have recently introduced an important improvement in the mode of fastening or locking the stoppers of bottles, decanters, jars, and other similar vessels. The subjoined engraving shows one of the patentees' modifications applied to a decanter.



A hole is bored through the neck of the bottle or decanter; into this hole is fitted a short metal tube, the exterior of which has a screw thread cut on it. A bolt or plug is fitted within this tube, the inner end of which is pointed, and projects through the neck of the decanter. A short helical spring is passed over the outer end of the bolt, this part being made of smaller diameter than the other portion. The spring is kept in its place, and presses against a cap which is screwed on to the short metal tube. This cap has a lateral aperture in it which gives access to the end of the bolt, in which an internal screw is tapped. The stopper is made with a groove that is cut in the lower part, which enters the neck of the bottle, and it is held fast therein by the end of the bolt entering this groove. The end of the bolt is made conical, and when the stopper is inserted in the bottle, the pressure of its lower edge forces back the bolt, which yields on the compression of the helical spring; when the stopper is fully down, the bolt springs forward into the groove, and the stopper is securely locked. To unlock it, the key is inserted through the cap, and screwed into the bolt, which is then drawn back; this action compresses the spring, and releases the bolt from the stopper. The application of this invention to chemical bottles, and other holders in which poisons are contained, is of the utmost importance; and we earnestly hope that every one having occasion for such articles will take care that they are duly secured in locked vessels.

Steam Hammers.—The following paragraph has recently appeared in several of the public prints:—"Messrs. R. Morrison and Co., of Newcastle, have just completed, for the Mersey Steel and Forge Company, the largest steam hammer in England, and probably in the world. The total height is 21 feet, and the width between the frames 14 feet 6 inches. The clear height from the ground to the under side of the frames is 9 feet 4 inches. The hammer bar is 15 inches in diameter, and 19 feet long, and is made of steel, with the piston, which is 36 inches diameter, forged in one solid piece. The hammer bar forms a solid mass of steel, weighing above 7 tons in the finished state, with a stroke or clear fall of 6 feet. The gearing for working it is very simple. It consists of a single lever, which, in the hands of any competent engineman, is amply sufficient to render the huge mass obedient to the slightest wish of the forgeman. The cylinder is 36 inches diameter, and weighs, finished, above 8 tons; the two frames weigh 15 tons." We have already engraved Mr. Morrison's hammer in our plate 105, vol. vii., and we can therefore speak with decision as to its simplicity and practical value. But any one who compares the statement as to size, in the paragraph just quoted, with the article and plate of Mr. Condie's "moving cylinder hammer," in part 113, vol. ii., second series, of this *Journal*, will see that the great Glasgow hammer is both larger and more powerful in its stroke, than that in Liverpool. In March, 1853, Mr. Condie erected a 6 ton hammer, with a 6 feet stroke, at the Lancefield Forge, Glasgow, with a width of opening in the framing of 20 feet, or 5½ feet wider than Mr. Morrison's hammer. This is the hammer with which all the large forgings of the *Great Eastern* were made. In July, 1857, Mr. Condie also erected, at the Glasgow Forge of Mr. Alexander Fulton, the 6½ ton hammer, with 7½ feet stroke, which, as we have already said, we have engraved in plate 212. This hammer has since been altered to 7 tons, with a width of 20 feet of opening in the framing, and a height of 8½ feet of clear working space beneath the horizontal bar of the frame; and it is, without doubt, the largest hammer at work in Great Britain. But we shall be glad to see both makers striving to bring out such admirable tools of a still larger size.

Manufacture of Horn by Rolling.—M. Possoz, of Ixelles, Belgium, has lately suggested the adoption of a combined softening and rolling process for working up horn into various articles and shapes. As a primary treatment, the horn is subjected to the action of a hot bath, being kept at a constant temperature by a jet of steam at a pressure of sixty or seventy pounds. In this way, the very heart of the horn is penetrated, and the material is rendered fit for undergoing the rolling or laminating process. When withdrawn from the baths, the pieces of horn are forced on to conical mandrils, for the purpose of straightening them. In this condition the horns remain until sufficiently hardened, when they are taken off the mandrils and split longitudinally into two halves, either by a circular rasp or by a cutter. The horns are again placed in the hot bath for a second softening, and afterwards in a cylindrical wrought-iron vessel, formed with a double bottom and filled with oil, into which a jet of steam is introduced. This vessel is worked under a high steam pressure as in the former case, and the horn is now rendered supple and soft and fit for the rolling operation. The "grain" of horn always runs straight, that is to say, the fibres are parallel to each other in the length of the individual horns; and consequently, when rolled, these fibres are all lengthened and compressed, and thus the material preserves its elasticity and solidity. When umbrella and parasol ribs are to be made, this rolling system affords peculiar facilities for the purpose; the whole process, in fact, does for horn, what has been so well accomplished for iron.

Railway Accidents in 1858.—Between the 1st of July and the 31st of December, 1858, 133 persons were killed, and 381 injured by railway accidents in the United Kingdom. 15 passengers were killed, and six injured from their own misconduct and want of caution, while 49 servants of railway companies were killed, and 25 injured from their own carelessness and violation of rules. 12 persons were killed and injured at level crossings, and 37 were killed and injured while trespassing. The total number of accidents to passenger trains during the half-year was 24, and to goods trains 5; 19 of these accidents arose from collisions.

Gourlier's Mode of Electro-coating Metals.—This is a French invention for coppering, zincing, tinning, and bronzing metals by the agency of the galvanic battery, and baths composed of various chemical elements. The chief feature consists in the preparation of the baths, the composition of which has always for a base a metallic salt, or metallic salts combined with one or more alkaline metalloids. These compositions vary with the character of the metal or metals with which the primitive metallic surface is to be coated. Hence there are different formulas for each of the operations of red and yellow coppering, bronzing, and the application of German silver or white alloy.

For Red Coppering.

Distilled water, 1,000 parts; yellow ferro-cyanide of potassium, 40 parts; hyposulphite of copper, 20 parts; carbonate of potass, 20 parts.

For Yellow Coppering.

There is added to the previous solution, sulphate of zinc, 25 parts; and this is then dissolved and filtered.

For White Alloy or German Silver.

The chlorides of the three metals forming the alloy are first produced by following their proportions, and these are then dissolved in a concentrated solution of cyanide of potassium, then 77 grains of liquid ammonia are added for each half-gallon of liquor obtained, and the mixture is filtered.

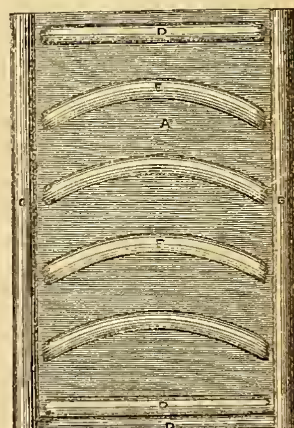
For Bronzing Wrought and Cast-Iron.

Distilled water, 1,000 parts; yellow ferro-cyanide of potassium, 28 parts; chloride of copper, 15 parts; proto-chloride of tin, 40 parts; hyposulphite of soda, 40 parts.

All these baths are placed in cast-iron boilers heated by slow fires, and the metal to be coated with the precipitate of copper, bronze, or white alloy, is brought into contact with the negative pole and plunged into the bath. This procedure is of course identical with that of the ordinary galvanoplastic process. Great care must obviously be taken to secure a clean, bright surface on the objects to be coated.

Enfield Rifle Establishment.—It seems there has been some gross blundering perpetrated at this establishment. Our soldiers in India who have been recently supplied with the Enfield rifle, having made many complaints against the cartridges, on the ground that they did not fit the rifles, it was at length determined to have an official examination, with a view of ascertaining where the fault really lay. "In consequence (says the special correspondent of the *Times*) of repeated reports of the inefficiency of the Enfield, owing to the impossibility of loading it, a rigid investigation was made into the ammunition and the new Enfields in the arsenal at Allahabad by officers under the direction of the Commander-in-Chief, and it was then found that the bores of the Enfields varied, so that at least 12 per cent. of them were too small for the ammunition. The latter was all of proper size. It is quite as well that this little mistake was discovered out here, and that it was not reserved for exposition to the time of some great European war, in which we should have found twelve men out of every hundred soldiers helpless in the day of battle." One might have thought that it was the duty of the authorities at Enfield to see that the rifles were all right before they were sent out to India, but the ways of royal servants are inscrutable.

M'Gavin's Improved Metal Roofing Plates.—A large amount of business is done in the export of metal roofing plates to our colonial possessions in Australia, these corrugated plates being found to answer the colonists' purpose much better than any other material for covering buildings. We have engraved the improved form of roofing plate, for which Mr. M'Gavin, of the Clyde Galvanising Works, has obtained colonial letters patent.



The engraving represents one modification of the improved roofing plate, manufactured for the purpose of roofing or covering buildings. The roofing plates consist of thin sheet iron pressed or stamped to the required figure, the sheet iron being previously galvanised or coated with a thin stratum or layer of zinc, to protect the metal from the influence of moisture and prevent its oxidation. The roofing plates are so stamped or impressed that each plate has a curved ridge formed on each side in the direction of its length. One of these ridges is bent, so as to form a curve of rather more than a quarter of a circle, as shown at B. The ridge, C, on the opposite side of the plate, A, is curved to the figure of a semicircle, this ridge being intended to overlap the ridge, B, of another roofing plate, when the plates are laid side by side to cover in a building. An increased rigidity is given these roofing plates by impressing or otherwise making horizontal and curved ridges in a direction at right angles to the length of the plate. According to this modification, there are three horizontal ridges, D, in each roofing plate—one near the upper edge, and the other two at the lower part of the plate. Between the parallel ridges or corrugations, D, are four or other number of curved ridges, E, which are impressed or otherwise formed in the plate, of a corresponding figure, and at equal distances asunder. Instead of making these ridges, E, of a curved form, they may be made of an angular or pointed figure. An important advantage attending the use of these curved or angular ridges is, that by giving to them this particular configuration, rain water runs off freely from the surface of the plate, and dust or other solid matter that may be deposited upon the roof is at once carried away by the unobstructed flow of water. In using these roofing plates for covering in buildings, they are laid upon the battens of the roof with the semicircular ridges, C, overlapping the ridges, B, of the neighbouring plates, and the lower edges of the upper row of plates overlapping the upper edges of the series below, so as to exclude effectually leakage of rain water into the building.

Wilkinson's Improved Pump Valves.—Mr. Wilkinson, of Ashford, Kent, has recently introduced the arrangement of pump valves represented in the subjoined figures. According to the arrangement shown in figs. 1 and 2, the valves are of a circular or cylindrical form, having a vertical section in the form

Figs. 1 and 2.

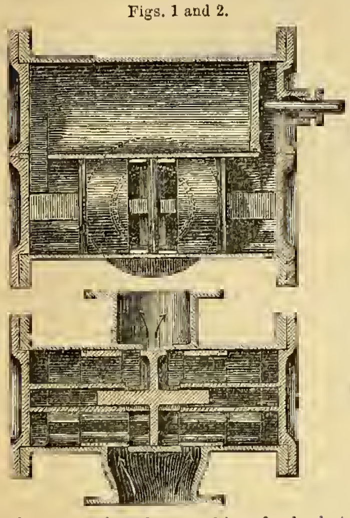
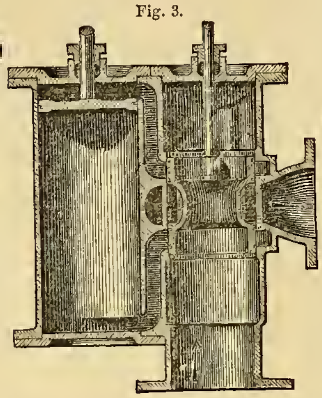


Fig. 3.



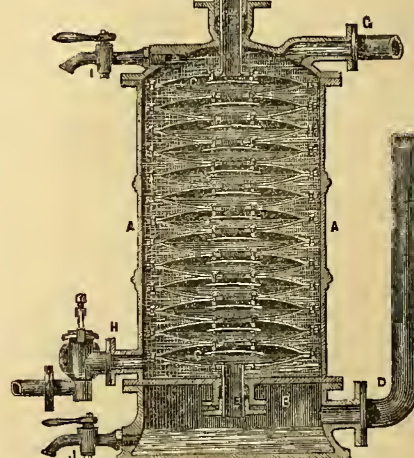
of an H, such valve working freely, but fluidtight, in a cylindrical chamber, bolted to or forming part of the pump casing. This chamber is formed on one side, with one or two inlet ports (according as it is required for a single or a double acting lift and force pump), and with a single outlet or delivery port on the opposite side. The central portion of the valve has corresponding apertures in it arranged in such a manner that, when the working piston of the pump is put in motion, the vacuum on one side and the compression on the other will move the valve so as to open the inlet on the one side and the outlet on the other alternately. Suitable metallic packing rings are fitted into grooves in the valve, for the purpose of keeping it fluidtight in its casing or chamber. According to another arrangement of the improved valves, shown in fig. 3, and which is adapted to be worked by an eccentric cam tappet or other suitable contrivance, and is applicable to the raising and forcing of fluids whilst working at a high velocity, the inventor uses a circular valve, having a clear passage round the outside of the valve for ingress or egress, and an opening or water-way through the centre of the valve, which is packed by elastic rings to enable it to work sufficiently watertight within its casing or cylinder. The portways over which this valve works should be cast with bridges, or in the form of a grating, to prevent the packing rings from slipping into them.

Highland and Agricultural Society of Scotland.—At the adjourned meeting, after the routine business, Mr. Forbes, jun., of Drum, announced the following awards for competitive papers:—

1. The Gold Medal to James Duncan, Old Manse, Denholm-Hawick, for a report on Finger-and-Toe in Turnips.
2. The Gold Medal to James Fulton, Temple, Maryhill, Glasgow, for a report on Making Chedder and Dunlop Cheese.
3. The Gold Medal to Thomas Macpherson Grant of Craigo, Montrose, for a report of Experiments with various descriptions of Manures applied to turnips.
4. The Gold Medal to Alexander Simpson, Teawig, Beauly, for a report on Farm Management.
5. The Gold Medal to Professor Tanner, Queen's College, Birmingham, for a report on the Manure of the Farm.
6. The Gold Medal to Professor Tanner, Queen's College, Birmingham, for a report on the Breeding and Rearing of Cattle.
7. The Gold Medal to John B. Webster, wood forester to his Royal Highness the Prince-Consort, Balmoral, Crathie, for a report on the Formation and Management of Young Plantations.
8. The Medium Gold Medal to Thomas Lawson, Carlarach, Innellan, Argyleshire, for a report on the Drainage of Sheep Farms.

New Clock at Leicester.—The people at Leicester have been calling attention to a new public clock, which has been set up at the Exchange. The frame need never be taken to pieces to remove any of the works if they should require repair, as they are so arranged that all the wheels may be taken out by unscrewing the pivot hole bushes. The clock is kept going whilst being wound up by the going ratchet plan, which has the advantage over the bolt and shutter generally used, of always being set up by the clockweight, instead of by the person winding it, who may forget to do so, and likewise of removing the supplemental force from the clock so soon as it is wound up. The pendulum is compensated with mercury, for the change of temperature from winter to summer, and consists of a strong glass cylinder, closed at the top and bottom with stuffing-boxes for the steel rod to pass through. It contains 98lb. of mercury, occupying the proper height in the cylinder for its expansion upward, to exactly counteract the expansion of the rod downward, and keep the radius of oscillation the same. The regulating nut is divided into seconds, and small regulating weights are added on the rod for the more minute division of time. The suspension spring is only three-tenths of an inch long between the clamps, instead of an inch or two, as generally employed; it is an inch and a half wide, but only 66-10,000ths of an inch thick, and was selected from a long piece by measuring across the width in action with a very delicate micrometer to the 10,000th of an inch, which is about the thickness of a fine human hair split into 30 parts. The same accuracy was observed to make the plates clamp the spring evenly all along the edges, and at a right angle to the perpendicular of the pendulum; to have the centre of the spring in the centre of the rod, and the top rod and cylinder all concentric with each other; to make the plane of motion of the crutch parallel to the plane of the pendulum, and both centres of motion to coincide. The result is, that now the pendulum is in action, it vibrates so truly in the same plane that the sensitive surface of the mercury betrays no tremor, although it is so delicate a test, that a light cart passing within 50 yards of the Exchange causes a perceptible undulation. Connected with the pendulum is the isochronous arc spring, which causes the long and short vibrations to be performed in the same time; so that whether the clock is clean or dirty, and the oil fluid or frozen, the clock will keep the same time. This is effected by the spring being drawn more into action the further the pendulum swings, and communicating just as much impulse to the pendulum as will enable it to perform the long journey in the same time as the short one. The illumination of the clock is effected by a new method, with two large lenses placed before the burners, which are connected by a pierced tube of jets, so as to light one burner from the other if either should go out during the day when the gas is turned very low. A hood connected with a pipe is placed over the gas, which carries off the vapour of combustion and perfectly ventilates the dial-room. The appearance of the dial is much superior to the usual method by night as well as by day, as the illumination is evenly diffused over the dial, without glare, or the position of the burners being distinguishable in any part.

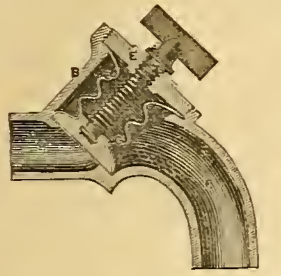
Heating the Feed-Water of Steam Boilers.—The accompanying illustration represents one arrangement of M. Baudouin's improved apparatus for heating feed-water. The apparatus is placed between the feed-pump and the boiler, and consists of a cylindrical or other suitably shaped reservoir or vessel, containing a number of dished plates riveted together so as to form a series of steam chambers, C; the water to be heated being contained round these chambers. At a short distance from the mouth of each of these steam-heating chambers is fitted a curved plate of metal, for the purpose of spreading or deflecting the steam through the interior of each chamber. The waste steam for heating the feed-water, enters at the top of the aperture by the pipe, F, and after passing through the entire series of chambers, escapes by the pipe, E, at the bottom, into the reservoir, B, and thence through the pipe, D. The reservoir, B, is fitted with a cock, and is placed under the heating apparatus, for the pur-



pose of collecting the water of condensation and running it off when requisite at intervals. A test-cock is fitted to the upper end of the apparatus, for the purpose of testing the heat of the feed as it enters the boiler, the cold water being pumped into the apparatus through the supply-pipe, H. The heated water passes off to the boiler through the pipe, G, which is carried out from the upper part of the heating cylinder, A. By means of an apparatus of this kind, the heat of the waste steam may be effectually economised.

Submarine Telegraph Cables.—In consequence of the failure of the Atlantic cable which was laid down last summer, many new schemes have been set afloat, and many improved forms of cable have been devised. It seems to be generally admitted that the old cable was much too heavy, and the inventors have principally turned their attention to the proper mode of lightening their cables so as to reduce them to the minimum of weight consistent with the necessary degree of strength. Mr. Allan's plan is to do away entirely with the outside covering of spiral wires and to make the core or conductor of the cable its main strength. The weight per mile need not exceed 10 cwt., while its specific gravity is as low as 1·35,—just sufficient to insure its sinking very *slowly* without any strain upon the rope while being paid out from the ship. The mode of its construction is one large solid copper wire, or conductor, wound round closely with fine iron wire. This is enclosed in three very thick coats of gutta percha, the whole being bound round with strands of tarred string. Mr. Henley, who sent off the great Australian cable the other day, has devised one on a principle entirely new, to cost only £100 per mile. The conductor has twice the conducting power of the old Atlantic cable, and is formed after the usual plan of seven copper wires twisted into one strand. The insulation is secured by two thick coats of gutta percha, served round with greased and tarred hemp. The last covering is formed of 18 strands, each strand being composed of three No. 19 fine wires and four tarred strings. The result of this curious mixture of tar and twine is to give to each strand the same strength as if it were all made of wire, with only half the weight. The lowest strain the whole cable breaks at is guaranteed at four tons, though in fact it has never been broken under five. The total weight is 15 cwt. per mile, and only 7 cwt. in water.

Elastic Diaphragm Stopcock.—The stopcock which we here engrave in section is the invention of Mr. Allman, whose plan consists in the application to stopcocks in general of an elastic material, invulnerable by liquids, to press a plate covered with the same material down upon the seat which forms the escape valve. The body or main shell, A, of the cock has cast upon it the inclined valve box, B. This box has within it a flexible tubular diaphragm, C, of caoutchouc, enveloping the actuating spindle and valve, D, and being held down at its open outer end by a cover, E, screwed on. The discharge is through the other end, F, of the main shell. The spindle is screwed, and works through the centre of the cover, E, as a nut, the lower end of the spindle being loosely jointed to the centre of the valve disc. With this arrangement, as the screw spindle is turned to the left, it elevates the valve disc from its inclined seat in the interior of the shell, and allows of a free escape of the fluid at F, whilst the tubular enclosure of the other working parts prevents all leakage by the spindle or valve chest cover. The reverse turn of the spindle, of course, forces the valve hard down upon its seat.



PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded October 19, 1858.

2328. Edmund Walker, Loudon Street—An improved filter.—(Communication.)

Recorded December 18.

2898. Isaac Ketchum, 59 Canning Street, Liverpool—Improvements in the method of roasting meat, poultry, game, by basting the same, and in the method of manufacturing the necessary apparatus for so doing.

Recorded December 27.

2960. John Davis, Liverpool—An improved portable self gas generating lamp.—(Communication from James L. Butler, Brooklin, New York, U. S.)

Recorded January 6, 1859.

46. Edward T. Hughes, 123 Chancery Lane—Improvements in machinery or apparatus for preparing cotton and other fibrous materials to be spun.—(Communication from Cesar Vallee, Carney, France.)
47. William Renton, Thomas Renton, and William Binns, Leeds, Yorkshire—Improvements in finishing woollen and other fabrics.
48. John Aspinall, Great Tower Street—Improvements in machines for the manufacture of bolts, rivets, and spikes.
49. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—An improved textile fabric, applicable to the manufacture of varnished cloths, and to other purposes.—(Communication from Andre P. Rodger, Paris.)
50. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in machinery or apparatus for boring and piercing rocks, applicable also to the dressing or working of stone, and as a power hammer generally.—(Communication from Monsieur G. Sommeiller, Turin, Sardinia.)

Recorded January 7.

51. William Spence, 50 Chancery Lane—Improvements in the mode of taking photographic pictures on wood.—(Communication from Charles B. Boyle, U. S.)
52. Isaac Holden, St. Denis, near Paris, and Angus Holden, Bradford, Yorkshire—Improvements in means or apparatus employed in preparing and combing wool and other fibres.
53. Edwin Heywood, Halifax, Yorkshire—Improvements in weaving.
54. Jean J. Florance, Paris—Improvements in reels or spooling-wheels.
55. George K. Geyelin—Regulating gas burners, which he calls the Universal Gas Burner Regulator.
56. Andrew Barclay, Kilmarnock, Ayrshire—Improvements in electric and magnetic telegraphs.
57. John Paterson, Wood Street—An improvement in bands and belts for the waist
58. Henry Reynolds, Denmark Hill, Surrey—Improvements in refining and decolorising saccharine substances.
59. William E. Newton, 66 Chancery Lane—Improvements in machinery for winding, twisting, and doubling fibrous materials.—(Communication from Louis B. Duboc, Jun., Paris.)

Recorded January 8.

60. Henry Harding, Dundalk, Louth, Ireland—Improvements in fire bars for steam boiler and other furnaces.
61. Charles F. Vasserot, 45 Essex Street, Strand—An improved chain and bucket pump.—(Communication from Andre X. D. Chevalier, Douai, Nord, France.)
62. Denny Friedlander, Manchester—An improved smoking pipe.
63. Theodore B. Hubbell, Castle Street—An improved trap for rabbits, rats, mice, and other like animals and vermin.—(Communication from C. B. Hubbell, Bridgeport, U. S.)
64. Frederick Versmann and Alphons Oppenheim, Bury Court, St. Mary Axe—Improvements in the treatment of various substances, by which to render the same uninflammable.
65. Alexander W. Williamson, University College—Improvements in condensers for steam engines and other purposes.
66. William Delany, Chicago, Cook county, Illinois, U. S.—Improvements in submarine boats or vessels, and in apparatus used for working under water.—(Communication from Lodner D. Phillips, Chicago.)
67. William Clark, 53 Chancery Lane—Improvements in purifying natural phosphates of lime.—(Communication from Emile C. Martin, Paris.)
68. Edward Cobbold, Hendon—Improvements in instruments for writing and marking, and for the preparation of certain substances for conversion into instruments for writing and marking, and for the application to useful purposes of certain products, arising from preparation aforesaid.
69. John T. Forster, Holland Road, Kensington—Improvements in bed berths, applicable for bunks, hammocks, cots, and other fixed and moveable sleeping places.
70. William E Newton, 66 Chancery Lane—Improvements in steam engines and steam generators.—(Communication from Louis Arnier, Marseilles, France.)
71. William A. Lyttle, General Post Office, Ireland—Taking the place of springs in many, if not all, of the combinations into which they enter, and also for equilibriating a varying force or weight.

Recorded January 10.

72. Robert D. Clegg, Manchester—Improvements in signalling apparatus.
73. Louis A. Normandy, jun., 67 Judd Street—Improvements in the process of distilling and clarifying resinous substances.—(Communication from E. Dromart, D. Dusillol, and A. Dusillol, Prechac, France.)
74. Thomas J. Claxton, Montreal, Canada—Improvements in the manufacture of boots and shoes.—(Communication from Mellan Bray, Montreal, Canada.)
75. Ferdinand Lehr, Hoboken, New Jersey, U. S.—Improvements in machinery for manufacturing metallic ribs for umbrellas, parasols, and other articles.
76. John S. Margetson, Cheapside—An improved box or case, suitable for hats, collars, and other useful purposes.
77. John White, Finchley—Improvements in cleansing or purifying air, and in increasing or reducing the temperature thereof, and in the application of air so treated to sanitary and other uses.

Recorded January 11.

79. Eugenio Agneni, 29 Devonshire Street, Queen Square, Bloomsbury—Increasing particularly the effect of decorative pictures, landscapes, drawings, and prints, through looking glasses.
80. Charles M. Kernot, Gloucester House, West Cowes, Isle of Wight, Southampton—Improvements in purifying and decolorising paraffine, and rendering the same white, hard, and sweet.
81. John Biers, the younger, 38 Rochester Road, Kentish Town, St. Pancras—A self-acting carriage-wheel brake.
82. Benjamin Robbin, Yarmouth, Nova Scotia—Improvements in the machinery for working pumps.
83. William Tillie, Londonderry, Ireland—An improvement in the manufacture of shirts and shirt fronts.
84. David E. Hughes, Northampton Square—An improved mode of insulating electrical conducting wires.
85. Bernard J. Rubenstein—Improvements in dentistry.
86. Robert Hawthorn and William Hawthorn, Newcastle-upon-Tyne—Improvements in apparatus for promoting combustion and preventing smoke in coal-burning locomotives and other steam boiler furnaces.
87. Charles W. Siemens, John Street, Adelphi—Improvements in supports for electric telegraphic line wires, and in tools or apparatus to be used in the construction of such supports, part of which improvements are applicable to the joining of pipes and other articles.
88. Frederick Versmann and Alphons Oppenheim, Bury Court, St. Mary Axe—Improvements in rendering fabrics and substances non-inflammable.
89. Nicholas P. Burgh, Sheerness—Improvements in steam engines.

Recorded January 12.

90. Philippe Bouche, 57 Rue de Bretagne, Paris—Improvements in the used means for mechanically raising up the gowns of ladies and young ladies.
91. William Bray and William T. G. Bray, Folkestone, Kent—Improvements in locomotive and traction engines.
92. William Oliver, Shadwell—Improvements in boats, and in the mode of propelling them.
93. John Thomson, Dundee, Forfarshire—Improvements in the manufacture of rugs.
94. Joseph Hands, Elgin Crescent, Notting Hill—Improvements in preserving or preparing skins intended to be converted into leather, or otherwise manufactured.
95. Joseph Gibbons, 345 Oxford Street—Improvements in fixing door and other knobs.
96. Samuel Canning and Henry Clifford, Leadenhall Street—Improvements in machinery for paying out and for recovering or picking up submarine telegraph ropes, cables, or chains.
97. Thomas Elwell, Paris—Improvements in governors for steam engines and other motive power engines.
98. William M'Naught, Manchester, and William M'Naught, Rochdale, Lancashire—Improvements in steam engines and in apparatus connected therewith.
99. Samuel Phillips, Moseley, Worcestershire—Improvements in fastenings for securing windows, shutters, and doors, and for other similar uses.
100. Robert Mushet, Coleford, Gloucestershire—A new or improved metallic alloy.
101. Robert Mushet, Coleford, Gloucestershire—An improvement or improvements in the manufacture of cast steel.
102. Charles N. May, Devizes, Wiltshire—Improvements in sluice valves.
103. Charles Beslay, 52 Rue St. Sebastien, Paris—Improvements in coating or covering iron or steel with tin, zinc, or lead, or alloys of those metals, by electrical deposit.

Recorded January 13.

104. Charles N. May, Devizes, Wiltshire—An improved heat indicator.
105. Richard A. Lightoller, Chorley, Lancashire—Certain improvements in machinery or apparatus for spinning cotton or other fibrous materials.
106. William Bennetts, Tuckingmill, Cornwall—Improvements in mechanism used for preventing accidents when raising or lowering skips, baskets, or apparatus, particularly applicable to mines.
107. William H. Crispin, Marsh Gate Lane, Stratford, Essex—Improvements in the construction of ships and other sailing and steam vessels.

108. Henry Critchley and Solomon Elston, Bury, Lancashire—Certain improvements in pistons for steam engines or other purposes.
109. George Scopes, Needham Market, Suffolkshire—Improvements in apparatus for communicating motion to cots, cradles, and other articles for children's use.
110. John Pickslcy and Reuben Sims, Bedford Foundry, Leigh, Lancashire—Improvements in lawn-mowing machines.
111. William H. Morrison, Nottingham—Improvements in wind musical instruments.
112. Daniel L. Banks, Kennington, Surrey—A method of constructing a travelling suspension rail or roadway, applicable, among other uses, as a bridge and lifting agent.
113. James J. Stevens, Darlington Works, Southwark, Surrey—Improvements in railway signal apparatuses.
114. François J. Maneeau and Eugene N. Vieillard, Paris—Improvements in breech-loading fire-arms and in cartridges.
115. John Grist, Beazley Crescent, Old Ford—Improvements in machinery for cutting and shaping staves and heads for casks, and for the manufacture of casks.
116. William A. Chadwick, Wandsworth Road, Surrey—A musical instrument, chiefly for teaching the intervals of musical scales.
117. William Wilson, Newcastle-on-Tyne—Improvements in machinery for felting bodies of hats and bonnets.—(Communication from J. S. Taylor, Danbury, Connecticut, U. S.)
118. Thomas Herbert and Edward Whitaker, Nottingham—Improvements in the manufacture of warp lace.
119. Owen Rowland, 4 Chapel Street West, May Fair—Improvements in laying electric telegraph wires in streets.
120. Joseph Barrans, 2 Caledonian Terrace, Queen's Road, Peckham—Improvements in traction and portable steam engines.
121. Thomas Sampson, Calle Cartanos, Barcelona, Spain—Improvements in apparatus for feeding steam boilers with water.

Recorded January 14.

122. Samuel Holt, Manchester—A new and improved manufacture of woven silk fabrics.
123. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—A new or improved time-measurer.—(Communication from Pasquale P. Ercolini, Premeno, Sardinian States.
124. William Craft, 12 Cambridge Road, and Thomas Wilson, Bradmore House, Chiswick—Improvements in drawers and napkins so as to render the same waterproof.
125. William Davis, 2 Ann Street, Globe Fields, Mile End—Improvements in sluice valves.
126. John Dauglish, Tunbridge Wells—Improvements in obtaining carbonic acid gas.
127. Robert Romaine, Chapel Street, Bedford Row—An improved arrangement of portable railway.

Recorded January 15.

128. Joseph Eccles, Blackburn, Lancashire—Improvements in the manufacture of articles from clay earths for building purposes, as substitutes for such articles as are usually formed of stone and other materials.
129. William H. E. M'Knight, Lydiard House, near Swindon, Wiltshire—An upright celled boiler applicable to all heating purposes by hot water or other fluid.
130. Polynice A. Viette, 25 Faubourg de Schaerbeck, near Brussels—Certain inks applicable for engraving and lithographic purposes.
131. Daniel L. Banks, 3 Kennington Row, Kennington Park, Surrey—Improvements in the method of constructing a travelling suspension rail or roadway, to be used for the cultivation of land.
132. Robert Mushet, Coleford, Gloucestershire—Improvements in the manufacture of cast steel.
133. William Betts, Wharf Road, City Road—Improvements in the manufacture of capsules, and in the apparatus to be employed therein
134. Robert Mushet, Coleford, Gloucestershire—An improvement or improvements in the manufacture of cast steel.

Recorded January 17.

135. William Morgan, 31 Grafton Street, Fitzroy Square—Improvements in printing and stencilling, and in the apparatus or machinery used therein, also for certain applications of such printing and stencilling.
136. Thomas Edwards, Liverpool—Improvements applicable to letter boxes and other like receptacles.
137. James Montgomery, New York, U. S.—Improvements in the hulls of steam and other vessels, and in the feed-water heaters, boilers, water-gauges, condensers, engines, and propelling machinery appertaining to the former, a portion of which improvements (with the exception of those on the hull) are applicable to analogous useful purposes.
138. Edward T. Hughes, 123 Chancery Lane—Improvements in machinery or apparatus for sowing seed.—(Communication from Constant Beure and Edouard Barret, Grand-Sancey, France.)
139. Pierre A. S. S. Sicard, Paris—An improved process and apparatus for converting cast iron into steel.
140. Samuel T. Cooper, Upper Clapton—Improvements in the use and application of artificial light.
141. William E. Newton, 66 Chancery Lane—An improvement in sewing machines.—(Communication.)
142. Edward Brooks, 43 Edward Street, Dorset Square—Improvements in locks.
143. Rodger G. Salter, Alphington, Devonshire—Improvements in apparatuses for collecting or picking up letters, papers, and other articles requiring to be stamped or printed.
144. George Collier and John Collier, Halifax, Yorkshire—Improvements in means or apparatus for washing and drying wool and other fibres, part of which improvements is also applicable for other purposes, where steam, hot water, or other fluids are required to be conveyed under pressure through moveable connections.
145. Robert Mushet, Coleford, Gloucestershire—Improvements in the manufacture of cast steel.

Recorded January 18.

146. Joze Luis, 1n Welbeck Street, Cavendish Square—A new machine for putting-on, equalising, and drying the colours on paper for hangings, book-binding, boarding, and fancy paper of every description.—(Communication from J. P. Faure, Paris.)
147. William Newman, Aston, near Birmingham—New or improved furniture for window and other blinds.
148. John Forster, Lancaster—Certain improvements in machinery or apparatus called "spinning frames" and "roving frames" employed for spinning and roving flax, tow, hemp, jute, and other fibrous substances.
149. George Hamilton, Liverpool—Improvements in treating rosin and resinous substances to obtain products therefrom, and in treating the products obtained from rosin and resinous substances.
150. Henry Gallon, Joseph H. Bean, and Samuel Lumb, Leeds—Improvements in machinery for slotting, morticing, tenoning, and cutting wood, iron, and other substances.
151. Charles D. Archibald, New York, U. S.—Generating force.—(Communication from Henry M. Paine, Worcester, Massachusetts.)
152. Richard A. Brooman, 166 Fleet Street—An improved silk thread, and a new fabric made entirely or partially from the same.—(Communication from C. Depoully, sen., Paris.)
153. Richard Garret, jun., and James Kerridge, Leiston Works, Saxmundham, Suffolkshire—An improved arrangement of combined thrashing and dressing machine.
154. John Fawcett, Kingston-upon-Hull—An improved preparation of food for cattle and horses.
155. Richard Bradley and William Craven, Westgate Common Foundry, Wakefield, Yorkshire—Improvements in machinery or apparatus for manufacturing bricks, tiles, and other similar articles.
156. William Trotter, South Acomb, Northumberland—Improvements in reaping machines.
157. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in air pistols and guns.—(Communication from Jacques L. L. Daime, Paris.)

Recorded January 19.

158. Joshua Thornton, Cleckheaton, Yorkshire—Improvements in carding engines.
159. William A. F. Powell, Bristol, Somersetshire—Improvements in stopping or closing jars and bottles.
160. Pehr A. Sparre, 50 Chancery Lane—Improvements in the manufacture of paper, suitable for bank-notes, cheques, bills, and similar articles
161. Thomas Clarke, Litchurch Lane, near Derby—Improvements in the manufacture of core barrels for piles or columns used either for railway piles or columns, or for water pipes or sewerage pipes.
162. Edward T. Hughes, 123 Chancery Lane—Improvements in machinery or apparatus for measuring and sorting silk and other textile materials.—(Communication from Jules Veyrin, Lyons, France.)
163. James Whitehead, Halifax, Yorkshire—Improvements in the means or machinery for the manufacture of purled wire.
164. Ebenezer Stevens, 5 Patriot Row, Cambridge Road—An improved cooking utensil.
165. Thomas A. Evans, 15 Queen's Road, Bayswater, and Walter J. H. Rodd, 38 Arlington Square, Islington—A new method of advertising.
166. William Poupard, Blackfriars Road, Surrey—An improved wheel-skid or shoe.
167. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Certain improvements in the manufacture or production of lasts, boot-trees, and clogs, and in the machinery and apparatus employed in the production of such articles.—(Communication from Jules Mathieu, Paris.)
169. William Clark, 53 Chancery Lane—Certain improvements in boots and shoes, and in the machinery, apparatus, and means employed in such manufacture.—(Communication from Charles J. P. Desnos, 29 Boulevard St. Martin, Paris.)

Recorded January 20.

170. James C. Reid and William Milner, Liverpool—Certain improvements in the construction of ships and vessels.
171. Harvey Hilliard and Thomas Chapman, Glasgow—Improvements in table knives, and in table knife sharpeners.
172. Abraham Lindo, Batignolles, France—Improvements in manufacturing soap.
173. William Woofe, Gloucester—Improvements in implements for ploughing, tilling, and paring land.
174. Edward T. Hughes, 123 Chancery Lane—Improvements for preventing incrustation in steam boilers or other vessels.—(Communication from Herr V. L. Royal, Berlin, Prussia.)
175. Thomas Greenwood and John Batley, Leeds, Yorkshire—An improvement in the process of gassing textile fabrics.—(Communication from H. V. Bergbe, Rue de St. Georges, Courtrai, Belgium.)
176. Samuel Phillips, Moseley, Worcestershire—Improvements in sliding sashes, shutters, or doors.
177. William E. Newton, 66 Chancery Lane—Improved apparatus for measuring water and other liquids.—(Communication from Mr. Alfred Noble, Paris.)
178. Thomas Greenwood, John Batley, and Jacob Dockray, Leeds, Yorkshire—Improved machinery for converting hemp and flax fibres into yarn, twine, ropes, and cordage.
179. Joseph Bent, Newhall Street, Birmingham—Certain improvements in clasps or fastenings, applicable for belts, garters, and other purposes.
180. James Shanks, Arbroath, Forfarshire—Improvements in mowing machines.
181. Josiah L. Clark, Haverstock Hill, and John Muirhead, Gloucester Road, Regent's Park—Improvements in electric telegraphs, and in the apparatus used in working the same.
182. Henry Sagar, Broughton, near Manchester, and Alexander Schultz, Paris—Improvements in producing pink shades on cotton fabrics or yarns.

Recorded January 21.

183. Thomas Richardson, 20 New Bridge Street, Newcastle-upon-Tyne—Improvements in the manufacture of manure.
184. Samuel Osler, Great Yarmouth, Norfolkshire, and John B. Balcombe, Brixton, Surrey—Improvements in apparatus for treating fish, so as to adapt it for manure, and in using the same alone or in combination with super-phosphate of lime or other phosphates.
185. Louis Le Prince, 261 Regent Street—The improvement of ladies' boots and shoes, called the cameleon boot and the cameleon shoe.
186. George B. Harkes, 1 Montague Terrace, Trinity Square, Southwark, Surrey—An improved machine for washing, wringing, and mangling.
187. George Ellis, 4 Collier Street, Pentonville—The improvement of muffs, to be called the patent reticule muff.
188. John Hick and William Hargreaves, Bolton-le-Moors, Lancashire—Improvements in the construction of steam boilers.
189. Richard Howell, Smethwick, Staffordshire, and Richard J. Willder, Birmingham—An improvement or improvements in taps or stop cocks.
190. Charles O'Hara, 4 Upper Seymour Street, Hyde Park—Improvements in propellers, for propelling steam-boats, ships, and vessels.
191. William Wells, Greenland, near Halifax, Yorkshire—Improvements in machinery or apparatus employed in spinning and twisting cotton, and other fibrous substances.
192. Alfred Davenport, Birmingham—An improved regulating burner for gas.—(Communication from Henry Woodward, New York, U. S.)
193. James Childs, Windsor House, Windsor Road, Putney, Surrey—An improvement in applying heat in the manufacture of artificial gums and teeth, and other articles composed of India rubber, or gutta percha, combined with sulphur.
194. James H. Hume, Broughty Ferry, Forfarshire—Improvements in warming apparatus for the feet.
195. Andre J. A. Gautier, J. G. Dumay, J. T. Persin, Paris—An improved manure.
196. William H. Morrison and Henry Kinsey, Nottingham—Improvements in means or apparatus employed in the manufacture of bonnet-fronts, ruches, ribbon trimmings, and other goffered or pleated articles.
197. James Newman, Birmingham—Improvements in the manufacture of chains.
198. Bernard Lauth, Surrey Street, Westminster—An improved mode of, and improved machinery for, rolling plates, bars, rods, and shafts.
199. John Edwards, 77 Aldermanbury—Improvements in the manufacture of buckles.

Recorded January 22.

200. Louis A. Dronin, 95 Rue Popincourt, Paris—Improvements in covering joinery work with metals or metallic alloys, and apparatus for the purpose.
201. David Moseley, Chapel Field Works, Ardwick, Manchester—Improvements in the manufacture of India rubber thread.
202. Benjamin Templar, Bristol—Improvements in umbrellas and parasols.
203. Edward Dorsett, 76 Old Broad Street, and John B. Blythe, Minerva Place, New Cross, Kent—Improvements in the distillation of oil from coal tar, and in apparatus for preserving timber therewith.
204. Michael Henry, 84 Fleet Street—Improvements in machinery or apparatus for manufacturing corks and bungs.—(Communication from Messrs. Dalverny and Thouzellier, Sommieres, France.)
205. William E. Newton, 66 Chancery Lane—Improved machinery for cutting files.—(Communication from Milton D. Whipple, United States of America.)
206. Thomas W. Rammell, 16 Spring Gardens—Improvements in atmospheric propulsion, and the structures, tubes, machinery, and apparatus applicable thereto.
207. Christian Sharps, Philadelphia, Pennsylvania, U. S.—Improvements in breech-loading repeating fire-arms.
208. Richard Barter, St. Ann's Hill, Blarney, Cork—Improvements in heating and ventilating buildings, and in apparatus connected therewith.

Recorded January 24.

209. William C. Homersham, Adelphi Terrace, Strand—Improvements in floating gridirons or stages for repairing ships or other vessels.
210. Robert Mushet, Coleford, Gloucestershire—Improvements in the manufacture of cast steel and iron.
211. Robert Mushet, Coleford, Gloucestershire—An improvement in the manufacture of cast steel.
212. Richard A. Brooman, 166 Fleet Street—Improvements in pumps.—(Communication from François Ruff, Paris.)
213. Joseph Lanberean, Paris—Improvements in air engines.
214. John Smith and William H. Smith, 8 Upper Fountain Place, City Road—Certain improvements in manufacturing paper, and in producing watermarks, patterns, figures, letters, and devices thereon, and in the construction of the mechanism employed therein.
215. John Savory and William R. Barker, 143 New Bond Street—Improvements in bottles for medicines and poisons.
216. John Fowler, jun., Cornhill, Robert Burton, Kingsland, David Greig, New Cross, Kent, and Jeremiah Head, Newcastle-on-Tyne—Improvements in agricultural implements, and in apparatus used for hauling agricultural implements by steam power.
217. Arthur Warner, 31 Threadneedle Street, and William Tooth, Sumner Street, Southwark, Surrey—Improvements in the manufacture of iron and gases for such and other uses.
218. John G. Proger, 13 Trinity Street, and David Davies, Stuart Street, Bute Docks, Cardiff, Glamorganshire—Improvements in lanterns used on board ship to signal to the steersman.
219. Right Honourable James, Earl of Caithness, Hill Street—Improvements in parts of the permanent way of railways.
220. Michael Swan, Henstridge Villas, St John's Wood—Improvements in ballasting ships, applicable also to the extinguishing fires on board ships.
221. William Tasker, the younger, Waterloo Iron Works, near Andover, Hants—Improvements in ploughs.

Recorded January 25.

223. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in machinery or apparatus for cutting and shaping wood.—(Communication from Peter H. Niles, Boston, U. S.)
224. Rudolph Bodmer, 2 Thavies' Inn, Holborn—Improved resin and resinous substances.—(Communication from Mr. Jean Crenseton, Paris.)
225. William Cutts, Oldham, Lancashire—Improvements in the manufacture of bobbins, spools, and cop tubes, and in the machinery employed therein.
226. William Hodgson and Henry Hodgson, Bradford, Yorkshire—Improvements in machinery or apparatus for preparing and spinning wool and other fibrous substances.
227. John White, Finchley—Improvements in means or apparatus to facilitate respiration under water, or under the influence of fire, or in any other situations where an artificial supply of air may be required, part of which improvements is also adapted to facilitate movement in or upon the surface of water.
228. William Andrews, 30 Cornhill—Improvements in electric telegraphs.
229. Frederick J. Jones, Aldermanbury—An improvement in shirt fronts.
230. Henry Brecknell and John Dyer, Bristol—Improvements in cocks and valves.
231. Isaiah Woodcock, Commercial Street, Spitalfields—Improvements in barometer and thermometer dials.
232. Benjamin J. Spedding, 9 Cross Street, Birkenhead, Cheshire—Improvements in apparatus for generating and regulating gas, and for impregnating the same with volatile hydrocarbon fluids.
233. Charles G. Kelvey and William Holland, Rock Ferry, Birkenhead, Cheshire—An improved escapement for chronometers and other time-keepers.
234. William E. Newton, 66 Chancery Lane—An improvement in life preserving vests.—(Communication from T. A. Dlano, United States of America.)

Recorded January 26.

235. William B. Alexander, Glasgow—Improvements in furnaces and apparatus for the manufacture of sugar, and for the consumption or prevention of smoke.
236. Isaac Hammond, Winchester, Hants—Improvements in breech-loading fire-arms, and in cartridges to be used therewith.
237. Obed Hassey, Baltimore, U. S.—Improvements in the construction of ships' blocks.
238. David Graham, Wapping—An improved method of driving centrifugal machines.—(Communication from T. Hanning, Mauritius.)
239. Jonas Wells, Keighley, and William Clough, Sutton, near Keighley, Yorkshire—An improved coupling for railway carriages and analogous uses.
240. Frederick C. C. Paulsen and Albin Alsing, Emmett Street, Limehouse—Improvements in preparing beverages usually called punch.
241. Mark Fernandez, 2 Devonshire Square, Bishopsgate Street Without—Improvements in straw and hay cutters.
242. James Kerr, 17 Bedford Terrace, Trinity Square, Southwark, Surrey—Improvements in the construction of revolving fire-arms.

Recorded January 27.

243. James Mercer, Boston, Massachusetts, U. S.—Improvements in the process of currying leather.—(Communication from Mr. Joseph Armstrong, Massachusetts, America.)
244. Wilson Ager, Rhorsburg, Columbia, Pennsylvania, U. S.—Improvements in machinery for cleaning rice.
245. Thomas Hartshorne, West Bromwich, Staffordshire—An improved metal to be used for making journey brasses for mills, rollers, forges, and all kinds of shafts and machinery, and also for shipping, and for bearings for shafts and journey brasses in general.
246. Elijah Dixon and Henry Whittaker, Preston, Lancashire—Improvements in apparatus used in weaving textile fabrics.
247. James Meacham, Birmingham—Improvements in pens and penholders.
248. Henry D. P. Cunningham, Bury, near Gosport, Hants—An improvement in the rig of ships or vessels.
249. Henry Rawson, Leicester—Improvements in machinery for preparing wool and other fibrous substances.
250. James Buckingham, Walworth Common, Surrey, and George Salt, Saltaire, near Bradford, Yorkshire—Improvements in the construction and adaptation of drawing, and other rollers employed in drawing and compressing fibres, which improved construction of rollers is also applicable in compressing fabrics.
251. Edward T. Hughes, 123 Chancery Lane—Improvements in the manufacture of biscuits.—(Communication from Messrs. Pascal and Sirben, Toulouse, France.)
252. George F. Bradbury, Oldham, Lancashire, and Joseph J. King, Glasgow—Improvements in certain apparatus applicable to sewing machines.
253. William Crowther, Leeds, Yorkshire—Improvements in the manufacture of prussiates of potash or soda, and in recovering a useful material therefrom.
254. James Gathercole, Bath Terrace, Camberwell, New Road, Surrey—Improved machinery for manufacturing envelopes and paper bags.

Recorded January 28.

255. Ignazio Zacheroni, Liverpool—An improved mode or method of preventing the escape of smoke into the atmosphere, and in the construction of chimney "pots" or "tops" for curing smoky chimneys.
256. William Robertson, Manchester—A new apparatus for propelling boats on canals, rivers, and lakes of moderate depth.
257. George Bartholomew, Linlithgow, North Britain—Improvements in shoes for horses and other animals requiring such shoes, and in the means of attaching the same to the feet.
258. Charles E. Amos, Grove, Southwark, and John Francis, Bangor, North Wales—Improvements in water pressure engines, and their application to pumping machinery.
259. Frederick Prince, 138 New Bond Street—A new breech-loading gun.
260. William Yates, Mary Street, Bromley—Improvements in furnaces.
261. Robert Griffiths, 69 Mornington Road—Improvements in regulating the pressure of steam in steam boilers, and in preventing the accumulation of deposit therein.—(Communication from Charles N. Copeland, New York.)
262. Henry Watson, High Bridge Works, Newcastle-upon-Tyne—Improvements in the manufacture of Knotter plates, used in the manufacture of paper.
263. Andrew Barclay, Kilmarnock, Ayrshire—Improvements in obtaining and distributing or applying electricity and magnetism.

Recorded January 29.

264. Louis Leisler, Glasgow—Improvements in extracting metallic copper from the pyrites residuum of vitirol works, and from other substances.—(Communication from Dr. Hasenclever, Aix-la-Chappel, Prussia.)
265. Josiah Lane, West Bromwich, Staffordshire—New or improved machinery for the manufacture of screws, and for tapping nuts for screws.
266. James M'Kenzie, St. Martin's-le-Grand—An improved method of operating ventilating valves, especially applicable to ventilating gas burners.
267. Joseph Marino, Stockholm, Sweden—An inodorous closet or commode.
268. George Davies, 1 Serle Street, Lincoln's Inn, and 28 St. Enoch Square, Glasgow—Improvements in apparatus applicable to measuring, regulating the pressure of, and consuming gas for illumination.—(Communication from J. M. Legris, Paris.)
269. Henry Grissell, Regents Canal Iron Works, Eagle Wharf Road—Improvements in machinery for moving ships or vessels on slips or inclined ways.
270. Jean J. A. de Bronac and Augustin J. M. Deherrypon, Paris—A new or improved process for treating metallic sulphurets, phosphurets, arseniurets, antimoniurets, and particularly sulphuretted ores of lead, antimony, copper, silver, zinc.
271. James Meacham, Birmingham—Improvements in apparatus for clasping and closing books, purses, reticules, and other similar articles, and for retaining and securing paper documents, letters, bills, and other memoranda.

Recorded January 31.

272. Thomas P. Smith, Stanmore—An apparatus for guiding or directing the pen or pencil in writing or drawing.
273. Daniel Bentley, Accrington, Lancashire—Improvements in self-acting apparatus, applicable to letterpress printing machines, for supplying and removing the paper.
274. John Raywood, Wentworth, Yorkshire—Certain improvements in the construction and method of working sewing machines.
275. Thomas Wilson, Birmingham—Improvements in breech-loading and other fire-arms.
276. James Robertson, Glasgow—Improvements in details, by which motive force is transmitted in machinery.
277. Henry J. Newcombe, Shenley, Hertshire—An improved apparatus for heating or warming buildings.
278. John P. Booth, Cork, Ireland—Improvements in ventilating ships.
279. Alfred V. Newton, 66 Chancery Lane—An improved method of extracting gold and silver from their ores.—(Communication from Lewis Solomon, United States of America.)

Recorded February 1.

280. Joseph Grimond, Manchester—Improvements in the manufacture of hearth rugs.
281. Laurent Rigolier, 5 Lyon Place Grolier, Rhone, France—A new brake for railway carriages.
282. John Hosking, 5 Catherine Terrace, Gateshead-on-Tyne, Durham, and Thomas Cock, Cleator-Moor, near Whitehaven, Cumberland—Improvements in furnaces or fire places.
283. Samuel B. Eveleigh, Salford, Lancashire—An improved form or construction of hats or covering for the head.
284. Richard Needham, Dukinfield, Cheshire—An improved water-gauge for steam boilers.
285. Samuel Plimsoll, 32 Hatton Garden.—Mining apparatus for use in mining coal and other minerals, and also for separating the small coal and crushed ores from the shale, dirt, and other matters with which it may be in combination, and for drying the same.
286. Mary A. Walker and Richard Walker, Graham Street, Birmingham—Certain improvements in the manufacture of percussion caps, and in the apparatus for effecting certain parts of the same.
287. Robert Gormully, 13 Grafton Street, Fitzroy Square, St. Pancras—Improvements in pianofortes with upright frames.
288. Thomas T. Pursglove, Battersea, Surrey—Improvements in barometers.
289. Richard A. Brooman, 166 Fleet Street—Improvements in sewing machines.—(Communication from J. P. Pirsson, New York.)
290. George A. Waller, Dublin—Improvements in the means of and apparatus for expressing liquid from semi-fluid substances and other substances containing liquid.

291. Michael Loam, Treskerby House, Truro, Cornwall—Improvements in machinery for raising sewage and other waters and matters.
292. Charles Crockford, Holywell, Flintshire—A mode or method of producing metallic sulphates.
293. Michael Henry, 84 Fleet Street—The manufacture and useful application of certain bituminous products and compounds of bitumen with other matters, and treating and applying certain natural bitumen or bitumens for such purposes.—(Communication from Moisant and Company, Havannah.)
294. Edward H. Bentall, Heybridge, near Maldon, Essex—Improvements applicable to machinery for grinding or pulverising various substances.
295. William E. Newton, 66 Chancery Lane—An improved blowing machine.—(Communication from Mr. Antoine L. H. F. de Sauville, Paris.)

Recorded February 2.

296. Edward E. Allen, Brompton Row—Improvements in stereoscopic apparatuses.
297. Edward Wilkins, 7 Addington Place, Camberwell, Surrey—Improvements in drain pipes and tiles for draining and liquid manuring land.
298. Robert Lancaster, Orrell, near Wigan, Lancashire—An improved mode of ventilating coal and other mines.
299. François F. Rateau, 60 Boulevart de Strasbourg, Paris—An improved steam engine actuated by regenerated steam.
300. Joseph R. Cooper, Birmingham—Improvements in breech-loading fire-arms.
301. Samuel Tearne, Birmingham—Improvements in ornamenting surfaces.
302. John Buncher, Birmingham—Improvements in the manufacture of eyes or fastenings for stair rods.
303. Isaac Clements, Birmingham—A new or improved method of manufacturing curtain rings.
304. John Hirst, jun., and James Hollingworth, Dobscross, Yorkshire—Improvements in the construction of power looms.
305. George Leach, Leeds, Yorkshire—Improvements in leashing yarn or thread, in the hank, and in machinery for winding off the same.
306. Henry F. Kemp and William Skey, Root Distillery, Louth, Lincolnshire—An improved food for cattle.

Recorded February 3.

307. Thomas Storer, Birmingham—A new or improved funeral carriage.
308. Jeremiah Woodrow, Oldham, Lancashire—Improvements in the manufacture of hats or coverings for the head.
309. William Clayton and Jacob Goodfellow, Blackburn, Lancashire—Certain improvements in metallic pistons.
310. Henry C. Jennings, 8 Great Tower Street—Improvements in the manufacture of paper and artificial parchment and of gelatine, applicable to the sizing of the same, and other purposes.
311. John Petrie, jun., Rochdale, and Thomas Wrigley, Heap Bridge, Lancashire—Improvements in machinery or apparatus for washing rags and other materials for the manufacture of paper.
312. Samuel D. Davidson, Leith, Mid Lothian—Improvements in locomotive steam engines.
313. Alexander G. Pooley, Globe Wharf, Rotherhithe, Surrey—Improvements in preparing fish for manure, and in apparatus for the same.

Recorded February 4.

314. Mark Smith, Sun Foundry, Heywood, Lancashire—Certain improvements in looms for weaving.
315. Hugh Greaves, 5 Victoria Street, Westminster—Improvements in the preparation of iron bars, of the various forms or sections used in the construction of sheet-iron structures, and in machinery employed for the same.
316. Warren Thompson, 45 Essex Street, Strand—An improved printing telegraph.
317. Alexander Allan, Perth—Improvements in locomotive steam engines, in part applicable for retarding and stopping railway trains.
319. Simon L. Trotman, Liverpool—Improvements for the more effectually securing or fastening envelopes or other like receptacles, and the more securely affixing postage stamps, or other adhesive labels.
320. Richard A. Brooman, 166 Fleet Street—An improvement in cooling worts and beer.—(Communication from Madame Jolibois, Dijon, France.)
321. Richard A. Brooman, 166 Fleet Street—Improvements in shirts.—(Communication from L. L. Neyman, Paris.)
322. George H. Baylis, 13 Vauxhall Walk, Lambeth, Surrey, and Francis Robinson, 88 Salisbury Street, Lisson Grove—An improved indicator for registering the withdrawal of liquids from vessels.
323. Frederick H. Maberly, Stow Market, Suffolkshire—Improvements in obtaining spring power, and in its application to various purposes.
324. Louis Bonneau, 279 Rue Saint Denis, Paris—Improvements in apparatus for registering the time carriages are employed in conveying persons from place to place, and also in moving from place to place when unoccupied.
325. Jacques M. E. Masson, Rue des Fosses, St. Thomas Evreux, France—Improvements in apparatus to facilitate working under water.
326. Patrick Adie, Strand—Improvements in apparatus for taking levels and measuring angles.
327. William R. J. Packer, 4 Leinster Street, St. Marks, Dublin—Improvements in the plough or plough-share, for the purpose of more effectually pulverising, breaking up, or cutting into small particles the earth or sod separated from the ground by the plough-share.
328. John Honeyman, Glasgow—Improvements in the construction of ships, vessels, and boats, and in propellers for propelling the same.
329. Andrew Barclay, Kilmarnock, Ayrshire—Improvements in electric-magnetic or electro-magnetic telegraph ropes or conductors, and in machinery or apparatus to be used on board ship for laying or paying out the same.
330. William Clark, 53 Chancery Lane—Improvements in the means or apparatus for preserving grain, flour, eggs, and other vegetable and animal substances.—(Communication from Louis J. Chateau, Paris.)

Recorded February 5.

331. Frederick H. Maberly, Stow Market, Suffolkshire—Improvements in apparatus for corking, for drawing corks, in taps, in the necks of bottles, in the bung-holes of barrels, and in similar articles.
332. Nathaniel Greenhalgh, William Shaw, and James Mallison, jun., Bolton, Lancashire—Certain improvements in the treatment and preparation of yarns or threads previously to dyeing.
333. Robert Tinkler, Penrith, Cumberland—Improvements in churns.
334. Henry Anderson, Liverpool—An improved construction of apparatus for winding window blinds, sun shades, and similar articles on their rollers.
335. Thomas Sykes and Benjamin C. Sykes, Cleckheaton, Yorkshire—Improvements in obtaining or separating oily, fatty, greasy, tarry, waxy, and resinous substances from oleaginous seeds, nuts and fruits, wool, silk, hair, cotton, flax, line, hemp, furs, skins, leather, bones, fish, and other animal matters and refuse, woollen and cotton waste and refuse, also textile fabrics and refuse grease, produced in various branches of industry, indigo, lac, lac dye, and other dyes.
336. Thomas R. Ayerst, Newenden, Kent—Improvements in breech-loading guns and other fire-arms.—(Communication from James H. Sears, Brantford, Brant Upper Canada.)
337. Major Booth, Manchester, and James Farmer, Salford, Lancashire—Improvements in sizing or stiffening woven fabrics.

Recorded February 7.

338. George F. Chantrell, Liverpool—Improvements in the treatment of charcoal after its manufacture or revivification.
339. James Holroyd, Leeds, Yorkshire—An improvement in apparatus used in finishing woollen and other cloths.
340. Abraham Lyons, 77 Chancery Lane—A pocket protector.
341. William H. Crispen, Marsh Gate Lane, Stratford, Essex—An improved atmospheric and hydraulic engine for sailing and steam vessels.
342. Matthew Curtis, Manchester, and John Miller, Staley Bridge—Improvements in certain mules for spinning cotton and other fibrous substances.
343. Joseph Lee, 18 Monson Street, Lincoln—Improvements in the manufacture of cranks for steam engines and other purposes.
344. Thomas Sims, Conduit Street, Regent Street—Improvements in the application of photography to engraving and printing.
345. Edward T. Hughes, 123 Chancery Lane—Improvements in ovens.—(Communication from Herr V. Langen, Berlin, Prussia.)
346. John Smith, Bradford, Yorkshire—Improvements in machinery or apparatus for preparing and combing wool and other fibrous substances.
347. John Wilson, 55 John Street, Sunderland—Improvements in ventilating mines, and in combining apparatus used for such purpose.

Recorded February 8.

348. Thomas Moss, 69 Fleet Street—Improvements in the manufacture of paper and printing ink, suitable for bank notes, bills of exchange, and other documents requiring like security against being copied.
349. Edward T. Hughes, 123 Chancery Lane—Improvements in machinery or apparatus for sorting and numbering the threads or filaments of silk or other fibrous materials.—(Communication from Fabius Mainardi, Lyons, France.)
351. George Thomas, 47 Hampton Street, Paddington—A double-bottomed horse-shoe.
352. Dr. Ernst Bagnicki, New York, U. S.—An improved syringing apparatus for curing Leucorrhea, and similar sexual diseases.
353. William Waller, Chesterfield, Derbyshire—Improvements in agricultural or farm implements or apparatus.—(Communication from William Rodgers, Toronto, Canada West.)
354. Robert R. Rowntree, Kingston-upon-Hull, Yorkshire—A portable tea testing apparatus.
355. John Aspinall, Great Tower Street—An improvement in the refining of sugar.
356. John B. Redman, New Palace Yard, Westminster—An improvement in the construction of carriage ways.
357. Alexander Clark, Gate Street, Lincoln's Inn—Improvements in revolving shutters and blinds, and in apparatus connected therewith.
358. William Clark, 53 Chancery Lane—Improved protectors for tobacco plants.—(Communication from Jules Romiguiere, Paris.)
359. Thomas S. Cressey, High Street, Homerton—Improvements in machinery used in the manufacture of casks.
360. John Juckes, Dame Street, Wharf Road, City Road, Islington—Improvements in stoves or fire-places.

Recorded February 9.

361. Edward Wilkins, 7 Addington Place, Camberwell Road, Surrey—Improvements in flower vases.
362. John S. Joseph, Rhostyllan, near Wrexham, Denbigh, North Wales—Improvements in coke ovens, and in cooling and extinguishing coke.
363. William Archer, Bolton, Lancashire—Certain improvements in Jacquard machines.
364. Humphrey Jefferies, Birmingham—An improvement in castors.
365. Joseph Crossley, Halifax—Improvements in the means employed when steaming printed yarns.
366. James Taylor, Stalybridge, and Charles Wild, Oldham, Lancashire—Improvements in self-acting mules for spinning and doubling.
367. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in fire-firms.—(Communication from William H. Bell, Washington, Columbia.)
368. George Bower, St. Neot's, Huntingdon—Improvements in apparatus for the manufacture of illuminating gas.
369. James E. M'Connell, Wolverton, Bucks—Improvements in steam boilers, and in the generation and treatment of steam.
370. William E. Newton, 66 Chancery Lane—An improved mode of bleaching and purifying or refining sugar and vegetable juices or extracts.—(Communication from Emile Rousseau, Paris.)
371. Edward Herring, Heath, Weybridge, Surrey—Improvements in the mashing and fermenting of grain for the production of alcohol.
372. William E. Newton, 66 Chancery Lane—Certain improvements in breech-loading fire-arms, and in cartridges to be used in such fire-arms.—(Communication from Gilbert Smith, New York, U. S.)

Recorded February 10.

373. Henry P. Burt, Charlotte Row, Mansion House—Improvements in railway carriages and waggons.
374. John Young, Wolverhampton, Staffordshire—An improvement or improvements in the construction of knobs, and the roses used for connecting knobs with doors, and with the cases of locks and latches, and other like fastenings.
375. John G. Taylor, Glasgow—Improvements in writing materials, and the manufacture thereof.
376. William A. Covert, Long Island, New York, U. S.—An improved self-acting railway switch.—(Communication from Charles L. Spencer, Rhode Island, U. S.)
377. Robert J. Ellis, Liverpool—Improvements in the apparatus for lifting sunken vessels and other submerged bodies.
379. Hector Inger, 3 Red Lion Square, Holborn—The improvement of blinkers used by horses whilst drawing, to be called the "Patent Safety Blinker."—(Communication from Edward Souche, 1 Rue Charlot Auxternes, Paris.)
380. Benjamin Burrows, Leicester—Improvements in looms for weaving narrow fabrics.
381. Cranley L. Perry, Sheepstead Farm, Marcham, Berkshire—An agricultural implement for paring and ploughing land.

Recorded February 11.

332. Martin Billing, Birmingham, and William Kloen, Aston, near Birmingham—A method of, and apparatus for, decolorising tea.
333. James Evans, Tarlton Street, Liverpool—An improvement in "Hansom" cabs.
384. James Parkinson, Manchester—A certain improvement in coffins.
385. Nicholas Bennett, 4 Furnival's Inn—Improvements in the construction of brooms or brushes for sweeping or cleansing streets, roads, and thoroughfares, also applicable to domestic purposes.

386. Henry Bruce, Kinleith Mill, Currie, Mid-Lothian—Improvements in apparatus for the manufacture of paper.
387. George Hyde, 61 Fleet Street—A pen for producing a copy or copies of a letter or other writing simultaneously with the production of the original.
388. Robert Cogan, Red Lion Square—Improved instruments for crushing and mixing solid and liquid substances.
389. Henry A. Bartlett, Thetford, Suffolkshire—Improvements in machinery to be used with or without the plough for clearing and cleaning land from weeds.
390. Charles Jackson, Store Street, Bedford Square—Improvements in the action of piano-fortes.
391. James Grimes, 6 Osborn Street, Whitechapel—Improvements in beer engines.
392. Henry Ransford, West Brompton—An improvement in building ships and other vessels.

Recorded February 12.

393. Gaylard Hadwen, Andenshaw, and John Wadsworth, Droylsden, Lancashire—Improvements in Jacquard apparatus, applicable to power looms.
394. Henry Lea, Birmingham—Improvements in changing or reversing motion.
395. Thomas Willis and George Chell, Lougsight, Manchester—Improvements in machinery for spinning, twisting, doubling, and winding yarns and threads.
396. Charles R. Moate, 65 Old Broad Street—Improvements in the manufacture of nuts, screws, bolts, spikes, and other beaded fastenings.—(Communication from Joseph Gibbs, Alexandria, Egypt.)
397. James Crabtree, Market Street, Bradford, Yorkshire—Improvements in the manufacture of bobbins and spools.
398. Samuel H. Huntly, Upper Baker Street—Improvements in cooking apparatus.
399. Thomas White and George Jenkins, Portsmouth, Southampton—Improvements in apparatus for raising and lowering ships along inclined slips.
400. James Bennett and John Bennett, Kingsland Road—An improvement in refrigerators for cooling beer and worts.
401. George Betjemann, George W. Betjemann, and John Betjemann, Upper Ashby Street—Improvements in book slides.
402. William G. Rawbone, Gloucester Street—Improvements in fire-arms and ordnance.
403. George T. Bousfield, Loughborough Park, Surrey—Improvements in revivifying the scarlet colour of woollen cloth, lace, and embroidery, in use for military and other garments and furniture.—(Communication from Messrs. Andres, Burdell, and Chicard, Paris.)
404. Henry Gardner, 1 Old Quebec Street, Portman Square—Improvements in machinery for breaking and reducing flax and other fibres.
405. Robert Bell, 4 Trafalgar Square, Charing Cross—Improvements in separating and recovering wool from fabrics composed of wool, or wool in connection with cotton and other vegetable substances.
406. William E. Newton, 66 Chancery Lane—Improvements in breech-loading fire-arms.—(Communication from James H. Merrill, United States of America.)
407. William E. Newton, 66 Chancery Lane—Improvements in sewing machines.—(Communication from James S. Moody, United States of America.)

Recorded February 14.

408. James Parkinson, Manchester—Certain improvements in coffins.
409. Thomas Hunt, Crewe, Cheshire—Improvements in steam boilers or generators, and in the prevention or combustion of smoke.
410. Charles Sanders, Birmingham—Certain improvements in ornamenting English passe-partouts for photographic pictures, also the glasses used with the same, and which said modes of ornamenting are also applicable to ornamenting photographic frames generally.
411. John Wright, New George Street, Sheffield, Yorkshire—Improvements in reducing and rolling steel and iron wire, and other forms of those metals, in long lengths.
412. Josiah L. Clark, Haverstock Hill—Improvements in the means of working railway signals and switches.
413. James Copcutt, 26 Kirby Street, Hatton Garden—Improvements in obtaining light from gases.
414. Robert Clegg, Islington, Frederick Angerstein, Kennington, Surrey, and John W. Page, Walworth Road, Surrey—Improvements in making soap.
415. Alfred B. Clarke, Edward Street, Blackfriars Road, Surrey—Improvements in discharging sewage and water from lands into tidal rivers, and in flooding lands therefrom, also conveying sewage and other waters or liquids across canals and over structures, part of such said improvements being applicable as a substitute for sluice cocks and valves.

Recorded February 15.

416. Edward H. Aldrich, Shoreditch—Improvements in ladies' dress caps.
417. Charles L. Roberts, Clerkenwell—The manufacture of an improved cigar.
418. Robert Mushet, Coleford, Gloucestershire—Improvements in the manufacture of steel iron and cast steel.
419. Frederick Walters, Sheffield, Yorkshire—The application of the waste heat from puddling furnaces.
420. Walter Raymond, 4 Albion Square, Dalston—An improved life-raft.
421. John Paterson, Wood Street—Improvements in brace buckles and loops, and in braces.
422. John T. Jones, Glasgow—Improvements in sewing machines.
423. George Bedson, Manchester—Improvements in joining wire for telegraphic and other purposes.

Recorded February 16.

424. Jean F. Tourrier, 41 Manchester Street, Manchester Square—Preventing oscillation of the last carriage of a railway train, and giving rigidity and steadiness throughout the train.
425. Matthew Crawford, Liverpool—An improved anti-fouling metallic varnish, applicable to ships' bottoms and other similar purposes.
426 Samuel Bailey, Wednesbury, Staffordshire—Certain apparatus for preventing the skip in mine operations being pulled over the pulley on which the rope or chain works, to which such skip or cage may be attached, as well as preventing the skip or cage re-descending until put in motion for that purpose.
427. Richard Cookson, Layton Hawes, near Blackpool, Lancashire, and Charles W. Homer, Castle Hill, near Northwich, Cheshire—Improvements in machinery for making bricks, tiles, tubes, and other articles of plastic materials, and in the mode of jointing drain pipes.
428. Charles E. Wright, Nottingham—Improvements in means or apparatus employed in the nursing or treatment of infants.
429. Richard J. S. Pearce, Fleet Street—Improvements in weighing and dynamic machines.
430. Pierre M. P. Bourjeaurd, Davies Street—An improved apparatus for supporting the womb.
431. William E. Newton, 66 Chancery Lane—An improved mowing machine or grass harvester.—(Communication from John P. Adriance, United States of America.)
432. Alfred V. Newton, 66 Chancery Lane—An improvement in the construction of brushes.—(Communication from Ira W. Shaler, United States of America.)
433. William E. Newton, 66 Chancery Lane—Improved machinery for making bricks.—(Communication from Mr. A. Milch, Berlin.)
434. William H. Hortsmann, New York, U. S.—Telegraphic cables, and the mode of constructing the same and laying them down.
435. John J. Russell, Wednesbury, Staffordshire—Improvements in machinery used for heating and welding the edges of the plates used in the manufacture of cylinders and other articles.
436. William A. O'Doherty, 5 Eastcheap—An improvement in black lead pencils and pencil cases.—(Communication from Daniel D. Sweet, Providence, Rhode Island, U. S.)
437. Jules Seguin, 4 Grande Rue de à St. Maurice, Seine, France—Improvements relating to the employment of moving power arising from the tides and its application to manufacturing, agricultural, and other purposes.
438. John S. Benson, Birmingham—A new or improved method of silvering glass.—(Communication from Mr. Morisson, Humburg.)
439. Joseph Breeden, Birmingham—New or improved machinery for the manufacture of taps or stop-cocks, and fittings for gas, steam, and water pipes.
440. John Eason, Oxford Street—Improvements in apparatus applicable to tanning, dyeing, and obtaining extracts from vegetable, animal, and mineral substances.

Recorded February 17.

441. Samuel T. Cooper, Upper Clapton—Improvements in the use and application of artificial light.
443. Henry Y. D. Scott, Brompton Barracks, Chatham, Kent—An improvement in the manufacture of cement.
444. Benoit Saillard, Lamb's Conduit Street—An improved mode of obtaining printing plates from collodion pictures.
445. Pierre E. Fraissinet, Paris—A new or improved structure of iron, applicable for paving, flooring, bridges, gratings, girders, and other like purposes.
446. Thomas Cattell, 30 Euston Square—Improvements in treating and purifying gutta percha.
447. Frederick W. Emerson, New Charlton, Kent—Improvements in the treatment of certain ores of lead, and obtaining from them valuable primary and secondary products.
449. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in apparatus for propelling and steering vessels and other floating craft.—(Communication from John Eaton, Belleville, Upper Canada.)

Recorded February 18.

450. John J. Cole, 24 Essex Street, Strand—Improvements in Venetian and other suspended blinds, and in the method of hanging and working them.
451. Charles Garton, Bristol—An improved method of treating cane sugar, in order to render it fitter to be employed in brewing, distilling, and wine and vinegar making.
452. Henry Swisland, 54 Great Sutton Street, Clerkenwell—Improvements in box sextants.
453. George Wallis, Stretton, near Penkridge, Staffordshire—A new or improved method of engraving, applicable to the production of printing surfaces and the ornamentation of metallic and other surfaces.
454. George Kammerer, Lombard Street—Improved gearing for gins or horse mills, applicable for grinding, winnowing, and other purposes requiring motive power.—(Communication from Messrs. Lotz, Ponance, Main et Loire, France.)
455. William Clark, 53 Chancery Lane—Improvements in emptying cesspools, and in raising other fluid and semi-fluid matters.—(Communication from Pierre T. Joly, jun., Paris.)
456. William Clark, 53 Chancery Lane—Improvements in pressure gauges.—(Communication from Louis Droissait, Paris.)
457. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in the manufacture of textile fabrics, and in the machinery or apparatus employed therein—(Communication from Monsieur Amans de Chavagneur, Paris.)

Recorded February 19.

458. Pierre A. J. Dujardin, Lille, France—Improvements in the printing apparatus of railway telegraphs.
459. Alphons R. L. M. de Normandy, 67 Judd Street, Brunswick Square—Improvements in an apparatus for obtaining fresh water from salt water.
461. William Clay, Liverpool—Improvements in the manufacture of deck and other beams, and of angular and other bars of various forms.
463. Samuel Wheatcroft, Brudenell Place, New North Road—Improvements in the method of, and the means for, uniting lace to blond and other fabrics, and also in the apparatus used for manufacturing or converting the same into bonnet and cap fronts, rouches, and such like similar articles of millinery.
464. Charles F. Vasserot, 45 Essex Street, Strand—An improved apparatus for manufacturing the strands of wire ropes.—(Communication from Jean B. P. Aubert, Clermont Ferrand, Puy des Dome, France.)
465. Charles F. Vasserot, 45 Essex Street, Strand—An improved carding machine.—(Communication from Victor M. Morin, Athis, Orne.)
466. Richard A. Brooman, 166 Fleet Street—Improvements in machinery for doubling threads.—(Communication from Adolphe Boucz, Paris.)
467. Ferdinand P. J. V. den Ouwelant, Paris—Improvements in apparatuses to be applied to fire places for obtaining a more complete combustion of the fuel employed therein.

Recorded February 21.

468. George Paul, Glasgow—Improvements in spindles and flyers.
469. Obed Blake, Blackwall—Improved machinery or apparatus used in the manufacture of glass.
470. Gilbert M'Culloch, Manchester—Improvements in machinery or apparatus for spinning, doubling, and throwing silk, and doubling other fibrous materials.
471. Thomas Wilson, Birmingham—Improvements in the manufacture and construction of ordnance.
472 Alfred Belpaire, Brussels, Belgium—Improvements in the reversing gear of locomotive and other steam engines.
473. George Humphrey, Deptford, Kent—Improvements in meters for measuring fluids and gases.
475. Robert Jobson, Wordsley, Staffordshire—Improvements in supplying water or other fluid to axletree boxes and other journal bearings to lubricate the same.
476. Alfred Tapercll, 37 Moorgate Street—Improvements in compositions or compounds used when cleaning glass.
477. Richard W. Johnson and William Stableford, Oldbury, Worcestershire—Improvements in axle boxes.
478. Joseph Schloss, Cannon Street—An improvement in locks or clasps for portemonnaies, pocket books, bags, and other like purposes.—(Communication from Vve. H. Schloss and Frere, Paris.)

Recorded February 22.

479. Thomas Smith, Chatteris, Cambridgeshire—Floating wheels for driving machinery.
480. William Soelman, 3 Bennett Street.—Improvements in the construction of propellers.
481. Joseph Grimond, Manchester—Improvements in the treatment and preparation of jute and other fibrous materials, and in machinery or apparatus employed therein.
482. James Curtis, Drury Lane—The manufacture of military sash net, and machinery to be employed therein.
483. William S. Clark, 76 Cannon Street West—Improvements in the formation of cast iron rails for city railways, and also in the method of uniting the ends of two adjacent rails for railway use.—(Communication from Sidney A. Beers, Brooklyn, New York.)
484. Joseph Hine, Clerkenwell—An improved hook slide.
485. Edward Lund, Manchester—Certain improvements in the manufacture of fabrics or textures to be used in the construction of umbrellas and parasols.
486. Richard A. Brooman, 166 Fleet Street—Method of fixing tannin upon textile fibres, and the employment thereof in dyeing black and dark colours.—(Communication from M. Verguin, Lyons, France.)
487. Thomas R. Harding, Leeds, Yorkshire—Improvements in the manufacture of card surfaces to be used in preparing fibrous materials.
488. William Gossage, Widnes, Lancashire—Improvements in the utilisation of alkali waste.

Recorded February 23.

489. Augustus W. Smethurst, Chorley, Lancashire—Improvements in machinery for driving looms for weaving.
490. Samuel Ridge, Hyde, Cheshire—Improvements in coupling or making the joints of pipes and other articles.
491. William Ashton, Heaton Norris, Lancashire—Improvements in gas regulators.
492. George Davies, 1 Serle Street, Lincoln's Inn, and 28 St. Enoch Square, Glasgow—Improved apparatus applicable to the evaporation of saccharine liquids, and for the concentration of heat for other purposes.—(Communication from Augustus Jouan, San Francisco, California.)
493. Uriah Scott, Camden Town—Improvements in carriages and various parts of the same, which parts may be applied to vehicles of any description.
494. William Sharp, Bingley, Yorkshire—Certain improvements in machinery for spinning and twisting worsted, cotton, silk, and other fibrous materials.
495. Samuel R. Samuels, Nottingham—Improvements in twist lace machines.
496. Samuel Russell, 12 Sheaf Gardens, Sheffield, Yorkshire—An improvement in the manufacture of handles for tea and coffee pots, jugs, pestles, knives, daggers, and forks, or any other description of article to which handles are applied.
497. George Turnbull, Calcutta, Bengal, East Indies—Improvements in the permanent way of railways.

Recorded February 24.

499. John Robinson, Lower House, near Burnley, Lancashire—Improvements in machinery and apparatus applicable to machinery for spinning and doubling.
500. Robert Mushet, Coleford, Gloucestershire—A new metallic compound or alloy.
501. Robert Mushet, Coleford, Gloucestershire—An improvement in the manufacture of cast steel.
503. Joseph Crosland, Crosland Moor, Huddersfield, Yorkshire—Improvements in looms for weaving textile fabrics.
504. Adolphe Lançon, jun., Besançon, department du Doubs, France—A new system of watches.
505. Jean H. G. D. Wagner, Paris—Apparatus for cleaning water, and removing all matters in suspension and dissolution contained in it, water intended to feed generators of all sorts (applicable also to other purposes), which besides previous to its getting into the generators, is heated to the highest degree without almost any expense.
506. John Dale, Cornbrook, Manchester—Improvements in concentrating caustic alkalis, and in applying a product therefrom to the purpose of obtaining motive power, and to other purposes.
507. Enock Price and Edmund Hawkins, Doncaster, Yorkshire—Improvements in the mode of forming fish plates, and in the method of fixing or attaching them to the joints of rails on railways.
508. Alfred C. Keily, Silchester Road, Notting Hill — Improvements in apparatus for drawing off fluids.

Recorded February 25.

509. Alexander Reid and Richard Tonge, Manchester—Certain improvements in weaving and in machinery employed therein.
510. Alexander Reid and Richard Tonge, Manchester—Certain improvements in or applicable to looms for weaving.
511. Thomas C. Hinde, Dudley, Worcestershire, and George J. Hinde, Wolverhampton, Staffordshire—Improvements in coating iron with copper or alloys of copper.
513. William M'Naught, Manchester—Certain improvements in steam engines, particularly applicable to compound steam engines.
514. Robert Fielden, jun., and Thomas Fielden, Walsden, Lancashire—An improvement or improvements in the manufacture of pickers to be used in looms for weaving, and also in the machinery or apparatus to be employed in the manufacture of the same.
515. James Reddie, Colehill Lodge, Fulham—An improved mode of propelling and steering vessels.
517. William Clark, 53 Chancery Lane — Improved apparatus for spinning, twisting, doubling, and drawing fibrous materials.—(Communication from Messrs. Leroux Brothers, Tracy-le-Mont, Oise, France.)

Recorded February 26.

518. Frederick Weekes, Bolney, Sussex—The treatment of certain alcoholic products.
519. George Earnshaw, Horbury, near Wakefield, Yorkshire—The treatment of woollen and other rags and waste of fibrous substances, so as to obtain useful products therefrom.
520. James Lee, St. Helen's, Lancashire—Certain improvements in ploughs.
521. Joseph Hine, Clerkenwell—An improved joint for cabinet making, carpentry, and other constructive purposes.
522. William Burgess, Newgate Street—An improvement in reaping and mowing machines.

Recorded February 28.

523. Edward Gatwood, Great George Street, Westminster — Improvements in buffing, traction, and bearing springs, applicable to railway carriages and locomotive engines.
524. François Brignoles, 3 Duke Street, Adelphi—The disinfection and rectification of alcohols, by the separation of the essential and other oils from the alcohol.—(Communication from Mr St. C. Prieur, Avignon, Town, France.)
525. Alexander Martin and Alexander Crichton, Pollockshaws, Renfrewshire—Improvements in weaving and woven goods.
526. James Howden, Glasgow—Improvements in machinery or apparatus for cutting, shaping, punching, and compressing metals.
527. John Leigh, Manchester—Improvements in the purification of coal gas.
528. George Horner, Falls Road, Belfast, Antrim, Ireland—Improvements in hackling flax, and other fibrous materials, and in machinery for the same.
529. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in apparatus for stopping horses.—(Communication from Madame Achet, Paris.)
530. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in apparatus for taking soundings, applicable also to the throwing of life lines.—(Communication from William P. Trowbridge, Washington, Columbia, U. S.)
531. Collinson Hall and Collinson Hall, the younger, Navestock, Essex—Improvements in steam agricultural machinery.
532. Archibald Turner, Leicester—Improvements in the manufacture of elastic fabrics.
533. Alfred V. Newton, 66 Chancery Lane—Improvements in constructing and working condensing engines.
534. William Hodson, Kingston Square, Hull—Improvements in rotatory engines.
535. Richard Brown, Earith, near St. Ives, Huntingdonshire, and William Milne, Bushey, Herts—Improvements in fire-arms.

Recorded March 1.

537. Thomas Cloake, 6 Saville Row, Walworth, Surrey — Stopping of the bodies and wheels of railway and other carriages.
538. James Holroyd, Leeds, Yorkshire—An improvement in finishing woollen cloths and cloths made from a combination of wool and other materials.
539. Rev. Henry Moule, Fordington, Dorsetshire—Improvements in apparatus applicable to the evaporation of sewage or other waters, and for affording heat for other uses.
540. James Wetherilt, Chapel Street West, Mayfair—Certain improvements in locks.
541. John Edwards, Fenton, Staffordshire—Improvements in stacking or holding biscuit, earthen, china, and glossed ware for firing.
542. George P. Rivers, Baron Rivers, Rushmore Lodge, Wiltshire—An improved implement for breaking up and preparing land.
543. James Templeman, Glasgow—Improvements in the manufacture or production of artificial fuel.
544. John Pile, West Hartlepool, Durham—Improvements in the construction of floating docks.
545. David Lichtenstadt, 1 Henry Cottages, Park Road, Peckham, Surrey—Converting certain vegetable substances into fibrous material for the manufacture of paper, textile, and other fabrics.

Recorded March 2.

547. Peter Currie, Birmingham—Certain improvements in spindles for locks, latches, and other door fastenings.
549. James M. Adams, David Law, and John Inglis, Glasgow—Improvements in fire places, grates, ranges, and stoves.
551. William F. Dearlove, 10 Dartmouth Street, Westminster—An improved chopping machine.
553. John W. Harker, 24 Upper Barnsbury Street, Islington, and John K. Field, Upper Marsh, Lambeth—Improvements in coating the bottoms of iron and other ships and vessels.—(Communication from John C. Harker and Frederick Field, Chili.)
555. Caleb Hill, Cheddar, Somersetshire—An improved construction of stay fastening.
557. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in the construction of grease boxes and bearings generally.—(Communication.)
559. James Newcomb and Joseph G. Lovell—Improvements in obtaining and applying motive power, especially adapted, amongst other purposes, to the propelling of ships and vessels.
561. William Brown, 4 and 5 Edgar Place, Mill End—Improvements in the manufacture of pipe mounts or stems, cigar tubes, and similar articles.

☞ *Information as to any of these applications, and their progress, may be had on application to the Editor of this Journal.*

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 25th January to 4th February, 1859.

Jan. 25th,	4149	Elias Lyons and Sons, Sutton, St. Helen's—"Glass bottle."
Feb. 9th,	4150	William and John Sangster, 75 Cheapside—"Parasol."
14th,	4151	John Whitehouse and Son, Birchall Street, Birmingham—"A bolt or fastener."

TO READERS AND CORRESPONDENTS.

Commencement of Volume IV., Second Series, of the Practical Mechanic's Journal.—The present Part, No. 133, is the commencement of the fourth volume, second series, of this *Journal*, or the twelfth volume, including the first series. The entire set of volumes may be had from any bookseller, in cloth lettered in gold, price 14s. each; or the whole 132 parts may be purchased separately, as originally published, at 1s. each—any single part being obtainable. The whole ten volumes may also be had, handsomely bound in half calf in five double volumes, twenty-four parts in each, with the Plates bound separately to correspond—price 31s. 6d. for each double volume and its separate volume of Plates. Volume III., second series, contains nineteen quarto pages of copperplate engravings, nearly 500 engravings on wood, and 344 pages of letterpress.

Postal Communication.—A correspondent writes us, suggesting that it would be very advantageous in accelerating the dispatch of letters from country places, to make the guard's van of each passenger train a receiving office—the letters to be removed and sorted at the large towns. No doubt, such a system would often save many hours' delay of letters in local offices.

Engineering in South America.—A young civil engineer writes thus:—"What kind of a prospect might be held forth to a mechanical or civil engineer, if he were to emigrate to South America, and what part of that Continent do you think most preferable for a young man in the above profession, also, what kind of machinery is in most demand there at present?" Perhaps some of our readers, who possess a personal acquaintance with the country, will help our correspondent with a few words of advice.

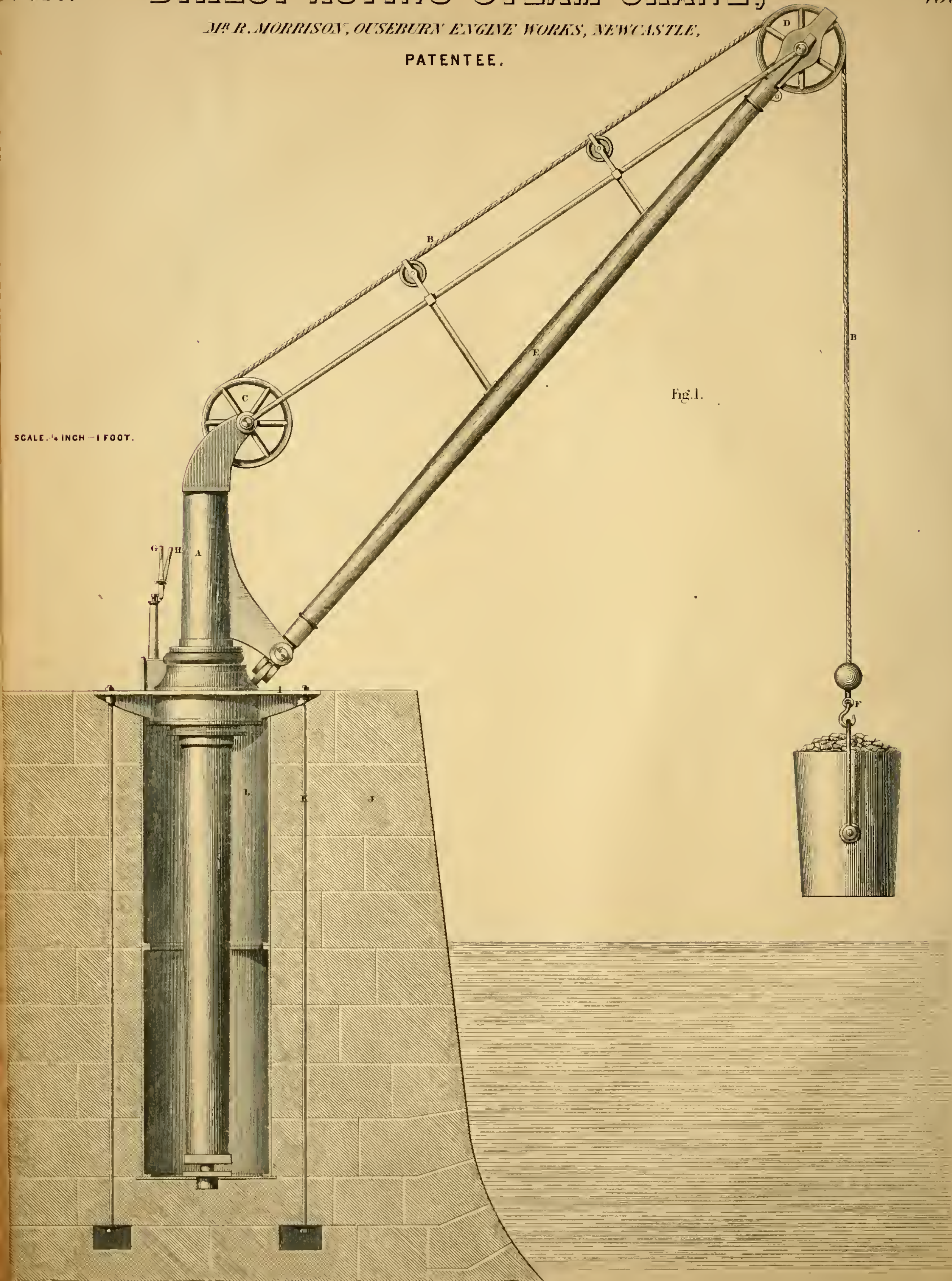
DIRECT-ACTING STEAM CRANE,

MR R. MORRISON, OUSEBURN ENGINE WORKS, NEWCASTLE,

PATENTEE.

Second Series

Vol. IV.



SCALE ¼ INCH = 1 FOOT.

Fig. 1.

DIRECT-ACTING STEAM CRANES.

By Mr. R. Morrison, *Ouseburn Engine Works, Newcastle-upon-Tyne.*

(Illustrated by Plate 237.)

Steam has lately been rapidly increasing in favour in its direct application as a hoisting power. Engineers have at length seen that, wherever locality and general convenience will admit it, this now universal agent affords by far the best means of accomplishing all heavy lifting work; where the operations are continued with little or no intermission, it wants, in fact, but steady employment, and possessing that, it does its work well.

Some very effective mechanical arrangements for the purpose have recently been introduced by Mr. R. Morrison, of the Ouseburn Engine Works, Newcastle-upon-Tyne; and we now present an engraving of one of a set of four several forms of them. The principal improvements in them are carried into practical effect by doing away with all spur wheels, pinions, axles, barrels, brakes, ordinary steam cylinders, piston rods, valves, chains, crane checks, and all other complications of gearing necessary to enable the present cranes to lift, lower, and swing round both ways. For these there is substituted a piston, with a flexible piston-rod working steam-tight through a stuffing-box in the top of the crane post, and passing over two pulleys forming the chain. By this arrangement the different movements of the crane are performed with the greatest facility and precision, the lifting being performed by the admission of the steam above the piston—forcing it down the cylinder or crane post to a distance equal to the lift required, when the steam is shut off and let on to the turning round disc, when the crane is swung round to the required position. The steam in the crane post or cylinder is then allowed to escape, fast or slow, as may be required, and the weight is lowered in the same time. The steam is again let on above the piston, to lift the empty tub, and also upon the disc, to swing the crane back to its first position to get loaded, and the same operation is repeated so long as the crane is required to work. By these means a crane with a lift of twenty-four feet and a radius of twenty feet will lift, swing round, discharge and swing back to reload, four times a minute; or, in other words, it will discharge four tubs of coals, of two tons each, in one minute, or more, if the tubs can be filled fast enough. In addition to the expedition gained with these cranes, the smoothness of motion, and the absence of any jerking, such as takes place with chains and the ordinary gearing, are of great importance, preventing undue strain upon the foundation, and also the sudden breaking of chains or other parts of the crane. Smoothness of motion is obviously of great advantage when cranes are used on board ship, as it is well known that the unsteady motion of the present cranes is very injurious to the decks of ships. This is so much the case that it is impossible to keep them water-tight for any considerable time, and when covered with lead or sheet iron, to prevent the water getting through, the decks and beams are eventually so much injured by the constant jerking and vibration caused by the ordinary steam cranes, that repairs are required far more frequently, and at more expense, than otherwise would be the case. Before these cranes were tried it was supposed that the steam would condense so much in the cylinder or crane post that no weight could be steadily held suspended to the hook for any length of time, but it is found from practice that such is not the case, and that no perceptible change can be seen in the position of the weight, if allowed to remain suspended to the rope or flexible piston for twenty minutes without any steam being admitted into the cylinder or crane post; in fact, with a well-proportioned crane there is no perceptible condensation of steam, even with the first lift, when the cylinder is cold, and no more power is required to lift two tons than a pressure of two tons upon the area of the piston, with the usual allowance for friction.

The arrangement will be clearly understood by reference to our plate, 237, representing the crane complete, as applied on a quay, for discharging coals, iron, and other materials, and is, in fact, a fac simile of a two ton crane now at work on the quay at the Ouseburn Engine Works, Newcastle-upon-Tyne.

This plate, numbered fig. 1, represents a complete side elevation of the crane. A is the crane post or cylinder, which may be made of cast or malleable iron in one length, or in two or more pieces, and bolted together and bored out to a size suitable for the desired weight to be lifted, and the pressure of steam to be used. The length of the bored portion of the crane post corresponds, in this case, to the amount of lift required. Within the cylinder there works a light piston, which is firmly secured to the end of the flexible piston rod or wire rope, B. This piston is made in such a manner, that when the pressure of steam is upon it, the packing expands and makes it steam-tight, but as soon as the pressure is relieved, the packing contracts, so that the piston will work freely in the cylinder, and the weight of the rope is sufficient to haul the piston.

The wire rope, B, works steam-tight through a stuffing-box in the top of the crane post or cylinder, and passes over the respective sheaves or pulleys, C and D, the one being carried in brackets on the top of the crane post or cylinder, and the other being fitted to the extremity of the jib, E. The rope continues down to the hook, F, and it will be seen that an oval ball of metal is on the rope, B, above the hook. This ball is cast hollow, and covers a spring and saddle arranged to connect the hook and links to the end of the rope, the spring being for the special purpose of relieving the crane and rope from any abrupt strain when beginning to lift the weight. It is worth mentioning here, that the wire rope is much safer than a chain, inasmuch as it is not liable to the sudden fracture often occurring in crane chains, nor is it affected to the same degree by the temperature of the atmosphere. The rope used on the crane in question is made of steel wire. It is one inch in diameter, and would carry ten tons, and is sufficiently flexible for all purposes.

The stuffing-box, through which the wire rope works near the top of the cylinder is fitted with a conical gland, pressed down by a helical spring, so that the packing is always kept well pressed up to and round the wire rope, B, without the necessity of screwing up, as is the case with the ordinary stuffing boxes.

The turning or swinging round cylinder is cast on, and forms part of, the bed-plate. It is truly bored, and fitted with a metal-packed disc or piston, secured to the outside of the crane post or cylinder, in such a manner as to allow the post to wear down without interfering with the freedom of the disc. The disc turns round with the crane post, and a similar disc is bolted to the inside of the turning round cylinder, and made steam-tight next the crane post by metallic packing and springs of the usual kind. Steam admitted on either side of these discs by the handle, G, acting on the steam valve in the steam chest, will turn the crane round either way, as may be required; and in like manner the handle, H, acting upon the lifting and lowering valve in the same steam chest, admits the steam through a passage in the post to the top of the lifting piston, and forcing the piston down the post, the weight or tub is raised to the required height. The valve is then closed, and the steam is retained in the cylinder, and thereby the weight is held in the same place, until the crane is swung round to the proper position by the handle, G, as already described. The handle, H, is then reversed, and the steam is allowed to escape into the atmosphere through the exhaust pipe, and the weight or tub is lowered to the required position, fast or slow, at the option of the attendant. Some apprehension at first existed, that on account of the expansive properties of steam, there would be some difficulty in starting and stopping the crane instantaneously; but no such difficulty exists in practice. The lifting valve is arranged so that the lifting can begin and stop instantly. The turning round valve is similar, and in stopping the crane when turning round suddenly, it is only requisite to put the steam upon the opposite side of the disc. This not only stops the crane at once, but forms an excellent cushion for the piston to strike against. But provision is made at each end of the lifting cylinder or post, as well as in the disc cylinder, for preventing accidents, in case the attendant should neglect to shut the steam off at the proper time. In trying the crane with water instead of steam, it was found that the starting and stopping were worked more easily with the latter than with the former; whilst the expense is much less with steam than it would be with water.

There are only two pipes attached to the crane—steam and exhaust pipes—which are both under grouud, and which pass in under the bed-plate, so that neither exbaust nor steam pipes are seen above ground when in working trim. The exhaust pipe of the crane in question is taken into a chimney elose by. I represents the foundation or bed-plate, upon which is cast the disc or turning round cylinder; J, is the quay wall, and K, the holding down or fouudation bolts; L, is the cast-iron casing of the well to prevent water from getting into it.

In our next part, we shall give the three other forms of these cranes, in illustration of their varieties of application.

ARCHITECTURE.

The course of lectures which have been in process of delivery at the South Kensington Museum have heen brought to a close in a pleasant way, with two discourses, by the Rev. J. L. Petit, M.A., and Mr. George Scharf, jun.

Mr. Petit's lecture was on Refinement in Architecture. He stated that a process of refinement was always taking place. The Doric of the Parthenon was an improvement on the Doric of Carthage. The Temple at Pæstum preceded the Temple of Neptune. He referred to false refinement, as in the towers of Westminster Abbey, and to the pure refiuement in the Parthenon—alluding particularly to the curve in the echinus of the capital of the pillars, and to the lamentable difference as to style of refinement in the urns which we often observe placed upon buildings. Nature, he stated, reserves her choicest measures for those who take the trouble to search for them. He mentioned the conventional form of the Parthenon as derived from that of a primæval hut, but exhibiting the highest refinement in the passage. Imitation cannot hold a place. All must be conventional or progressive in refinement. Bricks used as stone alone would be used, is bad, as in the great brick railway arches; and stone used as bricks has the same obliquity in true refinement. He controverted the idea, which has heen prevalent in some quarters, that the Gothic would not hear high sculpture or over nice work. Refinement in the Gothic should meet the Greek, and so the Greek the Gothic. In remarking upon good proportion as an element of refinement, he cited the examples of the cathedrals of Bourges and Rheims, and the opposite in the cathedrals of Seville and Milan, especially in the windows of the clerestory. Refinements in art, he stated to be quite distinct from improvements of nature, and controverted the idea that, as regards art, nature could not be improved. The engaged column he considered an example of the very reverse of refinement. He then gave other examples of refinement, and the want of it in the Romanesque and Gothic, and remarked upon the adaptation of a building to its uses. The form of a church, for instance, should be adapted to the form of service. "Form therefore to office" was essential to refinement. He then made some observations on the Bizantine style, the type that of Athens. He would not omit the great question of Ornament, and referred to the imitation of nature so much talked of now as the true foundation of ornament. But he considered that nature should be considered but as a guide only. Things are rather natural because they are beautiful, than beautiful because they are natural. Some most beautiful forms are uot found natural, as the Cycloid and Concoid.

Mr. George Scharf, jun., concluded the series of lectures with one on the Application of Colour to Form, and their distinctive Properties The application of polychromy to architecture and statuary was the prohlem of the day. As regards the latter, nothing had yet been done in modern times towards perfectiou. He considered that the ancient earthen positive colour was probably attributable to the business of the people heing generally carried on in the morning and evening, and not at midday, which was the chosen time of sleep. He thought there was a beauty of tone pervading the positive colours in the Prussian buildings very unlike that perceptible in the Crystal Palace. He referred to the middle-age work, and mentioned Giotto as well knowiug the true halauce of colour. Form and colour should never be confounded Form is connected with mind—colour with sense. He remarked upon the exquisite adaptation of colour to form, as shown in the daisy, the mallow, and the hearts-ease. Gibson's colouring did not, as he thought, go far enough. The many various shades in the colour of flesh and hair was not applicable in regard to eolouring statues. A great deal has yet to be done. He then descanted on the prize design for colouring a small architectural figure. He thought the use of tiuted blinds in churches by the Italians was excellent. The orange and purple blinds chiefly used diffused in the building a very harmonious light; and he considered this might be adopted beneficially, in this respect, by us.

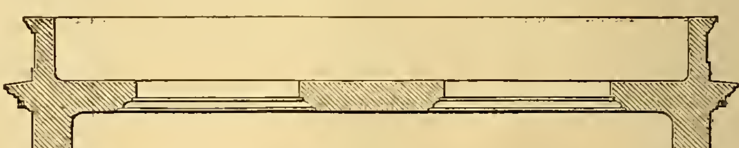
The session terminated very appropriately by the presentation of prizes to the successful competitors in the several departments—Mr A. O. P. Harrison, of 307 Euston Road, carrying off the largest prize of £5 5s. A list of the prizes offered in the ensuing season, and the subjects of competition were mentioned; and all art-workmen connected with building, and architecture, and decoration, may obtain the full particulars by application at the South Kensington Museum.

JONVAL TURBINES OF THREE HUNDRED HORSE-POWER,

AT THE NEW HARMONY MILLS, COHOES, NEW YORK.

The Jonval system of turbine has more than once formed the subject of an article in the *Practical Mechanic's Journal*, and we have now much pleasure in presenting an engraving of an actual working pair of these motors. They are the production of Mr. Emile Geyclin, and were erected by him at the New Harmony Mills, New York, where they are in effective operation. The wheels, reservoirs, and the girders supporting the reservoirs, together with the columns, entablatures, and bridges for carrying the bearings of the shafting, are altogether of iron; thus making the wheel building, and the whole arrangement of the motors, with the adjacent parts for conveying motion to the machinery in tbe mill, completely fire-proof.

At A is a cast-iron chamber or reservoir, above the cylinder, containing the motor. It communicates by means of a large nozzle with the hydraulic eanal, from which the required supply of water is taken. These chambers serve the purpose of penstocks; they are nine feet diameter. The chambers are supported in cast-iron girders, B, which are supported at their ends on shoulders in the walls of the wheel-house. Bolted to the lower part of the chamber, is the wheel cylinders, C, in the contracted part of which the moving wheel, D, or turbine proper revolves. In the couical part of the cylinder, above the moving wheel, the stationary or guide wheel, E, is placed; it serves to direct the water properly upon the buckets of the moving wheel. Supported on a cross bridge in the cylinder, is the step box, G, which serves to steady the lower part of the upright shaft, H. The weight of the shaft, water wheel, and gearing, is not, however, supported by the step, the shaft being supported at the top



of the chamber upon Parry's anti-friction rolls; the upper box of which arrangement is keyed to the shaft, and the lower rests on the top of the chamber. K is the gate, being a cylinder of cast-iron, guided by the stands, L; it is raised and lowered by the racks, M, secured to lugs cast in the gate. The racks are moved by the pinions, N, on the shaft, O, which is supported in stuffing boxes in the cylinder, C. On the end of this shaft is a worm wheel, gearing with a screw on the upright shaft, P. The hand wheel apparatus, Q, is arranged to suit this screw. The motion is conveyed, from the upright shafts of the two turbines to the horizontal shaft, by the large mortise bevel wheels, R, gearing with the pinions, S S, on the horizontal shaft. The bearings of the horizontal shaft, and also the upper bearings of the upright shafts, are carried by bridges secured to the cast-iron entablatures, V. The horizontal shaft is so arranged with a strong coupling between the wheels, and also with proper bearings, that both wheels may be worked together, or either of them alone, if required. The pulleys, W, are seven feet diameter, and twenty-two inches face. The strong columns, X, and the entablature, Y, support the bridges carrying the bearings of the shafting.

The entire arrangement is very compact, and the details well fitted. The work done, is done well, both as regards the operation of the working parts, and the per centage of power produced from the water used.

HISTORY OF THE SEWING MACHINE.

ARTICLE XIV.

Edward Joseph Hughes obtained a patent on the 26th of October, 1853, for "improvements in machinery or apparatus for sewing or stitching," in the specification of which he describes various modes of stitching by machinery; but we do not know that any of them have ever been considered of sufficient importance to become adopted. We propose, however, to give a short notice of such of the leading features as appear to us the most striking.

The invention consists more particularly of improvements in the machines patented by Mr. Hughes in 1852, and previously referred to by us. The first machine described in this specification, is arranged for using two straight needles, moving diagonally in needle frames, so as to cross each other at every stitch—the one needle being above the cloth and working downwards, and the other below the cloth and working upwards—both needle carriers and frames being actuated by lever arms from one cam, which serves also as the fly-wheel of the machine. This machine is a mere modification of the mechanism for working the two diagonal straight needles, previously described in Mr. Hughes' first specification, and of no practical value whatever. Mr. Hughes, in one of his machines, illustrates the application of endless notched or roughened surface chains, passing over pulleys, for the purpose of feeding the cloth along — a presser foot holding the cloth down upon a portion of the feed chain, which is brought up through an opening in the table or platform of the machine. The requisite intermittent, or step by step motion, is imparted to the feed chain by means of a series of falls of various length, working a ratchet wheel, and carried by a vibrating lever, which is actuated by a cam or wiper on the main shaft. We give an illustration of this feeding chain and mode of applying and working the same, at fig. 98, which will be sufficiently clear to our readers without any further description. We cannot but admit the novelty of this feed apparatus; but at the same time, we must confess ourselves profoundly ignorant of the advantages to be derived from the substitution of this comparatively costly and complicated apparatus, for the simple, cheap, and effective one previously patented in 1852, and described by us in our seventh article. Fig. 99 is a diagram of a two-thread stitch produced in Mr. Hughes' machine. This would appear, on examination, to be a very firm and lasting stitch, and no doubt is so *when made;* but the mode of producing this stitch is by no means clearly described in the specification. Three different combinations of apparatus are illustrated and described in the specification for forming the stitch in question, to which document

Fig. 98.

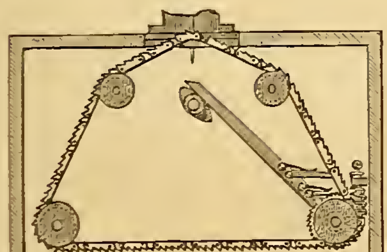
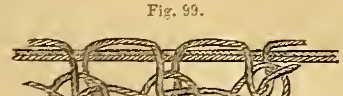


Fig. 99.



we beg to refer such of our readers as may feel sufficiently interested in the invention to desire to become masters of the same. The combination of instruments and their movements are extremely complicated, whilst the description and drawings are anything but clear and explicit; the whole of the views of one arrangement, indeed, are, as we are kindly informed in the specification, "*accidentally inverted!*"

Our readers really have no idea of the amount of patience and perseverance requisite at times, to dissect some of the very ingenious mechanical combinations constituting that imaginary class of sewing machines, whose sole existence has been in the fertile brain of an inspired inventor, and on the paper upon which they have been drawn.

Another portion of Mr. Hughes' invention relates to a means of performing the operation technically known as "closing," viz., the sewing or joining together any two pieces of strong material, such as the legs of boots, the uppers of shoes, &c. For this purpose it is proposed to use peculiarly formed clamps, one of which is shown in side view and plan, at figs. 100 and 101 respectively. The materials to be

Fig. 100.

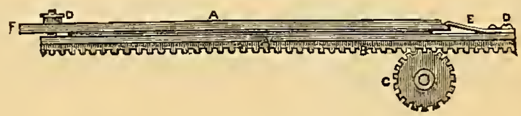
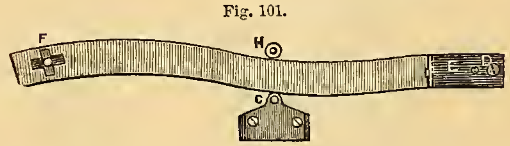
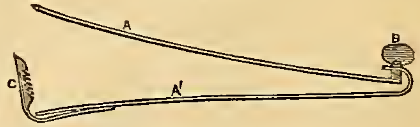


Fig. 101.



formed are placed between the holding jaws, A A^1, and are moved along under the needle whilst being sewed, by means of a rack, B, and pinion, C, or other similar contrivance. Motion is given to the pinion from the main shaft of the machine, by means of a cam, lever, and ratchet gear. In one end of the rack is a pin or stud, D, to which is fitted one end of the lower clamp or jaw, A^1, so as to turn loosely round the stud. The same stud serves also to secure the spring, E, which presses or bears upon a projection on the end of the upper jaw, A, and thus pressing the two jaws forcibly together, when the work or material to be sewed is placed between them. A second stud, F, is finally secured to the opposite end of the lower jaw, and passes up through a slot made in the upper jaw, A. A screw thread is formed upon this stud, and an oblong nut passed thereon, so that on screwing up the nut, the jaws may be made to compress or hold the material firmly between them, which, when requisite, can be instantly released, by simply turning the nut so as to correspond exactly with the slot, whereupon it will pass through and the clamp will fly open. These clamps are made of suitable form to adapt them to the form or deviation of seam to be produced, so that the stitching may always be close to the edge of the clamp from one end to the other. They are guided on one side by a small projection, G, (fig. 101,) on the top of the table, and close round the hole through which the needle passes, and against which one edge of the lower jaw traverses; whilst a small stud or roller, H, may be used on the other edge for keeping the clamp against the before-mentioned projection, G. This stud or roller may be permanently fixed on the upper part of the table, or to a spring, which shall continually press it against the edge of the clamp whilst the seam is being sewed. In this way the clamps, of whatever form, are moved along by the rack, carrying the work with them, and causing a seam to be stitched parallel with the edge of the clamp. In place of the arrangement above described, the clamp may consist simply of two curved springs, A A^1, (as shown in fig. 102,) having thin convex sides together, and one end of each spring screwed to the corresponding end of the other spring by an adjusting screw, B, the other two ends, after the work is placed between them, being pressed together by hand, and retained by a notched spring-catch, C. When this latter form of clamp is used, the work and clamp are held and guided by the hand, and the work is fed along by any suitable feeding apparatus, and the clamps may be made straight and placed far enough from the seam to be out of the way of the parts of the machine near to the needle. The inner sides or surfaces of the jaws or clamps which press directly upon the cloth, are grooved or furrowed, so as to have a firmer hold upon the material contained between them. Another part of this invention relates to an improvement upon, or rather a modification of, the machine previously

Fig. 102.



patented in 1852 by Mr. Hughes, wherein a vertical needle, worked in conjunction with a curvilinear needle working horizontally.

The present modification is illustrated by a vertical sectional elevation at fig. 103, a plan with the table removed at fig. 104, and an end elevation at fig. 105. In lieu of the curvilinear needle previously adopted, a straight one, A, is substituted. It is carried by the holder, B, connected with the horizontal slide, C, by the screw pin, D, so as to allow the holder to vibrate upon the pin as a centre. Motion is imparted to the slide, C, by a cam, E, into the groove of which works a stud pin fastened in the end of the slide. A slight vibration is given to the horizontal needle-holder by a cam, F, on the shaft, G, which cam in its rotation presses against an arm or lever, H, to which is attached the hooked projection, I, connected with the holder, B, and adjusted by a set screw. The reverse lateral motion of the needle and holder is obtained from the spring, L. The thread for the vertical needle is obtained in the usual manner from a spool or bobbin for the purpose, whilst a second spool or bobbin, M, supplies the second or filling thread to the horizontal needle. We are at a loss to know how Mr. Hughes can consistently make such a sweeping claim,

Fig. 103.

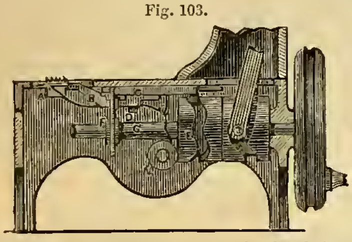


Fig. 104.

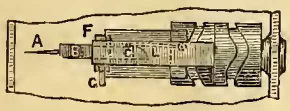
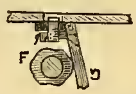


Fig. 105.



in 1853, as "the use of two straight needles working diagonally," when in 1852 he claimed "two straight needles in combination with each other, as described and illustrated," which straight needles we ourselves illustrated at figs. 62, 63, and 64 of our eighth article.

W. Anderson and A. W. Murphy applied for a patent on the 14th of November, 1853, for certain improvements relating to the class of goods known as "Ayrshire sewed work," used as collars, chemisettes, &c. The sewing machine is described, but as the invention is closely allied to the use of the sewing machine, we may, perhaps, be excused if we occupy just sufficient space to state shortly, that it consists in using a black or coloured muslin as the ground fabric in lieu of white or coloured muslin, whilst the sewed or hand-stitched embroidery produced upon its surface is either of black or coloured material alone, or black and white, or any intermediate colour combined. This combination produces a new mourning fabric.

We really must compliment the inventors upon the genius displayed in the truly wonderful conception of substituting *black* for *white!*

A patent was granted to Elmer Townsend, on the 24th of November, 1853, for certain improvements which had been communicated to him from William Butterfield. These improvements appear to have been confined to the formation of a one thread chain stitch by the aid of a hooked needle, which, after having passed through the cloth or material to be sewed, had its thread laid in its hook, so that on ascending again, it drew up the thread with it, in a doubled or looped state, through the cloth and through the previously formed loop. This is a very simple machine, no doubt, rather too simple, we should think, to produce good and *lasting seams.*

Lewis Jennings obtained a patent on the 30th of November, 1853, in the specification of which he describes a novel kind of the stitch produced by a vertical needle, having an eye near its point, and a hook or finger working in a horizontal direction beneath the fabric. This machine produces two peculiar forms of one-threaded stitches, but is also capable, if found desirable, of producing the ordinary chain or tambour stitch. The patentee states, that his improved stitch is of a sufficiently independent character to ensure the stability of the seam so formed, even though the thread be severed in several places. If this be really the case, which, however, with all due deference to Mr. Jennings, we are inclined to doubt, a very important improvement on the single thread stitch has been made, the sole objection to which is its instability. A single or one thread sewing machine capable of producing a really permanent and, to coin a word, *unrippable* stitch, would be our *beau ideal* of a good and practicable machine. Machines which are chiefly worked by young girls should obviously have as few parts as possible liable to derangement, and should be so constituted, as to require the least possible delay in preparing for work, consequently the fewer threads there are, and the fewer needles or instruments to be threaded, the better. We are not aware that the above desiderata have been as yet attained, but we feel confident the day is not far distant when they will be. We must reserve the detailed description of Mr. Jennings' machine till our next.

FURTHER FACTS ABOUT MINTING.

We promised in February last that we should continue our remarks upon "The Mint and Money Making;" for although it is presumed that the process of manufacturing coin was satisfactorily described at that time, some correlative matter was held over to another occasion. That occasion has now arrived, and the promise will be redeemed.

It was explained in the previous article that the precious metals were submitted to a variety of operations before they took the attractive form of current coins of the realm, and issued forth to do their mission, "wicked or charitable," as their possessors might determine. The precise manner, however, in which the presses which stamped the discs of silver or gold into existence, as shillings or sovereigns, was not described, nor was the mode of preparing the dies explained. The presses used at her Majesty's mint are on the screw principle, and they are very massive. Each casting forming the body of a press weighs nearly two tons. They are placed upon beds of masonry of immense strength, and are firmly bolted to those beds. The great mass of metal comprising the mint coining presses is thrown into the base of them—for this comprises the anvil, so to speak, upon which innumerable coins have to be forged, or rather struck. Through the upper part of the press passes a treble-threaded screw of very coarse pitch—five inch, in fact—and this works freely through a deep brass bush or internal screw. Attached to the foot of the screw is a die dish, or die holder, so arranged as to rise and fall with the upward and downward action of the screw, but not to turn with it. In this "die dish" is placed securely an inverted die. Upon the solid base of the press, and bolted to it, rests another die dish, holding a die with its face upwards—the action of the milled collar, moving on the neck of this lower die, and serrating the edges of the blanks supplied to it, we described before—and the dies are now prepared to imprint the device intended by the engraver. The mode of feeding the dies, too, was explained on a former occasion, and it is unnecessary here to repeat it. Fitting the upper and conically turned end of the vertical screw are two fly-arms of about five feet in length, and loaded at the ends with weights, varied according to the size of the coins in process of manipulation. These weights have also another purpose—they fall at every vibratory movement, or stroke of the arms, upon buffers. The buffers are safeguards to the dies in case of negligence on the part of the press-tender. So long as the press is in fair operation, and regularly supplied with its precious food, there is little for the buffers to do—they are merely kissed by the weighted arms. But if by accident or otherwise no blank is carried forward for its squeeze between the dies, then the buffers take the entire force with which the press is being impelled, and the faces of the dies cannot meet and become defaced, as they otherwise inevitably would. Resting upon the centre of the fly-arms is an upright hollow shaft, swelling out gracefully and trumpet-like at its base, and through its medium, motion is transmitted to the press. The trumpet shaft has a steadying bearing at its upper end, where it passes through the floor of the coining-press room; and above that bearing a lever, about twenty inches in length, is keyed upon it. It will be clear, it is hoped, to the reader, that motion given to this lever must be communicated to the screw of the press, and that the die placed beneath it must inevitably rise and fall with the screw. The lever then, it may now be explained, is attached, by means of a rod with socket and pin, to a pneumatic pump. This latter is open at the top, and is fitted with a piston packed with leather. The pump is placed vertically above a vacuum chamber of large dimensions, and communicates with it by means of an internal valve. The vacuum chamber is exhausted by a double-acting air-pump—invented in 1851 by the present foreman of the coining-press room, and which has proved of great value—worked by the twenty horse-power engine, at a distance of 200 feet from the presses. When it is intended to put a press in motion, the internal valve is forcibly opened, by means of a line and lever or trigger, and the pressure of the atmospheric column drives down the leather piston alluded to with great force. When the piston moves the lever of the press, the screw and the die move into it, and a piece of gold or silver is stamped. As the piston descends to the bottom of the pump, the internal valve is made to close self-actingly, and then the recoil from the blow necessarily carries the press upward—an external valve opening, to allow air to follow the ascending piston of the vacuum pump.

By an ingenious arrangement of springs and small levers, the opening and shutting of the internal and external valves are now continued with a rapidity varying from sixty to eighty times per minute, and at the same rate coining therefore goes on. Each of the eight coining-presses at the mint is fitted up in the same manner, with its pumps, levers, valves, springs, and other *fixings*, as Jonathan would say, and all at work together they produce on the average 500 sovereigns per minute! Strange that the air we breathe should coin the money we use; yet such is literally the fact. The quiet transmission of power from the distant steam-engine to the stamping-presses, constitutes an arrangement that is much admired by mechanical men. It is so neat and yet so effective.

Mr. JOHN WHITELAW, IRONFOUNDER, DUNFERMLINE,

PATENTEE.

Fig. 1.

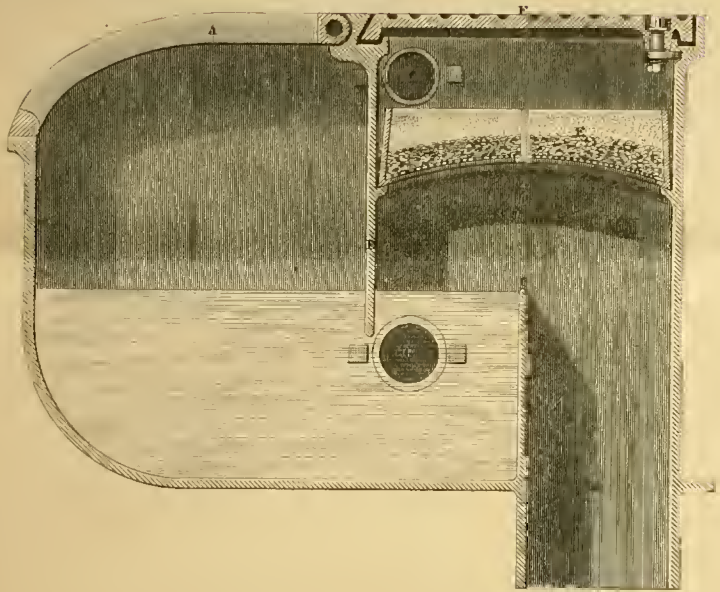


Fig. 2.

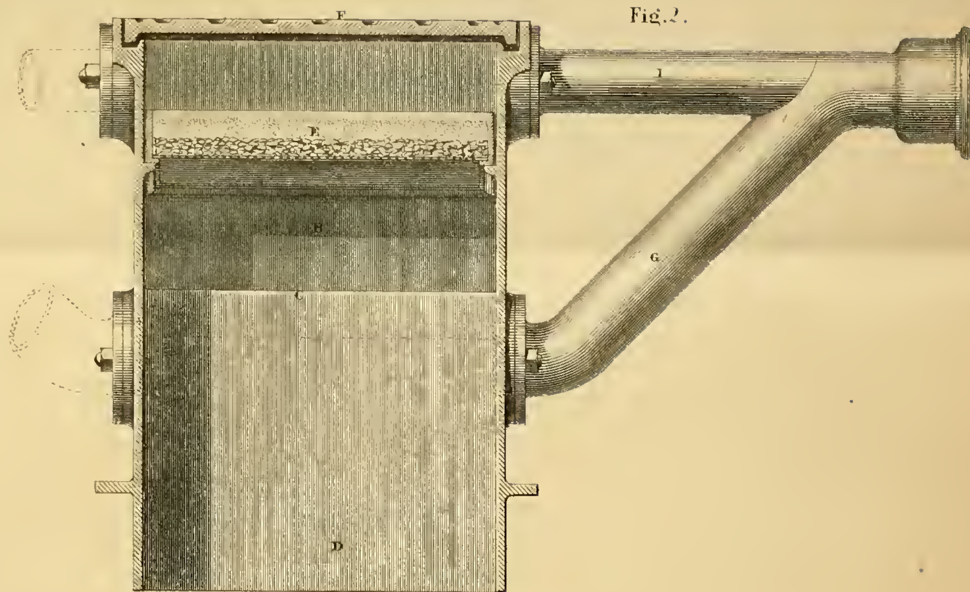


Fig. 3.

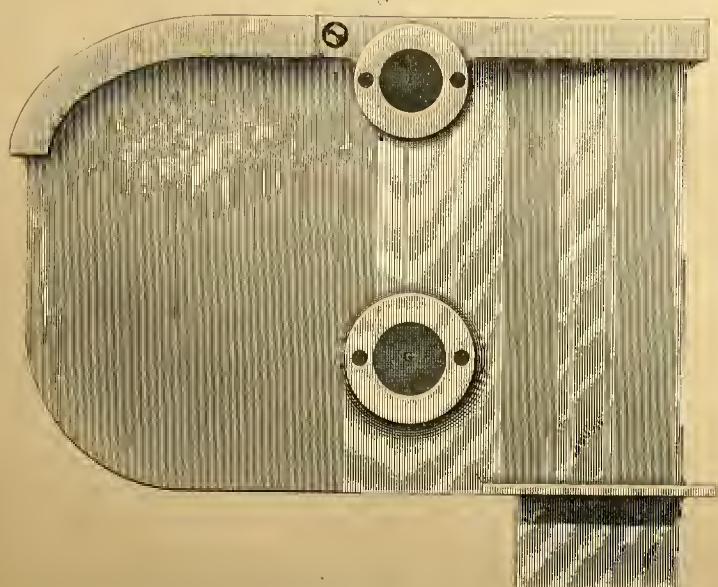
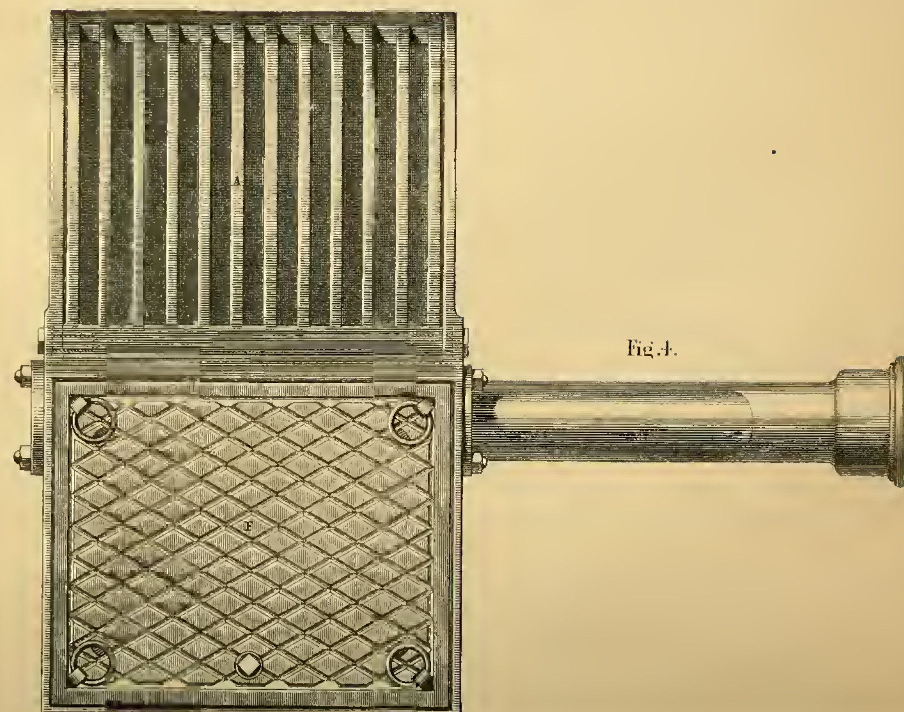


Fig. 4.



—SCALE.—

It may be termed a pumping of money; and the steam-engine used for the operation, pumps also water from a deep Artesian well for the supply of her Majesty's coiners.

With respect to the other point requiring elucidation—the method of getting up dies—we must, from want of space, be brief. Supposing the engraver to have perfected his design for a new coin on paper, he copies it carefully upon a well-prepared piece of softened steel, of the proper dimensions for his purpose, and commences to cut or engrave it with small tools adapted to the purpose. After a very considerable amount of tedious labour he completes this, and produces, in *intaglio*, a correct copy of his design. After repeated impressions taken from this in clay, and re-touchings contingent upon observations resulting from examination of his clay copies, the engraver sets about hardening his work. He is here met by practical difficulties which may mar all his previous labour. The face of the die must be protected carefully during the process. Various substances have been used for this; but mixed oil and lamp black answers well enough. This composition is spread thinly over the surface of the die, which is next placed face downward and surrounded by powdered charcoal. It is heated to a particular temperature, and in that state plunged into cold water. In this latter it is kept in a state of agitation until all ebullition ceases.

Much of the art of die-hardening depends on practice, and practice alone can qualify a workman for the task. We will suppose, in this particular instance, the operation to have been successful, and the engraver to have obtained, after a careful tempering of the material, a *matrix*. Well, from this *matrix* he must now endeavour to get up a *punch*—not like him of Fleet Street—but a piece of steel to show the engraving in relief. Another piece of this substance is cut from the bar, softened and turned flatly conical at one end. In this condition it is placed on the solid bed of the die press—a much stronger machine than the coining press, but moved by manual force—with its turned face uppermost; upon this face, with its engraved surface downwards, the matrix is placed. A heavy blow is next administered by the force of several revolutions of the heavy fly-arms of the press. After *one* such striking, a considerable effect will be found to have been produced upon the softened steel destined for the punch. A portion of the engraved work of the matrix will have become imprinted upon it. Several annealings of the embryo punch, and several more heavy thumps from the press, make it an exact copy in relief of the intaglio engraved *matrix*. This latter may now be laid aside, its mission for the present is at an end, and the punch when hardened, tempered, and possibly re-touched, is ready for the multiplication of coining dies—all to be produced by pressure from it, given in the same way as described in its own formation. A good punch will give impressions to thousands of money-making dies.

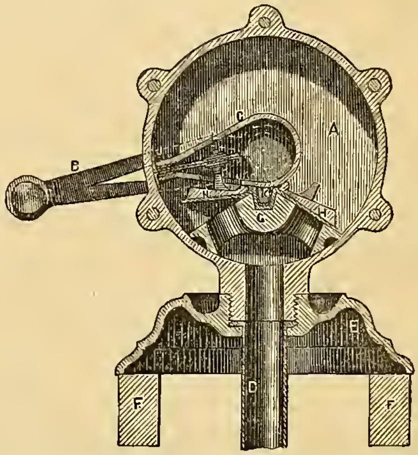
The length of time that dies of this kind last, depends, of course, much on the quality of the steel, and the care with which it has been managed. At present, we believe that Messrs. Gurton, of Sheffield, supply the whole of the steel used at the Royal Mint; and, of course, the experience of the workmen there enables them to treat it in the manner found best adapted for the purpose to which it is applied. A pair of good dies should communicate impressions to about thirty or forty thousand sovereigns. Small and thin coins are necessarily more fatal to dies than larger ones. Perhaps the sovereign is the best proportioned piece in the series of British coins; but it may be allowed us to say, that the time has come when a *matrix* should be got up with a new portrait of her Majesty depicted upon it—for certainly the Queen is less young than when, in 1837, Wyon, the elder, sketched that which still figures upon the gold coin named. A more matronly aspect might well be given to the metallic images of our Queen, when we recollect that that august lady has now a wedded daughter. Perhaps some of the Treasury or Mint authorities will accept the hint, which is given in the most loyal spirit imaginable, and act upon it.

In our previous article on minting, the care and accuracy with which the work is weighed from one department of the Royal Mint to another was spoken of, and it is in this way that precautions against peculation are taken. The decimal system of weights has long been in use at that establishment, and all gold and silver, whether in the form of ingots, bars, fillets, scissell, blanks, or coin, are weighed on that principle. The ounce is the unit, and it is divided into hundredths and thousandths of an ounce. The simplicity of the plan is perceptible in the manner in which the accounts are kept in the journals of the rooms. Possibly, ere many years have passed, the public mind will have been further reconciled to the introduction of the decimal system of coinage, too, which has every advantage on its side. At the mint at this hour a Canadian decimal coinage is in course of completion, and it is quite of a model character. The bronze one cent piece—equal to the halfpenny in value—is remarkably elegant. It has, too, the advantages of being justly proportioned as regards weight and diameter. It weighs precisely the one-hundredth part of an ounce avoirdupois, and thus might be used on emergencies in place of actual weights. It is also exactly one inch in diameter, and, in the absence of a carpenter's rule, might be employed, therefore, as a measure.

Having now conducted our readers in imagination through the various operations carried on in the mint, and *instructed* them to some extent, it may be trusted, in the art of *money making*, we take leave of the subject, and thank them for their attention to it.

RACE AND MATTHEW'S ROTATORY PUMP.

Rotatory pumps have always formed a favourite subject for mechanical contrivers; but stern practice yet adheres, for the most part, to the ordinary rectilinear pump barrel system. Messrs. Race and Matthew, whose pump we engrave in sectional elevation, have, however, afforded us yet another example of ingenious apparatus of the kind. It is simple, and apparently an effective working pump. It consists of a horizontal cast-iron cylinder, A, screwed to the stand, E, which is secured to stone



foundations, F. This cylinder is connected by two end plates or lids, having a central opening in each for the passage therethrough of a hollow shaft, which is actuated by a winch handle, B. A valve seat, G, cast in one piece, with the body of the cylinder, is formed with two openings, both communicating with the suction pipe, D. Upon this valve seating rest two leather valves, H, made from one piece of leather, which is secured by being forced by a wedge piece into a central groove or recess, between the two valves, as shown at K. The central shaft carries a metallic piston, C, formed out of a single plate or blade turned round the shaft, and terminating in an acute angle, the sides of which are united by bolts, which also secure between them a double copper plate, forming at the angle of the piston a species of flap valve, and serving as a packing against the inside of the cylinder. The piston, C, then divides the inner space of the cylinder, A, into two parts of variable capacity. The hollow central shaft passes through stuffing boxes, and is placed in communication with a discharge pipe. On turning the handle from right to left a partial vacuum will be formed in that portion of the cylinder above the valve, H, which will open, as shown in the engraving, and allow the water to enter the cylinder, whilst, at the same time, the common valve under the piston closes on its seat, L. On the motion being continued, the air or water contained in the space, A, will close the flap valve on one side, and open the communication on the other, so as to pass them through to the hollow shaft and discharge spout. The reverse motion produces the same effect; but of course, those valves which were previously shut, will now be open, and *vice versa*. The whole is easy of access for cleaning and for replacing the parts which may have become worn.

INODOROUS SEWERAGE AND DRAINAGE APPARATUS.

By Mr. John Whitelaw, *Foundry, Dunfermline.*

(*Illustrated by Plate* 238.)

Mr. Whitelaw's invention relates to the so arranging and constructing sewerage and drainage apparatus that, whilst the sewerage and drainage matters shall have free discharge, all objectionable effluvia from the passing matters are removed or prevented. In arranging receiving and discharging apparatus of this kind, the trap or sewer and drain chamber is so contrived, that the fluid matter discharged from the road or street are caused to flow into the receiver through a hinged grating—into the body of the trap chamber. From this part the matters flow off beneath a hanging diaphragm, thence passing off at the other side over the top of a second diaphragm or division, and thence down to the main sewer or discharge duct. This diaphragm portion of the chamber is covered by a perforated plate of metal, on which is disposed a layer of charcoal, lime, gypsum, or other suitable and effective deodoriser, which layer again is covered in by an adjustable top plate, level with the surface of the road or street. The roof water from the houses, or from other elevated surfaces, is conducted down into the chamber at the part between the two diaphragms, so as to discharge the water in the same way as the street surface water. Another branch, also from the water pipe, leads into the space containing the deodorising matter. This branch serves to allow of the free escape of the gases from the chamber after passing through the deodorising matter, so as to pass right up the water conducting pipes to the top of the house. In this way, so long as much rain water is discharged into the trap chamber, the gases are carried directly off down the drains; but when the water pipes are empty, the deodorised gases are passed off high up into the air, without doing any injury.

Our plate, 238, exhibits the arrangements in four several views. Fig. 1 is a vertical section of the drain trap complete; fig. 2 is a corresponding section at right angles to fig. 1; fig. 3 is an external elevation of the apparatus as corresponding to fig. 1; and fig. 4 is a plan of the whole details. The hinged grating, A, forms the admission port for the surface or gutter drainage of the road or street, and the fluid matter so supplied, fills up the chamber to the level shown, and then escapes beneath the pendant diaphragm, B, and over the lip, C, into the main discharge duct, D, down into the main sewer of the street. The pendant diaphragm, B, acting thus in concert with the mass of fluid in the bottom of the trap chamber, forms the usual fluid trap to prevent the upward discharge of noxious gases from the main sewer beneath. Over the discharge portion of the chamber, is a slightly arched perforated shallow tray, E, resting upon side flanges cast upon the interior of the chamber. This forms the receptacle for a layer of deodorising matter, such as charcoal or lime, or the two combined—a coarse layer being at the bottom, with a finer one at the top. In this way, any upward escape of gases becomes deodorised by the disinfecting layer; but no escape can take place at the level of the top of the trap, as the deodorising chamber is completely covered in by the top plate, F, which is bolted on. The same trap serves to take off the roof water of houses, by the side branch pipe, G, opening into the bottom of the trap amongst the fluid laying therein. This branch pipe is part of a main roof water pipe, H, which has also an upper horizontal branch, I, leading into the deodorising chamber above the charcoal layer. This branch conducts away the gases, after their passage through the disinfecting layer, to the tops of the houses—the object of the duplex arrangement being to enable the whole apparatus to act equally well in rainy and in dry weather. When rain-water is discharged heavily, the flow carries away the gases right down the main sewer, but when the pipes are empty, there is nothing to prevent a free upward escape passage by the branch, I, to the house tops. This arrangement thus supplies a want long felt in sewerage and drainage matters, as it comprises a good sewer and surface drain discharge, with a thorough prevention of all annoyance from gaseous discharges, as well by getting rid of the gases directly, as by deodorising them, and discharging them when so treated, at a lofty level, which may be attained either by rising the rain pipes or lamp columns, or other convenient elevated structure.

FORM AND PROPORTIONS OF WATER-JET ORIFICES.

Many experimental trials have been made from time to time, for the purpose of determining the best form and proportions of orifices for the nozzles of fire engines, and for other purposes—to secure the most copious fluid discharge within a given period, or the propulsion of the jet to the greatest distance. These investigations have not hitherto led to any very striking results. M. Jobard has latterly resumed his investigations in the matter, taking them up at the point to which they were formerly carried, namely, the employment of an aperture formed in a thin substance—an arrangement which no experimentalist or manufacturer has yet been able to use with advantage, and which M Flaud has found by experience, requires more force for an equal volume than other forms. The more or less truncated nozzle has, therefore, been still adhered to. Now, this form imparts to the fluid vein the fluctions and contractions analogous to those of the sonorous column in wind instruments, with a tendency to lateral dispersion of one part of the liquid, which, if it escape not by one side, re-enters the fluid vein by the affinity of aggregation, to detach itself further on from the opposite side. This species of plaiting, if we may so term it, of the fluid threads, flowing at different speeds and in different directions, impairs the transparency of the jet, which becomes scattered and broken on being brought in contact with the air, and carries only a short distance. The best jet which can be obtained, is that from a water carrier's cask; it has the transparency and tranquillity of a quarter circle of crystal, because all its molecules flow at a uniform speed. The nozzle which M. Jobard has constructed, is terminated by an orifice, in the form of a truncated cone, fitted to a cylindrical nozzle of large diameter. The lip of the cone should be sharp like a punch, after the fashion of which it operates upon the water, which is greatly compressed at its mouth or orifice. The jet, which is perfectly cut out, remains cylindrical to a great height, and has no tendency to scatter or diverge, since the eddies occasioned by the fluid vein are formed in the interior; whilst in the ordinary jets they are formed outside, by reason of the friction which the fluid encounters against the rigid sides of the nozzle. The result is very different when the jet is cut out of the centre of a mass of water. This jet is, as it were, wire drawn, and encounters in traversing a mass of water, merely a rolling friction against the eddies of the liquid traversed through. The best form, then, for the nozzle, is not the traditional tapered form, but that of a cylinder or field-marshal's baton.

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RECENT PATENTS.

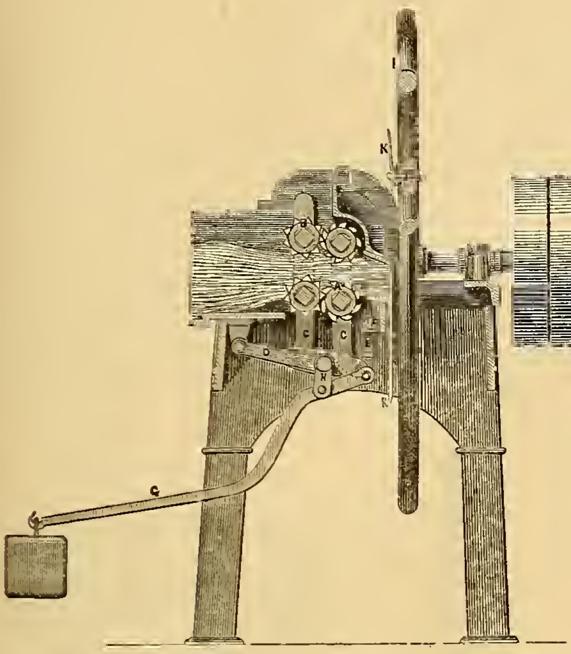
HAY AND STRAW CUTTING MACHINE.

Francis Richmond *and* Henry Chandler, *Salford.—Patent dated December* 31, 1858.

The patentees, whose names are so intimately associated with improvements in this class of agricultural implements, have recently introduced some further modifications in the construction of hay and straw cutting machines.

Fig. 1 of the subjoined engravings, is a plan, and fig. 2, a transverse sectional elevation of the same. The bed-plate of the machine is supported on the frame in the usual manner. The two bottom feed rollers, A, are supported in fixed bearings, and the top feed rollers, B, are so supported that each can rise or fall independently of the other, according to the depth of the feed. To the axles of the rollers, B, are suspended the links, C, the lower ends of which are jointed to the transverse beam. On the centre part of this beam is cast a projection, H, to which is jointed the long lever, G, furnished with a weight; this lever is also jointed to the swing frame, E, whose fulcrum is at F. To the transverse beam is cast or fixed the levers, D, the ends of which are jointed to the brackets fixed to the under side of the feeding plate. The mouthpiece consists of a bottom plate and side plates, in which are cast slots for the bearings of the top feed roller, B, and for the cover which moves up and down with the said roller, B, as now customary. The mouthpiece is cast of the metal known as cast steel; the object being to prevent the mouthpiece being injured by the action of the knives, which are connected to the fly-wheel fixed to the shaft, revolving in bearings cast to the bed-plate. The feed rollers are turned round from the shaft, by a bevel pinion gearing with a bevel wheel, and by the various wheels and shafts shown in the plan, which do not require to be described in detail, as they are common to machines of this description. The teeth of the first pair of feed rollers, A and B, are made to radiate from the axis, and they are tapered, whereas the teeth of the second pair of feed rollers are of the usual shape. The improved shaped teeth of the first rollers take better hold of the hay, or straw, or other vegetable substance to be cut, and consequently convey it more regularly to the

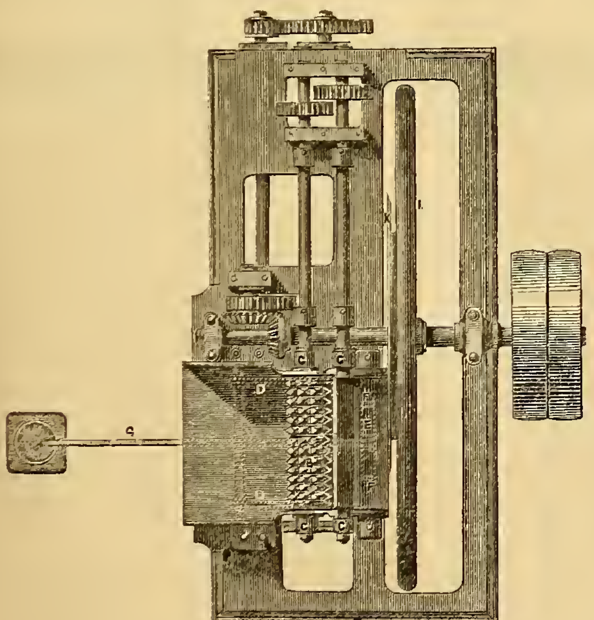
Fig. 1.



second pair of rollers, the teeth of which enter in the spaces between the teeth of the first pair of rollers and strip them; the teeth of the second pair of feed rollers are stripped by the plates at the mouthpiece, which are serrated in the usual manner.

As it is of the utmost importance in machines for cutting hay, straw, and other vegetable substances, to be able to adjust the knives to the face

Fig. 2.



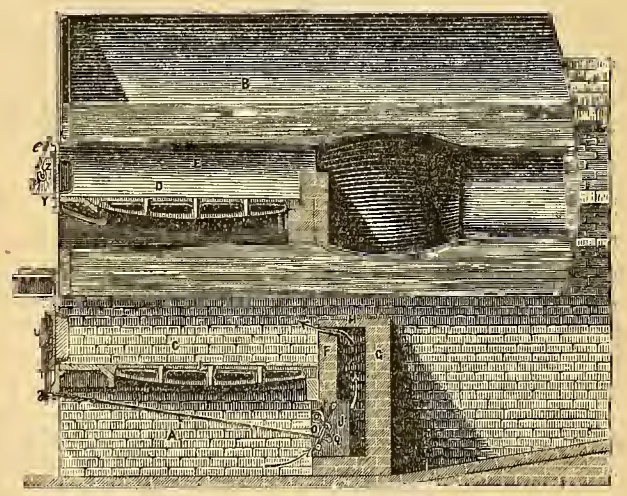
of the mouthpiece, the patentees construct the knives and connect them to the arms of the fly-wheel or other fixing, in the following manner:—The blade of the knife, K, is set at an angle to the face of the fly-wheel, I, as is now customary; each blade is stamped with four or other convenient number of projections, the outer faces of which are diagonal to the blade, and in a line with the face of the fly-wheel. These projections fit against the screwed bushes, which are furnished with six-sided heads, and are screwed into the arms of the fly-wheel; the bolts pass through the projections on the knives, through the bushes, and are tightened up against the arms of the fly-wheel, thereby firmly securing the knives. When it is necessary to adjust the cutting edge of the knife, the nuts of the bolts are slackened, and the bushes are turned round or partly round, either in one direction or the other, to increase or diminish the distance of the cutting edge or the knife from the face of the mouthpiece, and then the nuts of the bolts are again tightened; by this means the separate adjusting screws usually employed are dispensed with, and the knives are easier to adjust, and more securely attached to the fly-wheel or other fixing than heretofore. Each top roller can rise or fall independently of the other, according to the depth of the feed, consequently the pressure between the rollers is at all times equal, and the hay, or straw, or other vegetable substance to be cut, is always securely held between the front pair of rollers, which object could not be obtained in the machines of the ordinary construction, in which both top rollers move simultaneously.

FURNACES AND BOILERS.

David Auld, *Glasgow.—Patent dated April* 29, 1858.

The improvements Mr. Auld has specified under these letters patent relate firstly, to apparatus for regulating the supply of air to furnaces, and secondly, to an improved mode of efficiently supplying steam-boilers with water by mechanical means. Fig 1, of our illustrative engravings, is a longitudinal vertical section of a boiler heated by means of duplex furnaces. Fig. 2 is an elevation or front view of the apparatus for controlling the admission of air to the burning fuel. Fig. 3 is a vertical section corresponding to fig 2. Fig. 4 is a front view or elevation of another modification of the apparatus applied to the doors of the furnace in fig. 1. The brickwork, A, on which the boiler, B, rests, is built in

Fig. 1.



such manner as to form a furnace, C, below the shell of the boiler. The water within the boiler, B, is also heated by means of the furnaces, D, which are arranged within the longitudinal tubes, E, in the ordinary manner. Referring to the arrangement shown in the lower furnace, C, the bridge, F, over which the flame and incombustible products pass on their way to the flues, is built to form a chamber, through which the supply of air is admitted; that is to say, the bridge, F, is built of fire-brick in the usual way; behind this is a wall, G, leaving a space between the two. The space between the bridge, F, and the wall, G, is covered at the upper part with slabs of fire-clay, H; these slabs are supported at intervals on the bridge, F, leaving narrow slits between the bridge and slabs. The furnace bars, I, are arranged in the ordinary manner, as are also the other internal parts of the furnace. The bridge, F, is built completely across the space between the side walls, but in the lower part two openings are left in the brickwork, in which openings are fitted the apparatus by means of which the air is admitted to the back part of the fire. This apparatus consists of a rectangular box or casing, J, which is set into the brickwork, F; this box or casing forming the inlet for the air. It has across the upper part a downwardly directed angular ridge or fin, K, and the flooring or lower portion, L, of the box or casing forms an inclined plane ascending towards the back part of the box, as shown in the sectional view, fig. 3. To each side of the box, J, is bolted a bow or curved piece of metal, M, through the centre of which passes a screw, N. The pair of screws thus arranged form the adjustable pivots on which is carried a balanced box, O, the sides of which are cast with projecting spindles. The end of these spindles project out beyond the slots, which are made for the purpose in the sides of the casing, J; the screws, N, enter the hollow ends of the spindles, and in this way the box, O, oscillates freely upon its supporting pivots. The box, O, is of a rectangular figure, the front plate being secured to the back part by bolts and nuts, to afford access to its interior when necessary. The back part of the box, O, is made with an upwardly-directed angular partition, P; this partition extends from side to side of the box, and at its lowest part a series of holes is made, through which the contents of the partitioned part escape to the bottom of the box, O. A lever, Q, is fast to one of the spindles of the box, O; to the lower end of this lever a rod, R, is secured, the front extremity of which is jointed to a link, S The other end of this link is fast to the spindle, T, on which the furnace door, U, is hung in such manner that the spindle rotates in its socket with the opening and closing of the door. The upper extremity of the lever, Q, is slotted to receive a counter-weight, V, which is fastened to the lever by means of a nut, so that it may be fixed at any part within the range of the slot. A quantity of sand is placed within the box, O, the gradual descent of which, from the upper to the lower part of the box, causes it to turn slowly upon its axis, this motion serving to cut off the ingress of the air. When the furnace door is opened for the purpose of supplying the fire with fresh fuel, the rod, R, is drawn forward, which has the effect of pulling the lever, Q, so as to cause the box, O, to fall backwards. This sudden inversion of the box causes the sand contained therein to be thrown to the upper part of the box, so that it falls behind the partition, P, the shifting of the sand being facilitated by the smart blow with which the upper part of the projecting edge of the box comes in contact with the inclined plane, I, and the upper part of the casing, J. The furnace

Fig. 2.

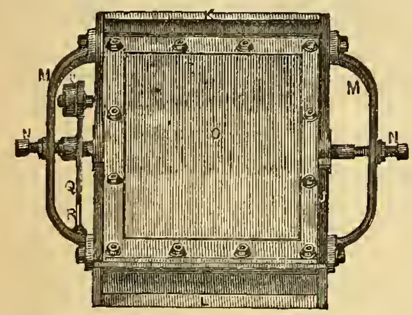


Fig. 3.

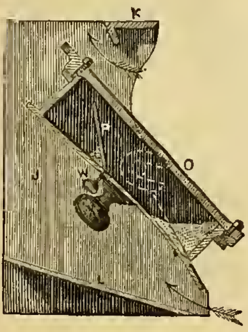
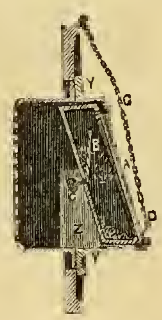
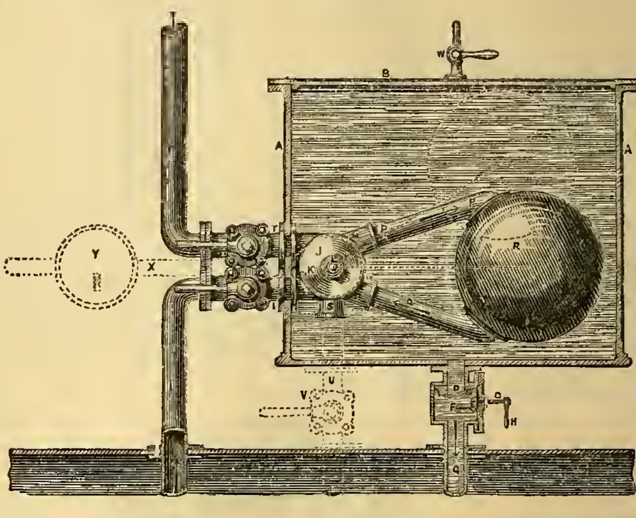


Fig. 4.



door now being closed, the box, O, does not return to its former position, in consequence of the preponderating weight in the upper part, which is so arranged that the bottom of the partition, P, is a little above the horizontal line; the metal knob, X, also serves to keep the box in equilibrio, as well as to assist the inverting movement. The air has now free access above and below the box, O, and as it emerges through the openings between the bridge, F, and the slabs, H, it meets the smoke arising from the fresh fuel, the combustible portion of which it ignites. In its passage through the air-chamber formed by the walls, F and G, it becomes heated, so that the furnance is not injuriously cooled down by this influx of fresh air. As the quantity of smoke decreases, it is necessary to diminish in a corresponding ratio the admission of the air; to this end the box, O, must be caused to slowly close the opening in the casing, J. This is accomplished by the gravitating action of the sand, which escapes through the apertures made for the purpose in the lower part of the partition, P, the escape being regulated by the screws, W. As the bottom of the box becomes heavier by the addition of the sand, it gradually approaches the vertical position—at each instant lessening the opening and the quantity of air admitted, until the upper and lower projecting edges of the box are in contact with the ridge, K, and the inclined plane, I. In this position of the box, O, all farther ingress of air is stopped except that which passes through the furnace bars; and so the box remains until it is necessary to put a fresh supply of fuel upon the fire. Another mode of arranging this self-acting apparatus is shown, as applied to the furnaces, D, fig. 1; in this modification the valvular apparatus is fitted in the door of each furnace, instead of below the fire bars. The furnace door, Y, is cast with a rectangular opening therein, in which is fixed the box or casing, Z, the back part of which is perforated as shown in fig. 4. At each side of the casing, Z, a slot or opening is cast in the metal, in which rest the spindles of the oscillating box, *a*, the upper part of the casing, Z, has an overhanging edge, against which the top part of the box, *a*, comes in contact when the valvular opening is closed. The interior of the box, *a*, is furnished with an angularly disposed partition, *b*, which has apertures at the bottom for the escape of the sand. These apertures may be partially or wholly closed by the screws, *c*, so as to afford the means of regulating the flow of the sand into the lower compartment. An eye or hook, *d*, is screwed into the lower part of the front of the box, *a*, and to this eye or hook a chain, *e*, is secured, the other extremity of the chain is made fast to a hook or staple fixed overhead. As thus arranged, the effect of opening the furnace door will be, that the drag upon the chain will cause the box, *a*, to fall backwards and jerk the sand therein contained to the upper part of the box, whence it falls behind the partition, *b*. The box, *a*, is so poised upon its supporting spindles that when the door of the furnace is shut, the lower part of the partition, *b*, is a little above the horizontal line; so

Fig. 5.

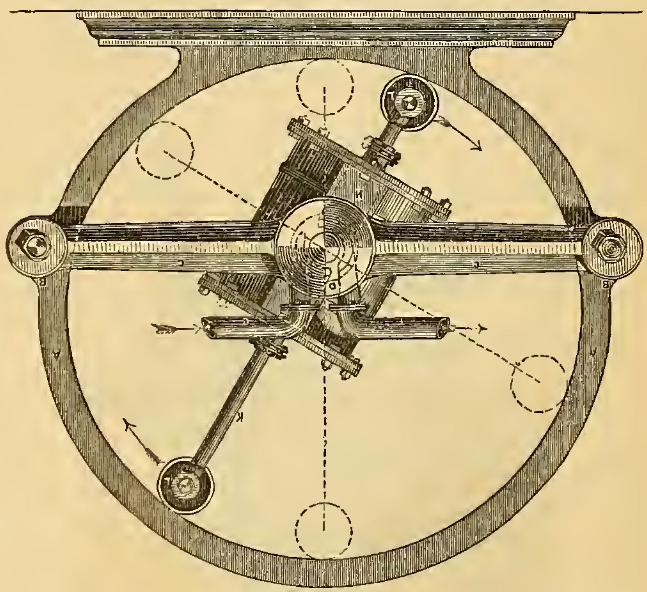


that whilst the air has free access to the furnace through the valvular opening, the box is sufficiently inclined to allow of the sand flowing through the apertures in the partition, *b*, into the lower compartment. In both arrangements of the valvular apparatus the time which the box takes to close the opening in the casing is adjusted to the quantity of fuel thrown in at each charge—the object being to close the valvular opening just as the fuel reaches a red heat, and smoke is no longer given off; after this the whole of the air admitted to the furnace must pass through the furnace bars. One modification of the apparatus for supplying boilers is shown in fig. 5, being a partially sectional elevation of the apparatus. According to this arrangement the apparatus consists of a rectangular metal box, A, which forms a water vessel or holder, the lid, B, being secured to the box by bolts and nuts. The water-holder, A, is placed in a convenient position above the boiler, B, with which it communicates by means of a pipe, C; this pipe is carried downwards, and terminates near the bottom of the boiler. Between the water vessel and the boiler the pipe, C, has a valve-box, in which is fitted the valve, D, which opens downwards. This valve is kept closed by the upward pressure of the water in the boiler; but when the water in the vessel, A, is no longer balanced by the water in the boiler, the valve, D, opens to admit a supply to the boiler, as will be presently described. The valve, D, may be made to act in a manner similar to any ordinary cock, by means of the wedge-shaped piece of metal, E, which slides to and fro on the spindle, F, and is fast to the lateral screw, G. This screw works through an internal screw made in the side of the valve-box, its outer end being squared to receive the handle, H, by means of which the metal wedge, E, may be moved to and fro so as to release or wedge up the valve, D. The object of this arrangement is to afford means for cutting off the communication between the boiler and the vessel, A, when required. In addition to the pipe, C, there is another which communicates from the boiler to the water vessel, A. This pipe, I, descends into the boiler only as far as the proper level of the water, so that when the water is below the predetermined level, the mouth of the pipe is open to the ingress of the steam. The pipe, I, enters the water vessel, A, through an aperture made for the purpose in its side, opposite to which opening is fixed a portion of the valvular apparatus, by means of which the flow of steam and water is controlled. The portion of the valvular apparatus which is bolted to the water vessel, A, consists of a cylindrical duplex chamber. This chamber, J, is divided into two parts by the diaphragm, K, the steam from the boiler having access to the lower division or chamber through the pipe, I. The diaphragm, K, is cast with an eye in the centre, which extends through the chamber and forms a bearing to receive the journal of the spindle, L, which is secured at one end to the chamber, J, by a nut screwed upon its extremity. The spindle, L, carries upon its central position the duplex valve, M, the cylindrical chamber of which is divided at the centre by the diaphragm, N. The valve, M, moves freely upon its spindle, L, its motion about which serves to open or close the ports in the chamber, J, and also those of another and corresponding chamber, O, which is carried upon the other extremity of the spindle, L. The valve, M, has two sockets cast upon its periphery, which receive the ends of the pipes, P and Q—these communicate with the interior of the ball-float, R. Each of the pipes, P and Q, communicate only with one compartment of the valve, M; that is to say, the pipe, P, with the compartment of the valve next the chamber, J, through which steam from the pipe, I. passes. The lower pipe, Q, is in like manner connected with the other compartment of the valve, which controls the ports of the chamber, O, in the lower part of which is the outlet pipe, S, through which the feed-water flows. The water vessel, A, is kept full of water, and both it and the boiler, B, are supplied from a cistern or reservoir placed above. The feed-water flows down the pipe, T, into the chamber, J, thence through the valve and pipe, P, into the float, R, from which it flows along the pipe, Q, into the second compartment of the valve, M, and into the water vessel, A, by the outlet passage, S. In its normal or inoperative position, the water vessel and ball-float are filled with water, the gravity of the ball-float serving to keep it in a horizontal line with the valve, M. When the water in the boiler falls below the mouth of the pipe, I, the steam instantly flows up the pipe and passes into the chamber, J. Whilst the ball-float is at its lowest point, the ports in the lower compartment of the chamber are kept open for the ingress of the steam, which thence passes into the valve, and by the pipe, P, into the ball-float, R. The pressure of steam upon the water in the ball-float causes it to flow along the pipe, Q, into the other compartment of the valve, thence into the chamber, O, and through the passage S, into the vessel, A. The equilibrium of the pressure being destroyed, the water opens the valve, N, and flows into the boiler by the pipe, C. The ejection of the water from the ball-float renders it specifically lighter than the surrounding fluid, it consequently rises to the upper part of the water vessel, A, to the position indicated by the dotted circle. The effect of this rising action of the ball-float is to open the ports in the upper compartment of the chamber, J, so that the water in the pipe, T, has free ingress to the valve, and thence by the pipe, T, to the ball-float, R. As the ball-float fills with water, its weight causes it to descend to its former position; thereby closing the water passages and opening the steam ports. A cock is fitted to each of the pipes, I and T, so that the passage of the steam or water may be shut off when necessary. Another mode of arranging this apparatus is shown by the dotted lines which form a continuation of the outlet pipe, S: in this modification the pipe, C, is dispensed with, and in lieu thereof, the feed pipe, U, is connected directly to the pipe, S. The pipe, U, is carried down to the bottom of the boiler, and between the top of the boiler and the water vessel, A, it is furnished with a cock, V, so as to shut off the communication when required. The action of the apparatus remains the same as before described, excepting that the feed-water flows directly down the pipe, U, into the boiler, instead of into the vessel, A; so that the water contained therein serves only as a buoyant medium to assist the rising of the ball-float, R. To ensure the vessel, A, being completely filled with water, and to prevent the accumulation of air therein, a cock, W, is fixed in the cover of the box or water vessel, A, so that by opening this from time to time the air may be discharged therefrom. Another mode of arranging the self-acting feed apparatus is indicated by the dotted lines in the central part of the figure. According to this modification, the arrangement of the boiler feed-pipe, U, the valve, M, the pipes, I and T, and the ball, R, remains essentially the same; but the water vessel is dispensed with, and in lieu thereof a counterweight is used to balance the ball. A lever, X, is attached to the valve, M, this lever extends in the opposite direction to the ball, R, and carries upon its outer extremity an adjustable counterweight, Y. Whilst the ball, R, is full of water, it remains in the position shown; but when the water is ejected therefrom by the inflowing of the steam, the counterweight then raises the ball so as to open the water passages and admit water from the pipe, T, as before described. In this form the apparatus may be very readily applied to the exterior of any boiler, the whole of the parts being conveniently accessible for examination or repair. In some cases the patentee prefers to use in lieu of the valve, M, a three-way cock, the opening and shutting of which is effected by the rise and fall of the ball, R. With either of the mechanical arrangements hereinbefore described, the operation of feeding or supplying boilers with a due and proper quantity of water by self-acting means is rendered certain and effective, the danger arising from a defective or insufficient supply being wholly avoided.

APPARATUS FOR OBTAINING MOTIVE POWER.

David Andrew, *Greenock.—Patent dated September* 4, 1858.

The annexed engraving is an elevation of one arrangement of the patentee's improvements in obtaining motive power. The framing of the machine consists of a large cast-iron ring, A, on one part of the periphery of which are cast two laterally projecting feet, that form a base for the circular framing. The broad ring of metal, A, has two snugs, B, cast on its circumference. These snugs are arranged in a diametrical direction, and are somewhat below or eccentric to the centre of the circular frame, A. To the snugs, B, are bolted two horizontal beams, C. Each of these beams has a boss formed in the centre, the two serving as bushes or bearings to receive the trunnions of a rotatory steam cylinder, which is arranged between the supporting beams, C. The boss, D, of the beam is cast hollow, and has diverging from its periphery the two pipes, F and G, which form the steam and exhaust pipes of the engine. The other boss of the beam has simply an aperture in the centre through which the main shaft of the engine passes. The cylinder, H, has cast on it the central lateral trunnions, I and J. The trunnion,



J, is made hollow, to allow the steam to pass from the hollow boss, D, to the interior of the cylinder; the boss, D, thus forming the valve chest of the engine. The cylinder, H, is fitted with a piston of the ordinary kind. This piston is provided with duplex rods, K, which work out through the end covers of the cylinder. In lieu of this arrangement a single rod of sufficient length may be used, the piston being fitted thereto in the centre of its length. The outer extremities of the rods, K, are made with duplex or forked ends, which serve to carry the spindles of the anti-friction rollers, L. These rollers work against the level surface of the internal part of the circular frame, A, the rollers being kept in contact therewith by the reciprocatory action of the piston. The steam is admitted through the pipe, G, to the valve chest or hollow boss, D, which is divided by a partition into two chambers, two segmentally shaped ports being formed in the face of the valve chest, which works in contact with the vertical part of the hollow trunnion, J. Two corresponding segmentally shaped ports are likewise cut through the face of the trunnion, J, which communicates with the interior of the cylinder, H. The ports in the cylinder trunnion, J, are alternately opened and closed to allow of the ingress, the expansive action, and the egress of the steam. As delineated in the figure, the moving parts of the engine are represented in that position in which the steam is impelling the piston in an upward direction. The pressure of the steam against the piston causes the upper anti-friction roller, L, to traverse over the surface of the frame, A, and this curvilinear motion is greatly assisted by the gravity of the lower portion of the cylinder, which causes the lower roller, L, to rapidly traverse the inclined surface of the frame, A. During this movement, the steam above the piston passes off through the exhaust ports and escapes by the pipe, F, away to a condenser or to the atmosphere. The momentum imparted to the cylinder by the downward motion of its lower end, is more than sufficient to carry it beyond the vertical position, and the steam being now admitted to the upper side of the piston, its face tends to urge the lower roller, L, to ascend the incline of the frame, A—the now overhanging weight of the upper part of the cylinder causing this ascent to be effected with a very trifling expenditure of power. In this manner the curvilinear motion—or revolution round its own transverse axis—of the cylinder, H, imparts rotatory motion to the shaft, M, attached to the trunnion, I, and which, in its turn, is caused to drive machinery, or is applied as a prime mover to other purposes. The diagram right lines and circles indicate a series of positions of the cylinder and its appurtenances during a revolution.

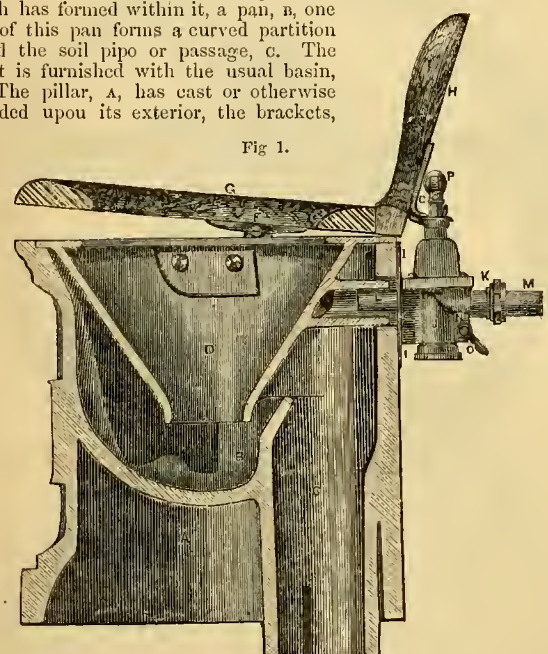
APPARATUS FOR REGULATING THE FLOW OF FLUIDS.

Alexander M'Ewan Peters.—*Patent dated September* 8, 1858.

The importance of a good self-acting apparatus, for ensuring the efficient cleansing of closet basins and urinals, is too evident to need one word of comment. The patentee of these improvements has arranged the self-acting valvular apparatus in a very convenient form, so as to ensure a certain and adequate supply of water, and, at the same time, avoiding waste.

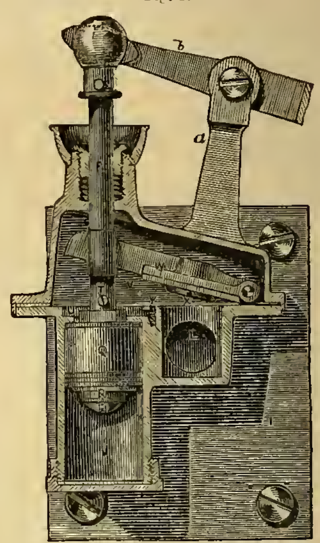
Fig. 1 is an elevation of one arrangement of the improved apparatus for regulating the flow of fluids, shown as applied to control or regulate the flow of water to a closet basin. Fig. 2 is a vertical section of the valvular apparatus delineated in fig. 1. The closet arrangement shown in fig. 1, consists of a stoneware pillar, A, which has formed within it, a pan, B, one side of this pan forms a curved partition round the soil pipe or passage, C. The closet is furnished with the usual basin, D. The pillar, A, has cast or otherwise moulded upon its exterior, the brackets,

Fig 1.



which have bevelled recesses formed therein to receive the plates of the metal eyes, in which the spindles, F, of the seat, G, rotate. Into these recesses the dove-tailed eye plates are fitted, so that they may be removed with great facility when it is necessary to remove the seat, G. The valvular apparatus for regulating the supply of water is secured to the back part of the pillar, A, by means of screws, which pass through the plate, I. The valve-chamber, J, is of a cylindrical form, and is closed at the lower end by a screw cap. The inlet pipe, K, opens into the valve chamber, J, and parallel with this is the outlet pipe, L—the inlet pipe, K, is connected to the service pipe, M, in the usual manner, the water having access to the lower part of the valve chamber, J, by means of the tubular passage, N, which is controlled by the stop-cock, O. The valve spindle, P, works out through a stuffing-box at the upper part of the apparatus; the lower end of the spindle is made of a triangular form, and this part passes through the valve, Q, where it has fitted to it the disc and washer, R. A screw, T, passes through the spindle, P, to control its downward movement through the valve, Q. The washer on the upper face of the valve, Q, comes up against the valve seating, U, when the spindle, P, is raised, and the water shut off from the outlet pipe, L. The aperture in the valve seating, U, opens into the chamber, V, in which is arranged the valve, W; the spindle of this valve is jointed to snugs that project upwards from the floor of the chamber, V. The free extremity of the spindle of the valve, W, passes through a slot made in the valve spindle, P, the motion of which regulates the action of the valve, W. The floor of the chamber, V, forms the seating of the valve, W, and when it is depressed it closes the circular aperture, X, which communicates with the outlet pipe, L. There is also a series of holes, Y, which are made through the floor of the chamber, V, and communicate with a water-way, Z, that is made just above the valve seating, U. Projecting from the upper part of the chamber, V, is an arm, *a*, the forked end of which carries the lever, *b*, one extremity of which is fitted to a slot in the upper end of the spindle, P. The lever, *b*, rests in the hooked clip, *c*, which is screwed to the mahogany back, H, of the closet, and to the outer part of the lever, *b*, is attached a counterweight. When the seat, G, is depressed by the weight of a person, the lever, *b*, is raised, which depresses the valve, Q, and also the valve, W; and as the descent of the valves is quick, but little water flows through the outlet, L, into the closet basin. When the seat, G, is liberated, the counterweight, *d*, raises the spindle, P, and then the water flows through the orifice, X, until the valve, Q, effectually closes the aperture in the valve seating, U. To facilitate the raising of the valve, W, when the spindle, P, is fully depressed, the water is caused to press upon its face by means of the passage which it has through the water-way, Z, and holes, Y; the pressure of the water acting upon the face of the valve, eases it off the seating, when the spindle, P, is acted upon by the counterweight, Z.

Fig. 2.



These improvements may also be adapted for controlling and regulating the supply of water to urinals, and other purposes, where it may be desirable to regulate the flow of water by means of valvular apparatus, actuated upon the oscillating principle. In adapting the improvements to urinals, a part of the flooring near the basin is caused to oscillate slightly upon its supporting spindles, or to descend, in order to open the valvular apparatus, and cause the water to flow so long as the actuating board is kept down.

SEWING MACHINE.

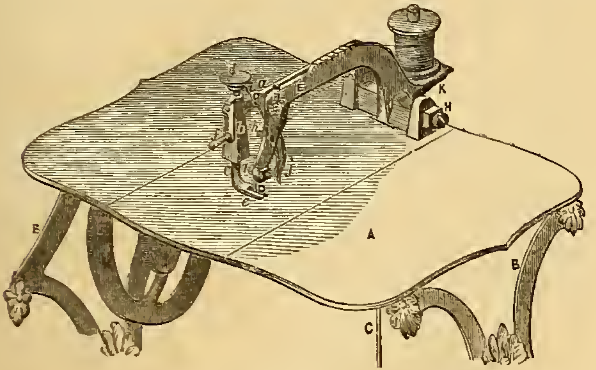
F. W. Brind, *London.—Patent dated September* 7, 1858.

In this sewing machine the variety of the stitch is made by the interlacing of two threads, of which one is carried by a shuttle and the other by a needle.

Fig. 1 of our illustrative engravings is a perspective view of a machine embracing the patentee's improvements. Fig. 2 is an end elevation, with a fragment of the table in section. Fig. 3 is a side elevation of the feed mechanism detached, to show its general construction and arrangement more fully.

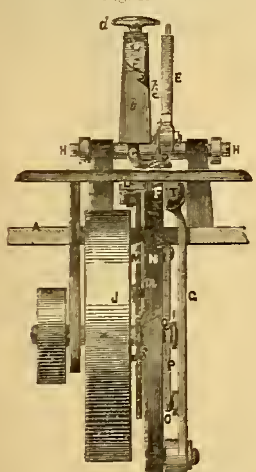
The machine consists of a strong table, A, supported on legs, B. On a stay connecting the front legs of the table a treadle is arranged, through which, by a connecting rod, C, motion is communicated to the machine in the usual manner. The needle, D, is carried on the front extremity of a vibrating arm, E, and the shuttle is carried in a circular race at F, on the upper extremity of another vibrating arm, G. The needle arm, E, is of an irregular form, represented in fig. 1, and turns on points, H, near the opposite end at which the needle is carried. The extremity of the arm near the pivot may, for convenience, be called the lower end, and that to which the needle is affixed, the upper end. To a pin on the lower end of this arm is connected a link rod, I, the other end of which is attached to a crank pin on the shaft of a revolving wheel, J, which wheel, as it rotates, communicates through the connecting rod, I, a vibratory motion to the needle bar, E. Care should be taken to place the wrist pin in the lower arm, E, at the proper distance from the points, H, so as to give the required amount of vibration to the needle arm, to form sufficient loop for the free passage of the shuttle. Immediately above, or nearly on a parallel with the points, H, the needle arm has an offset, K. formed upon it, from the centre of which projects a stem, upon which a spool is placed supplying the needle thread. On the upper side of the needle arm, E, is arranged a series of holes, for the purpose of governing the tension of the needle thread, to correspond with the tension of the shuttle thread; this is effected by lacing the needle thread

Fig 1.



through a greater or less number of the holes as may be required. The arm, G, which carries the shuttle, turns on a pivot affixed to a bracket, which projects down from the lower side of the table. This shuttle arm derives its motion from a slot, Q, in or about the middle of a vibrating lever, P, through the medium of a driving pin, O, which projects laterally from the said lever, P. The upper end of the shuttle arm, G, carries a shuttle case, T, of the required size and form, to receive the shuttle and drive it. This shuttle case being oblong, and at right angles to the arm which carries it, should be notched at one end, to admit the shuttle, and permit it to be easily withdrawn, the rear end of the case remaining entire to drive the shuttle forward. The shuttle case vibrates in a curved race, F, which closes the upper side and back of the case to keep the shuttle in. The front end of the race, F, is removable, for inserting, confining, and withdrawing the shuttle. The feed mechanism consists of a single bar, M, placed in the inner side of the bracket, N, and retained in position by a guide pin, *m*, passing through a slot formed in the bracket, N, which guide pin, *m*, also forms the pivot upon which said feed bar turns. On the face of the feed bar, M, next the wheel, J, is an inclined plane, R, against the lower side of which the cam, T, on the face of the wheel, J, operates, raising the bar perpendicularly sufficient to bring its upper end in contact with the material being sewed on its lower side. On the face of the wheel, J, in the proper relative position (see fig. 3), projects a pin, S, which, when the feed bar is elevated—as represented in fig. 3, by the cam, *t*, against the incline, R, in contact with the cloth—engages with the feed bar below the pivot, *m*, turning it upon its axis, moving its upper end forward, and carrying the cloth therewith the distance required for the length of a stitch. After the upper end of the feed bar, M, which may be provided with a single chisel edge, a series of notches, or elastic friction pad, composed of India-rubber or other adhesive substance, to move the cloth along, has made its full motion forward, by the advance of the pin, S, to a point parallel with its axis, the cam, T, passes from beneath the inclined plane, R, permitting the bar to descend, freeing its upper end from the cloth, and as the pin, S, continues to rotate, the spiral spring, W, attached to the upper end returns it in position, against the end of the gauge rod, in readiness for the next succeeding stitch.

Fig. 2.



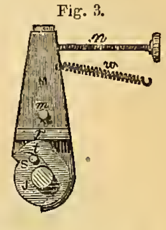
To govern the stitches, and vary them to any desired length, a rod, *n*, provided with a screw thread, and passing through a female screw, formed in the table, projects against the upper end of the feed bar, and as the motion of this feed bar in the direction desired to move the cloth is positive, by means of the pin, S, the spring, W, returns it against the end of the gauge rod, in whatever position it be set, by means of a thumb nut on the screw, *n*.

In a modified form of the feed mechanism, at the upper end of the vibrating lever, L, is carried two inclined planes; one incline raises the end of the feeding pawl, and the feeding is performed by the second incline striking against a pin on the under side of said feeding pawl, deflecting the same to the distance required for the length of the stitch. A spring constantly retains this pin of the pawl against the second incline, and the weight of the pawl is sufficient, it being pivoted at its opposite end to the table, to cause it to descend, freeing the feeding points, edge, or friction pad, from the cloth.

The length of the stitches may be governed and varied by a thumb nut and screw, as in fig. 3, or in any other convenient manner. The feeding of the cloth should take place after the preceding stitch is completed, during the descent of the needle, and before the needle enters the cloth.

To hold the material being sewed upon the table, a bar, *a*, of the same general form as the needle bar, is secured, at its rear end, to a standard in juxtaposition with the needle bar. On the front end of the bar, *a*, is a head, *b*, to which is fitted a sliding spring foot, the shank, *c*, of which passes through said head, *b*, and is provided on its upper end with a thumb nut, *d*, with which the foot is raised, in order to place the cloth beneath it. The lower end of the sliding spring bar is formed into a foot, *e*, which may be split, and the prongs projecting on either side of the needle will retain the cloth firmly upon the table as near the needle as possible, and at the same time allow the feed mechanism to move it, as the material is being sewed along. To raise and retain the sliding foot, *e*, so as to have free use of both hands in the arrangement of the work, a cam with a handle, *f*, is pivoted to the front side of the head, *b*, and acts against a projecting collar placed beneath the thumb nut, *e*, and around the shank of the sliding foot. Directly in the rear of this head, upon the bar, *a*, is arranged a spring looper, *g*, pivoted to a bracket projecting downwards from the arm, *a*. The lower end of this looper is formed into a spring fork, which, as the needle rises, is moved forward by the pin, *h*, on the side of the needle bar striking against its upper curved end, *i*, throwing the forked end forward which takes the needle thread between its prongs, *j*, and as the needle descends, carries the slack thread back, by which means a smooth and perfect seam is made. A spring, *k*, secured at its upper end to the bar, *a*, its lower end bearing against a pin on the inner side of the loop bar, *g*, throws its lower end back in the descent of the needle, carrying the slack thread therewith, the motion forward being positive, through the pin, *l*, upon the needle bar. The range of motion of the forked end of the looper is governed by a pin, l^1, projecting from the bracket, carrying the loop bar, *g*, against which the loop bar above its pivot strikes.

Fig. 3.



SUBMARINE TELEGRAPH CABLE.

Captain Drayson *and* Captain Binney.

The vast importance of rapid communication between different countries, or portions of the same country, renders the electric telegraph a subject of almost universal interest—an interest greatly heightened by the recent attempt to unite England and America. The amount of attention given to each portion of a telegraphic cable should be regulated by the relative importance of the several parts. The conducting wire is the heart of the whole, as that which conducts the almost vital element; this is the first made, and is of the first importance, and unless this wire be perfectly insulated, and will remain so, all the other part of the work will be but lost labour. The next important portion is the protection of this wire from violence, and from being forced into contact or communication with other conducting materials. The third step is that of laying the wire and its covering in the ocean. The following cable is submitted as one which would possess all the essentials of a good telegraph wire, and avoid the inevitable failures of the wires as at present constructed. A copper wire of any diameter, say, for example, one-tenth or one-eighth of an inch, is first washed over with liquid India-rubber, and then carefully bound round with undressed spun silk, in the ordinary way of insulating a wire for electric experiments; the whole is again painted with liquid India-rubber. This copper wire is then to be enclosed in a tunnel covering of vulcanised India-rubber—the form of the tunnel to be square outside, circular inside. The interior is to be sufficiently large to allow the wire to be surrounded by a small portion of air and to play freely. About one per cent., or less, of the whole length is to be constructed as follows, and is termed the elongating portion:—The wire to be covered and enclosed as before, but the tunnel to be somewhat larger, to admit of the wire being formed into a very open helical coil. This form is necessary to admit of the wire elongating itself without either fracture or attenuation. A cable constructed as above would possess the requisites before alluded to, viz:—Perfect and permanent insulation; as there is but one metal, there would be no sympathetic action. Lightness or comparative buoyancy; for the weight of the cable would be mainly dependent on the thickness of the conducting wire. Resistance to friction, &c.;

for the vulcanised India-rubber resists abrasion for a lengthened period, and recovers its form on the removal of pressure. A larger conducting wire, and therefore less loss of power and less weakness in case of accidental attenuation; for the conducting power of wires, otherwise similar, is directly in the ratio of their sectional areas. The helical arrangement, which, in conjunction with their tubular covering, guards against even such attenuation, and gives the property of perfect elasticity. Its lightness is such that, when coiled, its own weight cannot damage either the covering or the wire. The paying out becomes a simple operation; any accident to the cable could be remedied on board ship by artizans, and, owing to the lightness, the ship might be stopped, the cable buoyed up or re-coiled, and any repairs executed at once. The vulcanised India-rubber is a non-conductor, and its nature is not affected by any heat less than 300°. It has been *said* to rot; but the so-called rotting has only taken place when deleterious vapours or fluids have been passed through tubes, often constructed of the *least* perfect description of rubber. Even in these cases, it has not shown itself until after a lapse of some years, at the worst only partially injuring the elasticity of the rubber, and never, after any known length of time, destroying its waterproof qualities, while, for the purpose of lying in the sea, it may be considered almost everlasting. The joining of the different lengths of covering can be performed securely and easily by the makers. And this cable, from being so very light, could, if required, be "run under," and repaired at any time.

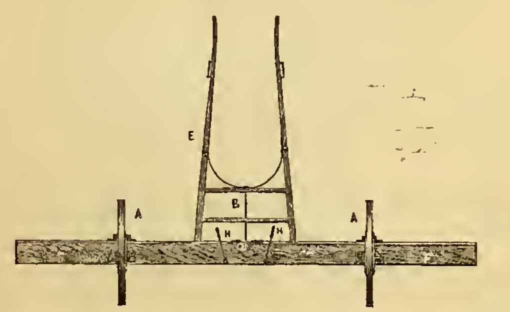
SEED SOWER.

George Finlayson, *Gighty Burn, Forfarshire.*
Patent dated Sept. 10, 1858.

The patentee's improvements consist in so arranging seed-sowing apparatus as used for sowing or depositing seeds of various kinds in land, that whilst the weight of the seed box or trough and appurtenances is retained where it ought to be, in a vertical line with the centre of the axles and carrying wheels, the box or trough is kept low down, so that the seeds are deposited with great certainty. These advantages are gained by passing the seed box or trough directly through the centres of the carrying wheels, or otherwise so disposing the box, that its longitudinal axis shall coincide, or nearly so, with the horizontal axial line of the wheels.

Fig. 1, of the subjoined engravings, is a plan of the machine; fig. 2 is an elevation of one of the bearing or travelling wheels, showing the seed box or trough in transverse section; and fig. 3 is a vertical section of one of the bearing wheels and a portion of the seed box, showing a part of the internal arrangement of the same. The machine

Fig. 1.



travels upon a pair of wheels, A, which sustain the entire weight of the seed holder and its contents. The central part or nave of these wheels differs from those in ordinary use, this part being made large enough to admit of the seed box or holder passing through it. The central part of each wheel consists of a cast-iron ring, having on its periphery a number of sockets, B, into which the spokes of the wheel are fitted. The central part of this cast-iron nave has a series of teeth cast thereon, so as to form an angular wheel, C. The nave is made sufficiently wide upon either side of this annular wheel, C, to admit of an antifriction roller traversing these portions of the interior of the ring. The annular wheel, C, is enclosed by means of a pair of circular end plates, D, which fit loosely into the nave of the wheel, so as not to impede the rotatory motion of the wheel, A, round these plates. At three equidistant points in the end plates, D, holes are made, through which are passed short axles, which are secured to the end plates by nuts. Each of these axles carry a pair of antifriction rollers, E, which are arranged singly upon either side of the central annular wheel, C. The antifriction rollers, E, rest upon the smooth annular surface of the cast-iron ring or nave, which in this manner serves as a bearing or support to the end plates, D. A triangular aperture is made in each of the end plates, D, corresponding in size with the seed box, F, which is of a triangular figure in its transverse section, and is in this modification constructed of wood. Each end of the seed box, F, is passed through the openings in the end plates, D, of the wheels, A, and at the parts where the seed box is attached to the end plates, its interior is divided by vertical partitions, G. Another mode of arranging this part of the machine consists in making the plates, D, with a groove or flange of a triangular figure, which is cast upon the outer side of each plate. The seed box, F, is made in three parts; the ends of the central part are fitted into the flanges of the inner plates, D, and the inner ends of the two outer portions of the box are in like manner fitted to the outer plates, D, which thus form vertical partitions, G, as shown in fig. 3. The ends of the seed box, F, which abut against the plates, D, have plate bolts fixed to them, which bolts are passed through holes made in the plates, D, and are secured thereto by nuts. As thus arranged, the seed box, F, being fast to the end plates, D, and these being supported by the antifriction rollers, E, which rest upon the annular surfaces of the naves of the wheels, A, it follows that the entire weight of the seed box and its contents is thrown upon the bearing wheels, which greatly facilitates the drawing of the machine over the land during the operation of sowing. Along the back face of the seed box, F, at uniform distances apart, apertures are made for the discharge of the seed from the box. In a seed box of nineteen feet in length, which

Fig. 2.

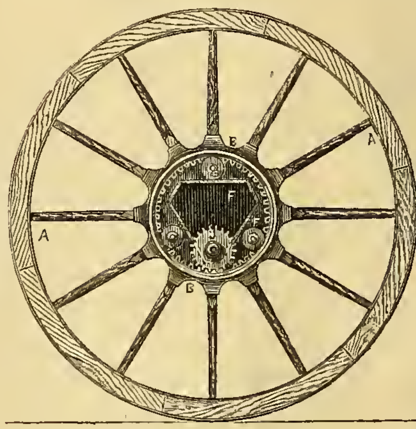
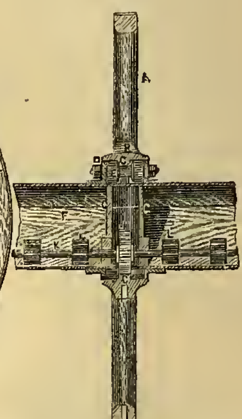


Fig. 3.



is the dimension preferred for it, there are thirty-six of these discharge apertures for the emission of the seed; the length, however, of the seed box, and the number of the discharging orifices may be varied as required. Each of the discharge apertures has fitted over it on the back of the seed box a wrought-iron plate, which has an orifice made therein to correspond to the opening in the seed box. The series of discharge apertures may be partially or completely closed by means of two horizontal sliding bars, which have holes made in them opposite to the discharge apertures. Each of the sliding bars slides to and fro in clasps, which are fixed to the back of the seed box, and each bar is actuated by means of a hand-lever, H. These hand levers, H, are centred upon studs at the back of the seed box; a hole is made in each lever which passes on to a stud projecting from the face of the sliding bar—the upper part of each lever has a stud projecting from its front side, which works through the segmental guide, I, and to which the lever may be fixed at any desired point. In this manner each sliding bar controls and regulates the emission of the seed from one-half of the discharge apertures, and by adjusting the hand-levers, H, the orifices in the seed box may be partly or wholly closed, so that, if required, only one-half the length of the seed box may be used at a time. By means of a screw worked from the centre of the seed box, against which screw the ends of the sliding bars abut, the bars are set previous to sowing with the machine, so that the discharge apertures cannot be opened by the hand-levers, beyond the predetermined extent. The rotatory motion of the wheels, A, causes the annular wheels, C, to give motion to a pinion, J, which is fitted within each of the annular wheels, and between the partitions, G, in the seed box, F. These pinions, J, are keyed upon a horizontal shaft, K, which extends from end to end of the seed box; this shaft has fast to it a series of pinions, L, each of which is fitted opposite to one of the discharge apertures. As the machine is drawn over the ground, the pinions, J, put the shaft, K, in motion, which carries with it the pinions, L, the leaves of which lift the seed, and cause it to fall through the discharge apertures on to the earth beneath. To the front of the seed box, F, is secured the splinter bar, M, and to this are jointed the horse shafts, N. Instead of using a splinter bar, two wrought-iron brackets may be fixed to the front of the seed box, each of these brackets having a projecting end about four inches and a half in length. These projecting parts are inserted in a slot made in the end of each shaft, and are secured thereto by means of a bolt and nut, thus forming a joint to allow of the seed box being turned either backwards or forwards. To the transverse rail, O, is jointed a bar, P. which extends backwards over the seed box, F; the free end of this bar has a number of holes made in it; these holes afford the means of securing the vertical hand-lever, Q, to the bar, P. This lever is fixed to the centre of the seed box, and terminates in a handle within convenient reach of the attendant; the lever, Q, has near its upper part a clasp, through which the free end of the bar, P, slides to and fro. A hole is made through the lever, Q, opposite to the series in the bar, P; a pin is attached to the lever, by passing which through the holes the lever may be secured to the bar, P, at any point within the range of the holes. This arrangement admits of the seed box, F, being turned upon its axis by shifting the handle, Q, to and fro; the object is to ensure an equal and uniform discharge of seed, whatever may be the elevation or declivity over which the machine is travelling. In this manner also, a greater quantity of seed may, if desired, be distributed over one part of the field than the other, by turning the box backward if more is required, or in the reverse direction if a smaller quantity is desired to be discharged. To enable the machine to be carried into a field having a gateway of the ordinary width, the shafts, N, are detached from the splinter bar, M, and the seed box and wheels are transferred to a light carriage, upon which the seed box is laid longitudinally The shafts, N, are attached to this carriage, and the whole may be readily drawn by a single horse, the fore part of the carriage being made to turn upon a bolt or stud. so as to be readily turned round in a roadway or into a field.

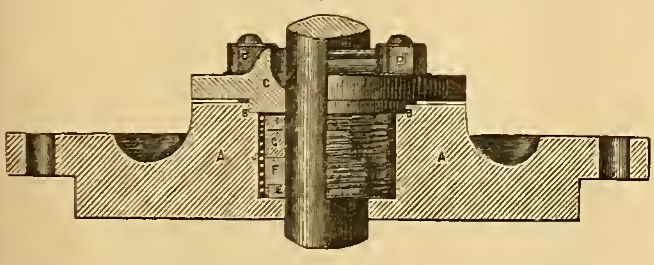
Another modification of these improvements in sowing machines consists in adapting the arrangement for sowing turnip seed and other similar purposes. This modification consists of a series of receivers or hoppers, in which the seed is placed; the lower part of each of these receivers consists of a tubular passage, which conveys the seed down to the box in which the discharge pinions or seed wheels are arranged. The series of discharge pinions are actuated from a pulley, which is driven by an endless belt arrangement. The sliding plate which closes or reduces the size of the discharge apertures is adjusted by means of a regulating screw or other analogous contrivance. In machines constructed according to this invention, the draught is much reduced, and from the manner in which the motion is communicated to the discharge pinions or seed wheels, the machine is easier to draw by one-half than most of the broad cast sowing machines at present in use.

METALLIC PACKING.

Robert Anderson, *Stirling.—Patent dated August* 18, 1858.

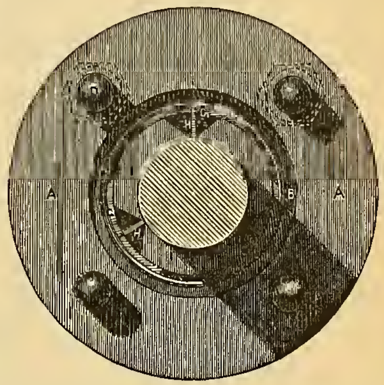
A really efficient metallic packing for piston rods has long been a desideratum with engineers. From what we have heard of Mr. Anderson's improved packing, its performance appears to have been in every respect satisfactory. The accompanying illustration represents a partially sectional elevation of the upper portion of a steam cylinder,

Fig. 1.



showing the improved metallic packing applied thereto. Fig. 2 is a transverse section of the arrangement. In this modification the stuffing-box is a simple cylindrical recess made in the cover, A, and similar to the ordinary stuffing-box, excepting that a groove or ring, B, is countersunk in the metal of the cover. This groove receives a corresponding shoulder, or cylindrical projecting part, which is turned upon the under face of the gland, C. By this means the gland, C, may be screwed down tightly by the screws, D, without pressing upon the arrangement of the metallic packing within the stuffing-box. The lowest series of segmentally-shaped packing pieces, E, are placed upon the bottom face of the stuffing-box—these are partially enclosed by the downwardly projecting rims of the lower tier of the main or central segments, F. These segmental pieces are made so that the inner or concave part of each, encloses or embraces a third portion of the diameter of the piston-rod. The sides of these segmentally-shaped pieces are made parallel to each other, or nearly so, in order that as the inner or concave surfaces wear away, the pieces still fit closely to the periphery of the piston-rod. The main portion or central part of the packing, consists of other segmental pieces of brass, arranged in two rows or tiers, F and G. These portions of the packing correspond in figure to the parts, E, excepting that at the periphery of each, a raised edge or vertical flange is there formed. Each of the segmental pieces, F and G, has inserted at its centre, and in a longitudinal direction, two small pieces of metal or feathers, H, which extend inwards from the periphery of the segment to the surface of the concave part. The three segmental pieces, E, which form the lower series of the main portion of the packing, are arranged equidistantly around the piston-rod, and in such a manner that the inner surfaces of the lower feathers, H, are interposed between the contiguous vertical edges of the segmental pieces, E, which are made to fit within the downwardly projecting rim of the segmental parts, F. Upon the series of segments, F, are disposed the second tier of corresponding parts, G—these are arranged so as to "break bond" with the lower tier. As thus arranged, the two tiers of segments are held together and kept in position by the upper feathers, H, which enter corresponding notches cut in the contiguous segment. Within the upwardly projecting rim of the segmental pieces, G, three of the smaller segmental pieces, I, are arranged—these correspond in all respects to the lowest series, E, and, like them, are arranged with the radial feathers of the upper pieces, G, interposed between their contiguous vertical edges. In this modification, the several segmental pieces are compressed inwardly by a series of helical springs, J, which are formed of steel wire. Several of these coils are sprung or otherwise passed over the periphery of the packing, so as to compress its several parts closely around the piston-rod. The concave surfaces of the segmental pieces being made, in the first instance, to fit accurately to the piston-rod, the compression of the springs keeps the segments close up to their work, and effectually prevents the escape of steam. At the same time, from the particular configuration given to the segmental part of the packing, the wearing away of the concave surfaces does not effect the fitting of the parts to each other and the periphery of the piston-rod; so that the parts always keep steam-tight, irrespective of the amount of wear.

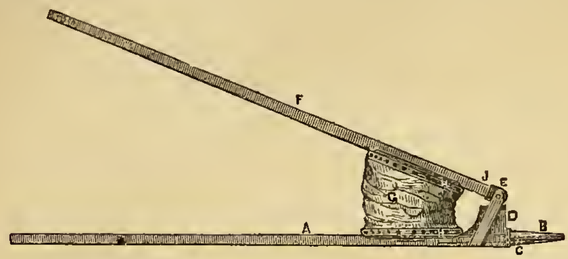
Fig. 2.



BELLOWS.

J. H. Johnson, *London and Glasgow.—(Communication.)—Patent dated August* 26, 1858.

These improvements are intended to remedy several imperfections which are inseparable from the present form of bellows. The accompanying engraving represents a side elevation of the bellows expanded. The bellows consists of a lower lever or arm, A, forming a base or fulcrum, upon one end of which is adapted a conical metal pipe or nozzle, B, which fits a round boss made on the end of the lever, A, to which boss is fitted a flap valve, C. This boss is formed in two halves—the one being part of the lever, A, and the other forming part of the block, D—to which is screwed a metal strap or fork piece, E, carrying the working centre of the upper lever, F. This fork, E, is screwed to the block, D, and the latter itself is secured to the lever, A, by four screws, inserted from the underside of the lever. In the lever, A, is formed a passage or thoroughfare, opening a communication between the body of the bellows and the nozzle, D. The body of the bellows, G, is a cylinder composed of hide, and affixed to the two wooden discs, H, I, turned with recesses to receive the leather of the bellow's body, which is secured thereto by means of wood screws and washers. The lower disc has a recess formed upon it, for the facility of adjusting it upon the lower lever, A, to which it is then secured by screws. An opening is made in the disc, H, which is covered by the ordinary inlet valve, and a second opening allows the air compressed by the bellows to escape by the before-mentioned passage in the lever, A. The upper disc, I, is constructed like the lower one, but without the openings referred to. It is fixed to the actuating lever, F, by screws, in a similar manner to the lower disc. The working lever, F, is fitted with a metal ferrule, J, at its front end, through which the pin or bolt, M^1, passes, which forms the working centre of the lever. Grooves or channels (shown in dotted lines), are made in the surface of the lever, A, for the purpose of admitting the air freely to the opening in the inlet valve. The recess or sunk portion in the disc, H, may be made in such a manner as to cover the grooves or channels, by making an opening or channel on each of the lateral faces of the lever, n, in contact with the sunk portion. These bellows may be composed of wood, iron, or any



other suitable material, and the body of the bellows may be of any desired form; and the blast-pipe or nozzle, B, may be of a conical or other shape, according to circumstances. The leather of the bellows may be secured to the discs otherwise than by screws; as, for example, metal straps or rings might be employed so as to encircle and grip the leather against the peripheries of the discs, or other convenient means may be adopted, whereby the removal of the old leather and the replacing of a fresh one may be readily accomplished. It may be here observed, that the stiffeners or supports of wire or cane hitherto placed inside bellows for holding out the sides, are entirely dispensed with in these bellows; and therefore a great reduction in the wear and tear of the leather occasioned by the friction of such supports, is obtained. In order to prevent leakage by reason of the porosity of the leather, it is further proposed to cover such leather with flexible skins, secured thereto either by glue, or cement, or by stitching.

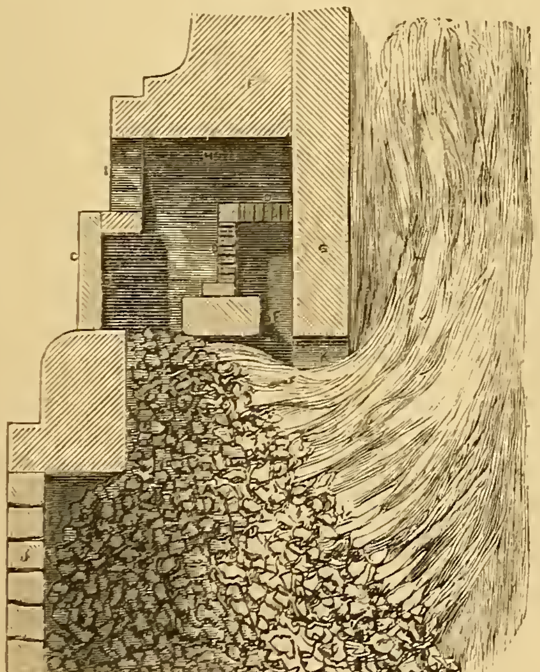
LAW REPORTS OF PATENT CASES.

Sewing-Thread Trade Marks: Taylor *v.* Degetau and Others.—This case, which came before the Vice-Chancellor's Court on an application for an injunction to restrain the defendant from infringing the the plaintiff's trade mark, is, in itself, of a very ordinary kind; but the sad commercial immorality elicited by the facts educed for the defence, takes it out of the usual category of such simple points. These facts refer to a practice, said to prevail in the thread and cotton trade, of winding "short lengths" on the reels or "spools," and marking them as "long lengths," or as containing a greater number of yards than are actually wound on them. The suit was instituted by Mr. William Taylor, the surviving partner in the firm of J. and W. Taylor, of Leicester, claiming to be the proprietor of a thread well known as "Taylor's Persian thread," which is wound upon reels by machinery—labels or marks being affixed at both ends of the reel, one denoting the quality of the thread, the other denoting (or purporting to denote) the number of yards on the particular reel. The object of the suit was to obtain an injunction against the defendants, Henry Degetau and Henry Dalton, both of Manchester, to restrain them from infringing the plaintiff's trade mark, and for an account of profits, and the usual consequential relief. Among other statements in the bill was one which was verified by the affidavit of the plaintiff himself, as follows:—"That my said firm of J. and W. Taylor affixes, and has always affixed, a label to the lower or reverse end of the reels of thread manufactured and wound by my said firm, and when the quantity of thread upon such reels amounts to 100, or 200, or any other even and complete 100 yards, my said firm has always caused, and still causes, to be printed upon such last-mentioned labels, figures, and words stating the quantity in yards of thread upon such reels; and my said firm has always wound, and still winds, such reels by means of machinery so constructed as to ascertain the length of the thread wound upon its reels; and whenever the quantity in yards has been or is stated on such lastly-mentioned labels, the same has always stated, and states, the true quantity of the sewing-thread wound thereon." It appeared, however, by the evidence, that in August, 1854, the firm had, at the special request of the defendant Degetau, supplied to the firm of Eller and Co., of Manchester, five cases, containing 250 gross of reels, each reel containing thereon 280 yards of cotton thread only, although marked with the number 300; and that the firm had also in the same month supplied Eller and Co., at their request, with 50 gross of reels containing 250 yards, and marked "300;" and that in other instances the firm had also supplied to "certain persons," at their special order, reels marked "300," but having a less quantity thereon. According to the evidence of Degetau, the plaintiff's firm had continued regularly to execute all orders given by him to them, and had regularly marked the reels or bobbins of cotton, pursuant to such orders, as containing "long lengths," when, in fact, they contained "short lengths," down to the month of September, 1855, when, in answer to a letter, enclosing another order for 600 dozen six-cord thread, 250 yards, marked "300 yards," on ivory spools (the cotton thread in the several previous orders given by him to the firm having been wound on wooden spools), the plaintiff's firm had declined to wind "short lengths" on "ivory spools," though he understood that the firm were willing to continue winding short lengths on the wooden spools. Messrs. Taylor subsequently declined altogether to execute orders for short lenghts, labelled as long, and this was followed by the alleged imitation, by the defendants, of the plaintiff's mark, with the false statements of length. In giving a long and very elaborate judgment, the Vice-Chancellor remarked very strongly upon the painful nature of the case, observing that the plaintiff came to this court with his affidavit, and said that although the practice had ceased for some months, making it one of the merits of his case, yet his establishment had always supplied the true measure. In such a case it was clear the court could not interfere by injunction. It was not such a case that he would be aided in his rights. The law as to trade marks stood differently at law and in equity. The law regarded the question as simply one of fraud by a defendant in fraudulently injuring the plaintiff. A court of equity looked further, considering a trade mark as a species of property, not like copyright, but which a man might have in his name, which was valuable to him, and which no one else had a right to use. Putting it on other grounds, this court protected the right because the owner had so established his character that it was an injury to him if another party, whether done fraudulently or not, were to be allowed to pass off or lead the world to suppose that certain goods bearing his name had been really manufactured by him, when they had not. But if it turned out that the sale of these goods by the plaintiff was a fraud on the public, the court would be really asked by him to do—what? Why to continue a monopoly of fraud. The meaning of it was, "Do not allow anybody else to continue selling short measure under my name." If the plaintiff said he had acquired a name in this trade, and if the court found the public had been deceived in the article by the plaintiff's own misrepresentation, the Court certainly would not assist him to continue that deceit. What control could this Court have if the plaintiff yielded to a fresh temptation? The public would be misled, by the very injunction granted, into the belief that the party obtaining it was a man of unblemished and deserved reputation, although the goods continued to be supplied in the manner he had described. The two grounds on which it seemed to him that the plaintiff could not be assisted were the general course of dealing by him down to 1857 (the goods sold at that time might now be circulating under false credit), and the particular fact of his attempt to support a case which was not only untrue, but depending on facts contrary to his depositions, and which could scarcely be absent from his mind, although it was suggested he was wholly ignorant of all these proceedings. Therefore the bill must be dismissed with costs subsequent to the filing of the answers, the defendant giving an undertaking in the terms of the third paragraph of the prayer of the bill. This decision very properly enforces the necessity of keeping to trade marks which tell the truth. A good and legitimate trade mark is a very important part of the positive stock-in-trade of the manufacturer of honesty and repute; but it must not cover deceptions, or, as we now see, the law will not stretch out its protecting arm to legalise and perpetuate a fraud.

Pottery Furnaces: Smoke Consuming Apparatus.—Doulton *v.* Stiff.—This was a motion for an injunction to restrain the defendant from using with, or in the arrangement of, the fire-places or furnaces of the kilns used by him at his pottery works, known as the London Pottery, High Street, Lambeth, air chambers in connection with the fire-places or furnaces, or any air chamber, constructed, contrived, or arranged so as to admit and heat atmospheric air, and conduct the same, when heated, into the upper part of the furnace or fire-place above the fuel therein, in accordance with, or in imitation of, the plaintiff's invention, the subject of letters patent granted to him, dated the 11th May, 1854. Mr. Glasse, Q.C., and Mr. Fooks, were counsel for the plaintiff, and Mr. Baily, Q.C., and Mr. Speed, instructed by Mr. J. Henry Johnson, of Lincoln's Inn Fields and Glasgow, were counsel for the defendant. The plaintiff's alleged invention is for "Improvements in kilns used in the manufacture of stoneware, earthenware, and china." The specification states the object of the invention to be an arrangement of fire-places or furnaces of kilns used in the manufacture of stoneware, earthenware, and china, so as to prevent the evolution of smoke into the atmosphere, and for that purpose, over each fire-place or furnace, a fire tile or thick plate perforated with numerous holes, is placed or fixed, and over that a chamber is formed to receive air, there being a slide or other means of regulating the flow of air into the chamber. By this arrangement, the perforated tile or plate becomes highly heated by the fire below, and the draft of the fire being inwards to the kiln, the air passes down through the perforations and becomes still more highly heated than when in the chamber above: and the heating of the air in the chamber may be assisted by having perforated or other plates or surfaces in the chamber, so as the air may become heated by passing in contact therewith. Drawings are annexed to the specification, and a description of them given, which show the ordinary furnace of a kiln—the perforated fire tiles over an opening at the upper part of the furnace—and a chamber over the perforated tiles, capable of being partially closed by introducing a tile or brick, or otherwise, at an opening to the atmosphere in front of the chamber, to reduce the quantity of air passing into the chamber. And the *novelty* is stated to consist in the application and arrangement of the parts shown and described for admitting and heating the air. Since the year 1857, the defendant has been using in his pottery, the ordinary kiln fire-place or furnace, with an opening at the back, next the kiln, communicating with a flue descending to the lower part of the burning fuel. The crown of the fire-place, consisting of a double course of brick-work, five inches thick, and over this is an air-flue with an opening to the atmosphere—the flow of air into this flue being regulated by suitable means. The inner end of this flue opens into the descending flue down which the air passes, and the effect produced is the entire consumption of smoke. The alleged infringement consists in the use of the *air flue* above the crown of the furnace, and the means for regulating the flow of air therein. Affidavits of scientific and other witnesses were filed on behalf of the defendant, to prove want of novelty of the alleged invention, and that the defendant had not infringed. His honour, the Vice-Chancellor, Kindersley, refused the injunction—the plaintiff to be at liberty to bring an action at law to establish the validity of his patent and the alleged infringement.

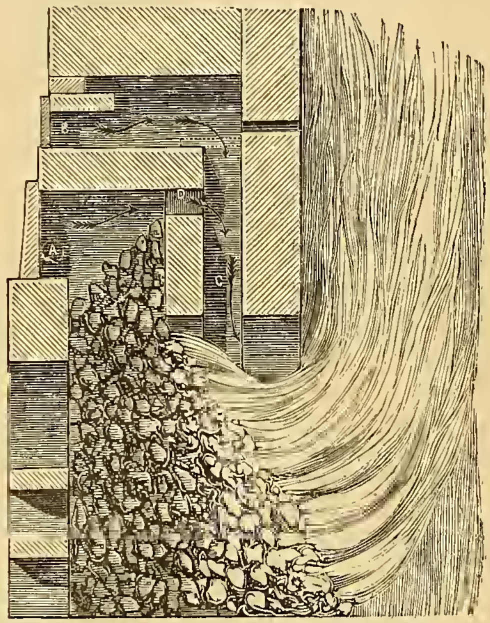
In the accompanying engravings we have shown in vertical sectional elevations the construction of the Pottery Furnaces used by Mr. Doulton and by Mr. Stiff. The first is one of the modifications shown in the drawings annexed to Mr. Doulton's specification. Fig. 1 shows a section of a fire-place or furnace of a kiln where no fire bars are employed. A is the fire-place or furnace, into which the fuel is placed through the opening, B, to facilitate which the tile or slab, C, is taken away, and then replaced; D is perforated fire tiles over an opening, E, at the upper part of the fire-place or furnace; F is part of the outer wall of the kiln; G is part of the lining of the kiln; H is a chamber above the perforated fire tiles, which can be partially closed by introducing a tile or brick, or otherwise, at the opening, I, to reduce the quantity of air passing into the chamber (and consequently to the fire), when the coal has become well ignited. There may be further perforated tiles used above those

Fig. 1.



shown to partially heat the air before it comes to those which are shown. J is bricks piled, as heretofore, loosely at the lower part of the furnace or fire-place, as shown, between which air can pass to support combustion, as well as down through the fuel from the chamber, H. By these arrangements the perforated tiles, D, become highly heated, and the atmospheric air is also heated in passing from the chamber, H, downwards through the perforated tiles into the upper part of the furnace or fire-place, and it enters above the fuel therein, and thence passes into the kiln, through the opening, K, where it meets with the products passing off from the fuel, and is ignited with them as they enter the kiln. The parts of the kiln and the parts of the fire-places or furnaces shown by the engraving are similar to those ordinary in use, and the novelty consists of the application and arrangement of the parts shown and described for admitting and heating the air. Fig. 2 represents a vertical lougitudinal section of one of the furnaces or fire places, a modi-

Fig. 2.



fication of which is used by Mr. Stiff. A is the opening through which the fuel is supplied to the body of the furnace, which opening is closed when requisite by a fire tile or block. The air which supports combustion, and effects the consumption of the smoke and gases enters by the air flue, B, passes down through the descending flue, C, at the bottom of which it meets the smoke and products of combustion evolved from the burning fuel. In its downward passage this air becomes mixed with the heated air from the surface of the fuel, which passes out by the back aperture, D, leading into the descending flue. The main supply of air is regulated by tiles placed at the mouth or entrance of the air flue, B. This air flue is constructed immediately above the crown of the furnace, and is separated therefrom by a course of five inches of fire brick. The sole object of the air flue is to supply air to the fuel, which Mr. Stiff prefers to have as cold as he can get it, although it is impossible for the air to pass along the flues without becoming highly heated.

Brick Machinery: Bulmer and Sharp *v.* Moore.—This was an action for infringement, tried at Armagh, before the chief baron, and a special jury. There were two counts—the first for the infringement of the patent, and the second for the use of the invention. The plaintiffs reside at Middlesborough, Yorkshire, and on the 5th of March, 1856, obtained a patent for "improvements in the manufacture of bricks, tiles, and other articles from plastic substances." The defendant is the proprietor of brick works at Ravenhill, near Belfast. The invention in dispute mainly consists of a revolving arm, or arms, working in a chamber beneath, or connected with, a pug mill, and use of certain guide rods, for the purpose of steadying the clay entering the moulds, and introducing steam into and among the clay, near its exit from the moulds, the daily production being about 20,000 bricks per day. It appeared that the defendant declined to order a machine from the accredited agent of the patentees, but had one made to order by a Belfast machine-maker, promising to settle with the patentees for their royalty. For the defence, Mr. Beart, the well known brick machine inventor, was examined, to show that the plaintiff's invention was the same as his earlier one; and it was further urged that what the defendant had done was very different to the plaintiff's plans. After a lengthened trial, his lordship stated the issues as follows:—1st. Whether the invention of plaintiffs, as described in first paragraph of summons and plaint, was new at the time of granting said letters patent? 2d. Whether the plaintiffs are the first and true inventors of said invention, as alleged? 3d. Whether plaintiffs' invention, as alleged in said first paragraph of summons and plaint, is an improvement in the manufacture of bricks, tiles, and other articles from plastic substances? 4th. Whether the defendant has infringed said letters patent of plaintiffs, as alleged? 5th. Whether defendant used plaintiffs' invention, or enjoyed privilege of using same, by permission of plaintiffs, as alleged? 6th. What was the loss, if any, plaintiff's had sustained by reason of the alleged grievance? And at the close of an elaborate charge, he said:—Respecting what constituted an infringement, if the defendant, without any express permission, made experiments in the construction of the machine by Wilson—not for the purpose of trade, but for the purpose of getting information himself as to the efficiency of the engine, and its nature, or as a matter of scientific character—that would not be an infringement of the patent. But if, without the permission of the plaintiffs, he made and constructed the machine for the purpose of trade, and used it for that purpose for any time, however short, that would be an infringement. If there was an actual permission, there would not be an infringement at all. The Jury returned a verdict for the plaintiffs on all the issues, finding that the invention of the plaintiffs was new at the time of the granting of the letters patent; that they were the first and true inventors; that the invention was an "improvement in the manufacture of bricks, tiles, and other articles from plastic substances;" that the defendant infringed the letters patent, and did not use the said invention, or enjoy the privilege of using the same, by permission of the plaintiffs; and the jury further found that the plaintiffs had sustained £25 damages and costs, by reason of the grievances; and, finally, that the defendant did not use the invention merely as an experiment, in order to decide whether he would take out a licence, but used the same for the purposes of trade.

Mantilla Shawls: Norton *v.* Nicholls.—This was a motion in the Court of Queen's Bench, before Lord Campbell, and Justices Wightman, Crompton, and Hill. It bears upon what may be called "the great shawl case," for never was so much trouble involved in so insignificant a matter. The counsel for the plaintiff moved, pursuant to leave reserved, for a rule calling upon the plaintiff to show cause why the verdict found in his favour should not be set aside, and a nonsuit entered, or why the verdict should not be entered for the defendant. The action was brought to recover damages for the infringement of the plaintiff's design of a shawl, registered under the 5th and 6th Victoria, cap. 100. The plaintiff's case resolved itself into five points, which constituted the alleged design. 1. It had a reversible or double texture. 2. It had a scallop which was said to be a new design. 3. Whereas the body of the shawl was double, the border was single. 4. One of the four corners was rounded. And, 5. The fringe was of a particular manufacture. Only the 2d and 4th came within the Act—viz., the scallop and rounded corner—and they were both old; but the plaintiff claimed the combination of the five points as constituting a new design within the Act, which was a question now to be determined. There was also a question as to the notice given to the defendant, who was the vendor, as required by the 7th section. Lord Campbell said the learned counsel might take a rule to show cause.—Rule *nisi* granted.

Printed Zebra Goods: Macnee and others *v.* Nimmo.—We thought this litigation, which has been so often reported in this *Journal*, was at last at an end, but it seems not; and from the latest result, which we now notice, it does not appear to be near a conclusion. The present action was before Mr. Justice Byles and a special jury, at Liverpool. It was directed by the Lords Justices, to try whether certain printed cotton fabrics called "zebras," as made by the defendant Nimmo, were an infringement of the plaintiff's patent. The defendant's goods were similar in some respects to the plaintiff's. The difference, it was contended, existed in their being a pattern or raised figure woven on the face of them, and the threads at the back, though loose or "flushed," as the plaintiff's were, being also like the face woven into a pattern. The flushing being only so much as was necessary to produce that pattern. For these goods the defendant had taken out a patent; the question was, Whether the goods were substantially similar to the plaintiff's? The trial lasted for some hours, and ended in a verdict for the defendant.

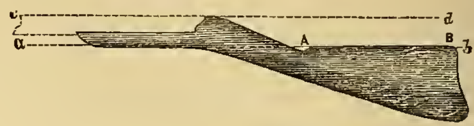
Patents for Munitions of War.—A bill under the care of the present Attorney and Solicitor-Generals and General Peel, the present Secretary of War, allows any inventor of any improvement in instruments or munitions of war to assign the benefit of such invention to the Secretary of State for War. The Secretary may certify to the Commissioners of Patents that the invention be kept secret.

REGISTERED DESIGN.

GUN STOCK.

Registered for Mr. J. P. Byrne, *Lower Ormond Quay, Dublin.*

The purpose of utility to which the shape or configuration of this design has reference, is the obtainment of a better and more certain guide for bringing the eye into a proper position for taking aim. The



annexed engraving represents a side elevation of the improved gun stock, with a sufficient portion of the barrel dotted in order to render more clear the nature of the improved configuration of the stock. This improved shape or configuration consists in making the upper edge, A, B, of the "cheek-piece" or "bent," exactly parallel with the line of the "rib" in double-barrel guns, or with the top surface of the barrel in single-barrel guns, as is indicated by the dotted lines, *a*, *b*, and *c*, *d*.

REVIEWS OF NEW BOOKS.

Novum Organon Renovatum. By William Whewell, D.D., Master of Trinity College, Cambridge. Being the Second Part of the Philosophy of the Inductive Sciences. London: John W. Parker.

Here, then, we have before us the long expected work at last. Trumpeted forth as it has been by many side-sounds of the press, and more especially by the learned author's own hand-bill—the "History of Scientific Ideas"—and after a careful and diligent perusal, to which we had brought all intention to be pleased, and to profit by any new principles evolved, we confess we have been dissapointed. And we stand not alone. Several of our contemporaries say as much—and no wonder. Hope was excited, anticipation brightened, and, after all, it turns out, as we ourselves had opined in one of our recent articles on the Prospects of Science, that Dr. Whewell has been labouring with some great idea, and does not appear—notwithstanding all his acknowledged powers—to have had strength enough to bring it forth. It is, nevertheless, a work of great care and elaboration, containing only 370 small octavo pages. It is divided into four books. Book 1, is occupied wholly with certain aphorisms—117 in all—relating to ideas in general in the pure sciences, in the mechanical sciences, in the secondary mechanical sciences, in the mechanics-chemical sciences, in chemistry, in nocphology, in classificatory science, in biology, and in palæontology. The second and third books are divided into chapters, each chapter into sections, and each section into "articles." Book 2, treats of knowledge with its sub-divisions, of two principal processes by which science is constructed, of the explication of conceptions, of facts as the materials of science, of the collegation of facts, of certain characteristics of scientific induction, of the logic of induction, of laws of phenomena and of causes, of art and science, and of the classificatious of science, to which are appended two very interesting and instructive inductive tables of astronomy and optics —in which sciences we have made the greatest advances. The 3d book (which is the most valuable portion of the work,) treats of methods employed in the reformation of science, with its sub-divisions, of methods of observation, of methods of acquiring clear scientific ideas, (including observations on intellectual education, and the discussion of ideas), analysis of the process of induction, general rules for the construction of the conception, special methods of induction applicable to quantity, methods of induction depending on resemblance, of the application of inductive truths, and of the induction of causes. Book 4, is wholly taken up with a series of aphorisms, and remarks, and illustrations on the language of science.

Such a catalogue of subjects appeared at first bewildering; but the author has exercised his ordinary facility in handling topics of the kind, that, without any claim to grace or dignity of language, he leads the reader onward to the close pleasantly enough, although, here and there on his way, leaving him to get out of a labyrinth as well as he may. But this not the thing promised. "I would present to the reader the philosophy, and, if possible, the art of discovery," (p. 142). He, however, immediately stops himself, and says, "But, in truth, we must acknowledge, before we proceed with this subject, that speaking with strictness, an art of discovery is not possible—that we can give no rules for the pursuit of truth which shall be universally and peremptorily applicable,"

(p. 142). Although he thus repudiates any art of discovery, he deliberately says, "We have now to attempt to describe the manner in which discoveries are made" (p. 27). Let us but once know this "manner" and surely we have this "art." And yet he afterwards says, "We shall attempt hereafter to give several rules of a more precise and detailed kind for the discovery of the causes, and still more of the laws of phenomena" (p. 128). Into such a mesh of contradictions do we get when we have some apprehension of the possession of some profound truth, and yet do not see it exactly, and claim to publish it.

The learned author now boldly affirms, that "An art of discovery is not possible." Surely this is going rather too far, for one, however *wise*—not to say merely learned—to say what is or is not possible in such a matter. For ourselves, we are of a different opinion, and believe that such an art may be discoverable when the world may be sufficiently informed by discoveries themselves, of the process by which each discovery was made. "May it not be," we take the words out of these very pages, "that the steps of (discovery) in these different cases, have in them something alike? May it not be that in each (discovery) there is some common principle, some common process?" It seems reasonable that there should be, or rather, we should say, there appears no reason why their should not be. It is obvious the form of reasoning we employ in the several steps in our course of study, is precisely the same as those we employ in another course, and this it is which enables us with an entirely novel set of phenomena before us, to start some fact connecting them all together in one category. The true conjecture may be altogether diverse from any others which may have been made explaining any particular class of facts, and our author gives this as a strong reason "how far we are from being able to reduce discovery to rule, or to give any precepts by which the want of real invention and sagacity shall be supplied" (p. 66). But we do not think this bears upon the point, and our opinion is confirmed by what the author says in another place. "It is true that the ideas which enable us to combine facts into general propositions, do commonly operate in our minds while we are still engaged in the office of observing. Ideas of one kind or another are requisite to connect our phenomena into facts, and to give meaning to the terms of our descriptions; and it frequently happens that, long before we have collected all the facts which induction requires, the mind *catches the suggestion which some of these ideas offer, and leap forward to a conjectural law*, while the labour of observation is yet unfinished." This comes of twisting things into ambitious theories. The fact is, that rules of discovery lie deeply buried in the peculiar facts to which the discovery relates, but are to be collected with patient thought. Consideration of the combined static and dynamic forces known, has, as yet, received no alteration whatever, but we are inclined to believe that some principle is capable of being evolved out of it, which would upset our philosopher's "philosophy." The substratum of the author's principle, which he desires to enunciate, appear to rest on a union of what is commonly and erroneously called Aristotle's logic, and that of Bacon. But there is nothing new in this. To a thinking mind, it is among the clearest of the clearest principles, that to be of any use—to be productive of progress in the very least degree—as exemplified by the whole history of science, and, what is more, by the whole course of the conscious actions of our own minds, (which is the most important history,) it is impossible for one of these "logics" to work alone. A very little reflection will demonstrate this to each of our readers. Hence, we do not believe that "induction mounts by a leap which is out of the reach of method" (p. 114); notwithstanding, we cannot otherwise account for such felicitous, and apparently inexplicable, strokes of inventive talent, as led Archimedes to refer the conditions of equilibrium on the lever to the conception of pressure, or which impelled Pascal to explain, by means of the conception of the weight of air, the facts which his predecessors had connected by the notion of nature's horror of a vaccuum, or which caused Vitello and Roger Bacon to refer the magnifying power of a convex lens to the bending of the rays of light towards the perpendicular, by reflection.

This is not the only halting portion of the volume, which was to have formed its bulk. The author seems to himself so high seated as to be able to see the foot of his throne but imperfectly at times. He says, that "Number, space, and time, are at the same time, objects and instruments of measurement;" but surely this betrays considerable confusion of thought, each being obviously changed in its features, as we take it as an object or as an instrument. It is not the same thing at all. Besides, there are some curious contradictions, or apparent contradictions. "Discovery," he says, "depends upon the previous cultivation or natural clearness of the appropriate idea, and therefore, no discovery is the work of accident" (p. 30). A few pages further on, he says, "Scientific discovery must ever depend upon some happy thought, of which we cannot trace the origin—some fortunate cast of intellect, rising above all rules" (p. 44). Now, all that is ever meant, or can be meant by accidents, is the accident of the new part or facts meeting. This peculiar "cast of intellect," which, in looking for something else, stumbles upon this or these, and seizes possession at once. Our author's definition of accident on this point is not the ordinary one. His section on "accidental discoveries" is therefore obscure. On "effectual and scientific method of scientific discoveries," has not been better "extracted from the past progress of science," by him than it had been by Bacon before that progress had begun. Dr. Whewell gives us more verbiage it is true, and exceedingly interesting it is in its way, no doubt; but nothing really has been added to the method of scientific discovery before known. It is something, however, to have made us conscious how really little it is after all that we know.

A wonderful compiler, as the inductive tables which he gives of astronomy and optics (particularly the latter) show; he, however, possesses real knowledge of its kind, and a happy mode of putting it before the less knowing. So much is this the case, that English literature, and perhaps one might say, all literature would generally feel the loss if his published writings were destroyed. This is fame enough one would think. But perhaps some further thought (not in the beaten tract however) may enable him to acquire a still far higher claim to be considered famous. He is evidently near some great truth, but has not yet quite attained it.

The author has some excellent remarks upon the use of hypothesis, which are his matured observations on a similar subject, upon which he once discoursed, some years since, at the Royal Institution. We refer our readers particularly to sections ii. and iii., c. 5. He, however, seems to imply that all hypothesis emanate entirely from the propounder's brain; but it appears to us obvious that they are simple results of facts, and if there be two or more hypothesis on the same set of facts, then that they are still simple results of facts, as connected together in a peculiar way in the propounder's memory. Hypothesis, true or false, is, in fact, a dynamic conclusion. If true, the facts upon which it is founded are real—have existence; if false, the so called facts are nonentities. A true hypothesis, thus considered, was exemplified in the case of Kepler, ellipse as the line of planetary motion; all the observed places of the planets Mars, he saw, formed the ellipse. He did not fancy it, it was there before his eyes. We are told in a dictatorial manner, somewhat offensive, that "the inductive intellect (as if every intellect is not more or less inductive) makes an operation which is subsequently justified by demonstration; and it has its sagacity, its peculiar character, by enumerating the proposition, when as yet the demonstration does not exist; but then it shows that it *is* sagacity, by also producing the demonstration." We see at once how erroneous this statement is. Here are some incidental observations which deserve notice:—

"The education of the senses, which is thus requisite in order to understand well the terminology of any science, must be acquired by an inspection of the objects which the science deals with; and is, perhaps, best promoted by the practical study of natural history. In the different departments of natural history, the descriptions of species are given by means of an extensive technical *terminology*; and that education, of which we now speak, ought to produce the effect of making the observer as familiar with each of the terms of this terminology, as we are with the words of our common language. The technical terms have a much more precise meaning than other terms, since they are defined by express convention, and not learned by common usage merely. Yet, though they are thus defined, not the definition, but the preception itself, is that which the term suggests to the proficient.

"In order to use the terminology to any good purpose, the student must possess it, not as a dictionary, but as a language. The terminology of his sciences must be the natural historian's most familiar tongue. He must learn to think in such language. And when this is achieved, the terminology, as I have elsewhere said, though to an uneducated eye cumbrous and pedentical, is felt to be a useful implement, not an oppressive burden. The impatient schoolboy looks upon his grammar and vocabulary as irksome and burdensome; but the accomplished student who has learned the language, by means of them, knows that they have given him the means of expressing what he thinks, and even of thinking more precisely. And as the study of language thus gives precision to the thoughts, the study of natural history, and especially of the descriptive part of it, gives precision to the senses."

Again:—

"This should be an object of exertion to all ingenious and hopeful minds. For that exertion is necessary—that after all possible facilities have been afforded, it is still a matter of toil and struggle to appropriate to ourselves the acquisitions of great discoverers is not to be denied. Elementary mechanics, like elementary geometry, is a study accessible to all; but like that too, or perhaps more than that, it is a study which requires effort and contention of mind—a forced steadiness of thought. It is long since one complained of this labour in geometry, and was answered, that in that region there is no *Royal road.* The same is true of mechanics, and must be true of all branches of solid education; but we should express the truth more appropriately in our days, by saying that there is no popular road to these sciences. In the mind, as in the body, strenuous exercise alone can give strength and activity. The art of exact thought can be acquired only by the labour of close thinking."

He recommends and insists upon geometry being studied in an educational course before algebra. He proposes to change the new name of Æsthetics to Callæsthetic—the former better signifying the doctrine of perception—the latter the doctrine of the perception of beauty. Some thoughts are happy. "General terms denote ideal conceptions," as a circle, an orbit, a rose. These are not images of real things, as was held by the Realists, but conceptions; yet they are conceptions not bound together by mere name, as the Nominalists held, but by an idea" (p. 6) Art and science differ. The object of science, is knowledge; the objects of art, are works. In art, truth is a means to an end; in science it is the only end. Hence the practical arts are not to be classed with the sciences (Ap. xxv. c. 8). Again, "Mechanical science depends on the conception of force, and is divided into statics—the doctrine of force presenting motion, and dynamics, the doctrine of force producing motion" (p. 13). Our readers will not be displeased to read the following on other points:—

"I have elsewhere spoken of the prevalent indistinctness of mechanical conceptions, and need not here dwell upon the indications constantly occurring in conversation and in literature, of the utter inaccuracy of thought on such subjects, which may often be detected; for instance, in the mode in which many men speak of centrifugal and centripetal forces; of projectile and central forces; of the effect of the moon upon the waters of the ocean; and the like. The incoherence of ideas which we frequently witness on such points, shows us clearly that, in the minds of a great number of men, well educated, according to the present standard, the acceptance of the doctrine of universal gravitation is a result of traditional prejudice, not of rational conviction. And those who are Newtonians, on such grounds, are not at all more intellectually advanced by being Newtonians in the nineteenth century, than they would have been by being Ptolemaics in the fifteenth.

It is, undoubtedly, in the highest degree desirable that all great advances in science should become the common property of all cultivated men. And this can only be done by introducing into the course of a liberal education, such studies as unfold and fix in men's minds the fundamental ideas upon which the new discovered truths rest. The progress made by the ancients in geography, astronomy, and other sciences, led them to assign, wisely and well, a place to arithmetic and geometry, among the steps of an ingenious education. The discoveries of modern times have rendered these slips still more indispensible, for we cannot consider a man as cultivated, up to the standard of the times, if he is not only ignorant of, but incapable of comprehending, the greatest achievements of the human intellect. And as innumerable discoveries of all ages have thus secured to geometry her place as a part of good education, so the great discoveries of Newton make it proper to introduce elementary mechanics as a part of the same course. If the education deserve to be called *good*, the pupil will not remain ignorant of those discoveries, the most remarkable extensions of the field of human knowledge which have ever occurred. Yet he cannot by possibility comprehend them, except his mind be previously disciplined by mechanical studies. No ideas are suited to become the elements of elementary education, till they have not only become perfectly distinct and fixed in the minds of the leading cultivators of the science to which they belong, but till they have been so for some considerable period, the entire clearness and steadiness of view which is essential to sound science, must have time to extend itself to a wide circle of disciples. The views and principles which are detected by the most profound and acute philosophers, are soon appropriated by all the most intelligent and active minds of their own and of the following generations; and when this has taken place (and not till then) it is right, by a proper constitution of our liberal education to extend a general knowledge of such principles to all cultivated persons. And it follows, from this view of the matter, that we are by no means to be in haste to adopt, into our course of education, all new discoveries as soon as they are made. They require some time in order to settle into their proper place and position in men's minds, and to show themselves under their true aspects; and till this is done, we confuse and disturb, rather than enlighten and unfold the ideas of learners, by introducing the discoveries into our elementary instruction. Hence, it was perhaps reasonable that a century should elapse from the time of Galileo, before the rigorous teaching of mechanics became a general element of intellectual training; and the doctrine of universal gravitation was hardly ripe for such an employment till the end of the last century. We must not direct the unformed youthful mind to launch its little bark upon the waters of speculation, till all the agitation of discovery, with its consequent fluctuation and controversy, has well subsided."

We have now given our readers some idea of this work, and would recommend those with well-disciplined imaginations to peruse it with care. Dr. Whewell is not a great man, but a learned man. There was, however, and could in the nature of things be, but one Bacon only. Whoever comes afterwards must follow him. To supersede him in his practical efforts, as is here done simply, is an easy task, but all rules which may be laid down, are clearly seen reduced or inferrable from those prescribed by him, just as the discovery of the planet Neptune was not due to the invention of a new analysis, but to a difference from the common mode of applying that well known. Dr. Whewell has signally failed in "constructing a *newer* organ" (p. 41) than the Organum of Bacon, but he has done considerable service by "consolidating the statutes" on the subject. If fame has been universally conceded to Alfred for his Common Law, and to Justinian and Napoleon for their respective Codes, which were nothing but compilations, some measure of regard must be bestowed upon our author, although the claims of the former may not demand the reverence due to original legislators, or those of the latter to that due to the unapproachable Verulam. For these reasons we think he has been "too presumptuous" in "attempting a revision and improvement of the methods by which science must rise and grow" (p. 3). The work forms altogether the mere material for a much greater work. There is nothing really grand or lofty about it. A greater work remains to be performed, which is capable of being as precise and certain as this pretends to be. It appears a straining up towards some undefined truth, and may form a stepping stone to it, but simply as a compilation of ancient and modern thought on science in general. In that it is not what it professed to become, it is a decided failure.

Lighthouse Illumination; being a description of the Holophotal System, and of Azimuthal Condensing and Apparent Lights; with other Improvements. By Thomas Stevenson, F.R.S.E., Civil Engineer. 8vo. Pp. 122. Copperplate Engravings and Wood-Cuts. London: Weale. 1859.

The present lighthouse system owes much to the Stevenson family. The members of that family have always been foremost in lighthouse engineering practice, as many of our finest modern structures of the class now stand to testify; whilst they have not been unmindful of the literature of engineering, and thus the country owes them a double debt. The works of every engineer are themselves open before us—but of few do we know properly the details or the history of their construction. Thus, whilst what is done may excite our admiration, it fails to convey to emulative minds that impressive lesson in practice by which they may really profit in the management of works of increasing extent and grandeur. In the present instance, Mr. Thomas Stevenson has well reminded us that he has not forgotten his combined engineering and literary craft; for, whilst we can all of us go and examine his finished works, we can also—as the volume before us now tells us—turn to a scientifically-arranged book, wherein the whole system of "lighthouse illumination" is fully and carefully explained.

The volume consists of seven chapters—involving, the materials of which the different kinds of lighthouse apparatus consist; holophotal system; modifications of holophotal system as applied to first order apparatus, which does not condense all the light into one beam; on azimuthal condensing lights, or apparatus for distributing naturally diverging rays of light over any azimuthal angle; on dipping and apparent lights; the reversing light; ocean lights, and elliptical burners; and an appendix, with formulæ for constructing totally reflecting hemispherical mirrors, by Mr. W. Swan. The first chapter, which relates to the relative merits of the Catoptric and Dioptric systems of lighthouse illumination, is partly a reproduction of a report to the Council for Trade, prepared by the Messrs. Stevenson in 1857, containing the only published experiments on the loss of the light, caused by the absorption of all the different media employed in lighthouse apparatus. The nomenclature of lighthouse apparatus, like that of many other specialities of practice, has suffered much from ambiguities of terms. Under the term "Catoptric" is included all apparatus in which the reflection is produced by *metallic* surfaces only. The term "Dioptric" refers to all apparatus made of *glass* only, whether acting by refraction and "total," or by "internal reflection." "Catadioptric" apparatus involves a combination of a metallic with a glass optical agent, or, what is practically, a combination of the two systems just described. "Holophotal," (*ολος, entire, φῶς, light*), refers purely to the light of maximum intensity, or to that optical arrangement by which the whole sphere of diverging rays proceeding from a given flame is condensed into one beam of parallel rays without the aid of unnecessary reflections or refractions, thus producing the maximum effect from the flame.

Practice has shown that fully one-third more light is transmitted by glass than by metallic specula, without reference to the form of apparatus, a fact which it will be well to bear strongly in mind in arranging illuminating apparatus. The holophotal system is now gradually making its way into full use. The north harbour light of Peterhead, and that of the Hoy Sound, were the first catadioptric holophotes. Since then the system has rapidly progressed; and the United States' Government has regularly adopted it. Mr. Stevenson has gone most carefully into the details of all the leading arrangements of light-transmitting apparatus; and he has illustrated his several positions, step by step, with far more than extraordinary care, the engravings being both copious and accurately minute. The book is one which tells all that is at present known on the difficult subject of applied optics for the transmission of light to great distances.

Annual Report of the Chief Engineer of the Water Works of the City of Philadelphia. Presented to Councils. 8vo. Pp. 48. Philadelphia. 1859.

This report is something more than the mere annual statement ordinarily presented to committees and councils of works. Mr. Birkinbine, the chief engineer of the great works which supply Philadelphia with the pure element, in doing his duty to the authorities of the city, has at the same time done much more, for he has produced what is really a practical essay on the peculiar branch of engineering involved in the supply of water to large towns. Philadelphia is supplied with water from four sets of works—the Fairmount, the Schuylkill, the Delaware, and Twenty-fourth Ward works. The Fairmount works were the first erected for bringing water into Philadelphia, and, with the exception of the turbine wheel and its attached pump, they are even now complete as when erected in 1822. Mr. Birkinbine tells us, that "in all their arrangements they reflect great credit on the wisdom and forethought of those who designed them, as well as the superior mechanical skill and integrity with which all the work was done. There are eight breast wheels, fifteen and eighteen feet diameter, fifteen feet length of bucket, and one Jonval turbine, seven feet diameter, giving motion to nine double-acting pumps, sixteen inches diameter of cylinder, and five and six feet stroke of piston. Their capacity at a good stage of water is twelve millions of gallons per day; and in seasons of drought ten millions may be set down as their utmost capacity. The compensating or store reservoirs, constructed by the Schuylkill Navigation Company on Tumbling Run, near Pottsville, are a great assistance to the works, for without them in the latter part of the summer the capacity of the works would probably not exceed eight millions of gallons per day; but these reservoirs are drawn off as the natural supply fails, and keep up the deficiency in part, caused by the large increased amount of water used by the Navigation Company since their locks have been so much increased. The great amount of water pumped from the mines adds also to the constant volume of the river. For the most part of the year the volume of water coming down the river is very much greater than can be passed upon the wheels, and, as a consequence, is wasted. When the proposed additional wheels and pumps are constructed, this will be made available, and give these works a capacity of from sixteen to twenty millions of gallons per day, except in the latter part of the summer, when it will be but ten millions. The cost of these works without mains or reservoirs, but including cost of water-power, dam, mill-house, and pumps, was in all about six hundred thousand dollars as they are now. The running expenses were last year, 3,847 dollars; add to this the interest of the cost, 36,000 dollars. The repairs, which are not so frequently necessary as to the steam machinery, but, by taking the repairs for some years, they are found to be about 5,000 dollars per annum for keeping up the dam, gates, wheels, and pumps in good working order. The cost of raising one million of gallons of water into the reservoir is 14 dollars 66 cents, or 15 27-100ths cents per million gallons raised one foot high. The power of the wheels is from thirty-five to forty horse-power each, or about three hundred and forty horse-power in all. The additional three wheels proposed will be about one hundred horse-power each, making the whole power of Fairmount works, with the proposed enlargements, equal to six hundred and forty horse-power."

The quantity of water pumped at these works in 1858 was considerably over three billions of gallons—the daily average being 8,379,229 gallons. At the Schuylkill works there are four condensing steam engines, the piston rods being directly attached to the pump rods. The quantity of water raised here by engines Nos. 1, 2, and 3, is nearly $1\frac{3}{4}$ billions of gallons—the consumption of coal being 17,645 pounds per day, and the average duty in millions of pounds, raised one foot high per 100 pounds of coal, being 25·5. No. 4 is a Cornish engine, with a vertical steam cylinder at one end of an overhead beam, and a single acting plunge pump at the other. The steam cylinder is sixty inches in diameter, with a stroke of ten feet; and the pump is thirty inches diameter, with the same stroke. The water raised by this engine is upwards of 1 1-10th billion gallons, the average duty in million pounds raised one foot high per 100 pounds of coal being 46·54.

At the Delaware works there are two engines, one high-pressure and one condensing. The water raised amounts annually to upwards of 757 millions of gallons, the duty in the before-named ratio being but 16.

At the Twenty-fourth Ward works there are two direct acting Cornish engines. The annual raising of water is upwards of 204 millions of gallons, showing a ratio of duty of 27.

The author gives some further detailed particulars of the works under his charge, the whole forming a very full and apparently accurate practical account of the great works which water the great city of Philadelphia. The report ought to be read by all British engineers of water works.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

March 22, 1859.

"On the water supply for the City of Melbourne, South Australia," by Mr. M. B. Jackson.

The City of Melbourne was described as being situated on the north bank of the Yarra Yarra river, at a distance, in a direct line, of two miles from Hobson's Bay. The population was, in December, 1857, nearly 95,500 souls, for whose use the supply of water was very inadequate, not exceeding $3\frac{1}{4}$ gallons per head per diem, at a cost of not less than £105,000 per annum.

The city was built partly on a clay slate rock, and partly on a basaltic rock or trap formation, the highest point, near Carlton Gardens, being about 148 feet above the river Yarra, whence numerous schemes were proposed for deriving a supply of water.

About the year 1845, Mr. Patrick Reid proposed a scheme of obtaining a supply of water for the city by means of a water wheel, to be worked by the falls; but the expense was considered to be too great.

In 1850, Mr. James Blackburn erected a small steam-engine, by which water was pumped into a tank, whence it was distributed by means of water carts.

In the same year, Captain Cole suggested a somewhat similar plan, which, from want of encouragement, was not carried into effect. About this time, Mr. J. C. King proposed to supply the city from the Yarra, by a tunnel through the hill near Dight's falls, and using the water of the river as the motive power. This project, on being referred to Mr. Blackburn, then town surveyor, was not approved of. It, however, had the effect of calling Mr. Blackburn's attention to the subject; and this induced him to recommend the river Plenty as a source for the water supply. In August, 1851, he reported that this source was capable of providing for the wants of 20,000 inhabitants, at an average daily supply of 40 gallons per head. This quantity, which was much too large for merely domestic purposes, included the supply for watering the streets, irrigating gardens, cleansing the sewers, and all other urban wants. The water, which was purer and softer than that of the Yarra, was to be derived from the Mount Disappointment range of granitic hills, whence there flowed a number of streams which, when united, after passing through the swamps, formed the river Plenty. This scheme met with general approbation, but it was not at the time perseverd in.

In 1852, Mr. Clement Hodgkinson proposed to obtain a supply from the Yarra, by means of steam-engines; and in this year Mr. James Oldham reported favourably on Mr. Blackburn's Plenty scheme, recommending the employment of iron pipes, instead of an open aqueduct, for bringing the water into the city.

In January, 1853, a select committee of the Legislature also reported in favour of Mr. Blackburn's plan, but advised a more careful investigation of the subject, by a commission of non-professional gentlemen. In June of that year, these commissioners requested several engineers, among whom was Mr. Jackson, to report to them on the subject. This resulted in the appointment of that gentleman as engineer of the Board. A more careful investigation was then ordered of the locality of the Plenty river, and finally, in October, 1854, it was decided to adopt that river as the source of water supply for 20,000 persons, at a daily rate of 30 gallons per head.

Mr. Blackburn was appointed consulting engineer, and up to the period of his decease in 1854, the utmost cordiality and unanimity existed between him and the author, to whom the execution of the design was confided.

The Plenty river, as was previously stated, derived its water from several streams, rising in the Mount Disappointment range of granitic hills; whence, after traversing the large swamps, they united at a spot a short distance from the intersecting of the upper aqueduct with the stream. The total estimated area, draining directly into the river, was about 40,000 acres, and the quantity of water delivered from the hills was, at the driest seasons, about 5000 gallons per minute; but at least 40 per cent. of this was lost in the passage through the swamps. The evaporation was estimated, by the author, at 4 feet 9 inches per annum, and the mean rain fall, at upwards of 32 inches per annum.

The works were commenced at the junction with the Plenty river, by cutting the water course in a northerly direction towards the Yan Yean reservoir, to reach which a tunnel of 440 yards in length was driven through a ridge of hills; the prevailing stratum being clay slate, which would not resist the action of air and water, unless it was lined with hard basaltic rock paving. This watercourse also served to drain the district through which it passed, and augmented the area of the gathering ground.

The Yan Yean reservoir was formed by throwing an embankment across a valley between two spurs of hills, and thus retaining the rain and flood-waters within it. The area, when full, was 1303 acres, and the average depth was not less than 18 feet, giving a cubic content of 38,000,000 of yards, or upwards of 6,400,000,000 gallons.

The area of the natural catchwater basin of the reservoir was 4650 acres, which would give, independently of the Plenty basin, but inclusive of the watercourse, a drainage area of 5250 acres, and to this great additions might be made, by drains cut into the slopes of the adjoining hills.

The embankment of the reservoir was 1053 yards in length at the top, and 30 feet high at the deepest part; the general top width was 20 feet with an inner slope of 3 to 1, and an outer slope of 2 to 1. The inside was finished with rough pitching, from 15 inches to 20 inches deep, with an unusually thick puddle trench, which latter was adopted on account of the clay being easily procured, and because the grubbing up of the long straggling roots of the gigantic trees formerly occupying the site of the reservoir, might have made clefts in the soil which it was desirable to close up hermetically; added to which there was difficulty in securing conscientiously good work in the Colony after the discovery of the gold fields.

The three inlet and two outlet pipes, each of 33 inches in diameter, were contained in a well tower, at the foot of the inner slope, and on the outer slope there was another tower and valve chest, with a main of 30 inches diameter. This arrangement was made in order to secure the supply of the city, at times, by means of a compensation pipe, while the inside tower was undergoing cleaning, and also to get rid of any air which might otherwise interfere with the circulation.

The pipes of 33 inches diameter, put through the embankment, were, in order to save time, cast at Sydney, and when the reservoir was finished and was partially full of water, the author was informed by one of the workmen that two of these pipes, at about the centre of the embankment, had been fractured for a long time. The water could not be drawn off by means of these pipes, without great hazard; so it was resolved to prepare a series of cylinders, 2 feet 6 inches long, having an outer diameter of $32\frac{3}{8}$ inches and made of boiler plate $\frac{1}{2}$ inch in thickness. These were passed seriatim up the main pipes, made fast by wedges of hard wood, and well caulked with iron cement, throughout the entire length of the main pipes, within the puddle trench and the aprons. This was the only important casualty which occurred during the progress of the work; and there is every reason to believe that the remedy was perfectly effectual.

A description was then given of the course of the water from the reservoir, by the main of pipes, 30 inches in diameter, carried across gullies on stone piers, and over the river Plenty by a stone bridge. At a distance of 560 chains from the reservoir, the diameter of the main was diminished to 27 inches, which was continued as far as the pressure regulator—a distance of 623 chains, and thence a main of 24 inches descended into Melbourne. The pressure regulator, which was manufactured by Messrs. Guest and Chrimes,* was adopted in consequence of the author's proposition to introduce a valve, in order to diminish the pressure on the lower portion of the main, and his opinion that filter beds were not necessary. The adoption was sanctioned by Mr. Wm. Fairbairn, who acted as agent in England for the commission, with power to alter, or modify, anything which appeared to him to be desirable. When these machines were first set to work, fractures of the main pipes repeatedly occurred, in consequence of the concussion, or recoil, on closing the valve. This was ultimately remedied by fixing air and safety valves on the pipes; but the author could not recommend the general adoption of these regulators. Disc valve regulators were also tried, but the author was of opinion that, "despite the beauty of the theory," he was "not prepared to recommend their use for large mains."

Reverting to the system of delivering the water to the city, the regulators, valves, pipes, means of crossing streams, gullies, &c., were described; and it was evident that the author had provided amply for all present contingencies and future extensions of the place.

The distribution of the water commenced at about 19 miles distance from Yan Yean, and at present there were (including these 19 miles of main), about 104 miles of pipes laid, varying from 24 inches to 3 inches inches in diameter.

In all the streets of more than one chain in width, a main of pipes was laid on each side, whilst in those under that width, the pipes were laid in the middle of the street. All the pipes were nine feet long, and with the old spiggot and faucit joints. The service pipes were of lead, lined with tin. There were 1700 of Bateman's fire-plugs, and the hydrants were manufactured by Messrs. Guest and Chrimes, a quantity of vulcanised India-rubber hose being also provided. The saving of property in cases of fire had proved to be enormous, and the rates of insurance had fallen 40 per cent. since the establishment of these water-works.

The gross cost of these works was stated to have been £664,452 1s. 2d., but that sum included several large items which would eventually be charged to other works—so that the nett cost up to 1st January, 1858, should be stated at £571,816 17s. 3d. These works were commenced in December, 1853, and were completely opened for public use in December, 1857.

A compulsory rate was to be levied, for meeting the interest of this capital, and to form a sinking fund for redeeming the capital During the period of the execution of the works, the rates of wages were: — Masons, 36s. per day; Labourers, 18s. to 20s. per day.

A series of appendices contained reports of the analysis of the waters, and statements of the rainfall and evaporation in various localities, and the paper was illustrated by drawings and diagrams.

"On a double off-set plotting scale, for the use of civil engineers and land surveyors," by Mr. J. G. Austin.

April 5, 1859.

Discussion on Jackson's Paper.—After the meeting, Mr. Siemens exhibited a machine of his invention, manufactured by Messrs. Guest and Chrimes, for joining lead and other pipes, by pressure only. The machine consisted of a strap of wrought iron, in the shape of the letter V, and of three dies, two of which were free to slide upon the inclined planes, while the third was pressed down upon them by means of a screw, passing through a moveable cross-head, embracing the sides of the open strap. The pipes to be joined were placed end to end, and a collar of lead was slipped over them. The collar was then placed between the three dies, and the pressure was applied by means of a screw-key, until the annular beads or rings, projecting from the internal surface of the dies, were imbedded into the lead collar. The machine was then removed, and a joint was formed, capable of resisting a hydraulic pressure of 1,100 feet. The security of the joint was increased by coating the surfaces, previously to their being joined, with white or red lead. The advantages claimed for this method of joining lead or other pipes, over the ordinary plumber's joint, were the comparative facility and cheapness of execution, as the cost of a joint of this description was said to be only about one-third or one-fourth that of the plumber's joint. A machine of a similar description was also used for joining telegraphic line wires, a specimen of which was likewise exhibited by Mr. Siemens.

"On a new system of axle boxes, not requiring lubricating, and without liability to heating," by M. Alphonse de Brussaut.—The new apparatus was described to consist of a series of four, six, eight, or any other convenient number of cylindrical rollers, of the length of the journal, retained at certain distances apart from each other, yet still united by elastic bands of vulcanised India-rubber. These rollers, thus united, and placed around the journal, would be set in motion by the pressure of the axle, without the possibility of collision with, or friction against each other, or of rubbing upon the surface of the journal, or of the bearing, and thus avoiding, as much as possible, any friction, or opposition to the motion of the journal. The action of rolling being thus substituted for sliding, there could not be any abrasion of the substances, and lubricating became unnecessary. The machines, so fitted, were stated to work with remarkable ease and steadiness, and to be set in motion, and the speed to be kept up with considerable facility. No inconvenience had been experienced from the fracture of the elastic bands, and shafts, making 450 to 500 revolutions per minute, worked perfectly well, without any symptom of heating.

The reasons for this action were stated in a plain and comprehensive manner, by showing, that in moving a body of an octagonal form along a plane, the, action must be either by sliding, or by rolling; in the former, lubrication was necessary, whereas in the latter, the presence of any lubricating matter would be prejudicial. Extending the latter principle to the cylindrical form, which was merely a body having an indefinite number of sides, it was evident that, by retaining these cylinders apart, by means of the elastic bands, so to avoid friction against each other, or upon the journal, or the bearing surface, a practically perfect rolling motion would be obtained, and it was contended, that by M. Brussaut's system, the two material results, of rapid rotation without heating, and a complete suppression of the use of grease, in all journals of machinery, were arrived at.

"On the permanent way of the Madras railway," by Mr. Bryce M'Master.—It was remarked that two leading features in the construction of railways in India were, the cheapness of those works entirely dependant upon native labour, and the resources of the country, and the expense of those dependant upon England for the supply of materials Among the latter of these was the permanent way, almost every part of which had, as yet, to be furnished from England. Thus, the portion of the Madras railway, from Madras to Arcot, being a length of $65\frac{1}{4}$ miles, had been constructed for £6,000 per mile, of which amount the permanent way alone had cost upwards of £3,000 per mile. On this portion of the line the earthwork, for a distance of 25 miles, was for a double line, and on the remainder for a single line only. All the bridges and culverts were for a double way. There was only a single line of rails laid throughout.

The permanent way on the portion of the line above indicated, was laid with the double headed rail, weighing 84 lbs. to the yard, in lengths of 20 feet. The rails were fish-jointed; and six sleepers were used to each rail length. The chairs, wooden trenails and keys, were all of the ordinary construction. West of Arcot, the line was laid with rails weighing 65 lbs. to the yard. These rails were laid on seven sleepers, to the same length of 20 feet. The gauge was 5 feet 6 inches.

The expense of freight, from England to Madras, for the first portion of the line, was very heavy, owing to all the materials having been sent out during the time of the Russian war. A reduction in these charges, as well as in the weight of the rails, might be expected to diminish the cost of the remaining portion of the line; although the greater distance to which the materials would have to be led, as the works were pushed on into the interior, would add to the cost as the line advanced.

At the commencement of the undertaking, tenders were invited in India for the supply of chairs, fishing-plates, bolts, and nuts; but the prices gave no ground for hope that the Indian iron could compete with the English, or that the Indian railways could look for any considerable supply from local sources. But what the country could supply was material for sleepers, as its forests and jungles afforded a great variety of hard and durable woods, well adapted for the purpose. On the Madras railway, twenty-eight different kinds of wood had been used, all of which, with few exceptions, had been found to answer well, when carefully selected. Although few woods were not attacked by the white ant, while lying exposed, and the sap wood in particular was much eaten away, yet in two years after the trains began to run, there was not a case known of a sleeper being attacked in the road. The vibration of the passing trains, and the frequent opening out of the ballast by the workmen, seemed sufficient to prevent the attacks of this universally destructive insect. Many woods were also liable to the attacks of other insects, which bored holes into them; but the sleepers, when covered with ballast, appeared to be free from their depredations. Creosoted fir sleepers, sent out from England, were found to be very durable; but their cost at Madras was 8s. 6d. each, or 9s. 6d. each when led fifty miles to the works, while the sleepers procured in the country varied in price from 4s. to 6s. 6d. each. A few thousand half-round Sâl sleepers were kyanised experimentally with corrosive sublimate, at a cost of sixpence per cubic foot; but they were not found to be more durable than those of the same wood, when unprepared. In the neighbourhood of Arcot granite blocks were used, but not to any great extent, on account of the roughness and rigidity of the road. Near the coast one mile of line was laid with laterite, but the blocks were found to split, and their use was consequently abandoned. Some native-made keys and trenails, were used, but the former were not pressed, and although they did very well in wet weather, in the hot season they shrunk so much as to be unfit for use. The trenails, which were of teak, answered very well. In laying the road at first the natives were found, as in almost every other, kind of work, intelligent and apt, when care and patience were taken in their instruction.

The damage to the line from settlements and slips, from the effects of the monsoons, had been much less than was anticipated, and one monsoon of extraordinary severity, having shown all the defects, it was confidently expected that little damage would be done in future; and that the line would be maintained as cheaply as its construction had been inexpensive.

SOCIETY OF ARTS.

March 30, 1859.

"On cotton in India, its present growth, and prospects of future supplies to this country," by Dr. J. Forbes Watson.

"On the practical bearing of the theory of electricity in submarine telegraphy —the electrical difficulties in long circuits, and the conditions requisite in a cable, to insure rapid and certain communication," by Mr. S. A. Varley.

* Engraved in plate 216, vol. ii., second series, *Practical Mechanic's Journal.*

The author began by stating that he had been led to bring that subject before the society, because it had always appeared to him that in the discussions which had taken place upon it, the principle of electrical science had not been always clearly kept in view. The difficulties raised by the influence of electric induction, which had shown itself so decidedly in telegraphic circuits since the introduction of gutta percha covered wire, although the theory had been so clearly stated by Faraday many years since, appeared to have been unexpected by most of our practical electricians, and it has now been referred to by some as a new fact which the electric telegraph had brought to light. After enlarging further on this subject, the author executed a series of careful experiments, which he had made with the view of ascertaining accurately the laws of induction, particularly in gutta percha covered wire. These were shown in a tabular form, and Mr. Varley then passed to the consideration of the uative influences of quantity and intensity in electric currents, which, though accurately defined, he thought was often lost sight of in practice. Practically, it was found that when the insulation was very perfect, there was no great difficulty in working with minimum quantities; but when the insulation was imperfect, larger dynamic quantities were found to answer better. With reference to the difficulties caused by induction, the author pointed out what in his opinion was erroneous in the conclusions derived from the experiments made by the electricians of the Atlantic Telegraph Company, and also showed the objections to the suggestion to obviate the effects of induction by using a return wire, instead of the earth. In conclusion, he discussed the relative efficacy of some of the plans which had been suggested for reducing the amount of induction, and for modifying its effects, and stated that he had been for some time engaged in designing an apparatus for determining, by actual experiments, the amount of retardation experienced in submarine circuits possessing conductors of varying resistance, and insulated with different thicknesses of insulating material, which he hoped might tend to the solution of some of the important problems involved in electric telegraphy.

April 13, 1859.

"On Professor Hughes' system of type printing telegraphs and methods of insulation, with general reference to submarine cables," by Mr. Hyde.

The author, after calling attention to the past importance of perfect insulation, said, that although gutta percha had been found to be the best insulating medium for long submarine lines, yet this substance, however, was more or less porous, minute flaws might exist, which did not show themselves until some time after the immersion of a cable. To meet these defects, to fill up any minute pores in the gutta percha, and also to cure any accidental fracture or puncture of it, Professor Hughes introduced a viscid semi-fluid substance, of a non-conducting character, between the conducting wire and the gutta percha, or the wire might first be coated with gutta percha, and the viscid fluid introduced between the layers of gutta percha; as soon as a puncture was made in the gutta percha coating this fluid oozed out, which was of such a nature that it hardened when it came in contact with the surrounding water. This hardening property allowed no more of the fluid to ooze out than was necessary to fill the fracture, and at the same time to glue and unite the separated parts of the gutta percha. The author then proceeded to speak of the various telegraphic instruments used, referring especially to the wording instrument of Morie and House, and explained the type printing instrument of Professor Hughes, which is worked by means of 28 keys, arranged like those of a piano forte. These keys correspond to 28 holes arranged in a circle on the table of the instrument. Each key is connected by a lever with a cast steel knob, which, when the key is pressed down by the finger, rises up through one of the holes. An arm, driven by clockwork, connected with a vertical shaft, sweeps over the 28 holes, when a key marked with a particular letter is touched, the knob corresponding with this letter rises, the revolving arm passes over it, and for the instant closes the circuit, and allows an electrical impulse to be transmitted. This impulse causes the particular letter to be recorded on a slip of paper, in printer's ink, by means of a type-wheel connected with the machine, which lifts the press and the paper upon which the message is to be printed, against it. The time of the lasting of the locking of the shafts depends upon the arrival of the electrical wire, and thus with two instruments in perfect harmony, the operator has the printing apparatus of the distant instrument as completely under his direction, as the one before him. The instruments at each end of the line are adjusted by means of spring pendulums, to work synchronously; but in order to correct any minute variation in time, between the instruments in circuit, there is a corrector, or wheel, attached to the shaft, with hook-shaped teeth, which sink into corresponding cavities in the type-wheel. The latter being loose upon the slip, or only held by friction, is removed backward or forward by the corrector, or exactly the same route as the type-wheel, on the instrument from which the message is being sent. This correction takes place in the act of printing every letter. Mr. Hyde stated, that European news, consisting of about 3000 words, by the arrival of each transatlantic steamer, is transmitted by this instrument, from Boston to New York, a circuit of about 300 miles, at the rate of 2000 to 2500 unabrieviated words an hour. There are 25 stations on the circuit which receive copies of the news, all of which are printed in plain Roman type, by the Boston operator, all the instruments receiving the message at the same time, the receiving clerks of each station having simply to hand the slip as it arrives, to the party entitled to receive it.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

March 22, 1859.

The President, Mr. Fairbairn, exhibited a specimen of Mr. Allen's submarine electric cable, which consists of a central copper wire strengthened by an envelope of fine steel wires, the whole being coated with two or three layers of gutta percha. In the conversation which ensued, an opinion was expressed that this form of cable would be liable to kink, particularly if laid in heavy weather. It was suggested that a better insulating medium than gutta percha might be discovered.

Mr. Ransome stated that he had frequently found that gutta percha became so rotten in the course of two or three years that it could be crumbled away between the fingers. It could, however, be restored to its original condition by immersing it in hot water.

Professor Calvert remarked that immersion in water did not always preserve the qualities of gutta percha.

Mr. Binney made a statement to show that the originator of what is now called "micro-photography" was Mr. J. B. Dancer, the well-known Manchester optician.

"On the j-nodal k-partitions of the r-gon," by the Rev. T. P. Kirkman, M.A.

"On an experimental inquiry into the effect of severe pressure upon the properties of gunpowder," by Mr. W. Fairbairn. During the late war, the author received from the Government authorities at Woolwich different samples of Waltham Abbey gunpowder, for the purpose of submitting them to severe compression, in order to ascertain the effect of close contact between the particles upon its explosive properties. At the Government works there is no machinery of sufficient strength to give a pressure of more than 5,000 lbs. to 6,000 lbs. per square inch; and as it was considered advisable to test the quality of the powder under the influence of greatly increased pressure, the author was requested to compress it, in an apparatus of his own, calculated to effect its condensation under a force of more than 60,000 lbs. per square inch. By carrying the pressure in this way far beyond the ordinary limits, it was expected that the precise influence of compression on the properties of the powder would be more clearly and accurately exhibited. The samples of powder were placed in a wrought iron box, and compressed by a lever acting upon them by a solid piston, with a force varying from 38,000 lbs. to 67,000 lbs. per square inch in the different specimens. When taken from the apparatus, the powder was found to have been consolidated into cylinders of $1\frac{1}{4}$ inches in diameter, with smooth polished surfaces, every trace of its granular character having disappeared. From the report of Mr. Abel, the chemist of the War Department, we learn that the specific gravity of the specimens was increased by the pressure, but not to so great an extent as might have been expected. The specimens having been granulated were then burned, and it was found, on comparing the results with those of similar experiments on ordinary press-cake, that the amount of residue left by the compressed powders, after ignition, was greater in proportion as the pressure was increased. This increase of residue is probably to be attributed to the more gradual combustion and the diminished intensity of heat generated by compressed powder. Experiments were then instituted to determine the amount of charcoal left unconsumed in the residue. They showed conclusively that the condensation of the powder had caused a more perfect chemical action in combustion, as the percentage of carbon was considerably diminished in the compressed powders. Nitric acid was very carefully searched for in the residues of the compressed powders, but none could be detected, although in ordinary gunpowder a portion of the acid of the saltpetre always escapes decomposition. An important objection to the application of increased pressure in the manufacture of gunpowder, notwithstanding the more intimate mechanical mixture of its constituents, is, that the quantity of the residue left after combustion is increased, and a larger proportion of powder escapes ignition altogether when a charge is fired from a gun. If, however, larger quantities were submitted to compression, it is probable that the closer contact of the particles might be found to act beneficially, and a powder be produced of an improved and stronger quality, resulting from a judicious application of increased pressure and a more perfect system of granulation.

Dr. Roscoe expressed his opinion that we as yet know very little about the chemistry of gunpowder, and drew the attention of the society to the interesting and important "Memoirs on the Analysis of the Products and Combustion of Gunpowder," lately published by Professor Bunsen. He found that the decomposition which occurs in an explosion is by no means as simple as was formerly supposed. Besides the usual products of carbonic acid, carbonic oxide, nitrogen, and sulphate of potassium, Bunsen showed the presence of hydrogen, oxides of nitrogen, cyanide of potassium, sulpho-cyanide of potassium, sulphate and carbonate of potash, and various other salts, the relative quantities of which were all determined.

[These experiments derive additional interest from the fact of the occurrence of the recent melancholy accident at Hounslow, where the gunpowder exploded during compression.]

April 5, 1859.

The chairman, Dr. J. P. Joule, exhibited several slips of paper, having messages inscribed on them by Professor Thomson's new electric telegraph apparatus.

Mr. T. T. Wilkinson called the attention of the meeting to a very valuable mathematical manuscript in the Manchester Chetham Library.

"On the method of systematic products, and its application to the finite algebraic solution of equations," by the Rev. R. Harley.

"On comparative sociology, or the application of the comparative method to the investigation of social laws," by the Rev. W. N. Molesworth.

ROYAL SOCIETY.

February 4, 1859.

"On the gorilla," by Professor Owen, F.R.S.

February 11, 1859.

"On some of the grounds of disatisfaction with modern gothic architecture," by E. B. Denison, Esq.

FEBRUARY 18, 1859.

"On certain auditory phenomena," hy S. S. Alison, M.D.

MARCH 4, 1859.

"On the veined structure of glaciers," by John Tyndall, Esq., F.R.S.

MARCH 10, 1859.

"On new volatile organic acids of the herry of the mountain ash," by Dr. Hoffmann.

"Further remarks on the organo-metallic radicals mercuric, stannic, and plumbic ethyle," by Mr. G. B. Buckton.

MARCH 11, 1859.

"On magnesium, calcium, lithium, and their congeners," hy W. Odling, M.B.

MARCH, 17, 1859.

"On the action of carbonic oxide on sodium-alcohol," by J. A. Wanklyn, Esq.—Postscript to a paper "On the the deflection of the plumb-line in India, caused by the attraction of the Himalayan mountains," by Acrhdeacon Pratt.

MARCH, 24, 1859.

"On the conic of five pontic contact at any part of a plane curve," by A. Cayley, Esq.

"On the vertebral characters of the order Pterosauria (*Ow.*), as exemplified in the Genera Pterodactylus (*Cuv.*), and Demiphodon (*Ow.*)," by Prof. Owen.

GEOLOGISTS' ASSOCIATION.

APRIL 4, 1859.

The ordinary monthly meeting was held this evening, at the rooms, 5 Cavendish Square, when 20 new memhers were elected. The paper of the evening was—"On the red chalk of England," hy the Rev. Thomas Niltshire.

Formation was stated to be peculiar to this country, and only to occur here in Yorkshire, Lincolnshire, and Norfolk. It first appears at Speston, near Filey, in Yorkshire, being here of the thickness of 30 feet. It then travels westward for about 20 miles, when it turns to the south-east, aud is traceahle along the foot of the Yorkshire wolds, till it is lost in the marsh lands a few miles to the west of Hull. It re-appears at Ferraby, in Lincolnshire, may he recognised across that country aud on the horders of the Wash, and is again seen at Hunstanton, on the south shore of that great sea hay. From Hunstanton it is to be traced to within a few miles north of Lynn, where it finally disappears. All along its eourse it underlies the lower (white) chalk, and in Yorkshire, rests unconformably on the speeton clay, while in Lincolnshire and Norfolk, the subjacent beds are of a dark colour, and form a pebbly mass, which is supposed to belong to the lower greensand. By some persons the red chalk is supposed to be the representation of the gault, from the fact of the identity of many of its fossils with those peculiar to the latter formation. The red chalk is very fositiferous, and contains terebratulæ, belemnites, and coral, in abundance, and at Hunstanton (where its thickness is only four feet) it is harder and darker in colour than at Specton, and contains pebbles, which are not found in the red chalk of the latter place. There are indications that the red chalk has heen subjected to violent watery action, for water-worn fragments of it have heen discovered in a drift hed at Muswell Hill, near London, indistinguishable in character and fossils from the red chalk of Hunstanton.

ASSOCIATION OF FOREMEN ENGINEERS.

APRIL 2, 1859.

"On the best means of producing heavy eastings in iron," by Mr. W. Keyte.

The great experience of the writer enahled him to deal with his subject in a manner most satisfactory to his audience, and all the minutiæ of the foundry were gone into with a clearness that left nothing to be desired. No point, from the making of the pattern to the cooling of the casting, was ommited, and carefully prepared diagrams illustrated many portions of the paper. Mr. Newton, who occupied the chair, complemented Mr. Keyte very highly at its conclusion, and after some remarks from Messrs. Stahler and Mudith Jones, a vote of thanks was unanimously awarded him.

Mr. John Briggs was annonnced as the reader of the next monthly paper, on the first Saturday in May; the subject heing the "concussion of water."

We cannot but congratulate this society on the spirit with which it is advancing on the road to honour and prosperity, and we trust that the day is not far distant when, instead of meeting at St. Swithen's Lane Assembly Rooms, it may have a "local habitation" of its own.

CHEMICAL SOCIETY.

MARCH 3, 1859.

"On some derivations from the Olefines," hy Dr. Guthrie.

MONTHLY NOTES.

MARINE MEMORANDA.

The Indus steam Flotilla, for the inland navigation of India, progresses in the most favourable manner. The first or model hoat is flat-bottomed, having two engines of 120 nominal horse-power, and a deck-house which almost covers the entire vessel. Her length over all is 200 feet, her beam, 38 feet, and draught of water, 1 foot 10 inches. As a passenger-boat, and with average cargo, her speed is equal to 13 miles an hour, and with harges containing 500 tons cargo in tow she can give an average speed of eight miles an bour. Messrs. Richardson and Co., of Stocktou, are now under contract to deliver at Kurrachee, before the end of this year, six additional steamers similar to the model vessel, with seven accommodation flats. In addition to these, six tug-steamers and 33 cargo barges have heen for some time under construction at Liverpool, and two of the steamers are packed and ready for shipment. One of these vessels was recently tested on the Mersey, her draught was 17 inches, and speed in still water averaged eight miles an hour, towing four barges carrying 450 tons. It is considered that these vessels are not only of the utmost importance for the conveyance of the permanent way materials for the Punjah Railway, hut are well adapted to meet the commercial requirements of the countries drained hy the Indus and its tributaries. Since the last report, the contract with the Secretary of State for India in Council with this company has heen executed, granting, with other privileges, the guarantee of 5 per cent. per annum upon such additional capital as may be required to complete the flotilla, in addition to £250,000 already guaranteed.

A report has been made to the Admiralty, hy Captain Washington, R.N., Captain Vetch, R.E., and Mr. Barry Gibbons, on the capahilities and requirements of the port and harbour of Galway. These gentlemen were ordered to report on the questions, whether any part of Galway Bay is capable of being made a harbour of refuge, and whether, from its position, the local advantages which it possesses, would invest it with claims as a packet station. The reporters reply, that Galway Bay is, to a great extent, a harbour already formed by nature. Its approach from the ocean is well defined, it is easy of access, and free from outlying dangers. It has a width of 20 miles between the outer headlands which shelter the hay, while the magnificent natural break-water of the Arran Isles stretches across 14 miles of the width, and arrests the force of the swell of the Atlantic, leaving on either side a navigable channel or sound of some four miles in width, well defined hy day, and admirably lighted by night. This bay is 25 miles in length from the Isles of Arran to the town of Galway, and all within it is safe as far as concerns the main point of a harbour of refuge —viz., the saving of life. As far as the reporters are aware no loss of life from stress of weather ever occurred in Galway Bay within the Arran Isles. That Galway has a claim as a packet station the enterprise of the Lever Transatlantic Packet Company has satisfactorily demonstrated. It is an established fact, that large transatlantic steamers, carrying 300 passengers, have for months used Galway as a packet station, have performed their voyages with punctuality and safety, and on one occasion made the passage from Newfoundland to Ireland in less than six days, the quickest passage on record.

As an interesting and certainly important contribution to our notes on marine matters, we present the following statement of the catch of seals and whales at Davis' Straits and Greenland during the year 1858:—

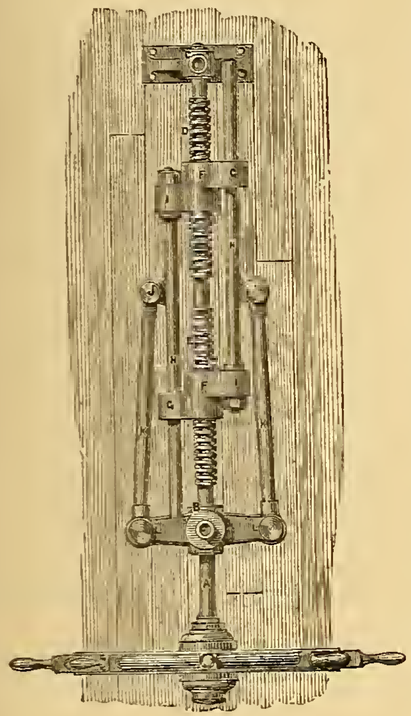
	Vessels.	*Seals.*	*Whales.*	*Tuns Seal Oil.*	*Tuns Whale Oil.*	*Cwts. Whale Oil*
Peterhead,	27	79,838	31	947	351	426
Fraserburgh,	5	11,649	—	145	—	—
Aherdeen,	6	3,290	27	25	242½	354
Dundee,	4	—	14	—	202	212
Kirkcaldy,	3	—	7	—	84¼	116½
Bo'ness,	1	—	1	—	13	14
Hull,	7	959	28	8½	356	426
	53	95,736	108	1,125½	1,249½	1,548½

The average catch of oil by the vessels from the respeetive ports, and the approximate value of the produce hrought home, stand as follows:—

	Vessels.	*Tuns.*	*Value.*
Peterhead, ...	27 ...	48 ...	£72,982
Fraserburgh, ...	5 ...	29 ...	7,696
Aberdeen, ...	6 ...	44½ ...	18,280
Dundee, ...	4 ...	50½ ...	12,380
Kirkcaldy, ...	3 ...	28 ...	5,910
Bo'ness, ...	1 ...	13 ...	806
Hull, ...	7 ...	52 ...	23,542
			£141,496

This sum exceeds the value of importations in 1857 by £16,393. The approximate value of oils, skins, and whalehone brought to Britain from thosc important fisheries is stated at £1,239,024. The number of vessels which have gone out this season is sixty-four, fourteen being steam-vessels, and eight the increase altogether since last year. Three vessels were lost during the year, viz., the *Eclipse* and *Traveller* of Peterhead, and *Heroine* of Dundee.

RIGHT AND LEFT SCREW STEERING GEAR FOR SHIPS.—Several ships have recently heen fitted hy Messrs. Steel, of Greenock, with a very effective arrangement of right and left screw spindle steering gear, the invention of Mr. M'William, of that place. Our engraving gives a view of one of the arrangements in plan. The steering wheel is fitted on the forward end of a horizontal screw spindle, set in bearings in the tops of fore and aft pillar standards. This spindle is cut with a right and left screw thread, each of which has upon it a corresponding nut formed with an eye on each side. On each side of the screw spindle there is placed a longitudinal parallel traversing spindle, set in reverse directions as regards each other. In each case, one end of the traversing spindle is attached by a nut, to one of the eyes of one of the main traversing nuts, whilst its opposite end works freely through the corresponding eye of the other main nut. As this occurs on both sides of the main screw spindle, it follows that each traversing nut carries a separate spindle; which, in turn, is guided by the eye of the other traversing nut. An eye is formed intermediately upon the outer side of each traversing spindle, and to these eyes there are pointed, the after ends of a pair of connecting rods, which pass forward for attachment to the top of the actual vertical rudder spindle, which is tubular, and carried upon the forward pillar standard already referred to as a centre.



The top of this rudder spindle has fitted upon it a double lever arm, fitted with point studs for connection with the forward ends of the traversing spindle connecting rods. The result of this arrangement is, that as the steering wheel is turned, the two main traversing nuts are traversed in reverse directions, and their respective connecting rods acting on the double lever arm, or tiller of the rudder spindle, thus turn the rudder as desired. To steady the action of the traversing spindles, their free ends may be set in stationary bearings carried by the pillar standards. According to another modification, the longitudinal traversing spindles are done away with, and the main traversing nuts are themselves directly connected by connecting rods, with the double lever arm or tiller of the rudder. In this arrangement, the right and left screw spindle is mounted in pillar bearings, as in the apparatus already described, and on each side of it, and parallel with it, there is a fixed horizontal guide spindle, set in the standards or framing. Each main nut on the screw spindle has a long guide eye on its outer side, which eye is accurately fitted upon the guide spindle on that side. The eyes are considerably longer than the nuts themselves; but the nuts being set in reverse directions as regards each other, the angular projections and recesses can work into each other, and thus the nuts can come close together and save longitudinal space. The outside, opposite, or reverse corners of the main nuts, have each an eye upon them for connection with the after ends of a pair of connecting rods, the forward ends of which are respectively pointed to the double lever arm or tiller. This arrangement reduces the length taken up by the apparatus longitudinally. There are fewer working parts about it, and the action of the nuts is steadier than in the preceding instance.

British Columbia.—We have now some further authentic intelligence from this distant colony. The views of the continent on approaching it across the Gulf of Georgia are said to be very striking, from the vast collection of mountains that meet the eye. The entrance to Fraser River lies between two points, called Point Garry and Point Pelly, at a distance of nine miles to the north of Point Roberts, where the 49th parallel of latitude strikes the sea, and where, consequently, the British and United States' boundaries meet. The scenery around Point Roberts is said to be almost tropical in its luxuriance and colouring. Outside the mouth of the river shallows render the approach difficult, but there is one deep passage which only requires to be properly marked out by buoys to give vessels safe access. The river is two miles wide at the mouth, and continues of the same width for some miles upwards. There is here a large extent of flat land, a sort of delta formed by the river, which it partially overflows. The soil, from the luxuriance of the vegetation, appears to be rich, but unfortunately there is no site for a town at or near the mouth. The river becomes about a mile wide a few miles above the mouth, and its depth is very great, with a strong current, requiring steam power to make head against it. The water is pure, and of excellent potable quality, abounding with fish, chiefly salmon and sturgeon. The river has never a less depth than ten fathoms for eighty miles from the mouth. Ten miles from the entrance the banks are thickly clothed with trees, chiefly alder, poplar, sycamore, and willow. After a while the banks retreat, and a large lake is formed, into which the river enters from a passage amongst mountains several thousand feet high, densely clothed with pines. "It is difficult to say," says the *Times*' correspondent, "which gratifies the eye most on this beautiful river, the rich, varying hues of the foliage on each side, which changes so frequently as to dispel monotony, or the foreground (? background) of cerulean mountains clothed in their tall, graceful pines." Fort Langley, a post of the Hudson's Bay Company, on a plateau near the junction of the Pitt River with the Fraser, is surrounded by a stockade of strong pickets, by way of defence. The soil of the neighbourhood is rich, producing, when cleared of trees, an abundant crop of excellent grass, but forest occupies the ground at present. Here an island, two miles long, divides the river; and a short distance above there is an expansion of the river, with a group of seven islands of fantastic figures. A silver mine has been discovered not far from the fort. It is proposed to build a town on a good site about two miles below Fort Langley. At a distance of ten or fifteen miles above that place the river forms a succession of fine reaches, winding round deposits made by streams that join the Fraser. The pines are no longer seen near the river, but maple and other trees indicate a good soil. Mountains of considerable height are not far off, very various in shape, but all well timbered with pine. Above, where banks of clay appear, cedar is the chief tree. The Smess River, coming from the south-east, joins the Fraser at a point some twenty-three miles from Langley. The upper part of the Smess valley is a wide, open plain, with abundance of tall grass. It is crossed by the 49th parallel, so that part of it belongs to the Americans. In the neighbourhood of the junction of the Smess and Fraser begins a range of mountains on each side of the latter, which in their middle position, have a height of 2000 or 3000 feet, though much lower at the extremities of the ranges. More islands intervene between the mouth of the Smess and that of the Chilwauick, five miles above, the latter draining a large lake some twenty miles away. Both these rivers are navigable by large canoes. The next tributary of the Fraser is the Harrison, forty-five miles above Langley, which drains a series of lakes in an extensive district traversed by two mountain chains, which terminate on the Gulf of Georgia. The mountain ranges which hem in the Fraser are probably 200 miles in length, treading nearly north and south, and that river in forcing its way between them becomes more and more rapid, and passes through many gorges, but patches of park-like scenery, occasionally make their appearance on the banks, whilst the mountains are still clothed with pines. The geological structure of these mountains appears to be metamorphic slate, chiefly gneiss and mica slate, with intrusive dikes of granite and sienite. From their direction they seem to oppose an insuperable obstacle to the formation of a railway from the east to the west coasts of America—a gigantic scheme that has been talked about. Fort Hope is sixty-five miles above Fort Langley, and so far small steamers can make their way. Hereabouts the gold washings begin. The metal is found in very small particles dispersed through the surface soil, and hence is easily obtained, though much is lost from its minuteness. It is difficult to ascertain the truth as regards the miner's gains, but there appears to be a general feeling of disappointment, and it is certain that a considerable number has returned to California. The estimated number remaining at work is between 3000 and 4000. Indians abound on the river, but they have not hitherto given much trouble. They are very skilful in the management of boats in the rapids of the streams, and many of them have entered the service of the Hudson's Bay Company as porters, &c. The engineers of the British and American Governments are at work laying out the boundary line between the two territories.

Water Regulating Apparatus.—A very effective arrangement, especially adapted for the regulation of the flow of water to water closets, has lately been contrived and introduced by Mr. James Robertson, of Glasgow. It consists of a short cylindrical chamber of pretty large diameter, having a top and bottom cover screwed on. The bottom cover or end forms the actual shallow chamber through which the supply of water from the main is brought to the apparatus. This portion is cast in one piece on the main supply-pipe, being disposed horizontally—that is to say, with its plane parallel to the axial line of the main-pipe which runs along it beneath. In the centre of this end disc, there is an aperture communicating with the inlet section of the main pipe, whilst there is a second aperture, slightly eccentrically disposed, and communicating with the opposite or outflow section of the main-pipe leading to the closet pan—the two apertures being, of course, completely separated by a sectional portion of metal cast in for the purpose. Upon this perforated disc shell face, there is fitted a circular disc of caoutchouc, arranged to bear upon an external annular face all round the shell. This flexible disc has screwed upon each face a button or small disc-piece of metal, the under one of these small discs having fitted to it a soft or flexible face-piece of leather or other material, to form a valvular fit upon an elevated annular working face round the central hole in the shell. The central or barrel portion of the operating chamber has attached to it a lateral water-pipe of narrow bore, and fitted with a stop-cock for setting the flow. The top cover or end disc of the chamber has passed through its centre a vertical spindle, fitted with a helical spring to keep it up. The lower end of this spindle, which is passed through the cover, has upon it a holding collar or button to carry a second large flexible disc of caoutchouc, which, like the one already described, is of the same diameter as the cylinder's bore. The upper cover is dished on its inner face for the elastic disc to settle into and leave more space beneath. The action of this apparatus is this:—when the closet is about to be used, the pressure upon the seat causes the main upper spindle to be depressed, and this spindle then forces down the upper flexible disc, so as to contract the space available for water in the cylinder beneath it, and thus force the contained water back through the lateral stop-cock, into the main; the water-way through the stop-cock being purposely adjusted to pass the water slowly through. Then, on the release of the operating spindle from pressure, the water in the main-pipe beneath, meeting with little or no pressure from above the disc to interfere with its upward force, lifts the bottom flexible disc and flows through from the inlet section of the main, by the apertures already described, into the outlet section, thus reaching the pan of the closet. This flow continues until the upper interal pressure between the two flexible discs in the cylinder is made up by the inward flow of water again, through the lateral stop-cock, when the lower flexible disc will resume its seat and cut off the supply of water to the basin or pan. The apparatus is then again fit for use. Instead of the lateral adjusting stop-cock, a minute perforation may be made through the central stud or button-holding piece of the lower flexible disc, through which the water will flow and reflow for the regulation of the main supply. According to another form, too, the upper flexible disc in the chamber may be set to rest upon a slight internal shoulder, near the top of the cylindrical part of the cylinder—the cover having a central spindle passed through it to bear upon the loosely disposed flexible disc, by means of a button head. And by a third plan, one flexible disc only need be used. In this last case, the single flexible disc rests upon the bottom face of the main shell, and it has attached to it a central spindle passing down from below, through the central water-way, and into a bottom guide-hole in the main shell. This spindle has a minute aperture in it for the purpose already described, and the main shell beneath it has a screwed aperture for admission to cleanse out the minute hole when necessary. The top cap of the chamber has an inverted valve spindle with a button end upon the part entered into the chamber, and when the closet is used, a handle is pulled to work this valve-piece, so as to depress the elastic disc beneath it, or relieve the same from pressure, as the case may be—the water above the flexible disc being allowed to escape freely away, instead of being forced back into the main.

The Oyster Manufacture.—Although oysters are not exactly spun and woven like cotton, or smelted and rolled like iron, their artificial production has advanced so far as to put the process pretty much in the light of a manufacture. The sowing and breeding of oysters has long been an important branch of our industry; and now, the French government has set steadily to work with the matter, on a grand scale, on the coast of France. The place chosen for the experiments in question is a part of the Bay of St. Brieuc, a spot naturally well situated, and which, for an extent of 12,000 hectares ($2\frac{1}{2}$ acres each), is very favourable for the breeding of oysters, the bottom being shelly sand, slightly mixed with clay or mud. The tide, which there runs from N.W. to S.W., and from S.W. to N.W., at the rate of about three miles an hour, keeps the water constantly renewed, and carries off all unhealthy deposits, and contracts, by breaking against the rocks on the shore, the necessary vivifying properties. The immersion of the breeding oysters was commenced in March and concluded about the end of April, during which time about 3,000,000 of oysters, taken some from the sea and others from the banks at Cancale and Tregnler, were distributed in ten longitudinal beds in different parts of the bay, forming together a superficies of 1,000 hectares. The position for these banks had been traced out beforehand on a chart, and floating flags were placed to direct the movement of the vessels engaged in the operation. In order that the immersion of the oysters should be made with perfect regularity, and that the female oysters should not be injured by lying too thickly one over the other, two steamers, towing boats laden with oysters, proceeded from one end of the bank marked out to the other, letting down the oysters as they went, and then, when reaching the other end, turning round and retracing their way, thus distributing the fish with as much regularity as a plough could turn up a furrow in a field. After having laid down the oysters in conditions most favourable for their multiplication, it was necessary to organise around and over them prompt means for collecting the spawn, and constraining it to fix itself on the spot. One of the plans adopted to accomplish this object was to cover the bottom of the new bed with old oyster shells, so that not a single embryo could fall without finding a solid body to fix itself to. The second plan, as already stated in a former report, was to place long lines of boughs of trees, arranged like facines, from one extremity of each bed to the other. These fascines were balasted by a weight placed at the bottom, and the tops of them when fixed in their position, stood about eighteen or twenty inches above the bed of oysters, and thus prevented any of the spawn from being carried away by the current. These fascines were placed by men with diving dresses. As the cords with which the fascines were at first fastened would soon wear out, the report states that they may hereafter be replaced by small chains of galvanised iron, manufactured for the purpose in the arsenals of the State. The most exact indications have been made on the chart of the bay, so that the fascines may be taken up as regularly, in order that the oysters attached to them may be collected, as a farmer could pick the fruit from his trees. The report then goes on to say that, although six months have scarcely elapsed since the operations were performed, the result has exceeded the most sanguine expectations. The banks of Cancale and of Granville, in their most prosperous days, never showed such an amount of production. The fascines have on their branches such clumps of oysters that they resemble trees in an orchard, the boughs of which are in the spring hidden by the exuberance of the blossoms. They may be called real petrefactions. One of those fascines, which had been brought to Paris in order that his Majesty might judge of the effect of the plan, had young oysters on it to the number of 20,000. They are already more than an inch in diameter, and they only occupied in the water the space which would be covered by a sheaf of corn in a field. These oysters, when they have arrived at perfection, will be worth at the current price, at least £16. The bay of St. Brieuc will consequently become a really rich treasury, if other beds similar to those already formed be laid down there.

Rivet Making Machine—Mr. Robert Barr, of Glasgow, has recently made and introduced a machine for the manufacture of rivets, spikes, nails, and screw blanks, by the agency of a vertically acting ram or pressure, actuated by an overhead cam, carried upon a horizontal shaft. Under one arrangement, the machine takes the general form of a vertical drill. If single, the standard frame is arranged for being set against a wall, and the driving power for it is obtained either from a small steam cylinder bolted to the frame, and actuating a crank on the first motion shaft, or from a band pulley worked from any continuous mover. The movement of the first motion shaft is communicated through a train of spur wheel gearing, to the horizontal cam shaft running in end bearings in the upper part of the framing. This shaft has attached at its central part a cam, which, in its revolution, bears upon the upper end of the vertical ram, being so connected to the latter as to be capable of raising it after each depression. This vertical ram is set in suitable guides carried by the framing, its lower end having the die for the rivet head in it. The counter die plate, in which the lengths of severed rod are severally deposited for being moulded to shape, is a circular disc, formed with an annular V piece on its lower side, to fit into a corresponding V recess on the fixed carrying plate of the framing. The disc recesses are arranged in a circle on the upper surface of this disc, in such a manner, that as the disc is turned, each die is successively presented to the action of the ram. The turning of the die disc is effected by a continuously revolving vertical shaft driven from the main gearing, and having at its lower end an arm, which acts upon suitable studs attached to the die disc, so as to set round the disc to the extent of the intervals of the dies at each turn. The lengths for the rivets are severed from the bars by a segmental lever action cutter, worked from a crank in connection with the main gearing. Prior to each descent of the ram, a length of metal or a "blank" is deposited in a die aperture in the disc, and the subsequent descent of the ram then shapes the rivet. Each die aperture has an adjustable bottom central stud in it, and after each rivet has been shaped, a bottom traversing wedge, actuated by the gearing, lifts up this bottom stud and elevates the finished rivet for removal. The rivet may then either be picked off by hand, or struck off laterally by a small catch actuated by the gearing. Instead of this rotatory die disc action, traversing die plates may be used, with two, four, or other number of operating rams. When four rams are used, they are worked in pairs by two overhead cams, and the finished rivets are removed from the dies, either by the wedge action already described, or by the cam movements operating upon lifting rods for setting up the die studs from below. The die plates are set in suitable guides on the fixed platform of the framing, and are alternately traversed forward after each shaping action, by an operating movement worked from the gearing, for the removal of the rivet and the redeposit of a blank. The same general arrangements, under various modifications, answer for making spikes, nails, and screw blanks.

Meteorology—Barometry.—Rule to find the difference of the temperature of the atmosphere at different heights upon the supposition that the difference of temperature is the result of expansion or compression of air.

Let h = the height of a barometric column in feet at the sea level, in latitude 45° and at the temperature zero (*i. e.*, the temperature of freezing water.)

m = the density of the mercury or other fluid in the barometer.

a = the density of air at the temperature zero under the pressure h.

Put $C = \frac{m\,h}{a}$ (= 26,096 feet, as determined by experiment.)

H = the height in feet of any given point in the atmosphere above the sea-level.

D = the diminution of temperature in degrees of Fahrenheit at the height, H.

e = the co-efficient of the expansion of air for every degree of Fahrenheit above zero $\left(=\frac{1}{480}\right)$.

L = the latitude of the place.

R = the radius of the earth (= 20,900,000 feet).

n = the co-efficient of the increase of the force of gravity from the equator to the pole $\left(=\frac{1}{194}\right)$.

Then $D = \frac{H}{2\,e\,C}\left(1-\frac{H}{R}\right)(1-\frac{1}{2}\,n \cos 2\,L.$

$= \frac{H}{2\,e\,C}\left(1-\frac{H}{R}\right)$ nearly [exactly, if L = 45°.]

$= \frac{H}{2\,e\,C}$ nearly, unless H is very great.

$= \frac{15}{1631}$ H.

$= \frac{1}{109}$ H, nearly.

The above formula neglects the effect of aqueons vapours in the air, which, if included, would slightly modify the result.

Observations.—It appears that, according to the above supposition, the temperature of the atmosphere would diminish at the rate of 1° for 109 feet, or about 48° per mile of elevation near the earth's surface, and at a somewhat lower rate at very great elevations. The actual decrease near the earth's surface is found to be about 1° for 300 feet. From this we may infer that, though the temperature of the atmosphere is less at greater elevations, yet the *specific* heat increases rather rapidly, which must greatly oppose sudden and extensive mixtures of the upper and lower strata. We may also infer that, unless from violent causes, the temperature can never decrease much more than at the rate of 1° for 109 feet of elevation; for, if it did so, the upper strata would become specifically heavier than the lower strata, and a rapid circulation would ensue. According to Professor Leslie, as quoted in Brande's Dictionary, Art. "Aimati," the decrease of temperature is exhibited as follows:—

Elevation in miles,......................	0	1	2	3	4	5
Different elevation in feet for 1° decrease in temperature,..........	300	295	277	252	223	192

If these ratios be continued to the elevation of eight miles, according to the apparent law by which they are calculated, they exceed the limit of 1° for 109 feet.

The Grand Aim of Education.—The very corner-stone of an education intended to form great minds must be the recognition of the principle that the object is to call forth the greatest quantity of intellectual *power*, and to inspire the intensest *love of truth*; and this without a particle of regard to the results to which the exercise of the power may lead, even though it should conduct the pupil to opinions diametrically opposite to those of his teachers. We say this not that we think opinions unimportant, but precisely because of the immense importance which we attach to them; for in proportion to the degree of intellectual power and love of truth which we succeed in creating is the certainty that (whatever may happen in any one particular instance), in the aggregate of instances, true opinions will be the result; and intellectual power and practical love of truth are alike impossible where the reasoner is shown his conclusions, and informed beforehand that he is expected to arrive at them. We are not so absurd as to propose that the teacher should not inculcate his own opinions as the true ones, and exert his utmost powers to exhibit their truth in the strongest light. To abstain from this would be to nourish the worst intellectual habit of all—that of not finding and not looking for certainty in anything. But the teacher himself should not be held to any creed: nor should the question be whether the opinions he inculcates are the true ones, but whether he knows all creeds, and, in enforcing his own, states the arguments for all conflicting opinions fairly.—*J. S. Mill.*

New Plastic Composition for Moulding.—Compositions of reduced substances, capable of being moulded or shaped into accurate forms, and possessing characteristics of durability, are always in demand. They answer for so many purposes of importance, when strength is really secured in them, that the industrial world is always on the look out for them. A contribution of the kind has just been made in France, by M. Meyer, who has developed a new process for uniting and solidifying granular or filamentous matters into solid masses of considerable usefulness. The granular matter used is sand, lime, ashes, all kinds of pulverised ores or minerals, sawdust, waste wood, and other analogous matters. All kinds of filamentous materials, such as cotton, wool, and flax, may similarly be employed. The matters used for effecting the cementation of these substances are casein and albumen in various forms, such as are respectively obtained from milk and eggs, mixed with lime, or other alkaline matter. Any colouring ingredient may be added to the mass, to suit it for its particular office; or one only of the ingredients may be coloured, so that when mixed up it gives the appearance of marble. Similarly precious stones and wood may be counterfeited, and the composition may be used either in the sheet or solid form.

How the Earth is Peopled.—The Director of the Statistical Bureau of Berlin furnishes the following curious statement:—"The population of the whole earth is estimated to be 1,288,000,000, viz.—Europe, 272,000,000; Asia, 755,000,000; Africa, 200,000,000; America, 59,000,000; and Australia, 2,000,000. The population of Europe is thus subdivided:—Russia contains 62,000,000; the Austrian States, 36,398,620; France, 36,039,364; Great Britain and Ireland, 27,488,853; Prussia, 17,089,407; Turkey, 18,740,000; Spain, 15,518,000; the Two Sicilies, 8,616,922; Sweden and Norway, 5,072,820; Sardinia, 4,976,034; Belgium, 4,607,066; Bavaria, 4,547,239; the Netherlands, 3,487,617; Portugal, 3,471,199; the Papal States, 3,100,000; Switzerland, 2,494,500; Denmark, 2,468,648. In Asia, the Chinese Empire contains, 400,000,000; the East Indies, 171,000,000; the Indian Archipelago, 80,000,000; Japan, 35,000,000; Hindostan and Asiatic Turkey, each 15,000,000. In America, the United States are computed to contain 23,191,876; Brazil, 7,677,800; Mexico, 7,661,520. In the several nations of the earth there are 335,000,000 of Christians (of whom 170,000,000 are Papists, 89,000,000 Protestants, and 76,000,000 followers of the Greek Church). The number of Jews amounts to 5,000,000; of these 2,890,750 are in Europe, viz.:—1,250,000 in European Russia, 853,304 in Austria, 234,248 in Prussia, 192,176 in other parts of Germany, 62,470 in the Netherlands, 33,953 in Italy, 73,995 in France, 36,000 in Great Britain, and 70,000 in Turkey. The followers of various Asiatic religions are estimated at 600,000,000, Mahomedans at 160,000,000, and "Heathens" (the Gentiles proper), at 200,000,000.

Victoria, Australia.—The imports in 1857 amounted to £7,069,550; in 1858, to £6,343,124. The exports in 1857 amounted to £6,467,900, and in 1858 to £6,524,820. The ounces of gold annually exported since 1852 are shown in the following table:—

1852.	1853.	1854.	1855.	1856.	1857.
1,974,975	2,497,723	2,144,699	2,576,745	3,003,811	2,729,655

Two railways only are in actual operation; one, the short Hobson's Bay line, has been a prosperous undertaking; the other one, the Geelong line, is still in difficulties. The town of Geelong itself is far from flourishing; its population is decreasing (in 1854, about 40,000, in 1857, only about 23,000), and as a consequence the value of property is much depreciated. However, a railway is proposed to be made from Geelong to the gold fields at Ballarat, passing through a fine agricultural district, and this may exercise a favourable influence on the place. This line, having a length of rather more than fifty-two miles, was taken by contractors who failed to comply with the preliminary conditions, and the next tender (£1,271,841) has been accepted. The Melbourne people are getting up joint-stock banks of their own, not seeing why the home folks should pocket the profits of this business.

Utilisation of Marine Algæ.—We have always held the view that marine plants have never received anything like a fair share of attention at the hands of man; and we are glad to see that a movement has been made for the better consideration of their qualities. The sum of £100 has been placed at the disposal of the Council of the Society of Arts, by Sir Walter C. Trevelyan, as a prize to be awarded for the best essay on the applications of the marine algæ and their products as food or medicine for man and domestic animals, or for dyeing and other manufacturing purposes. Competitors must give the results of their original investigations on sea weeds, and they must prepare a series of specimens illustrative of the best modes of collecting, preserving, and preparing the several species. Mere compilations will not be admitted to competition. The essays, with accompanying specimens, must be sent to the Society of Arts, by the 31st of December, 1860. Each essay must be marked, "Essay on Marine Algæ," and must have a motto, or distinctive mark attached, which mark must also be written on a sealed letter, containing the name and address of the author. The letters containing the names and addresses of the authors will remain with the Society of Arts, and none will be opened except that bearing the motto or mark attached to the essay to which the adjudicators award the prize.

Scientific Education.—If England is to keep pace with other countries as a manufacturing nation, it must be by her sons of industry becoming humble disciples of science. It is indispensable in this country to have a scientific education in connection with manufactures, if we wish to outstrip the intellectual competition which now happily for the world prevails in all the departments of industry. As surely as darkness follows the setting of the sun, so surely will England recede as a manufacturing nation, unless her industrial population become much more conversant with science than they are now.—*Dr. Lyon Playfair.*

Railway Performance in 1858.—The length of line open in England and Wales on the 30th of June, 1858, was 6895 miles. 52 million passengers travelled over the lines in the half year preceding that date, 20 millions being travellers by Parliamentary trains; 10 million tons of general merchandise; 18 million tons of coal and other minerals; 873,000 head of cattle and three million sheep and pigs were carried by the railways during the same time. The total number of miles travelled by train was 35 millions. The total receipts from all sources of traffic was £9,406,000, three millions having been derived from passengers' fares, about the same sum from general merchandise, and $1\frac{1}{2}$ millions from coal and other minerals. The total number of passengers in Scotland was about $6\frac{1}{2}$ millions, paying £386,000 for themselves, and £25,000 for horses, dogs, carriages, &c. The number of miles travelled over by trains in Scotland was four millions, and the total receipts from all sources of traffic, £1,178,000. In Ireland the total number of passengers was $3\frac{1}{2}$ million, paying for themselves, their horses, and luggage, £308,000. The total number of miles travelled over was two millions, and the total receipts, £546,000. The total number of miles travelled over in the United Kingdom was 42 millions, and the total receipts 11 millions.

Pressure of the Atmosphere at Greenwich.—Mr. Glaisher has lately deduced from the observations of eighteen years, ending with 1858, the mean daily pressure of atmosphere at Greenwich throughout the year. The lowest reading is 29·684 inches on November 23d—the highest, 29·938, on March 8th. From the 23d of November to the 29th–31st December a rise takes place. During these days the height of 29·900 is attained, and then there is a fall until January 12th arrives. From that day the mercury rises until the year's maximum is reached. Then a fall occurs up to April 11th; then a slight rise to April 28th; then a slight fall to May 17th; then a rise to June 2d–8th. There is then a slight decrease to June 14th, and then a slight rise to June 28th–July 1st, from which latter day there is a very slight fall to July 6th, followed by a scarcely greater rise up to July 11th. Then follows a regular descent to August 4th–8th, after which there is a rise to September 7th, when the reading is 29·910. The mercury then falls to October 4th–9th, from which latter day it rises up to November 9th, and then falls to the minimum of the year. It will be seen that the fluctuations of the mercury during the year are numerous, and that there are three periods at which the reading 29·900 is reached or exceeded.

Grand Trunk Railway, Canada.—The total length of this line now open is 880 miles, and next October it is expected that the gigantic bridge, and the extension of 70 miles, to Sarnia, will be ready for traffic. Money is still wanted to complete the whole length of 1057 miles. This immense undertaking has already cost £11,537,700, and £1,111,500 are required to open the whole road. The totol cost will probably be close upon thirteen millions, sterling. The directors, however, are hopeful (as what directors are not beforehand?) that they will be able to divide a fair dividend amongst the shareholders.

Necessity of Combining Science with Skill.—There never was a time when it was so necessary, as now, that skill and science should be united for the promotion of the industrial arts. Science, in its progress, is improving and simplifying processes of manufacture, while it is opening, at the same time, a communication between the nations of the earth. Mere adventitious local advantages, apart from skill and science in their adaptation, become of much less moment than they formerly were. The staple manufactures are now carried on in all parts of Europe, and there is a constantly increasing, and active competition of most of the great nations in all the markets of the world. If England still continue to advance, it will not be that her coal and iron are plentiful, but because she unites science with practice, and because she enables her discoveries in philosophy to keep pace with her aptitude in applying them.—*Dr. Lyon Playfair.*

Lord Bacon.—To Lord Bacon we are indebted for an almost daily extension of our knowledge of the laws of nature in the outward world. Every succeeding year is an additional confirmation to us that we are travelling in the true path of knowledge; and as it brings in fresh tributes of science for the increase of human happiness, it extorts from us fresh tributes of praise to the guide and father of true philosophy.—*Rev. Sydney Smith.*

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded November 16.

2576. William B. Johnson and Joseph Shepherd, Manchester—Improvements in machinery or apparatus for adjusting the permanent way of railways.

Recorded December 16.

2880. Robert Wilson, sen., and Robert Wilson, jun., Livesy Street, Manchester—Certain improvements in the preparation of leather in combination with India-rubber and other materials, for the manufacturing of hose pipes and other purposes where leather is required to be impervious to water, steam, or frost.

Recorded January 19.

168. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in apparatus for making cigarettes.—(Communication from Jacques L. L. Daime, Paris.)

Recorded January 24.

222. Henry Owen, Portswood, Southampton, Hampshire—Improvements in stockings.

Recorded February 8.

350. James Hoskin, Walworth Common, Surrey—Improvements in the manufacture of lamps.

Recorded February 10.

378. George L. Stocks, Bridge Road, Poplar—Improvements in steering apparatuses.

H

Recorded February 17.

448. Charles Fay, Manchester—Improvements in apparatus for working railway brakes.

Recorded February 19.

460. Thomas Earle, Clapham, Surrey—Improved apparatus for conveying signals to railway trains in motion.
462. William Basford, Burslem, Staffordshire—Improvements in the method of, and means for, drying bricks and tiles preparatory to their being burnt, and also in the construction of kilns or ovens for burning such bricks, tiles, pipes, pottery, or earthenware, and in the mode of charging or placing these said articles therein to be burnt or fired, and also in certain appliances for regulating the heat therein.

Recorded February 24.

498. Henry B. Barlow, Manchester—Improvements in apparatus for condensing steam.—(Communication from François Daina, Bergamo, Austria.)
502. James Holms, Glasgow—Improvements in machinery or apparatus for propelling vessels, ships, and boats.

Recorded February 25.

512. Charles W. Siemens, John Street, Adelphi—Improvements in electric telegraphs and apparatus, and in supports for electric telegraphic line wires.—(Communication from Werner Siemens, Berlin, Prussia.)
516. George Peover, Wilmington Square, Clerkenwell—An improved optical instrument, being an improvement upon the kaleidoscope.

Recorded March 1.

536. Edward J. Hughes, 123 Chancery Lane—Improvements in preserving animal food, poultry, game, fish, fruit, and other similar substances.—(Communication from Edouard Gorges, Paris.)

Recorded March 2.

546. John T. Carter, Belfast, Antrim—Improvements in machinery for crushing, bruising, and preparing flax, hemp, and other fibrous materials requiring such treatment.
548. John Valda—Improvements in studs and other like fastenings for dresses, belts, or other purposes.
550. Robert H. Collyer, Alpha Road—A process of preparing materials for the manufacture of paper, and a machine employed therein, which machine is applicable for crushing, grinding, bruising, and reducing various substances.
552. Frederick J. Jones, Aldermanbury—An improvement in buckles and clasps.
554. Etienne Roche, Marseille, France—Improvements in the manufacture of paper suitable for forming cigarettes and for other purposes, and also improvements in the manufacture of cigars.
556. William E. Newton, 66 Chancery Lane—Improvements in the construction of barometers or instruments to indicate pressure.—(Communication from Mr. Alfred Nobel, Paris.)
558. Joseph Kershaw, Allerton, near Bradford, Yorkshire—Improvements in means or apparatus employed in weaving.
560. Henry Brown, Galashiels, Selkirkshire—Improvements in machinery for cutting and finishing the surfaces of woollen and other fabrics.

Recorded March 3.

562. Hermann Kohn, 5 North Place, Gray's-Inn-Road—Improvements in articles of wearing apparel called coats.
563. John Harrison, Bermondsey, Southwark, Surrey—An improvement or improvements in the construction of rotating window sashes.
564. Thomas Wilson, Birmingham—An improvement or improvements in breech-loading fire-arms.
565. Albert W. Hale, New Britain, Connecticut, U. S.—A new and improved machine for cutting and mincing meat, vegetables, &c.
566. James D. Dougall, Glasgow—Improvements in fire-arms.
567. William Jackson, Colne, Lancashire—Improvements in shuttles for looms.
568. William Score, 9 Osborne Terrace, Clapham Road, Surrey—Improvements in the manufacture of soap.
569. Horatio Leonard, Massachusetts, U. S.—An improvement in the manufacture of paraffine candles.
570. William Tucker, Massachusetts, U. S.—An improvement in bit stocks or auger handles.
571. Thomas Cook, Stowmarket, Suffolkshire—An apparatus for raising and lowering coffins and bodies, either for burial or disinterment.

Recorded March 4.

573. Charles F. Dennet, Pall Mall—Improvements in bayonets.
574. Mark Rider, Todmorden, Yorkshire—Improvments in, or applicable to, machines for preparing, spinning, and doubling cotton and other fibrous materials.
575. James Cowban and Elias Andrews, Burnley, Lancashire—Improvements in machinery or apparatus for spinning fibrous materials.
576. Richard A. Brooman, 166 Fleet Street—An improvement in boiler stays.—(Communication from Jean Perrier, Nimes, France.)
577. Charles R. Mead, 176 Great Dover Street, Southwark—Improvements in water gas meters.

Recorded March 5.

578. William Bailes and James Bailes, 434 Oxford Street, Westminster—An improved ship's birth for prevention of sea sickness, composed of wood and metal.
579. John M. Dunlop, Manchester—Improvements in machinery or apparatus for cleaning fibrous materials.
580. John Leigh, Manchester—Improvements in the purification of coal gas.
581. John Fraser, Banff—Improvements in ploughs.
582. Frederick W. Parker, Sheffield, Yorkshire—Improvements in sewing machines.
583. Edward Vigars, Paddington—Improvements in the construction of ships and other vessels.
584. William P. Savage, Roxham, Downham Market, Norfolkshire—An improved machine for excavating, raising, and depositing soil.
585. François Verdeil, 30 Rue St. Sulpice, Paris, and Edmond Michel, 4 Quai Imperial, Puteaux, Seine—Improvements in treating madder.
586. George Leach, Leeds, Yorkshire—Improved machinery for reeling and leashing yarn or thread.
587. Francis Morton, James Street, Liverpool—An improvement in the construction of strained fences.

Recorded March 7.

589. Hugh W. Patrick, 4 Mill Hill Terrace, Acton—An improvement or improvements in an apparatus for chemical and dental laboratories, or other manufacturing or experimental uses, which he proposes calling a "paragon laboratory forge."
590. Duncan Proudfoot, Glasgow—Improvements in Turkey red dyeing.
591. Armand Cabany, Anzin, France—A new system of quoins (wedges) for railways.
592. William Palmer, Long Eaton, Derbyshire—An improved railway carriage brake, and coupling apparatus connected therewith
593. Frederick Ayckbourn, 27 Henry Street, Vauxhall Gardens—Laminating India-rubber cloths with paper sheets.
594. William Gossage, Widnes, Lancashire—Improvements in the treatment of certain ores of copper for the extraction of metals therefrom.
595. John Aspinall, Great Tower Street—Improvements in evaporating in vacuo.
596. Pierre E. Aimont, Paris—Improvements in the construction of waggons and other carriages for railways and ordinary roads, and of apparatuses connected therewith.
597. John Orr, 31 South Albion Street, Glasgow—Improvements in weaving ornamental fabrics.
598. John P. Clarke, King's Street Mills, Leicester—Improvements in the manufacture of reels for the winding on cotton, linen, thread, silk, or other fibrous materials.
599. John L. Jullion and Gordon Pirie, Stoneywood Works, Aberdeen—The manufacture of gelatine.

Recorded March 8.

600. James King and Alfred Wilcock, Moss Mill, near Rochdale, Lancashire—Improvements in certain parts of machines used in preparing, spinning, and doubling cotton and other fibrous materials.
601. Adam Booth, the elder, and Adam Booth, the younger, Manchester—Improvements in machinery or apparatus for making or manufacturing tags for laces.
602. William Hallilay, Wakefield, Yorkshire—Improvements in apparatus for preventing smoke and economizing fuel.
603. George Twigg, Birmingham—An improved fusee-igniter for the use of smokers.
604. Charles Mills, High Street, Camden Town—Improvements in the action of pianofortes.
605. John N. Ryder, Bexley Heath, Kent—Improvements in preserving fruits, and in apparatus for such purposes.
606. Edward Deane, 1 Arthur Street, East, London Bridge—Improvements in apparatus for the transmission of gas and other fluids
607. William Clark, 53 Chancery Lane—Improvements in submarine telegraph cables.—(Communication from Auguste H. S. Treve, Paris.)
608. Bennett M. Belling, 55 Queen's Road, Bayswater—An improved apparatus for hardening India-rubber for the bases of teeth.

Recorded March 9.

609. James Pilbrow, Tottenham—Certain improvements in, or a new method or methods of obtaining and applying motive power, a modification of which is also applicable for pumping or forcing liquids, gases, and fluids.
610. John A. Williams, Baydon, Wiltshire—Improvements in machinery or apparatus for cultivating land by steam power.
611. Sir William G. Armstrong, Newcastle-upon-Tyne, Northumberland—Improvements in rifled ordnance and its projectiles.
612. John R. Nicholson, Redditch, Worcestershire—New or improved machinery to be used in the manufacture of needles, a part or parts of which said machinery may also be used for pointing pins and other like articles.
613. John Erwood, 132 Goswell Street, Clerkenwell, and Joseph Skertchly, Ashby-de-la-Zouch, Leicester—Improvements in the manufacture of glass, sand, and emery papers and cloths, and other similar articles used for like purposes.
614. George C. Pearce, Cyfarthfa, Glamorganshire—An improvement in cornets, trumpets, trombones, and other like wind instruments.
615. John S. Russell, Great George Street, Westminster—Improvements in building ships and other vessels.
617. Alfred V. Newton, 66 Chancery Lane—Improved machinery for rolling horse shoe iron.—(Communication from William W. Lewis, United States of America.)
618. William E. Newton, 66 Chancery Lane—Improvements in billiard tables.—(Communication from Abraham Bassford, New York.)
619. Henry Fisher, Birkenhead, Cheshire—Improvements in machinery or apparatus for cutting thin sheets of metal into strips, and for tempering sheets or strips of metal.

Recorded March 10.

620. John C. Martin, High Street, Barnes, Surrey—An improvement in the manufacture of cannon and small fire-arms, and of projectiles to be used with the same.
621. James Yuill, Glasgow—Improvements in saddle trees.
622. Richard F. Woodward, Birmingham—An improvement or improvements in the manufacture of certain kinds of scale beams and fittings used therewith.
623. Henry Lodge, Liverpool—Improved means of protecting ships, batteries, and other constructions or buildings from the effects of projectiles of various kinds.

Recorded March 11.

624. James H. Burton, Enfield Lock—An improvement in breech-loading fire-arms.
625. John C. Hadden, 4 Cannon Row, Westminster—Improvements in casting mortars and cannon.
627. Samuel Wheatcroft, Bruduell Place, New North Road—Improvements in the construction of goffering and rouching machines in order to render them self-registering and self-indicating.
628. Nathan Washburn, Massachusetts, U. S.—A new and useful or improved machine for rolling tires for wheels.
629. Frederick Clarke, Norland Square—An improved mode of and apparatus for cutting, drying, and preparing peat to be used as fuel, or for other purposes for which it may be usefully employed.
630. Alfred V. Newton, 66 Chancery Lane—An improved construction of steam engine, applicable also to the raising of water.—(Communication from Samuel Huse, United States of America.)

Recorded March 12.

631. John Cunliffe and Frederick Piggott, Manchester, and George Mallinson, Salford, Lancashire—Improvements in the manufacture of ornamental woven fabrics.
632. William E. Newton, 66 Chancery Lane—An improvement in endless chain propellers for boats and other vessels.—(Communication from Anson Wolcott, New York.)
633. William E. Newton, 66 Chancery Lane—Improvements in the manufacture of shoes and other coverings for the feet.—(Communication from Christopher Meyer, New Brunswick.)

634. James Palmer, Sutton Coldfield, Warwickshire—A new or improved trap for catching animals, birds, and fishes.
635. John T. Calow, Staveley, Derbyshire—A compound action in cage machinery, with the apparatus connected therewith, having a perforated shield for saving life and property in the event of a rope, band, or chain breaking, or the engine-man drawing the cage too high at coal or other shafts, where slides are applicable, which said invention is also applicable to hoisting or other lifting machines.
636. James Thornton, Liverpool—Improvements in machinery for the manufacture of bricks, tiles, and other similar articles.
637. John Court, Brompton Row—An improvement in nibs for gas burners.
638. Richard Allison, Birmingham—Improvements in apparatuses for boring and sinking.
639. James Macnab, Linlithgow—Improvements in telegraphing or signalling apparatus.

Recorded March 14.

640. Richard Waller, 50 Baker Street, Portman Square—Improvements in joining leather, flexible and textile materials, for the production of boots and shoes, and articles of the like description, and harness, strapping, bags, sails, tent-covers, portmanteaus, and such other articles, together with machinery and apparatus for that purpose.
641. Richard A. Brooman, 166 Fleet Street—An improved method of treating wool and other fibres in order to form threads.—(Communication from Messrs. Tavernier and Vouillon, Paris.)
642. Alfred Tylor, Warwick Lane, Newgate Street—Improvements in apparatus for regulating the supply of water to water closets and other vessels.
643. Thomas Lightfoot, Accrington, Lancashire—Improvements in fixing colours on woven fabrics or fibrous materials.
644. David Joy, Leeds, Yorkshire—Improvements in hydraulic engines and meters.
645. Charles H. Hurst, Victoria Terrace, Royal Road, Kennington Park, Surrey—An improved wrench or spanner.
646. Edwin Smith, Dudley Port, Staffordshire—Improvements in treating or preparing furnaces used in the manufacture of iron.
647. Thomas Patstone, Birmingham—Improvements in shades or glasses, for gas and other lamps, and in the supports of the said shades or glasses.
648. John S. Dawes, Smethwick House, near Birmingham—A new or improved method, or combination of arrangements for the better securing and collecting of night soil or town manure, and rendering it more valuable for agricultural purposes.

Recorded March 15.

649. Walter Langton, 14 Wharf, Belvedere Road, Lambeth, Surrey—Improvements in the manufacture of keys and wood fastenings used in constructing railways.
650. Charles Desurmont, Seclin, France, and Charles Goudeau, Alost, Belgium—Certain improvements in looms for weaving.
651. George B. Galloway, Newcastle-upon-Tyne, Northumberland—Improvements upon, and in connection with, his former patents, and in the manufacture of fuel, and working steam engines more economically.
652. Charles Ritchie, 143 Strand—Improvements in calculating machines.
653. William Clark, 53 Chancery Lane—Improvements in the apparatus of electric lamps or lights.—(Communication from Victor L. M. Serrin, Paris.)
654. Benjamin Rider, 61 Red Cross Street, Borough, Surrey—Improvements in hats, caps, and other coverings for the head, and in the apparatus used in the manufacture of such articles.

Recorded March 16.

655. John Dixon and Robert Clayton, Bradford, Yorkshire—Improvements in rolling iron and steel for manufacturing railway wheels and for other purposes.
656. George Seymour, 6 Golden Square, Regent Street—Improvements in making refined sugar, and making potash and soda from the residues.—(Communication from Hypolite Leplay, Pont de Madron, near Toulouse, France.)
657. William Robertson and James G. Orchar, Dundee, Forfarshire—Improvements in weaving.
658. Charles Parker, Dundee, Forfarshire—Improvements in looms for weaving.
659. James Parker, Claremont Cottage, Lilford Road, Camberwell, Surrey—Improvements in lever sails, and in submerged feathering propellers.
660. Isaiah Ash, 17 Great Bridport Street, Blandford Square—Improvements in the construction of locks and latches.
661. Francis Mordan, Goswell Road—A means of keeping a stopper connected with a bottle, jar, or such like receptacle, when removed from the mouth thereof.
663. James Fuller, Reading, Berkshire—Improvements in churns.
664. William Avery, Birmingham—Improvements in machinery for the manufacture of screws.
665. Joseph M. Denys, 4 South Street, Finsbury—Certain improvements in the construction of railway crossings.
666. Edmund Anscombe, 95 Westbourn Street, Pimlico—An apparatus for taking an accurate delineation of any view or object in open air or otherwise.
667. Joseph Harris, jun., Massachusetts, U. S.—A new and useful or improved carpet sweeper.
668. James Clark, Newton Heath, near Manchester—Improvements in the manufacture of fabrics in which compounds containing India-rubber are used.
669. George Hamilton, St. Martin's-le-Grand, and William H. Nash, Poplar—Improvements in tumbler or lever locks, and in keys for such and other locks.
670. Henry Bessemer, Queen Street Place, New Cannon Street—Improvements in the manufacture of crank axles.
671. Thomas W. Miller, Portsmouth—Improvements in blocking or securing ships and other vessels whilst being removed, examined, or repaired.

Recorded March 17.

672. Coleman Defries, Houndsditch—Improvements in lamps.
673. Charles Garnett, Cleckheaton, Yorkshire—Improvements in machinery for ginning cotton, and for cleaning cotton and certain other fibrous materials.
674. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in machinery or apparatus for folding and stitching sheets of paper.—(Communication from Messrs. Sulzberger and Graf, Fraunfeld, Switzerland.)
675. Edward T. Hughes, 123 Chancery Lane—Improvements in machinery or apparatus for crushing sugar-canes and other materials.—(Communication from Saint J. Therese, Lamentin, Martinique, France.)
676. Richard A. Brooman, 166 Fleet Street—Treating barley so as to obtain new alimentary substances therefrom. —(Communication from Pierre Marmay, Riom, France.)
677. Thomas Skelton, Plaistow, Essex—Improvements in steering apparatus.
678. Andrew G. Hutchinson, West Derby, Lancashire—Improvements for counteracting damp in buildings.
679. Ph. Larochette, Paris—Improvements in machinery for brewing.
681. Arthur Warner, 31 Threadneedle Street, and William H. Tooth, Summer Street, Southwark—Improvements in the manufacture of iron.
682. Julien Donat, 6 Rue Paradis Marais, Paris—Improvements in apparatus used with matches for obtaining instantaneous light.

Recorded March 18.

683. William Cook, Kingston-upon-Hull—A smoke consumer.
684. William B. Taylor, Ballymena, Antrim, Ireland—Certain improvements in or applicable to looms for weaving.
685. Sir William G. Armstrong, Newcastle-upon-Tyne, Northumberland—Improvements in the means of igniting explosive projectiles.
687. John Molesworth, Rochdale, Lancashire—An improvement in telegraphic communication.—(Communication from Frederick N. Gisbourne and Francis O. J. Smith, Boston, U. S.)
689. John Hinks and George Wells, Birmingham—A new or improved penholder.
690. Robert Mushet, Coleford, Gloucestershire—A new or improved metallic alloy.
691. Robert Mushet, Coleford, Gloucestershire—An improvement in the manufacture of cast steel.
692. Albert L. Thirion, Asche en Refail, Province de Namur, Belgium—Improvements in water, wind, steam, and hand mills.
693. Charles Lambert, Sunk Island, Yorkshire—Improvements in corn and seed drills.
694. John W. Duncan, Grove End Road, St. John's Wood, and James E. A. Gwynne, Hanover Terrace, Regents Park—Improvements in, or connected with, apparatus for the generation, application, and condensation of steam, part of which apparatus or arrangements is applicable to other purposes.

Recorded March 19.

695. Thomas Allen, Wingate, Sheffield, Yorkshire—Improvements in petticoats.
696. William B. Gingell, 37 Corn Street, Bristol—Improvements in the form of metal bars used for the stiles, rails, heads, and sills of window sashes, casements, and other lights.
697. Edmund L. Benzon, Sheffield, Yorkshire—An improvement in the casting of steel. —(Communication from Ewald Riepe, Pau, France.)
698. Samuel Stein, Chapel Place, Poultry—Manufacturing a resinous carton or pasteboard from vegetable matter, an improvement for roofing, ship sheathing, lining walls to prevent dampness, and other uses.—(Communication from Auguste M. Chevalier, Avignon, France.)
699. Henry Whitaker, Newman Street—A new musical instrument to be called "The Cherubine Minor.
700. John W. Hart, 60 St. Mary Axe—An apparatus for the destruction of flies and other insects.—(Communication from Frederick Barnett, Paris.)
701. William Haigh, Reddish, Lancashire—An improved manufacture of paper, to be employed for the pupose of packing and other similar uses.
702. James Howden and Alexander Morton, Glasgow—Improvements in apparatus for obtaining and regulating motive power.
703. Robert Mushet, Coleford, Gloucestershire—An improvement or improvements in the manufacture of cast steel.
704. William and Samuel Pickstone, Radcliff Bridge, near Manchester—An improvement in stiffening, sizing, filling, or weighting textile fabrics.
705. Alfred V. Newton, 66 Chancery Lane—Improvements in propelling vessels.—(Communication from Theodore W. Phinney, Newport, Rhode Island.)
706. William C. Cambridge, Bristol—An improved construction of chain harrow.

Recorded March 21.

707. William Haggett, Sherbourne, Dorsetshire—An improved method of treating metals and other materials to increase their strength.
708. Arnould Baucq, Marchiennes, France—Maintaining graters mechanically.
709. William Hudson and Christopher Catlow, Burnley, Lancashire—Certain improvements in looms for weaving.
710. Robert Whittaker, Lennox Mill, Stirlingshire—Improvements in the manufacture or construction of metallic rollers or cylinders and mandrills for printing.
711. George Ferguson, Strand—The combination and application of certain materials for the destruction of insects and vermin.
712. Joseph Roberts, Stately Bridge, Cheshire—Improvements in packings for pistons.
713. Sigismond Leoni, St. Paul Street—Improvements in the manufacture of useful and ornamental articles, surfaces, and works, parts of articles and parts of machinery or apparatus, from talc and other silicates of magnesia, and with the same combined with other substances.
714. Joseph Bickerton, Oldham, Lancashire—Improvements in opening and securing window sashes.
715. George Cregg, Sheffield, Yorkshire—Improvements in currying or manufacturing leather.
716. William Warne, John A. Fanshawe, James A. Jaques, and Thomas Galpin, Tottenham—An improved compound or preparation of materials for, and mode of covering and insulating wires or conductors used for telegraphic or electrical purposes.
717. William Rhodes, Wade Street, Thornton Road, Bradford, Yorkshire—Certain improvements in fire-proof safes.

Recorded March 22.

718. George P. A. Lutz, Rue Menars, Paris—An improvement in veils.
719. John Davies, 18 Frith Street, Soho—Improvements in musical instruments.
720. Pacifico Tagliacozzo, 27 Broad Street Buildings—An improvement in metallic pens.
721. William A. Gilbee, 4 South Street, Finsbury—An improved apparatus for stretching and polishing silk thread.—(Communication from Messrs. Lyonnet and Prenat, St. Etinne, France.)
722. William Weild, Manchester—Improvements in machinery and arrangements for coating slips, sheets, rods, and bars of metal, and laths, rods, and boards of wood, and similar articles formed of other substances, with paints, varnishes, and other like preparations, and drying the same.
723. Frederick Ashford, Commercial Road—Improved means of fastening and securing treasure or bullion cases.
724. John T. Pitman, 67 Gracecburch Street—Improvements in springs for railroad cars, and for other purposes.—(Communication from John I. Fields, Brooklyn, New York, U. S.)
725. Edward Maynard, Washington, Columbia, U. S.—Improving breech-loading fire-arms.
726. Samuel Newington, Ridgway, Ticehurst, Sussex—Improvements in apparatus for distributing seeds and manure.
727. Daniel L. Banks, Kennington, Surrey—Improvements in suspension rail or road ways, and in machinery or apparatus connected therewith.
728. William P. Wilkins, Ipswich, Suffolkshire—Improvements in the arrangements of valves, and in their application to steam engines.
729. Sir Peter Fairbairn and Robert Newton, Leeds, Yorkshire—Straightening and separating the fibres of silk waste, and laying them in parallel lengths preparatory to combing or dressing.
731. Richard A. Brooman, 166 Fleet Street—Improvements in fire-arms and ordnance, and in projectiles and apparatus to be employed therewith.—(Communication from Charles Rochaz, Paris.)

732. Jacobus Tyssen, Rotterdam, Holland—An improved apparatus for indicating the speed of ships and other vessels.
733. Charles A. Watkins, Greek Street, Soho Square—Improvements in the manufacture of brushes.
734. John Macintosh, North Bank, Regent's Park, and Godfrey Rhodes, Regent Street—Improvements in tents and such like coverings for shelter against the weather.

Recorded March 23.

735. Samuel Oram, 137 Fleet Street—Improvements in pipes or tubes for generating and superheating steam.
736. William Adamson, Patent Slip, Wellington Quay, Newcastle-on-Tyne—Improvements in apparatus for propelling vessels.
737. Samuel Clarke, Albany Street, Regent's Park—Improvements in the manufacture of candles.
738. William Middleship, Grove Terrace, South Grove, Mile End—Improvements in propelling vessels.
739. John Evans, Nash Mills, King's Langley, Herfordshire—Improvements in the manufacture of paper.
741. Jean V. Hielakker, Brussels, Belgium—Improved apparatus for pressing or moulding artificial or patent fuel, fire-bricks, and similar articles.
742. George Neal, Great Charles Street, Birmingham—Certain improvements in apparatus or fittings connected with the burning of gas for regulating and economising its consumption.
743. William Delany, Norfolk Street, Strand—Improvements in ploughs for tilling land.—(Communication from Lodner D. Phillips, Chicago, U. S.)
744. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in machinery or apparatus for the manufacture of sheet tin.—(Communication from Monsieur Masson, Paris.)
745. Pierre P. Boll, Paris, and Hermann Reger, Cologne—Improvements in steam boiler and other furnaces.—(Communication from Antoine Speich, Strasbourg.)
746. Frederic Tillett, Banner Street, St. Luke's—Improvements in machinery for cutting splints for matches.

Recorded March 24.

747. William Garforth and James Garforth, Dukinfield, Cheshire—A certain improvement in metallic pistons.
748. William E. Wiley, 34 Great Hampton, Birmingham—Improvements in the manufacture of boxes or cases used for holding needles, pens, matches, pencils, and for other like purposes.
749. William E. Wiley, 34 Great Hampton Street, Birmingham—New or improved instruments to be used in burning and supporting candles.
750. Frederick E. Sharp, 3 Gloucester Terrace, Blackheath, Kent—Improvements in machinery for corking bottles.
751. Edward S. Tebutt, Leicester—Improvements in the manufacture of clastic fabrics.
752. Charles Sanderson, Sheffield, Yorkshire—Improvements in preparing, tempering, and covering, or coating thin strips or sheets of steel.
753. William Clark, 53 Chancery Lane—A machine for separating oats from their husks or chaff.—(Communication from Leon J. E. Dupont, Paris.)

Recorded March 25.

754. Hugh Rigby, Salford, Lancashire—Improvements in machinery or apparatus for obtaining motive power, applicable to hoists, and all other purposes to which motive power can be applied.
755. Charles Cowper, 20 Southampton Buildings, Chancery Lane—Improvements in telegraphic cables.—(Communication from Robert J. Bingham, Rue de la Rochefoucauld, Paris.)
756. Richard Baker, Liverpool—Improvements in chronometers, watches, and other timekeepers.
757. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in fire-arms.—(Communication from Francis H. Bell, Washington, Columbia, U. S.)
758. William E. Newton, 66 Chancery Lane—Improvements in ovens for baking bread, and other substances.—(Communication from Thomas Russell, New York.)
759. Christopher Hill, Chippenham Station, Great Western Railway—Improvements in the permanent way of railways.
760. Humphrey Humphreys, the elder, Buckingham—An improvement in unhairing hides and skins, and in the manufacture of leather.

Recorded March 26.

761. George Haseltine, 37 King Street—Improvements in the manufacture of small metallic chains.—(Communication from Edwin H. Perry, Rhode Island, U. S.)
763. Elizabeth Steane, Manor Rise, Brixton, Surrey—An improved means or apparatus for preventing candles dropping or guttering.
765. Mark Firth, Sheffield, Yorkshire—Improvements in machinery for grinding saws and flat plates of steel.—(Communication from E. T. Jones, Montreal.)
766. George Naylor, 7 Durnford Street, East Stonehouse, Devonshire—An apparatus for measuring and indicating the distance passed over or travelled by the same.
767. John C. Evans, and Peter Soames, Morden Iron Works, East Greenwich, Kent—Improvements in apparatus for superheating steam.
768. Matthew A. Muir and James M'Ilwham, Glasgow—Improvements in moulding or shaping metals.
769. Edward Dowling, Little Queen Street, Holborn—Improvements in weights.
770. Benjamin Smith and Charles L. Smith, Corbet's Court, Spitalfields—Improvements in the preparation of certain colouring matter, applicable for dyeing and printing.
771. Joseph Buckley, Orlando Greenhalgh, and Robert Hutchinson, Horwick, Lancashire—Improvements in machinery or apparatus for printing woven fabrics.

Recorded March 28.

772. Charles J. Richardson, 34 Kingston Square, and 9A King Street, Whitehall—Improvements in apparatus to be applied to chimneys or flues of buildings, for preventing downdraught or return smoke, for their insuring upward ventilation, and for reducing the quantity of smoke or the blacks from the smoke passing into the atmosphere.
773. Charles F. Vasserot, 45 Essex Street, Strand—An improved diving apparatus.—(Communication from Philippe Bigard, Lyons, France.)
774. James Buckingham, Westmoreland House, Walworth Common, Surrey—Improvements in machinery or apparatus employed in drawing fibrous substances.
775. Alfred V. Newton, 66 Chancery Lane—An improved construction of furnace for reheating steel preparatory to the hardening, tempering, or annealing process.—(Communication from Perry G. Gardiner, New York.)
776. Archibald Turner, Leicester—Improvements in the manufacture of elastic fabrics.
777. Alfred V. Newton, 66 Chancery Lane—Improved apparatus for retaining the oil or other fluid used for annealing, tempering, and hardening steel at an equable low temperature.—(Communication from Perry G. Gardiner, New York.)

Recorded March 29.

778. Thomas Carr, Bebington, Cheshire—Improvements in machinery for disintegrating artificial manures, and various other substances.
779. Charles L. Roberts, Clerkenwell—Improvements in cigars.
780. William Mossman, 50 Cumming Street, Pentonville, Clerkenwell—Improvements in machinery applied to embossing or cutting presses, for the better and more expeditious manner of manufacturing ornamental cut out and embossed work in paper, leather, parchment, cloth, foil, and other materials.
781. John W. Kelly, Ennis, Clare, Ireland—Improvements in gas burners.
782. Ernest de Caranza, 97 Rue des Petits Champs, Paris—A new system of gas lighting through new apparatuses and matters richer in gas than pit coal.
783. Edwin N. Normington, 19 High Street, Camden Town—The cleansing and remanufacturing of old used dirty railway grease for the manufacturing of new railway grease, for the cleansing and remanufacturing of old used cotton waste, tow, or any textile fabrics, and for the purifying of oils or any fatty matter.
785. Richard Serle, Woodford Wells, Essex—Improvements in apparatus used for transmitting signals by electricity for telegraphic purposes, and in the construction of telegraphic cables.
786. Isaac Spight, Glandford Briggs, Lincolnshire—Improvements in horse hoes.
787. Thomas Taylor, Vere Street—Improved means of giving increased strength to paper.
788. Henry P. Burt, Charlotte Row, Mansion House—Improvements in apparatus for preparing and preserving timber.
789. Henry Moss, 62 Brill Row, Somers Town, and Thomas West, 5 Jewin Street—A machine for the cutting of leather for every purpose, and cutting cloths, linen, and other fabrics, and materials.

Recorded March 30.

791. John H. Linsey, 103 Cheapside—Certain improvements in binding or covering books.
793. William V. Edwards, Swindon, Wiltshire—Improvements in the construction of ways and apparatus to facilitate the conveyance of mails, goods, and passengers.
794. George T. Bousfield, Loughborough Park, Brixton, Surrey—Improvements in preventing explosions in steam boilers.—(Communication from François Marchal, Clermond Ferand, France.)
795. Thomas D. Shipman, Toronto, Canada West, North America—Improvements in apparatus for stamping and printing.—(Communication from Mr. Kendell, Canada, North America.)
796. Humphrey Jefferies, Birmingham—Improvements in castors for furniture.
797. John Cartwright, Shrewsbury, Salopshire—An improved implement for crushing clods and pulverising the surface soil, also convertable into a press wheel roller.
798. Cowper P. Coles, Southsea, Hantshire—An apparatus for defending guns and gunners in ships of war, gun boats, and land batteries.
799. William Gossage, Widnes, Lancashire—Improvements in the manufacture of certain alkaline silicates, and in the production therefrom of liquor silicis or liquid flint.
800. Alfred V. Newton, 66 Chancery Lane—An improved governor for marine and other steam engines.—(Communication from H. C. Sergeant, United States of America)
801. William Smith, King Street, Smithfield, and Edmund Smith, Hamburgh—Improvements in means or apparatus for the purpose of regulating the flow or passage of fluids.

Recorded March 31.

802. John Lacy, Samuel Simpson, and Henry Smith, Travis Holme Mill, Walsden, near Todmorden, Lancashire—Certain improvements in machinery for preparing and spinning cotton and other fibrous materials.
803. Charles Pickering, Tonbridge, Kent—Improved apparatus for brewing.
804. Robert C. Ross, Glasgow—Improved apparatus for cultivating land.
805. Thomas Ivory, Edinburgh—Improvements in rotatory engines.
807. Alexander Morton, Morton Place, Kilmarnock—Improvements in sextants or quadrants for nautical purposes, and which are also adapted to the measuring of altitudes or angular distances.
809. James S. Bateson, 17 Bolton Street, Mayfair—Improvements in generating steam and in the apparatus employed therein.
810. Francis Morton, James Street, Liverpool—Improvements in the construction of fences and the posts or pillars for the same, parts of which improvements are also applicable to the construction of gate posts or poles for telegraphic purposes or for signal posts.
811. William E. Newton, 66 Chancery Lane—Improvements in mills for cleaning rice.—(Communication from Peter M'Kinley, Charleston, U. S.)
812. Alfred V. Newton, 66 Chancery Lane—Improvements in the construction of steam boilers and other furnaces.—(Communication from Jonathan Amory, Boston, U. S.)

Recorded April 1.

813. Daniel K. Clark, 11 Adam Street, Adelphia—Feed water heating apparatus.
814. Frederick P. A. Auburtin, 32 Gerard Street, Islington—An improved preparation of food for herbivorous animals.

☞ *Information as to any of these applications, and their progress, may be had on application to the Editor of this Journal.*

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 28th February to 13th April, 1859.

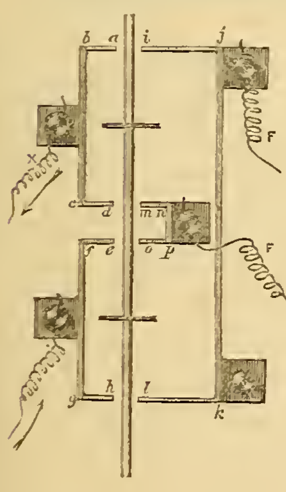
Feb. 28th,	4152	William Larke and Son, 17 Little Moorfields, City, E.C.—"Air Tight Slide Cover."
Mar. 4th,	4153	Oastler and Palmer, 13 White's Grounds, Bermoudsey—"Parts of a Buckle."
—	4154	Stephen William Silver & Co., 66 and 67 Cornhill, E.C., &c.—"The Solar Hat Ventillation."
8th,	4155	Dawson and Macnicol, 50 Buchanan Street, Glasgow—"Shirt."
9th,	4156	George Salter & Co., West Bromwich—"Spring Balance."
10th,	4157	Gray and Bailey, Berkley Street, Birmingham—"A Bottle or Roasting Jack."
16th,	4158	Colin Pullinger, Selsey, near Colchester—"Attomatou Mouse and Rat Trap."
26th,	4159	Brecknell, Turner, and Sons, The Bee Hive, Haymarket, S.W.—"Shade for Candlesticks."
April 4th,	4160	Moore, Adams, and Peade, 2 Friday Street, Cheapside, E.C.—"Overcoat, to be called the Vienna Wrapper."
5th,	4161	Parkes and Fell, 10 Upper Hockley Street, Birmingham—"Self-Sustaining Ear-Ring."
12th,	4162	Taylor and Elvey, Edingley Southwell, Notts—"An Improved Drill."
—	4163	Henry Parrich, Birmingham—"A Pin or Skewer."
13th,	4164	George Jeffries, Golden Ball Street, Norwich—"A Machine for Charging Breech-Loading Cartridges."

ELECTRO-MAGNETIC MAXIMUM AND MINIMUM PRESSURE AND LEVEL INDICATOR.

This very ingenious and serviceable apparatus, which has been patented in this country by M. Aristidé Servier, a civil engineer of Paris, is applicable to all kinds of pressure or level indicators, whether working with a directly vertical action or round an indicating dial. Its object is to give, the moment that a predetermined maximum or minimum pressure or level has been attained, and at any distance from the place where the indicator is stationed, a separate and distinct signal for each of these limits—these signals being perceptible not only to the eye, but to the ear. All this is secured by taking advantage of the scientific fact, that the magnetic needle will deflect in one direction or the other, under the action of a current of electricity, according to the direction of such current. For this purpose the indicator is provided with a commutator, the form of which is determined accordingly as the indicator works vertically or in a circular direction round a dial. A simple diagram will enable the action of this apparatus to be better understood than a complete drawing, the object of the apparatus being to cause the indicator itself to close a voltaic circuit, and at the same time to reverse the direction of the current accordingly as the minimum or maximum limit is attained.

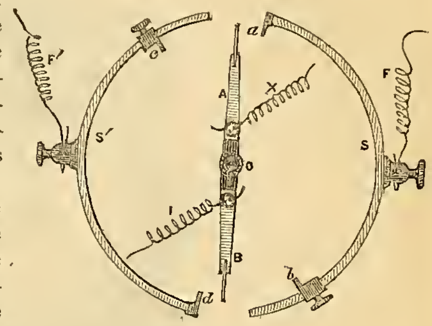
Fig. 1 of the diagrams represents four vertical metallic contact pieces, *a b c d*, *e f g h*, *i j k l*, and *m n o p*, insulated from each other, and arranged in such a manner that the horizontal projections, *a b* and *i j*, *f e* and *o p*, *c d* and *m n*, *g h* and *l k*, are all in the same horizontal line with each other, and that the distance, *b c*, be equal to *f g*. Upon the moveable rod or indicator is fixed an insulator, fitted with two metallic contact pieces, disposed at a distance apart equal to *b c* and *f g*, and which play between the projections of the four metallic contact pieces above referred to, by the rising or falling of the indicator rod. The piece, *a b c d*, is in communication with one of the poles of a battery—the positive pole, for example; the piece, *e f g h*, with the negative pole; and each of the two other pieces, with one of the ends of the wire coil of an electro-magnet, which we will presently refer to. The result is, that when the rod of the indicator attains the maximum point determined upon, the two insulated metallic contacts which it carries bring into electrical communication—the one, the points *a b* and *i j*; the other, the points *e f*, and *o p*.

Fig. 1.



The circuit is thus closed, and the current passes from *a b c d* to *i j k l*, and follows the wire, F, to return by the wire, F¹, and by the pieces, *m n o p*, and *e f g h*. When, on the other hand, the indicator rod reaches the minimum level, one of the contact pieces will connect the points *c d*, and *m n*, and the other, the points *g h*, and *l k*; the circuit is thus again established, but the current, passing from *a b c d*, to *m n o p*, will then follow the wire, F¹, to return by the wire, F—that is to say, in a direction contrary to its former course. In order to vary the relative values of the maximum and minimum limits, it is obvious that it is simply requisite to regulate or adjust the distance between the metallic points, between which play the insulated contact pieces carried by the indicator rod. And in order to vary the absolute value of the limits, it suffices to change the position of the adjustable slide, which carries the two contact pieces upon the indicator rod. For a circular or dial indicator, a similar but slightly modified arrangement is adopted. Let O (fig. 2) be the axis of the indicator. This axis carries two separate pointers, A and B, disposed in a line with, but entirely insulated from, each other. One is in communication with the positive pole of a battery, and the other with the negative pole. S S¹ are two fixed metallic semicircles, which are also insulated from each other, and carry the metallic projections, *a b c d*, arranged in such a manner that *a* and *d* are in one radius of the circle, and *c* and *b* in another radius. Each of these two semicircles is in communication with one of the extremities of the wire coil of the electro-magnet before mentioned. When a fixed minimum pressure or level is shown by the indicator, the needle, A, will come in contact with the projection, *a*, and the needle, B, with the projection, *d*, the electric circuit is thereby established, and the current passes by the needle, A, to the wire, F, and returns by the wire, F¹, and the needle, B. When, on the the other hand, the maximum limit is attained, the needle, A, comes in contact with the projection, *c*, and the needle, B, with the projection, *b*, and the current passes by the needle, A, to the wire, F¹, and returns by the wire, F, and needle, B—that is to say, its direction is reversed.

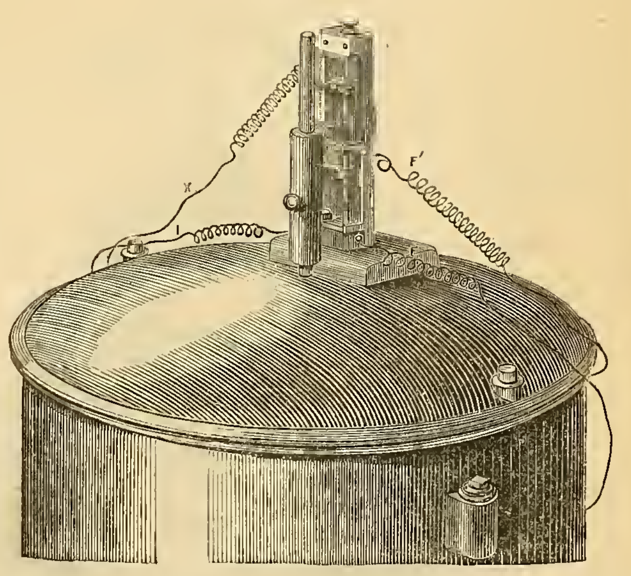
Fig. 2.



The relative values of the maximum and minimum limits are varied by changing the positions of the projections, *c* and *b*, which should always be on the same radius; the absolute value of the limits is varied, by causing the insulator which carries the two metal semicircles to be turned more or less on the axis, O.

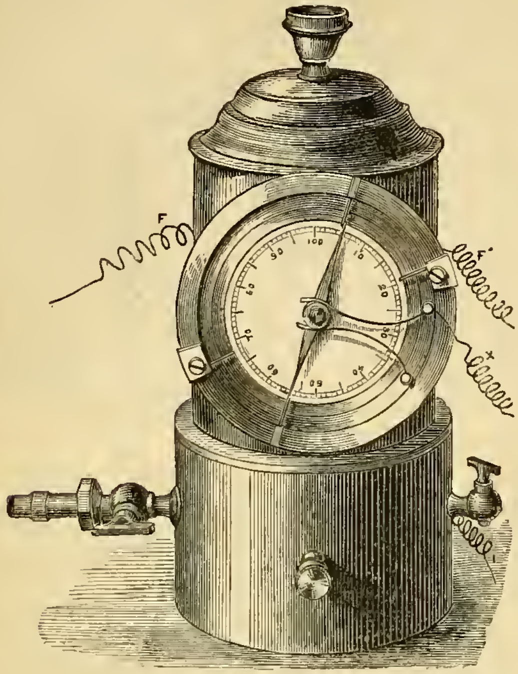
Fig. 3 represents a vertical bell indicator, and fig. 4 a dial indicator, each being fitted with a suitable commentator. The wires, F and F¹, which proceed either from the vertical commutator (fig. 3), or from the circular commutator (fig. 4), are each connected, as before described, to one of the ends of the coil of an electro-magnet, E (shown at fig. 5), above which is suspended vertically a magnetic needle, A, the ends of its axis being pointed, and working in conical bearings of agate or other hard substance, so as to admit of perfect freedom of motion. When the

Fig. 3.



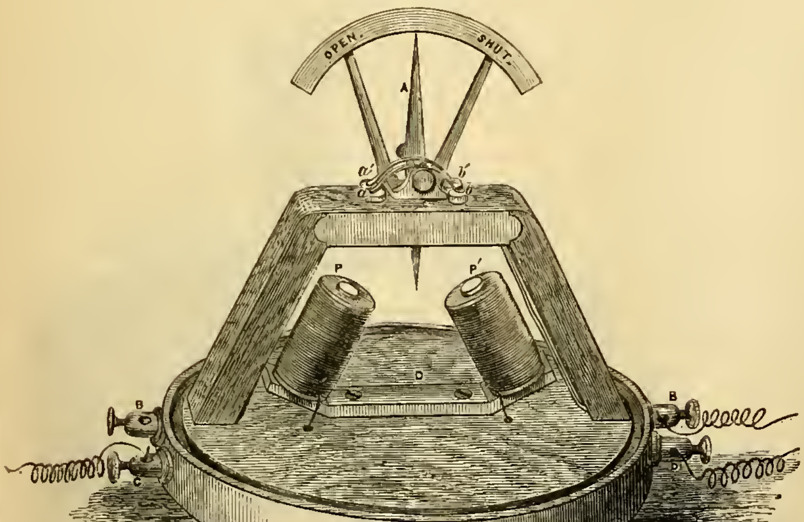
current passes in one direction, determined by the commutator, the pole, P, of the electro-magnet becomes the north pole, and the pole, P¹, the south pole; on the reversal of the current, P becomes the south pole,

Fig. 4.



and P' the north pole, so that the needle will be deflected either to the left or to the right, according to the direction of the current; or, in other words, accordingly as the maximum or minimum limit is attained by the indicator. Over and above these signals given by the needle, this same needle, in its turn, carries two small bells of different tones, to be sounded according to the direction in which it may be deflected. For

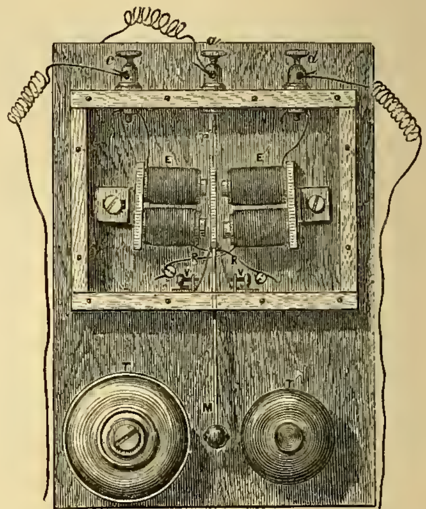
Fig. 5.



this purpose, the axis of the needle carries two platinum wires, $a\ b$ and $a'\ b^1$, so that when it is deflected to the left, the extremities, $a\ a^1$, of the wires dip each into a separate cup containing mercury; when deflected to the right, the extremities, $b\ b^1$, of the wires dip into two other cups suitably placed, and corresponding to the first ones. The cups, which correspond to the ends, a and b, are both connected with the binding screw, B, but each of the cups corresponding to the ends, a^1 and b^1, are insulated, and communicate, the one with the binding screw, C, and the other with the screw, D. The screws, B, are connected with one of the poles of a battery, the other pole of which is connected with the binding screw, a (see fig. 6). The binding screw, C (fig. 5), is connected with the screw, c (fig. 6), and the screw, D (fig. 5), is connected with the screw, d (fig. 6).

It is obvious, as will be seen on referring to the delineation of the two bells, fig. 6, that when the magnetic needle is deflected to the left, the bell, T, will be struck repeatedly, whilst, if the needle be deflected to the right, the bell, T¹, will be sounded. The hammer, M, of the bells is suspended from the binding screw, a, by means of a small flexible spring, r, and the portion comprised between the two electro-magnets, E E¹, consists of a bar of soft iron, which carries at its lower extremity, two springs, R and R¹. These springs bear against two screws, V and V¹, the object of which is to regulate the tension of the springs, and at the same time, form electric contacts. The screw, V¹, communicates with one of the ends of the magnetic coil, E, the other end of which is connected to the binding screw, C. The regulating screw, V, communicates with one of the ends of the coil, E¹, the other end of which is connected to the binding screw, d. It follows, from this arrangement, that when the magnetic needle is deflected to the left, and closes the circuit through the electro-magnet, E, the hammer, M, strikes the bell, T; but then the spring, R, becomes disconnected from the screw, V¹, and the current which passed through R¹ and V¹, is interrupted, the hammer resumes its vertical position, and the current being again established, the hammer again strikes the bell, T, without touching the bell, T¹. When the needle is deflected to the right, the current passes through the electro-magnet, E¹, by the spring, R; whereupon the smaller bell, T¹, is struck a succession of sharp blows by the hammer, M, whilst the larger bell, T, remains silent. As regards the applications of this invention, it may be remarked generally, that it may be applied in all cases where a maximum or minimum limit, indicated by the vertical or circular play or movement of an indicator, requires to be signalled at a distance, and in cases where it is advantageous to know, not only that one of the two limits has been attained, *but which of the two.* By this invention a distinct and double signal is given; that is to say, a different sign and a different sound for each limit, which has never hitherto been accomplished, so far as we can learn. This result, moreover, is obtained by the aid of one electric wire only, which connects the two extreme stations, as, of course, in practice, one of the wires, F and F¹, will be replaced by the earth.

Fig. 6.



We may here point out a few of the most important uses to which this apparatus may be most advantageously applied, and amongst the first of these we may refer to gas and water-works, where it is important that a certain determined pressure, of the lowest possible amount capable of fulfilling the requirements of the service, be maintained; so that all losses arising from leakage and excess of consumption in the public service, and in contracts by the hour, may be avoided. In these undertakings the loss is generally very considerable, and is greatly augmented by excess of pressure. In order to attain a minimum loss in the distribution of gas, it will suffice to connect with the gasometer, a pressure indicator, furnished with the commutator above described; and to adjust the commutator to certain limits, beyond which it is not intended to exceed, the minimum limit being the reduced pressure at which the light will begin to be perceptibly impaired, and the maximum ranging close to the minimum; the magnetic needle and the bell being placed at that part of the works which supplies the gasometer, where instant notice will be given when it is necessary to augment or diminish the passage of gas thereto.

As regards water works, the prevention of escape or leakage becomes still more important, for over and above the loss of the water itself, these leakages occasion a subsidence or settling of the soil, and, consequently, a disrupture of the junctions of the mains, and sometimes of the bricks of conduits. The following is the mode of applying this apparatus in connection with water works. Suppose a small reservoir, similar to a stand pipe, to be connected with the principal main, upon which it is desirable to maintain a determined pressure. This reservoir will be furnished with a permanently adjusted orifice, in such a manner that the level of the water will remain unchanged in the reservoir at a given pressure. Should the pressure become reduced, the level will descend; if augmented, it will rise. Now, supposing a float to be placed in this reservoir, it will rise or fall according to the variations of pressure in the main. In this application, the indicator would have a vertical movement, as first described by us, and to which the commutator is adapted, which through the indications transmitted by it to any convenient locality, enables the pressure in the main to be kept at a fixed and determined point. Nothing further is then required but the selection of the most suitable part of the main to which to connect the indicator, so that the lowest possible pressure may be exerted, compatible with efficient service.

This apparatus may also be applied to coke ovens. It is well known that the entire amount of gas produced in coke ovens can only be collected by maintaining the pressure on the apparatus as nearly as possible at zero. The following is the mode of operating. Connect the pressure indicator furnished with the commutator adjusted between $-\frac{1}{2}$ line and $+\frac{1}{2}$ line, to the outlet pipe of the ovens. The magnetic needle, the deflections of which are determined by the play of the indicator, is placed inside the building containing the engine which works the exhauster. The engineer will thus be instantly informed of any change of pressure, and can then regulate the speed of the engine accordingly. The magnetic needle itself, however, may be made, by the same arrangement which enables it to ring an electric bell, to regulate the steam valve. Thus, suppose a small gas regulator in the form of a bell, which, by its rising and falling, opens and closes the steam valve by means of an arrangement of levers. The entrance to the regulator is connected with a pipe from the works, and the exit with another pipe, within which the pressure is less than the first one. The inlet and outlet orifices of the regulator are so adjusted, that, at a given speed of the engine, as much gas will be expelled from the bell as entered it. Moreover, at the inlet and outlet orifices, is a small valve, actuated by electro-magnets—one of these magnets acting for one direction of the needle, and the other for the contrary direction. By this means, if the pressure in the ovens exceed zero, the magnetic needle will be deflected to one side, and will open, by the aid of the magnet brought into action, the inlet valve of the regulator. The gas will then enter therein in large quantities, and the bell will be elevated, the steam valve of the engine will be more and more opened, and the speed of the engine will, consequently, be increased. If, on the contrary, the pressure in the ovens falls below zero, the outlet valve of the regulator will be opened, and the steam valve will be gradually closed by the descent of the regulator bell.

Finally, in some cases, it may be desirable to maintain the level of the water or other fluids contained within a reservoir or vessel, between two fixed limits, as, for example, the water in gasometer wells, in all which cases, the apparatus above described may be applied with very great advantage, and with perfect certainty of action, so long as the electric contact surfaces are kept clean and free from corrosion.

MANUFACTURE OF HORN, HOOF, AND TORTOISE-SHELL ARTICLES FROM RASPINGS, SAW-DUST, AND WASTE.

Horn, as a raw material, is possessed of many qualities which would render it well fitted for working up in the better kinds of furniture and cabinet work, were it not that it is limited in size to such comparatively small plates as the natural animal growth, when opened out flat, will produce. It is hard, and very durable, whilst it works easily and is of great cohesive strength; being capable of withstanding a tensile strain of from 12,000 to 16,000 pounds per square inch, before giving way. It is also capable of receiving a very high and fine polish without the aid of paste, varnish, or other foreign matter. Now, if, with all these qualifications, we could obtain horn in plates or masses of superior size, we should at once bring the material into wide use for a multitude of purposes, to which, at present, it cannot be applied, by reason of its irregular shape and diminutive size. Such a result appears to have first been satisfactorily obtained by Mr. James Macpherson, the comb manufacturer, of Aberdeen. This gentleman has very ingeniously discovered, that by the simplest possible process, he can solidify the raspings, saw-dust, and other waste of horns, hoofs, and tortoise-shell, so as to produce large plates, sheets, and blocks of fine solid horn. He has also found, that by a generally similar course of procedure, he can solidify, cement, or join portions of his raw materials, so as to secure, not only an increase in dimensions, but also a variety and increased beauty of effect, as regards colour and fibre—as when two kinds of horn, or horn and shell are joined together, or when differently coloured portions are cemented into one mass.

In preparing a slab or a moulded article from the waste material, Mr. Macpherson proceeds by primarily placing a quantity of the disintegrated material, well cleansed and freed from grease and foreign matters, in a pressing cloth. The mass so bound up, is then soaked in water, which may either be boiling or have been previously boiled, so as to expel the air, which would otherwise interfere, to some extent, with the cohesion of the particles: water, in which is dissolved about one ounce of lime and one and a-half ounces of potash to each three gallons, is the best suited for this fluid treatment. The moistening so given to the horn, begins the process of decomposition, thereby cleansing the surfaces and rendering them properly fitted for uniting. The moistened and partially softened mass is then enclosed in a preparatory mould, heated up to nearly the temperature ordinarily used in pressing and moulding articles of horn, or about 300° Fahrenheit. Pressure is then applied to the mould, so as to expel all the superfluous moisture, and bring the material into a block or slab of nearly the size and shape of the article wanted. After being allowed to remain in the mould for a few minutes, to give the mass firmness and consistency, it is withdrawn, and subsequently placed in the finishing mould, which is, of course, of the exact size and shape of the article to be made. In this stage of the operation, the greatest care must be taken to secure a fine regular heat, just as if the article were to be pressed and moulded in solid horn, as at present practised. The mould surface must be free from oleaginous matter; but to prevent adhesion, it may be very lightly touched with fine grease. In this moulding operation, the block may be inlaid with metal or pearl for ornamental work. The smaller and finer the waste dust used, the finer will be the work; so that it is advisable to preserve the finest and purest material for the surfaces, whilst the coarser portions are kept in the centre. Much of the excellence of the work produced, will, of course, depend upon the moulds and the pressure used in working them—as a pressure of from 3000 to 4000 pounds per square inch is necessary for securing the due solidification of the particles.

From 60 pounds of horn saw-dust or shavings, a fine slab of an area of 12 square feet, and three-fourths of an inch in thickness, suitable for the top of a table, can be produced—of course, such a slab may be of any form and of a variable thickness, just as the exigencies of the design may demand. The moulded surfaces are perfectly smooth, directly from the mould; but the polishing is an after process, although the dyeing or artificial colouring, when that is required, can be performed simultaneously with the actual moulding—the raw materials themselves being dyed or stained prior to the pressure being applied.

The same general principle applies also to the cementing or junction of distinct pieces of horn, hoof, or tortoise-shell. In this process, the pieces are neatly fitted together, and then moistened, the parts being covered over with paper to confine the water and steam, and prevent the atmosphere from acting upon the surfaces at the instant of cementation. A pair of tongs, suitable for grasping the scarfed portions, are then heated to the proper moulding temperature, and the parts grasped therewith are then placed in a vice, with sufficient squeezing force upon them to cause the work to extend under the tongs. The work is then left until it is cold, when a perfect joint is produced, the whole mass being homogeneous.

The simplicity of the entire process is a great feature in its favour, and as the moulded material presents all the appearance of real solid horn, with many artificial beauties which that material does not possess, it is reasonable to suppose that the invention will work a considerable change in the horn and collateral manufactures. One pound weight of natural horn, contains about 22 cubic inches of material, and the solidified horn is of about the same density, although from its appearance, and we have several samples of the work before us, the artificial substance seems even more dense. It never becomes fluid during the treatment which it receives, and in all the operations of bringing up and polishing the surface, it is subject to all the conditions and laws affecting the natural material from which it is made, when in its original form; the only difference is, that the new material is fibreless, there being no grain in it, so that it is equally strong in all directions.

Mr. Macpherson has submitted seven of his early samples to us. One of these consists of two pieces of horn cemented together, the two being chosen of very dissimilar colours, and set with their natural grains crossing each other, so as to exhibit the accuracy and beauty of the junction very clearly. Another is composed of two pieces of hoof, similarly cemented. These pieces present an excellent effect, more like tortoise-shell than ordinary horn. A third specimen shows what can be obtained by dyeing the dust black prior to the first moulding, and then inlaying the surface with silver in the after moulding process. The other samples show the plain moulded saw-dust prior to polishing—a slab of moulded shavings dyed in the first process—a slab of solidified horn dust as taken off by the grind-stones in reducing horn combs—and a highly polished slab of solidified dust. The material seems well suited for ornamental panels, work boxes, dressing-cases, door knobs, and other articles not easily made out of natural horn.

As to the labour cost of producing articles from the artificial material, it is to be remembered that in treating ordinary horn or hoof, it must be all dressed clean with a knife before it can be put into a mould, and there is always a loss of material of from 25 to 50 per cent. of the whole. This work is done by a skilled mechanic, and occupies a large amount of time. On the other hand, the waste material can be weighed out to the exact quantity for the article to be made, and no loss arises; and when artificial colouring is necessary, the waste can be all dyed through by simple immersion in the boiling dye for a few minutes, whilst solid horn takes some hours to dye, and is then only stained on the surface. The solid tops of horn, when good, sell for £30 a ton; the waste can be had for £6 or £8 a ton, and a greater relative quantity can be turned to useful account from the waste than from solid horn. The process thus affords a means of economically working up what is otherwise a cheap waste material, of which many hundred tons are annually produced in this country.

HISTORY OF THE SEWING MACHINE.

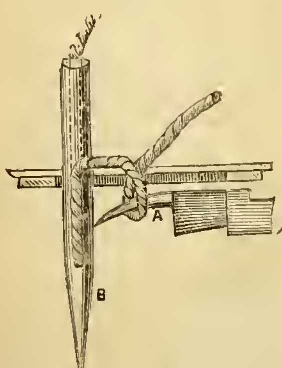
ARTICLE XV.

In producing the stitch (fig. 106), by Mr. Jennings' machine, the needle first descends through the cloth, carrying the thread with it, which thread is next to be extended into a loop. This is effected by the advance of a finger, which, by taking up the thread on its point, pre-

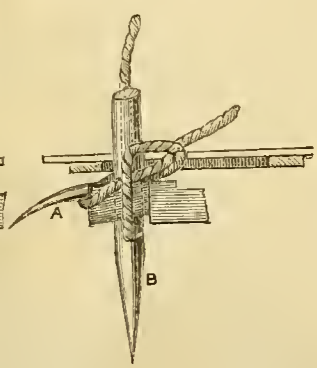
Fig. 106.

vents it from being drawn back on the ascent of the needle. The *modus operandi* will be better understood on referring to the annexed diagrams, Nos. 1, 2, 3, 4, and 5, which show the operation in its various stages. No. 1 shows the loop as formed on the finger, A, and the needle, B,

No. 1.

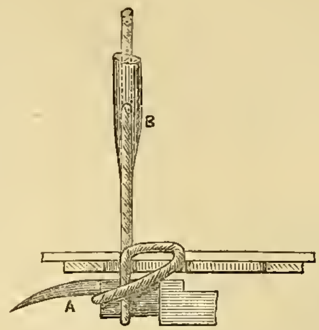


No. 2.

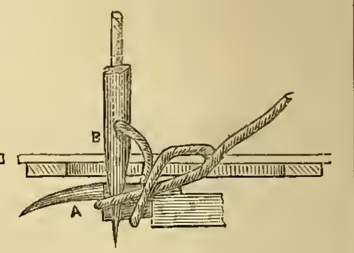


depressed to form a second loop; the needle then rises slightly to slacken the thread and expand or open the loop sufficiently to admit the point of the finger, which now advances to the position, No. 2, where it is represented as having thrust the first formed loop through the second loop, which is being made by the ascent of the needle. When the needle has risen clear of the work, as in No. 3, it will have left a loop round the shoulder of the finger, at which moment the fabric advances, the thread having been slackened off to facilitate this operation. The needle then descends again, as in No. 4, to make another stitch, and the finger being still advanced (and held under the needle by suitable means), the needle will now pass through the loop on the shoulder of the finger, and as it continues to descend, the finger will be drawn back; the loop thus caught by the needle will be drawn off the point of the finger, and the loop formed on the shoulder of the finger will be drawn forwards on to the point, as shown at No. 5. The continued descent of the needle will carry the thread through the loop round the needle point, and when the thread is slackened by the partial rising of the needle, the finger, in its advance, will carry the loop on its point through the loop formed by the slackened needle thread, and by a repetition of these movements, the row of stitches shown at fig. 106, will be produced; and, we should say, at a very considerable expenditure of thread. The same objection,

No. 3.



No. 4.



though to a less extent, applies to the other stitch, fig. 107. To produce this stitch, it is merely requisite to change the cam previously used for working the finger, for another one capable of giving the motions required to suit the change of stitch. The movements of the needle and finger are the same as for the stitch, fig. 106, up to the fifth and sixth movements, or diagrams Nos. 5 and 6, and need not, therefore, be repeated here. As the fifth and sixth movements are, however, peculiar to this stitch, we give a separate diagram of them, at Nos. 5*a* and 6*a*. Referring to the above description of the movement, No. 5, instead of the finger waiting for the descent of the needle to pass the thread through the cast-off loop, the finger advances, as shown by the diagram, No. 5*a*, and tightens the loop which the needle has received on its stem. The finger then recedes, and drops the loop which it held, which loop is drawn up by the descent of the needle, as shown at No. 6*a*. The cam then drives the finger forward to catch another loop,

No. 5.

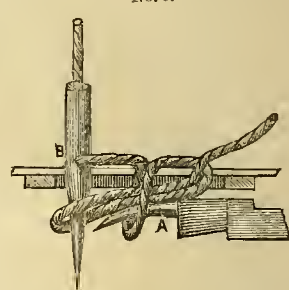
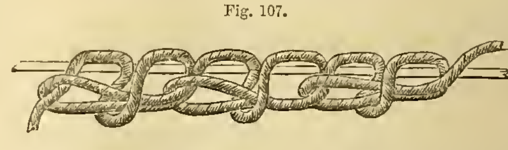


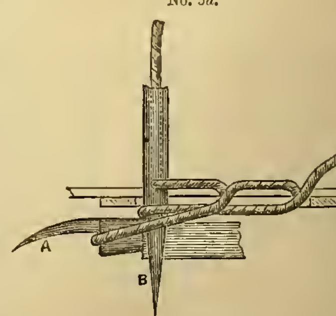
Fig. 107.



and the movements described above, and illustrated by the diagrams, Nos. 1, 2, 3, and 4, are then repeated.

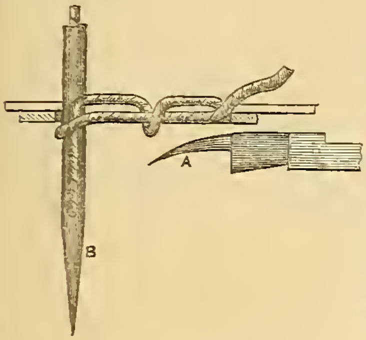
A patent was granted to Julian Bernard, Esq., on the 6th of December, 1853, for "Improvements in machinery or apparatus for stitching or uniting and ornamenting various materials." One of the chief features of novelty in this invention, is the use of a rotatory arm or bracket, working round a fixed centre on the bed-plate, for carrying the needle and part of the mechanism which actuates it, whereby the arm and needle may be brought to different positions over the surface of the bed-plate, so as to operate in combination with other subordinate combinations of mechanism beneath, and, consequently, afford facility for producing, in one machine, two, three, or more varieties of stitching, according to the different arrangements of mechanism beneath the bed-plate. Or, in lieu of this rotatory arm, a revolving table or bed-plate may be used. Fig. 108 represents, in section, a portion of a sewing machine bed-plate, fitted with a rotatory bracket or arm, and showing the needle actuating mechanism. A is the fixed bed-plate or table, having a boss, B, formed in the

No. 5*a*.



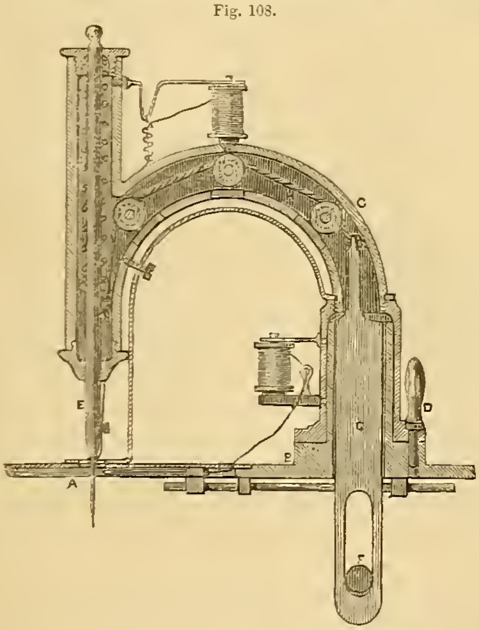
centre thereof, upon which is fitted, to revolve freely but steadily, the hollow curved arm or bracket, C. A stop pin, D, passed through a flange on the base of the bracket, serves to fix the same at any desired position over the table, by dropping into a hole or notch suitably disposed in the expanded portion of the boss.

No. 6a.



The front portion of the arm, C, which receives the needle slide or rod, E, consists of a hollow cylinder having a cap screwed into the upper and lower extremities. These caps are perforated, to allow of the passage therethrough of the needle slide, which may consist of a round spindle with a key-way to prevent it from turning. Within the cylinder is a helical spring, which surrounds the needle slide, and bears, at its lower end, upon a shoulder or collar fitted or formed thereon, and at its upper end, against the upper screwed cap above referred to. The tendency of the spring will, consequently, be to force the needle slide downwards, and pass the needle through the fabric. The elevation of the slide and needle is effected by a suitable cam on the driving shaft,

Fig. 108.



F, which shaft and cam are placed immediately beneath the boss round which the arm rotates. We have not shown this cam in our illustration, as our readers will readily follow us in the description without it. G is a bar which is slotted at its lower end to embrace the driving shaft by which it is guided, and is connected at its upper extremity to a cord, gut, or chain, H, attached to the needle slide, and passing over guide pulleys in the interior of the arm. A stud or antifriction roller on the side of the bar, G, at its lower end, is acted upon by the cam before mentioned, and, consequently, every time the bar, G, is depressed, the cord, H, will be pulled downwards, and the needle slide elevated. So soon, however, as the cam releases the stud or roller on the bar, G, the helical spring comes into operation and forces the needle down again into the fabric, which, in the meantime, has been fed forward for another stitch. The needle is thus actuated by the combined effects of the cam and helical spring. By placing the needle cam and main shaft, immediately beneath the working centre of the arm or bracket, the latter may be turned so as to bring the needle over any desired portion of the table or bed-plate, without in the least interfering with the action of the needle cam upon the bar, G. A machine may thus be constructed, capable of performing a variety of stitching, as each subordinate combination of mechanism beneath the table may be specially arranged, according to the particular form of stitch required—one needle slide and needle actuating mechanism co-operating successively with the subordinate combinations beneath. There are numerous other ingenuities in Mr. Bernard's invention which we would fain dwell upon, but to do so would encroach more upon our space than we can afford. We must, therefore, content ourselves with a few culled sweets, leaving the more substantial morsels to be gathered by our readers from the printed specification itself, which, we may just remark, is rather terrifying at first sight, consisting as it does of 29 pages of letter-press, and 6 elaborate sheets of drawings

One striking feature of novelty in Mr. Bernard's invention is the production of a *three thread* stitch, diagrams of which we give at figs. 109 and 110. A very pleasing ornamenting effect may be produced by using three threads of different colours. Mr. Bernard describes two modes of uniting and actuating these threads, which we need not enter into here. Fig. 111 represents a front elevation of the revolving arm, shown in section at fig. 108. This latter figure shows the bed-plate and feed motion in connection therewith, the sewing mechanism beneath the table being omitted to avoid unnecessary confusion. The material is fed or traversed under the needle, by being laid upon and pressed against an endless band, W, of leather, or other suitable material, which is passed over the two tension pulleys, X X^1, carried in brackets attached to the under side of the table. This band passes through slots in the table and traverses for some distance along its upper surface, as shown. It is tightened by an adjusting screw, which causes the bearing, Z, of the pulley, X^1, to slide to and fro in its slotted bracket. Z^1, Z^{11} are guide pulleys or rollers, for directing the course of the material and for keeping it in a continual state of tension, so as to effectually prevent all chance of its puckering beneath the needle. These guide rollers are respectively fitted into the lower forked ends of the rods, Z^3, which are kept pressed down by helical springs, inside the cylindrical guides, Z^4, connected to each side of the cylindrical casing above referred to, which contains the needle slide. Suitable catches at Z^5, serve to maintain the rods and their rollers at any desired elevation. The feed motion is derived from a lever worked by a tappet on the main shaft, and giving motion to a peculiar friction arrangement placed inside the pulley, X^1, which imparts an intermittant or step by step motion thereto. This friction feed motion

Fig. 109.

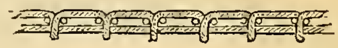
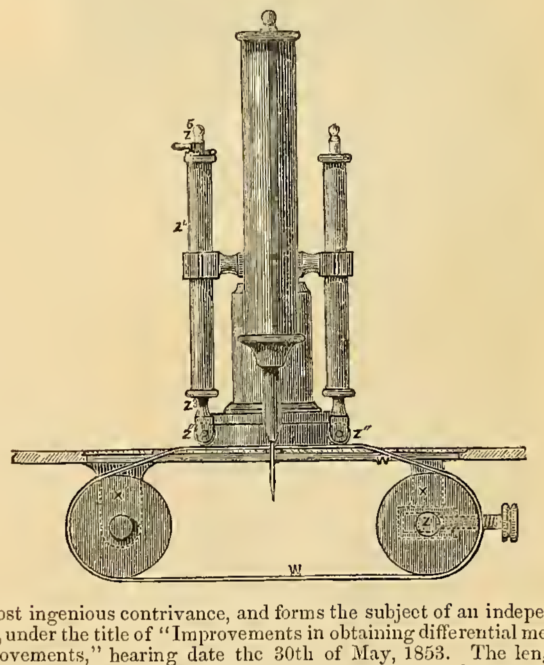


Fig. 110.

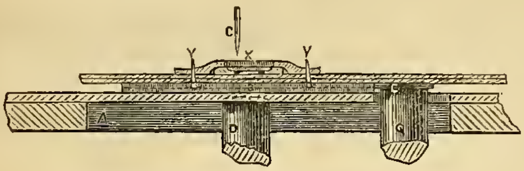
Fig. 111.



is a most ingenious contrivance, and forms the subject of an independent patent, under the title of "Improvements in obtaining differential mechanical movements," bearing date the 30th of May, 1853. The length of the stitch is adjusted by means of a notched eccentric, in lieu of the ordinary thumb-screw. The action of this notched eccentric is to bring the end of the feed lever nearer to, or further from, the tappet on the main shaft, so as to regulate the amount of movement at each stroke of such tappet, and, if required, to bring the end of the lever entirely out of the range of the tappet, and so stop the feed. An indicator and dial, placed outside the machine, are also referred to in the specification, for the purpose of showing the exact length of stitch produced during the operation of the machine.

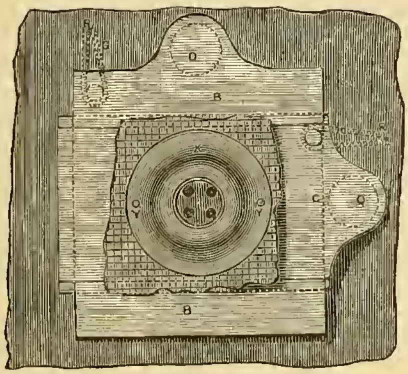
Another important feature of novelty in Mr. Bernard's invention, is the sewing or attaching of buttons, or other similar fastenings, on to materials in a sewing machine, by bringing the holes of those parts of the button or fastening, through which the needle is to be passed or inserted, successively beneath the point of such needle, by suitable mechanism; and also the securing of buttons, or other similar fastenings, to materials, by a thread passed in a double or looped form through the button, and afterwards securing such thread by looping, whether alone with itself or in combination with one or more other threads. Fig. 112 re-

Fig. 112.



presents a vertical section of a portion of a sewing machine, arranged for the attachment of buttons, or other fastenings of a like nature, to materials; and fig. 113 is a corresponding sectional plan of the same. B and C are two compound sliding plates, the one working in the other. To the plate, B, is secured the vertical stud, D, which is fitted at its lower

Fig. 113.



extremity with a short pin, kept pressed against the periphery of a suitable cam, by an India-rubber or other spring—it is thus obvious that the rotation of the cam will impart a to and fro sliding motion to the plate, B. The shaft which carries this cam, actuates, by means of mitre wheels, a second horizontal shaft at right angles to the first, which is fitted with another cam, whose periphery gives motion to the second slide, C, through a pin in the side of the vertical stud, Q, secured to the plate, C. A spring, R, also serves to keep this plate under the influence of its cam. The slide or plate, C, works in a groove in the slide, B, and the material to which the button, or other similar fastening, is to be attached, is laid upon the surface of the two plates, B and C. The button is then placed upon the material, in a proper position beneath the needle of the machine, and is held down, so as to be retained in proper position, by means of a disc or plate, X. This disc has a circular aperture formed in its centre, sufficiently large to enclose the space occupied by the holes in the button; it is placed over the button and material, and is held in its proper position by the two sharp-pointed pins, Y, fixed in the plate, C, and projecting up through the material, as shown in fig. 112. The needle, G, of the machine being elevated, the plate, B, with the button and material, is pushed forward by the cam for that purpose, a distance corresponding to the distance between the adjacent holes in the button, and the needle then descends again through the hole brought beneath it. On the second rising of the needle, the plate, C, is slid to one side by the spring, R, thereby bringing a third hole beneath the needle. On the third ascent of the needle, the plate, B, is drawn back by the caoutchouc spring, so as to bring the fourth hole of the button under the needle point, which completes the movement of the machine.

Mr. Bernard describes, also, a machine for stitching the edges of button holes, the first of the kind which we have encountered in our researches at the patent office. In this machine a double pointed needle is used, with an eye near the centre, to which needle an up and down movement is imparted, passing it in its ascent through the material or edge of the button hole, and descending again through the slit of the hole, or outside the edge of the material—a lateral motion being imparted to the latter for that purpose. The needle thread is brought over its point in the form of a loop at each ascending movement, by means of two fingers, so that the stitch produced by this machine will be similar to the ordinary button-hole stitch produced by the hand. The needle is actuated by two slotted rods or holders, the one working below the fabric, and the other above; so that they each receive the needle in turn and are made to grip it firmly for the time, by means of sliding collars and spring levers.

Amongst other contrivances described by Mr. Bernard, we may mention the application of clutches or friction discs and straps to sewing machines, for the purpose of throwing in or out of gear, and for regulating or stopping entirely the various moving parts, and the driving or actuating of sewing machines, by means of a weight or spring, with a suitable escapement movement, on the principle of the movement of a clock; so that a machine, once started, will go on sewing by itself until run down! The idea is certainly novel; but, excepting in the case of a lady's drawing room or boudoir sewing machine, we cannot see the advantage to be gained. In the application above mentioned, it would certainly obviate the use of the unsightly treaddle, which all the powers of the ornamental cabinet-makers can make nothing of *but* a treaddle; for however ornamented and scrolled over—there it is, an unmistakable foot lever and connecting rod, which never harmonises with the rest of the furniture.

DIRECT-ACTING STEAM CRANES.

By Mr. R. Morrison, *Ouseburn Engine Works, Newcastle-upon-Tyne.*

(*Illustrated by Plates* 237, 239, 240, *and* 241.)

The series of illustrations of these very simple and effective cranes, which we recommended last month, is now completed, by the addition of the three separate plates, 239, 240, and 241, exemplifying so many other distinct forms, under which the inventor has carried out his ideas. Plate 239, fig. 2, contains a complete side elevation of another quay crane, in which the actuating steam cylinder, A, is horizontal. It is fitted with turning apparatus attached to a foundation plate, and is especially suitable for situations where there is not sufficient depth for the usual vertical post, such as is represented in plate 237. With this exception of the substitution of a horizontal for a vertical cylinder, quite independent of the crane post, and with the wire rope of the piston passed round a bottom guide pulley, the arrangement is the same as in the first example. The dotted lines in the foundation show the position of the long steam cylinder, as placed near the surface of the pavement, in cases where it is unadvisable to have it lower down This arrangement is suitable for warehouses, the rope leading to the different storeys; or the cylinder may stand upright in the warehouse.

Plate 240, fig. 3, is a view of a crane, as used for ship and other purposes, where a length of post, sufficient for the lift, cannot be obtained; or when it is not desirable that the post should go below the deck or surface of the ground The jib, A, is here ingeniously made to form the actuating steam cylinder, being of wrought-iron, bored out throughout its entire length for this purpose. The wire rope emerges at B, through a stuffing-box in the upper end of the jib cylinder, so that the connection between the actuating piston and the load is very direct. The crane post, C, is made hollow at the upper part, for the passage of the steam, whilst it is solid below. The post itself is a fixture, the jib and side frames revolving around it. The handle, D, affords the means of governing the operations of the crane, by means of a valve on the level of the deck, which admits steam through the tube, E, to the upper end of the jib cylinder. As here drawn, this crane has no self-acting turning apparatus, but this can, of course, be fitted to it.

Plate 241, fig. 4, is a view of a ship crane, with the post, A, acting as the steam cylinder. Whenever steam is talked of as an actuating power for such purposes as the present, the question of cost immediately presents itself. This has been satisfactorily settled by practical tests, wherein, taking the water pressure at fifty pounds, and steam at thirty-five pounds per square inch, it has been found that the cost of steam is but fourpence halfpenny per hour, against eight shillings per hour for water. This result is arrived at by taking the cost of water at sevenpence per 1,000 gallons, and coal at fourteen shillings per chaldron, the existing price at Newcastle, and it gives a difference of about twenty to one in favour of steam.

There can be no doubt that a great step has been achieved in these cranes, as regards simplicity, economy, and working effect.

TRACING TRANSFER PROCESS FOR REPRODUCING DRAWINGS.

The happy idea of using a paper, which is both a tracing and transfer medium, in placing drawings upon the stone or zinc, for reproduction and multiplication by the lithographic and zincographic processes, has lately been successfully worked out by Mr. William Smith, an experienced Edinburgh lithographer. According to the practice hitherto pursued, in printing copies of such work, for instance, as railway plans, working specification drawings for tenders, examples of mechanical engineering, Mr. R. MORRISON, OUSEBURN ENGINE WORKS, NEWCASTLE,

PATENTEE.

SCALE, ¼ INCH = 1 FOOT.

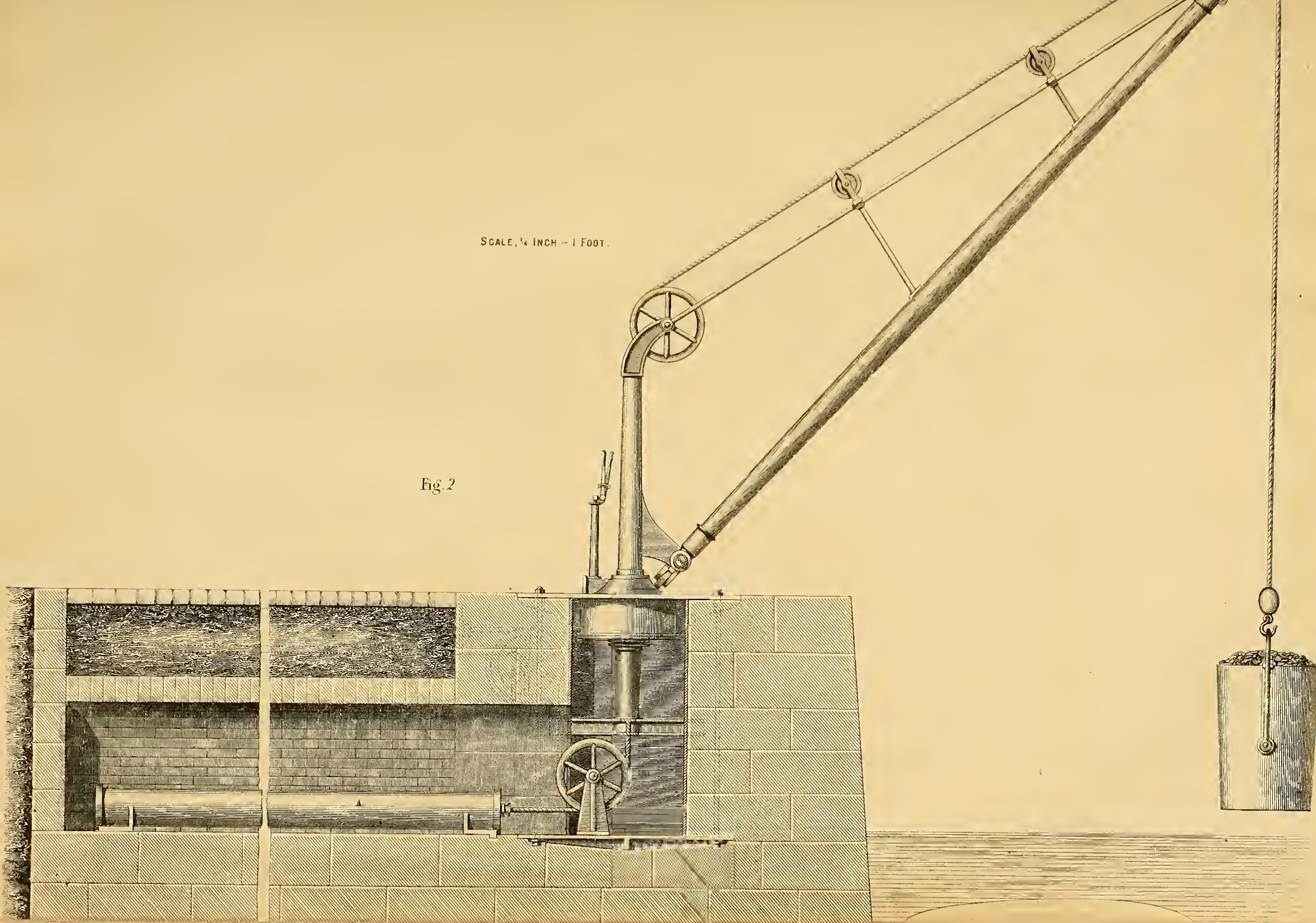


Fig. 2

DIRECT-ACTING STEAM CRANE,

MR R. MORRISON, OUSEBURN ENGINE WORKS, NEWCASTLE,

PATENTEE.

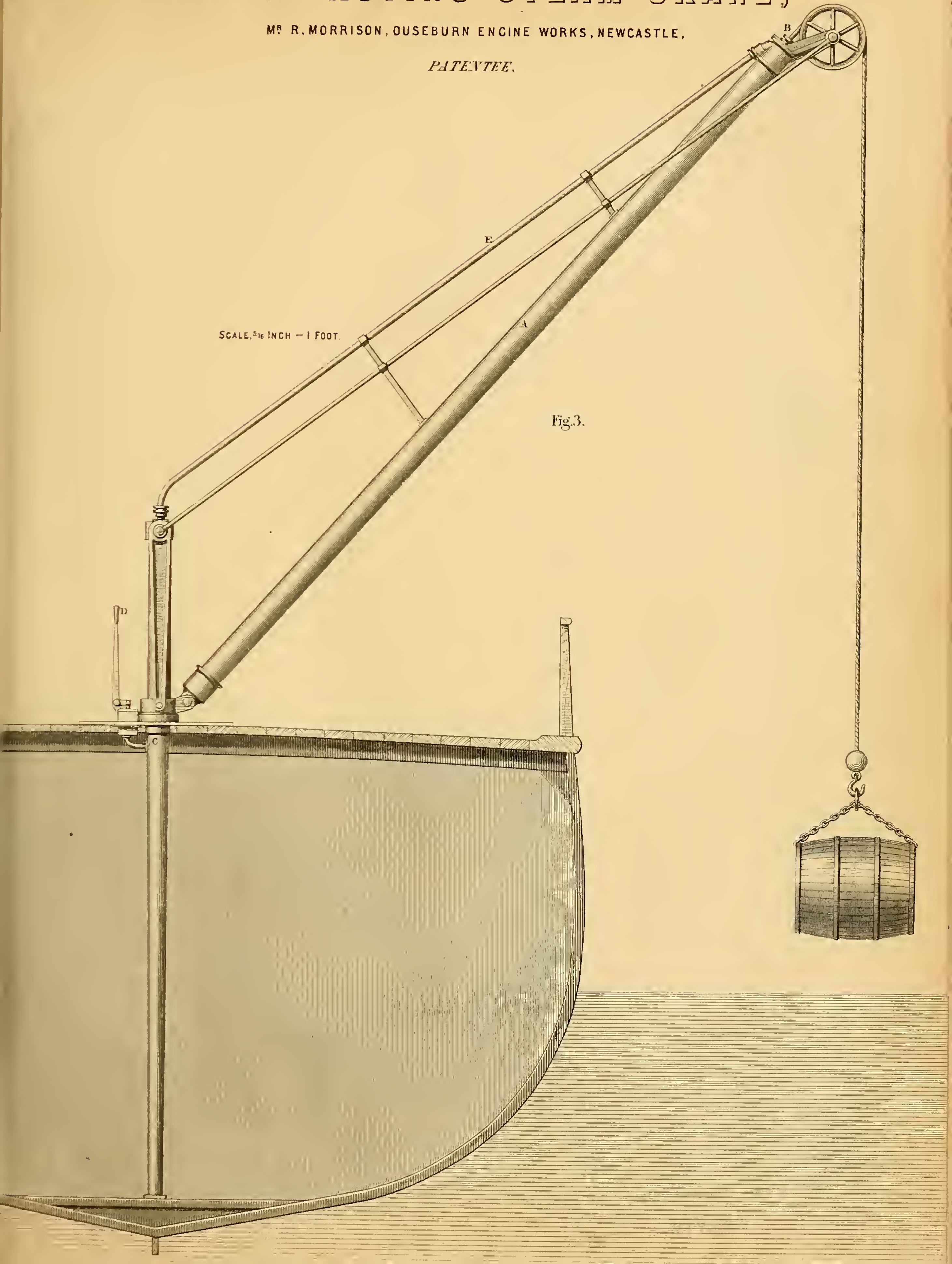
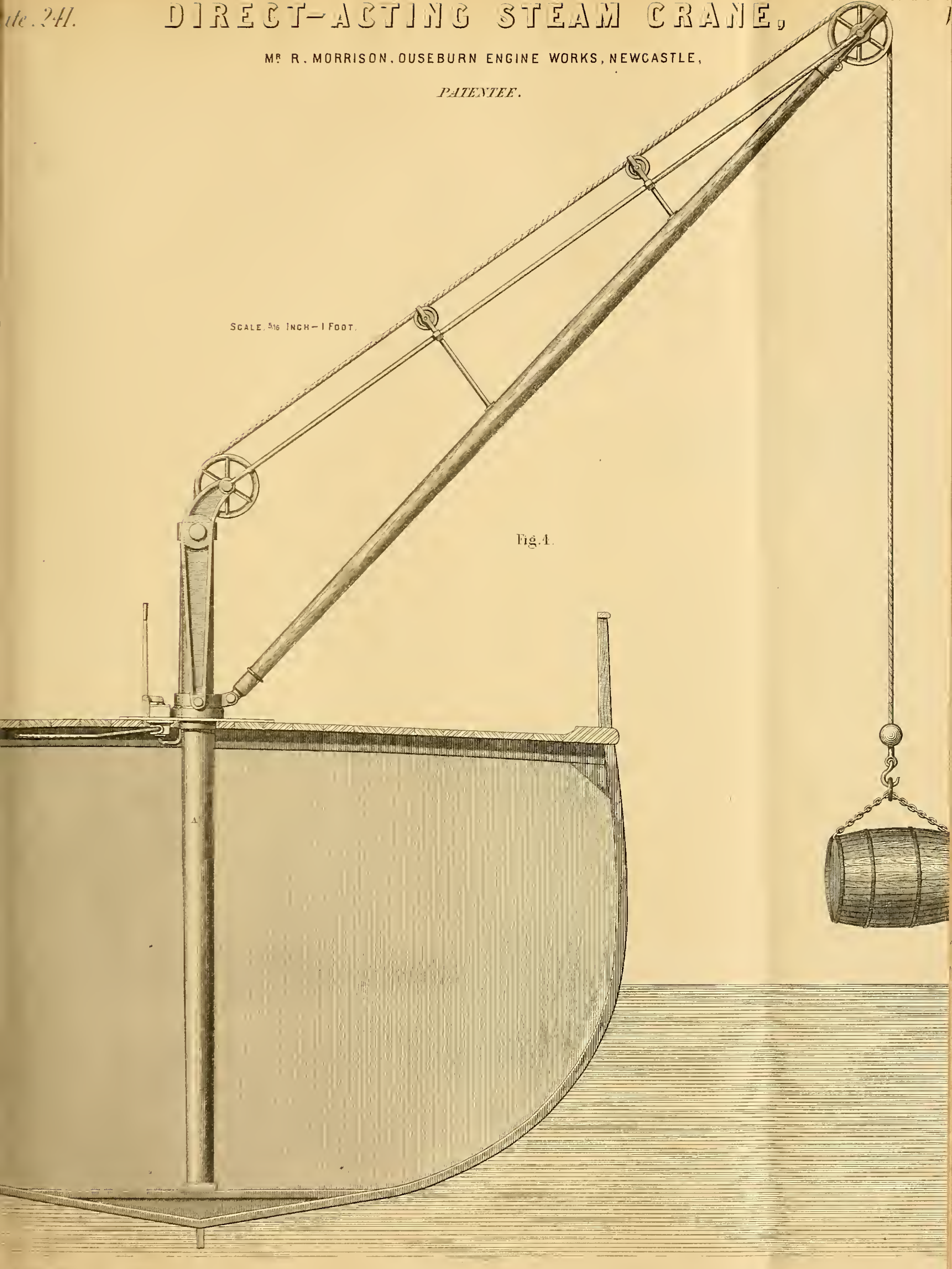


Fig.3.

DIRECT-ACTING STEAM CRANE,

Mr. R. MORRISON, OUSEBURN ENGINE WORKS, NEWCASTLE,

PATENTEE.



and other delineations, the draughtsman takes a tracing from his original sheet, and hands it to the lithographer, who, by another round-about tracing and copying process, at last gets it upon the stone to print from. Mr. Smith, however, goes to work by primarily preparing a sheet of tracing or translucent paper with the usual lithographic transfer medium, being a mixture of gelatine, flake white, and water, with a little gamboge to colour it. The sheet thus prepared, forms what we have termed a composite tracing and transfer paper, as it serves the two purposes of obtaining the original tracing from the design, and transferring the copy thus obtained, to the lithographic surface; and it is indeed used as the lithographer or zincographer's tracing and transfer sheet combined. In proceeding to lithograph a drawing or figure by its means, it is fixed with its prepared face upwards, upon the original drawing or figure to be reproduced by the lithographic process, and as it is more or less transparent or translucent, the operator can easily trace the drawings through it. The drawing is then traced through the prepared sheet with lithographer's transfer ink, and when all such parts as require to be traced are finished, the transfer tracing paper may be removed from the original, and the details completed. The traced delineation is then damped in the usual way, by moistening the back of the sheet, or what is more effectual, by placing it in a damping book, and then transferred to the stone or plate in the ordinary manner. The removal of the sheet from the stone is effected by treating the back of the paper with a copious supply of hot water, until the composition becomes soft, when the sheet will be easily removed, by raising it at one end and slowly drawing it backwards. The water should be constantly applied till all the paper is removed. The tracing in transfer ink is thus left upon the stone or plate, and it is then inked up and prepared, being printed from in the ordinary manner. This system of lithographing or zincographing drawings, allows of the most accurate execution of the work, without in any way injuring the original. Only one tracing, and that the actual transfer one, is required, so that the chances of error are most materially reduced; and lastly, the time occupied in multiplying drawings is by this process very greatly reduced.

This process, simple as it is, must obviously facilitate lithographic reproduction very much, whilst it will enable the lithographic artist to adhere much more closely to his original, than he can hope to do when working the common process. Besides these advantages, the system will manifestly enable the ordinary draughtsman to prepare his own drawings for being printed lithographically, thus still further improving the chances of speed and accuracy of the work. We have already seen some very good examples of engineering drawings reproduced in this way, and although we do not mean to say, that by its means the draughtsman—whose business must ever be that of the draughtsman only—can at all supersede or materially interfere with the artistic lithographic experiment; yet he will plainly be able thus to perform many operations in his own room, for the execution of which he has hitherto been obliged to rely upon the lithographer. The improvement is a sound one, which must obviously make its way, to the advantage both of originators and printing reproducers.

THE SOCIETY OF ARTS EXHIBITION.

The eleventh annual exhibition of inventions, "being a collection of articles recently invented, patented, or registered," was duly opened on the 25th of April. The catalogue, which is profusely illustrated with woodcuts, tells us that this year's collection comprehends 448 articles, arranged under the several heads of "engineering, mining, and railway mechanism; machinery and manufacturing appliances; naval and military appliances; philosophical apparatus; agricultural implements and machinery; building, sanatory, and domestic appliances; miscellanca; and drawings."

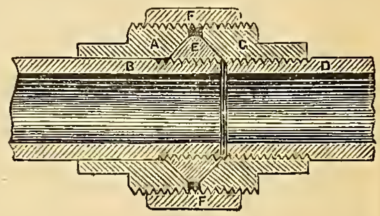
Under the first section, a leading prominence is very properly given to two devices by Mr. Brotherhood, of Chippenham, and Mr. Ashton, of Birkenhead, respectively, for coal burning locomotive boilers. Mr. Brotherhood accomplishes his end by interposing a combustion chamber between the fire bore and the tubes, provision being made for the due mixing of air with the flame and gases. Mr. Ashton uses an iron deflector, hinged over the furnace doorway, so as to deflect the entering air down amongst the gases. When the engine stands, the absence of the blast is compensated for by a steam jet.

Messrs. Garnet, of Wharfside, Otley, Yorkshire, exhibit a felt made entirely of waste woollen refuse from paper mills, which is converted into a coarse pulp in the ordinary rag engine for paper-making. It is put upon the steam boiler in a wet or pulp state, and matted together with a piece of flat wood; when dry, it becomes one solid piece, and is an excellent non-conductor of heat, as upon a boiler working 50 or 60 tons pressure, it is stated that candles may be laid for weeks without melting. It may at any time be taken off and replaced by steeping in hot water until again softened.

Messrs. Price and Dawes, of the Cleveland Works, Wolverhampton, the well-known safe and lock makers, show a model of a boiler, cylindrical in form, with a main longitudinal tube from end to end, having a number of oblique taper tubes placed within the lower half of the circumference of the shell or body of the boiler and the main longitudinal tube, into which they open and convey the hot air from the fires, the whole of it passing direct to the damper flue and chimney, thus dispensing with horizontal return flues. The same inventors have also a boiler safety apparatus, a marine engine governor, and adjustable expansion gear, and a rolling lever. The governor consists of a ring of metal hinged upon a revolving shaft, and placed within the current of steam passing to the engine; being also so arranged that by its centrifugal power, acting in opposition to a spring, the speed regulates the area of the opening and the allowance of steam to the engine. Instead of about 30 points of bearing, as in the ordinary governor and throttle-valve, this governor has but five, three of which only are called into action on opening or closing.

The high and low pressure steam and vacuum gauges of Messrs. Johnson and Varley, of Peterborough, are very good things of their class, but they are so well illustrated in the catalogue, that we need not engrave them here.

A new pipe joint, for connecting pipes instantaneously, without the use of solder, by Mr. Heap, of Ashton-under-Lyne, is a very effective contrivance. The examples show a lead, lead and iron, and iron coupling. Our engraving represents the last form. The iron ring, A, is passed loosely over the end of the pipe, B, and the other ring, C, is screwed fast on the end of the pipe, D. The leaden hoop, E, is then screwed on to the pipe, B, when the whole of the parts are at once connected by screwing on the external iron hoop, F. In joining lead, or lead and iron, the leaden end is bulged out into a curved flange for screwing up by an external screwed hoop.



Mr. Stephen Carey, of Chippenham, shows a useful arrangement of cast-iron channel plates. The surfaces are concaved transversely to three-fourths of an inch, and they have a series of broken fillets running longitudinally upon them, to pin a good foothold to horses, allowing the water to pass between and prevent splashing.

Under the second section, we have the simple Indian "churka," or cotton gin, shown by the Manchester Cotton Supply Association, for the purpose of finding out, by offering premiums of £20, £10, and £5, if British machinists can improve upon the untutored natives' production.

Messrs. P. and C. Garnett, of Cleckheaton, Yorkshire, show a more ambitious machine—a toothed roller cotton gin—very simple, however, and consisting of but three horizontal shafts. The top one is the saw shaft, the second carries a metal roller, with a spiral saw ribbon inserted in it, and the bottom one carries a cylindrical brush. The "churka" costs but four shillings, but it can only clean two pounds of cotton per day. Messrs. Garnett's machine can turn out two hundred pounds per day.

There is only one sewing machine in the exhibition—the "boudoir" machine, by Messrs. Wilson, of Holborn. As its title indicates, it is intended simply for light ladies' work.

Messrs. Bradbury, of Oldham, have a useful binding guide for sewing machines. It consists of a series of upright steel pegs, over and under which the binding is alternately passed. It is then drawn in front of a shield, and then passed through a guide having fixed tongues in it, which fold the binding so as to allow the needle to pass through it, and fix it to the fabric to be bound. With one of these guides, it is said that twelve dozen pairs of stays can be bound per day.

Mr. Walker, the well known sewing needle maker, of Alcester, exhibits his riged-eyed needle, embodying an improvement which all sempstresses must highly appreciate. Our engraving shows what the point is. A ridge is formed upon the side of the needle, just in advance of the eye, and this opens the way for the free passage of the thread being

Fig. 1.

Fig. 2.

sewed. Fig. 2 represents a side view of the parts, showing how the thread lies below the ridge, which slightly extends the hole in front of it, and enables the needle to pass with it through the cloth instantaneously, without the least effort of the worker. This improved form permits of greater strengh, without clumsiness of the head of the needle, and the eye, is, therefore, made full, so as to be very easily threaded.

Messrs. Adamson and Co., of Newton Moor Ironworks, Hyde, exhibit a very good arrangement of hydrostatic lifting jack. This apparatus is composed of two main parts, the lower and outer side-case or cylinder, and the top and inner ram. A small inverted pump is fixed at the lower end of the lifting ram, which is worked by a lever and rocking shaft passing through the square head or top part, which top also forms a cistern to contain as much oil or water as will lift the ram the required height. When the jack is used for lifting, the oil contained in the head of the ram is forced into the outer case or cylinder at bottom, which causes the ram to ascend. When required for lowering, the lever is partly drawn off the working shaft until the second projection can come in contact with the head of the jack; by depressing the lever in this position, a quick or slow lowering motion is obtained without manual labour. It is stated that with this apparatus one man can do as much work as four men with screw jacks of equal power.

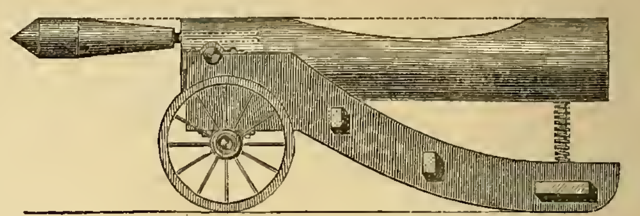
Porquerées self-registering weighing machine, shown by Messrs. Burgess and Key, possesses the ingenious novelty of an automatic printing arrangement, which operates so that the instant the weight of the article is ascertained, it is printed on a sheet of paper.

In the third division, Mr. J. White, of Finchley, exhibits his diving dress, with apparatus for facilitating breathing under water—a most ingenious thing. This apparatus consists of a metallic covering, fixed closely round the nose and mouth by means of a hand fastened round the head. In connection with this covering there are two pipes, each provided with a valve, one with an inlet valve for the supply of fresh air, the other with an outlet valve for the passage of the air exhaled from the lungs. Two pipes, which are fastened by a bayonet-catch, are attached to the ends of these pipes in the mouthpiece, and the other end of each of them is turned downwards, and fixed in the upper part of a vessel so constructed, that it will float on the water, and admit air into the lungs, but prevent the admission of water. This vessel consists of a funnel, covered with perforated tin. Into the larger part, the tubes before-mentioned are fixed, and the whole is supported in an upright position, and partly immersed by means of weights attached to the lower end, and floats to the upper. All water thus entering by means of the perforations escapes down the tube. In communication with the pipes are compressible and expansible chambers, capable of being operated on at the will of the diver, as a means of increasing or decreasing his buoyancy, and so enabling him to ascend or descend in the water. Other apparatus attached to the same dress consists of two pipes furnished with respective stops, which may be attached to the valved pipes of the mouth-piece at one end of them, and to air-tight cavities in the dress by the other end; the pipe for inhaling in a cavity filled with air, and the pipe for exhaling in an empty cavity. The object of this apparatus is to enable the wearer to breathe with facility in water, as long as the supply of air lasts, when exposed to the violence of the wind and waves. The like apparatus may be used for breathing under water, provided the air cavities are made so as to be incompressible by the weight of the water. In these last cases, the cavity containing the fresh air is separated from the cavity which is to receive the exhaled air, by a flexible diaphragm, of such size that (without any mixture of the two) the exhaled air may occupy the same space as the fresh air did before it was inhaled. The diving dress and apparatus is effective for the preservation of life in shipwreck. With the pipes attached to cavities in the dress, respiration will be carried on for some time in the midst of the roughest water; and when the air in the cavity is all used, the wearer may use the float, which may be kept in position by the hand, when necessary, or with the mouth-piece alone, he will breathe as freely as if without any such apparatus for breathing. The diving dress will protect the body from the coldness of the water, which is dangerous to life in cases of shipwreck, and the contained air will keep the body buoyant. Mr. White also shows an apparatus for facilitating respiration in the midst of smoke or noxious gases. This consists of a mouth-piece of metal, fixed in an air-proof head dress descending round the neck, where it is to be closely enveloped by the ordinary clothing, to prevent the access of smoke or gas to the lungs. Two pipes, with valves for breathing, as in the diving apparatus before described, are connected together at one end, and can be fixed to the mouth-piece. The inhaling pipe is in connection with a vessel of air, which is to be attached to the body—the exhaling pipe is in communication with the surrounding air. The whole body and apparatus, when exposed to fire, may be enveloped in a loose dress of woollen fabric, saturated with water.

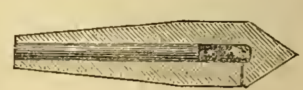
Mr. Sutton, the well-known photographer of St. Brelade's Bay, Jersey, shows a model of an improved boat, constructed entirely of straight timber.

Mr. Hunter's anchor, with oscillating arms, has the palm enclosed within the arm, the latter being kept open, and the sides parallel up to the crown, so that the earth may rise and pass over the palm and through the arm in a solid state, giving great strength and holding power.

The rocket gun, by Mr. Henry Reveley, of Poole, Dorset, which we here engrave, with its projectile in detailed section, will be regarded with interest at the present juncture. In this piece of ordnance, the projectile takes the form of a rude cannon, or rather that of the iron case of a Congreve rocket, and may be readily obtained from every foundry in the kingdom as the usual price of cast iron, plus the cost of drilling the touch-hole. Its proportion as to strength is that usually adopted, namely, that about the charge the thickness of the metal must be at



least equal to the diameter of the bore, so that a rocket projectile of an inch bore, would be at least three inches in diameter, therefore, as little likely to burst as the ordnance now in use. There is, however, an advantage in the rocket projectile, that if it should burst, the splinters all fly forward, as has been fully proved.



No particular carriage is required, but merely a wrought iron pin of the diameter of the bore, fixed in a heavy lump of cast iron, or it may be very conveniently fixed from a simple rod of iron fitting the bore, and about 10 or 12 feet long. The end, however, must be well secured against a lump of iron, a rock, or a stump pile set fast in the ground, for the recoil is very similar to the blow of the ram of a pile engine. In reckoning ordnance as pounders, according to the weight of shot, the 1-inch bore rocket gun would be a 6-pounder; a 2-inch bore, a 24-pounder; a 4-inch bore, a 96-pounder, although the charge of powder would be very little more than that due to the actual bore.

In "philosophical apparatus," we find a great many examples of telegraphic apparatus. Amongst these is a submarine cable by Mr. John Walker, of Cowper Street, in which the wire with its insulation, is independent of the outer covering, which consists of an elastic tube of iron or steel wire. Mr. Walker takes a No. 12 copper wire, or 7 of No. 20, twisting them in the usual way, covering them with India-rubber, with an external coating of fine glass rolled in until the surface is smooth and bright. When thus prepared, it is rolled round the copper wire until it is three-eighths of an inch in diameter, and over this is the elastic wire tube, finally covered with anything to give the cable longitudinal strength.

Mr. R. H. Bow exhibits his spirit levels without fixed stands. These are so arranged that the observer may note at the same instant the height of the cross hair as projected against the levelling staff, and the momentary central position of the bubble in the spirit-level. The simplest form of the instrument, shown by the first of our annexed figures, differs but little in external appearance from the common pocket or workman's

Fig. 1.

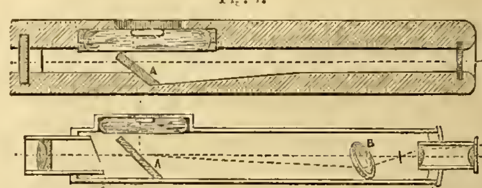
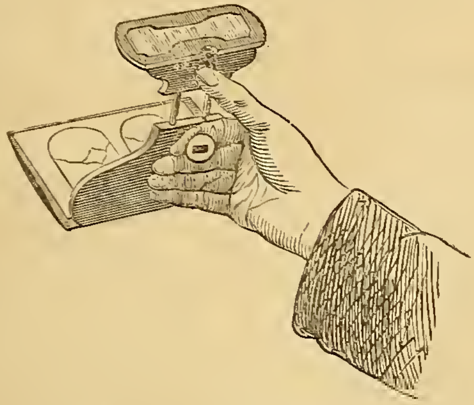


Fig. 2.

spirit-level, and can be put to the same uses; in addition to its particular duty of affording observations, by being simply held in the hand whilst looking through it. For more accurate observations, other forms of the instrument may be constructed, in which a telescope with cross hair may be incorporated with the spirit-level; the most perfect of these is that shown by the second figure, which, by means of the very narrow reflector, A, and the thin slice of a lens, B, an image of the bubble is formed near the cross hairs, and consequently seen as though part of the landscape.

Mr. A. W. Bennett, of Bishopsgate Street Without, sends his model drawing-room or clairvoyant stereoscope, which at once commends itself to notice. The two portions of the instrument are connected by sliding rods, as shown in our engraving, thus enabling the focus to be adjusted by a simple motion of the thumb. The position of the lenses, in combination with the facility of focal adjustments, enables a much higher magnifying power to be employed than can be obtained with the ordinary stereoscope, whilst there is an arrangement at the base, which renders the instrument available for transparent views. It is fitted in a locked case, which contains, in addition, six or eight dozen stereoscope slides. Lovers of the beauties of stereoscopes—and they are now equal in number to our population—will thank Mr. Swan, who, through Mr.



Bennett, has given us this most convenient little instrument for properly developing the exquisite beauties of this now universal class of artistic productions.

OUR YEARLY PICTURES.

Not among the least of the pleasures that May brings, is the sight of the contributions of our painters to the different galleries of Art which then abound in the metropolis. Our earliest memory is associated with some indefinite impressions of agreeable feeling connected with them; and perhaps it is half to this and half to present impressions that the pleasure we experience is so great as it is. We are anxious, before they arrive, to meet our old acquaintances again—acquaintances who rarely give us cause to be excited but by the benigner sentiments of our nature, and who are, for the very most part, operating to our soul's good. Reverence the painter! All honour to the artist! How many a weary hour does he spunge up from life-time, blotting out of our consciousness painful lookings-back or futures boding of ill! God bless the painter! We never approach within sight of the palette in the monument in Kensall Green, or that in the plinth of Wilkie's statue in the National Gallery, without some feeling akin to love. Mighty art! A little bit of colour, a few hairs, what are they in themselves? But when the intelligent human soul works with them—uses them as a language to express the ever-living sentiments or aspirations of humanity—what great things they are rendered! Bodying forth, like the poet, "forms of things" to all others "unknown," and giving to what was before "airy nothing, a local habitation and a name"—a name in man's consciousness, and a habitation in his heart of hearts. Who in London cannot have stepped aside once—if once only—out of the dull and noisome din of public or private affairs into the rooms of the National Gallery, and experienced that lull of storming passion which makes him, for the moment at least, feel himself to be again a man—not only a reasonable soul and human flesh subsisting, but something far greater than such—one of a multitude of such! It is alone this high inheritance of his which he has thus been made to feel, which raises in his mind the idea of art itself. It becomes a teacher, a civiliser. If it do not teach, if it do not civilise, away with it! It is not art; it is a daub upon an outside door, not the genius-mark carefully treasured up in the Holy of Holies, and thence to go forth again kindling or illuminating humanity. And what is the love of this art but another form of hymn to the Giver of all other good. It is not important what art is cherished—painting, or sculpture, or music, or poetry—it is all one. The love of each has the same results to ourselves and others. Each contributes its waters to the great ocean of happiness. But our lives are occupied in dividing and bringing together—in separating and uniting; and, as we progress, so must we expect analysis to be continually throwing out its leaves and buds, and synthesis bringing them back again to vision, as a new and beautiful plant. Our one solitary Exhibition of the Royal Academy, within but a few years past called or known by the name only of "The Exhibition," has, from many causes, which we cannot detail here, ushered into being many others. Painting, architecture, sculpture, drawing, and engraving, were all represented, as indeed they now still are; but we have all these things displayed in far greater abundance (except as regards sculpture—and why not sculpture?) elsewhere, and not in one locality, but in many localities, adapted, according to the principle of true progress, to the wants and desires of all classes of artists, lovers of art, and mere lookers-on. There are, first, the Royal Academy "pictures;" then the British Institution; then the Suffolk Street Gallery; then the Crystal Palace Gallery; then the Portland Gallery; then last, and, in some examples,

far from being least, the Canterbury Hall collection. We have, besides these, the great multitude of works, which really must be considered a large exhibition in themselves, and presented in a form, too, which is always acceptable—gratis—in the many auction rooms of the metropolis, where much is to be learnt in art, and which it would be better if our young artists could frequent more than they do. It has been our own practice hitherto to notice only the pictures in the Royal Academy Exhibition. In this we do not hesitate to say we have partaken of a prejudice, of which, until lately, we were unconscious. There are the same contributors nearly to all. Then why, we asked ourselves, should we notice only the contributions to one? We have thought differently of the matter. Why should we not notice all the exhibitions, including even the "old" and "new" societies of painters in water colours? Well, but the labour of such a work! Now, our readers must understand the principle which we mean to apply to it. We do not—we never did—wish to hold the position of a "carping critic." If we cannot praise, we have no taste to blame. Let us show the good if we can, and eschew the bad. We do not care to have such things as "The Opinion of the Press" (a painful picture in one of the exhibitions) thrust upon us. We know that in these matters the press can neither mar nor make in the long run. When we praise, we candidly confess we do so because it is a greater pleasure to praise; and surely when we have no time to do all things, we may be permitted to encircle ourselves with a few of the more pleasant objects, or, in other words, select our *own* friends.

In doing this, we, after all, do nothing more than is done by all the world. And really, as we travel over the different walls of the different galleries—as we pore upon the "things" exposed to sale at auctions or at picture-dealers, getting to legion as the latter now fare—we catch ourselves constantly and involuntarily exclaiming with wonder, at the enormous mass of absolute trash which we see. How far better would the producers have been employed, doubtless for themselves, far less doubtless to others, in ploughing, or sowing, or reaping, the fields which they have vainly attempted to represent. But we dare not blame. For do not all these "things" find purchasers? Most certainly they do. Not lovers of true pictures, perhaps, but some purchasers. Among the rest, such an one, who said once to a friend of ours, who, after purchasing a painting above mediocrity, expressed his wonder that the seller should have asked less for it than for another which was but a daub. "As I buys I sells." Not such we mean, but those who buy of such—the real geniune lover of pictures, who goes groping about among Italian palaces and churches, as well as in strange places, in great cities, for something that he fancies or which strikes his fancy. How wonderful it is when we think of it, that not a single wretched daub that is "done," and stuck into a frame, but what may be seen exposed in our occasional walks as an attraction to some taste!. The infinites are thus among the pictures as among other things, and could not but make us—if as willing to be critical as Denoris—very, very humble, and which would still make us much rather praise than blame.

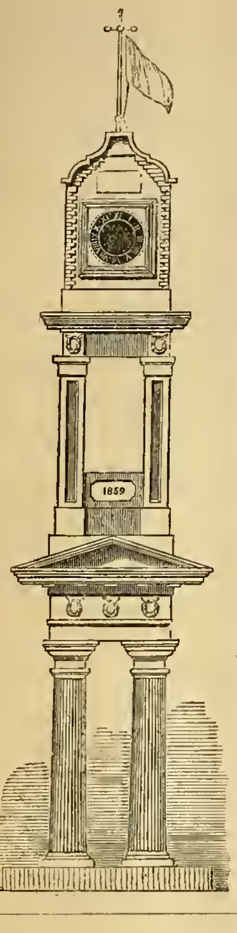
We propose confining our notice to paintings and drawings, but to drawings and paintings exhibited every and anywhere at the yearly pay-place gatherings. Our sculptors must have a similar notice hereafter. They do not press upon us like the former. It is infinitely an easier task to paint a pleasant easel picture, than to carve from the block a figure, or even a bust. Hence paintings come upon us by the thousand; sculptures barely by the hundred. We must, however, here express one passing opinion, which is, that our sculptors are in advance of painters in their art. There is not to be found among their works that mediocrity and that inferiority which is to be found among the painters. All agree that unity of thought is the *sine qua non* of sculptered form; but all do not agree that this is the case as to painting—it is only the best judges who think so. Hence our small body of sculptors form a body of highly intelligent and thoughtful men; while the painters (take them as a body) are rather commonplace. This character of their respective arts is shown in the respective training of their followers; and hence, there are few, if any, of our sculptors who have not had their minds well disciplined by classical and other learning, while but few of our painters possess this advantage.

The only difficulty is where to begin in the great circle of industry before us—industry we call it, as a general name—for it is not all, not one hundredth part of it, is art.

Where a person sends his productions to different exhibitions, he is just as likely to send what he considers an inferior (but really his superior) work to an inferior exhibition. Painters are like poets in this. They are not proper judges of their own labours. That which has occupied them a long time—that which has more captivated their own idiosyncratic taste—that in which difficulties (to them) have best been overcome, must ever be entitled to the highest place. But the critic or connoisseur thinks not so, or rather his judgments is not founded on the like elements. His judgment must be founded, to be respected, on much higher grounds—a great position for the weal or the woe of art.

We hope, in our next number, to place our readers *au courant* as regards the present paintings, hazarding, in the meantime, a fear, that our first impressions that it is not a great year, will be confirmed.

K



PUBLIC CLOCK TOWER AT BURNLEY.

The commissioners acting under the Burnley Improvement Act some time ago advertised for designs for a public clock tower for the town, to contain a 15-inch main wheel clock, with four illuminated dials of four feet in diameter. The tower itself was specified not to be more than nine feet square, and the height not less than forty feet, whilst the cost was restricted to £400. The premium offered was ten guineas for the best design, and five guineas for the second. Upwards of ninety designs were sent in, the chosen one being by Messrs. Bellamy & Hardy, architects, Lincoln; and the second best by Mr. Nash, of Reading. The design which we now engrave is neither of these: it is by Mr. John Robinson, of Lower House, Burnley, and seems to us to be appropriate for the purpose, whilst it is simple, elegant, and cheap in construction. The lower open space between the doric columns might be rendered available for one or more statues, or other ornamental work of art. Or it would be admirably adapted for a public fountain, so as most effectually to combine the useful with the ornamental. The upper enclosed space is intended to form a convenient rostrum for the delivery of open-air addresses or other public announcements; a convenience the want of which has been too often experienced. The topmost compartment of the building is appropriated to the clock, and the whole is surmounted by a flag-staff, wind-vane, and time-ball apparatus. Mr. Robinson has certainly endeavoured to blend as much as possible of the really useful in his design.

INDIAN PATENT LAW.

Our readers may recollect that in a former number of this *Journal* (vol. viii., p. 247), attention was called to a bill which had then been lately introduced into the Legislative Council of India, and which was intended to remedy the hardship which British inventors had long felt in being unable to obtain protection for their inventions within the limits of our Indian empire. The bill alluded to was subsequently passed, and received the assent of the Governor-General; but her Majesty's law officers having given it as their opinion that the Legislative Council was not competent to pass a bill which, like this, affected the royal prerogative, without previously obtaining the sanction of the Crown, the act was disallowed by the Court of Directors, and was ultimately, in 1857, repealed. It was enacted, however, by the Act of Parliament passed in 1853, to provide for the government of India, that no law made by the Governor-General in council should be invalid merely on account of its affecting the royal prerogative, if it had received the previous sanction of the Crown; and, accordingly, an act, based upon the abortive act above referred to, but differing from it in some important particulars, has just received the sanction of her Majesty, with a view to its immediate introduction into the Legislative Council of India. As there appears to be no doubt of its passing that body forthwith, and becoming in a very short time a code of patent law for India, we think that some account of its provisions will not be unacceptable to our readers. These provisions are in substance as follow:—

Exclusive privileges may be obtained for protecting the invention or improvement of any art, or process, or manner of producing, preparing, or making an article, and also the invention or improvement of any article prepared or produced by manufacture. It is required that the invention be useful, and that it be new; and an invention is to be considered new if it have not, at the time the exclusive privilege is applied for, been publicly used in India or in any part of the United Kingdom, or been made publicly known in any part of India or of the United Kingdom by means of any written or printed publication. If, however, the knowledge of an invention has been obtained surreptitiously, or has been communicated to the public in breach of confidence, the public use or knowledge is in that case to be no bar to the acquisition of the exclusive privilege, if the inventor have not acquiesced in it, and if he make his application within six months after the public use has commenced; nor is the use of an invention by an inventor, or his agent, or any person with his license, for a period not exceeding one year before the exclusive privilege is applied for, to be deemed a public use within the meaning of the act. The provisions of the act are available, not merely for actual inventors, but also for the personal representatives and the assignees of actual inventors; and they extend also to foreigners, whether resident abroad or not. The importer of a new invention into India is, however, expressly excluded from the benefits of the act, unless he be also the actual inventor, or his personal representative or assignee.

The act does not contemplate the grant of any letters patent; but the exclusive privilege is to be acquired by merely filing a specification of the invention, upon which, without any further process, the applicant will become at once entitled to the exclusive right of using and selling the invention in India, and authorising others to do so, for the term of fourteen years from the date of filing the specification. Leave to file the specification must, however, be previously obtained; and for this purpose, a petition must be presented to the Governor-General in council, who is empowered to refer it to any person or persons for inquiry, and, in the event of an order authorising the specification to be filed being granted, to annex any conditions he deems proper to the order. The fees attending the inquiry are to be paid by the petitioner, and no specification is to be filed until all the fees have been paid. Every specification must be filed within six months after obtaining the Governor-General's order.

The specification must be in writing, signed by the petitioner, and must particularly describe the invention, and how it is to be performed. The petition and specification are each to be accompanied by a declaration, signed by the petitioner, or by his agent, if he be absent from India, stating that he is in possession of the invention, which he believes will be of public utility, and that to the best of his belief it is not known or used in India, or in any part of the United Kingdom, and that it is truly described in the petition and specification. Persons making false statements in these declarations are to be considered guilty of perjury; and wilful mis-statements in the petition or specification will render the exclusive privilege liable to be declared void. The specifications filed under this act are to be registered in a book, which is to be kept in the office of the Secretary to the Government, and is to be open to the public on payment of a small fee.

Any part of an invention may be disclaimed, should it appear at a future time to the petitioner that he ought not to have included it in his petition or specification; and in case of any defect or insufficiency in the latter, leave may be obtained to file an amended specification, which, however, is not to extend the exclusive privilege before acquired. In both these cases, moreover, it must be shown that no fraud has been intended. The term of an exclusive privilege may be extended for a term not exceeding fourteen years from the expiration of the first fourteen years, upon taking certain proceedings not more than one year, nor less than six months, from the expiration of the original term. All rights which had been acquired under the repealed act, previously to its repeal, are preserved.

Every exclusive privilege granted by the act is to cease, if the Governor-General in council shall declare the same, or the mode in which it is exercised be mischievous to the state, or prejudicial to the public—a provision, by the way, which, though perhaps necessary under the peculiar circumstances of the Indian Government, may have the effect of preventing inventors from embarking large capital, or taking much trouble, in the endeavour to introduce new inventions into India. Further, if satisfactory proof be afforded to the courts of law that any condition, upon which leave to file a specification was granted, has been broken, power is given to the Governor-General in council to declare that the exclusive privilege thereby obtained shall cease.

Any inventor who has obtained letters patent for the exclusive use of an invention in the United Kingdom may, by taking proper proceedings, obtain protection in India for his invention, which is to be deemed new there, if it was not publicly used or known in India before the date of the petition for letters patent; but no such exclusive privilege is to extend beyond the term of the letters patent, unless they are renewed, in which case the exclusive privilege may also be extended for a like term.

If any person, not being the actual inventor, or the representative, or assignee, of an actual inventor, has fraudulently obtained any exclusive privilege for protecting an invention, he may be compelled, upon proof of the fraud, to assign the exclusive privilege to the actual inventor, or his representative, or assignee, and to account to him for the profits.

The act contains provisions allowing any persons to apply to the courts of law for a declaration that any alleged exclusive privilege has not been acquired, in consequence of non-compliance with the requirements of the act; and there are also regulations respecting the conduct of proceedings to restrain infringements, &c., but as these relate mainly to the practice of the Indian Courts, it is unnecessary further to refer to them here.

Such is an outline of this important act, which we trust will be the means of stimulating manufacturing industry in all parts of our vast Indian empire.

FINE ARTS AND ART COLLECTIONS.

The authorities of the popular museum at Kensington, appear determined that the public shall lose no opportunity of understanding the works collected there. A series of lectures has been devised on Hindoo and Mahommedan art, sculpture in relief, and ceramic art, and some of them we must notice.

Dr. G. Kinkell, formerly Professor of the History of Arts and Modern Civilisation in the University of Bonn, gave the first two lectures. That on Hindoo art, as illustrated by the history, drawings, buildings, and sculpture of the Hindoo, seemed to be popular, from the large audience which had assembled to hear it. He confined his observations to the period before Mahommedanism, or to heathen art. Two distinct races could be traced as constituting the present community of India, namely, a dark or black race, which extended more towards the south, and a white or lighter race (closely related to the Persians), who became the conquerors of the former. The Aborigines were not a temple-building race. Temples were first built, long subsequently, to ordinary notions. The well-known and interesting grotto temples are not the oldest, as some have supposed. The oldest are much smaller, and may be said to have been erected only as reliquaries to contain relics of Buddha and his disciples. Hence, the Buddhist temples are the oldest, and these can be traced back to no more distant age than 250 B.C. There are very few of these now remaining. He then referred to the grotto, or rock, or cavern temples, as they sometimes were called, and particularly to that of Ellora He remarked that elevation was entirely absent in them. They were coeval only with the beginning of the Gothic, or pointed style of architecture in Europe, or with the foundation of Westminster Abbey. He then touched upon the pyramid temples, and noticed the different species of them. 1st, The real temple, as he would call it, having no openings; and 2d, The gate temple, with openings. The great forte of the Hindoo architects, in all these temples, was ornamentation. But, as to serious sculpture, and serious painting, their imagination was not up to either, and when they attempted it they signally failed. Dr. Kinkell exhibited various specimens exemplifying his opinions, and made his audience laugh heartily over the distorted figures of the great many-handed Buddha. As to painting in general, as applied to architecture, he considered it fit only for the ball room, and not to refresh men's minds. The followers of Mohammed made a great change, particularly in leaving out sculpture of the figure. They took the ornamental part of the Hindoo artist and worked upon that, and produced an entirely new era in the architecture of the Indian continent.

Dr. Kinkell's second lecture was more interesting than the first. It was no easy task to illustrate, in an hour, the influence of Byzantine art on the schools of the east, the development of the arts of the Mahommedans in Egypt, Spain, and India, as seen in their mosques and other buildings and decorations. After adverting to the extraordinarly rapid advance of Mahommedanism, and the now tolerably well appreciated causes of it, he proceeded to give some very just opinions on the architecture of the Arabs. It is somewhat remarkable that they appear to have had positively no art themselves. They merely employed the nations they subdued in working, each in its own way, but on principles which the Arabs originated. Hence the great varieties and differences in the shapes of Moorish and Indian Mahommedan art. He then referred to the origin and differences in the mosques, churches, and old temples; the architecture and art displayed in each being adequately subservient to the purposes of their erection. He described the well-known temple of Mecca, and touched upon the progress of mosque building—instancing the mosque of Cordova, and that of Cairo, in which the art had reached its highest style. It is in the Mahommedan art that the pointed arch first is to be seen. The celebrated cuba of Sicily settles this point, for this cuba (corrupted, as is supposed, from cupola) is known to have been built before the year 1000 A.D. Dr. Kinkell showed the national character of his own mind, by stating that the cupola represented the despotic character of Mahommedan government, which was well expressed by it. He noticed, with considerable feeling, eliciting much interest, the justly celebrated tombs of Hindostan—particularly that of Nourmahal, and the Taj Mahal at Delhi—the latter being a splendid and affecting memorial of the beloved wife of Shah Jehan. But the Mahommedans in India, although they built like giants, ornamented only like jewellers. This was a peculiarity which, however, contributes to make up the art as we see it exhibited, and which, strange to say, (judging from generally admitted principles) produces not an unpleasing effect. Dr. Kinkell concluded by alluding to Alhambra, now so familar to many, from the large copy model building in the Crystal Palace. Not good in any way as architecture, it exhibited the most exquisite decoration, to the complete exclusion of statuary; while it showed what a mistake the Mahommedans made when they attempted anything in the way of statues, as exemplified in the queer-looking stone lions in the Court of Lions, the sculptural defects in which, were amusingly commented on.

Both the above lectures were admirably illustrated with numerous drawings, models, and examples in metal and pottery, from the collection in the museum.

Richard Westmacott, Esq., R.A., on the subject of Relief in general, (Rilievo) which he considered was a practical subject, and required to be treated practically. It is the only mode of representing continuation of action in sculpture; the powers of sculpture being ordinarily much circumscribed. The Nineveh sculptures formed a good ancient example. This form of continuation of action was then considered as an accessory in architecture. He explained the differences between high (alto) and low (bass) relief, and *intaglio* and sculpture in the round, or as an ordinary statue—referring to the beautiful examples in bas-relief, of the least raised kind, of Donatello, particularly to his celebrated Virgin and Child. He dwelt upon the characteristics of the artist, and of the artizan in this art, and then passed on to some observations on the metopes and frieze of the Parthenon, pronouncing the stereotyped eulogy on the Panathenaic procession He considered that colouring sculpture was a great mistake, as painting was quite a distinct art, although he admitted that sculpture was dependent upon conventionalism. The frieze of the Partheuon was conventional, but remarkably beautiful, and did not need colour. He alluded to the sculptures of the Parthenon being set up so much in the present day as the great exemplar, and warned students that servile imitation might injure sculpture. He noticed the peculiar reflected light under which the frieze was viewable *in situ*, and to the much better effect which it then had, from what it has now in our museum. After showing that the representation of perspective was completely out of the sphere of the sculptor's art, as well as that of fore-shortening objects—unsatisfactory attempts at which were pointed out in several famous examples, particularly the "Gates of Paradise," of Ghiberti—he demonstrated the three leading conditions to which sculpture in relief was subject. 1st, It must depend on the situation for which it is destined; 2d, On the distance from which it is intended to be seen; and 3d, On the quantity and quality of light capable of being thrown upon it.

Mr. T. C. Robinson finished the short course of six lectures, by delivering three on Fictile manufacture. The first being on the subject of the Ancient Greek Vases. After referring to the great extent of the subject, and observing that it was rather the object of attention of the antiquary, he still believed it to be eminently the object of art. The oldest vases were probably thought of and preserved as curiosities. They did not appear to have been commonly used; but after having been carefully preserved by the owner, to have been buried with him, or deposited in his tomb. It is singular that these vases were lost sight of by the Romans. They afterwards became less and less rare, as cemeteries of ancient cities brought their contents to light. Sir William Hamilton's researches on this subject, in 1760, formed an epoch. His "vases" formed an immense step towards popularising these fictile gems. Winckleman had afterwards greatly assisted in rescuing these beauties from oblivion, if oblivion were then possible. That the vases are Etruscan the lecturer denied. He considered the Etruscan theory completely false; adducing several proofs in explanation of his views, showing the vases to have been Greek, or manufactured by Greek artists. He described the great necropolis of Vulci, where so many tombs had been discovered, and so many vases in those tombs. He very graphically described the appearance of those tombs on being opened, lined with their huge slabs of stone, with a single skeleton in the centre, and the vases ranged around it on the ground, or suspended on the walls, accompanied with the remains of arms and armour. He then pointed out the different styles of the vases as follows:—1st, The Early or Egyptian, ranging from 660 B.C. to 550 B.C.; 2d, The Archaic, from 430 B.C., for about 100 years. The above were known by the figures being painted black on the red ground of the ware. 3d, The Severe or Transitional style—red on black ground—460 B.C. to 430 B.C.; 4th, The Beautiful, or pure Greek, from about 400 B.C.; and 5th, The Decline, terminating about 150 B.C. He also pointed out the typical shapes at different epochs, and then went shortly into the technical parts of the subject. In all the vases, red clay was the foundation of the ware, which was coated with a vitreous glaze. The black vitreous glaze often observed has been lost—silica iron and manganese enable us to imitate it, but at a distance only. The original black glaze is not producible. The ancients had no glaze but this black glaze. All the vases appear to have been formed on the potter's wheel. There has been no singularly shaped, or oval, or flat-sided vase found. The forms are universally in curves, and the beauty of the curves appears to depend on their irregularity.

The second of Mr. Robinson's discourses was on the Italian Majolica Wares. He began by observing that the general characteristic of the ancient Greek vases was beauty of form alone. For although there were some sort of coloured figures upon them, in black, white, or red, colour, as we understand the term, was not used in fictile manufacture before the great revival of the arts. This, perhaps, arose from black being the only known vitrifiable pigment. The white tint was chiefly employed by the mediœval artist. The majolica wares (called so probably from having first been made in Majorca) had two principal places of production. 1st, In Spain, among the Moors—called *Hispano-moresco*—of which the tiles of Alhambra may be mentioned as examples; and 2d, In Italy, where they became fully developed. They were made all over Italy; but best at Fienza. After describing the ware as being of red earth, coated with a white glaze, and then painted upon, the lecturer mentioned a peculiar metalic oxicidescent lustre which was obtained, and, in many specimens, is most brilliant—the art of producing which is now lost. All the wares were lustrous, and the lustre was evidently in the colour applied to the surface. Another lustre, the ruby, is also lost. The wares were evidently, at first, considered very valuable, as they are found, in the form of round plates, inserted in many of the ancient churches of Italy, as decorations on the exterior. These were produced in the fourteenth and first half of the fifteenth century. Towards the close of the fifteenth century, the art began to decline, until the seventeenth century, when it appears to have been given up. The wares most coveted are those made at Fienza; Wibiero, by the artist Deruta; and Gubio, by the artists Maestro Prestino, and Maestro Georgio. Those of Gubio are sometimes called Raphael ware; but the idea that Raphael had actually painted the ware has been long exploded. In the decline of the art, pictures entirely cover the ware, leaving no marginal ornament on plates, &c.; and these pictures were sometimes copied from parts of celebrated works by the great painters.

Mr. Robinson concluded his lectures with one on Fictile manufacture in general. It is universally conceded that the invention of porcelain is due to the Chinese. There are but two kinds: 1st, Chinese or Japanese; and 2d, European. He described the material as intermediate between common pottery and glass. Porcelain is either of the *pâte dur* or *pâte tendre*. The hand porcelain is the oldest. The best authorities now agree that the discovery of porcelain must have been made in China, between 185 B.C. and 87 A.D. We are not the only people among whom connoisseurs and collectors exist. They abound in China, and have done so for many centuries; so much so, that it is known that, between the years 1567 and 1619, the Chinese became famous for copying ancient wares, for sale as antiques. The lecturer told an anecdote of a modern copy of a small ancient vase, having been sold as an antique, for 1000 ounces of silver. He stated that the ceramic art was now declining in China. After describing the well-known cracklin porcelain—the curious appearance of which is due to a cracking of the glaze, and a filling up of the cracks with a dark pigment—and the egg-shell porcelain, called so on account of its extreme thinness, he proceeded to describe the principal European products, as those of St. Cloud, 1695, Meissen, 1715, where true porcelain was first produced in Europe, on the discovery in the neighbourhood, of kaolin and felspar associated together, Sevres, and the English wares of Chelsea, Worcester, &c.; and concluded, after gratifying a very numerous and attentive audience on every occasion. All his lectures having been profusely illustrated with specimens and drawings, of the most beautiful and illustrative kind.

THE NEW ACT FOR REGULATING PATENTS FOR IMPROVEMENTS IN INSTRUMENTS AND MUNITIONS OF WAR.

(22 Vict., c. 13.)

An act relating to the above subject, and to which allusion was made in our last number, received the royal assent shortly before the dissolution of the late Parliament. Its intention is to give power in certain cases to the Government, to prevent the publication of patented inventions relating to instruments and munitions of war, and the means by which this object is effected are the following:—By section 1, inventors of the improvements in question are empowered to assign their inventions to the Secretary of State for War, who may then (under section 3) certify to the Commissioners of Patents his opinion that the invention should be kept secret; by section 2, adjustments already made are brought within the act. When such a certificate has been given, it is provided by section 4, that the petition for letters patent, the declaration, specification and drawings, and all disclaimers, &c.; or, when the Secretary of State certifies, after the filing of the petition, such of the above documents as may be filed after his so certifying, shall, in lieu of being filed or left in the ordinary way in the office of the commissioners, or in the office appointed for that purpose, under "The Patent Law Amendment Act, 1852," be delivered to the Clerk of the Patents, in a packet sealed with the seal of the Secretary of State. This delivery will probably be considered a performance of the ordinary condition requiring a specification to be filed; a point which may be of importance in the probable event of its being found impossible to keep the invention secret, and the Government in that case desiring, by granting licenses or otherwise, to make a profit of their purchase. By section 8 it is further provided, that when the certificate is given after the filing of the petition, the documents which have been already filed shall be put into a packet, sealed with the seal of the commissioners. These packets are by sections 5, 6, 7, to be kept sealed until the expiration of the patent, except when it may be necessary to have access to them, for the purpose of recording the day of filing any of the documents, or for the purpose of any reference to one of the law officers, either in relation to the same or any other invention; but they may at any time be delivered to the Secretary of State, or to such person as the Lord Chancellor may order; and at the expiration of the patent they are to be delivered to the Secretary of State.

No specification of a patent invention, to which the act applies, is to be printed, published, or sold, or open to the inspection of the public (section 9); and no *scire facias* is to be brought to repeal any patent in relation to which the Secretary of State has certified (section 10).

Section 11 enables the Secretary of State to waive the benefit of the act with respect to any particular invention; and by section 12, the communication of the invention to the Secretary of State, or to any person authorized by him to investigate its merits, shall not, nor shall anything, done for the purpose of the investigation, be deemed use or publication so as to avoid the patent.

It will be observed that the act only applies to cases where the inventor has assigned his invention to the Secretary of State; and accordingly, if Government desire to keep an invention secret, they must first become the owners of it; and thus, in case the inventor should ask an exorbitant price, the Government are left to balance the advantage of having the invention kept secret against the disadvantage of paying for it, perhaps twenty times as much as the inventor could obtain by working it in the ordinary course of trade. This difficulty is, however, perhaps unavoidable; since it could only have been got over by allowing the Government the power of keeping from the public any inventions relating to munitions of war, which they might think ought not to be published, a power which it was probably thought might have been made the means of great oppression.

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RECENT PATENTS.

INDIA-RUBBER.

J. H. Johnson, *London and Glasgow* (A. G. Day, *Connecticut, U. S.*)—*Patent dated August* 13, 1858.

This invention relates, firstly, to the process of cleaning the crude rubber or other vulcanisable gums, for which letters patent were granted to the patentee on or about the 7th August, 1855, but which process has since been modified and improved. That invention was described as a peculiar system or mode of treating caoutchouc, and other similar gums, in the raw state, for the purpose of entirely freeing such gums from dirt and all foreign bodies, and of removing therefrom the noxious gases. The specification stated in substance that the raw gum is first cut or torn, by any suitable machinery, into small shreds, and is then washed in the ordinary way. It has since been ascertained that, instead of treating the article in the above manner, it is a great improvement to pass it in pieces of from six to ten, or even thirty pounds weight, through a pair of toothed rollers of a particular kind, abundantly supplied with water. The specification also described the air-exhausting apparatus and the pumps as confined to exhausting the air, without using any pressure above the ordinary atmospheric pressure, by means of the apparatus. But it has since been ascertained that using alternate exhaustion and extra pressure beyond that of the atmosphere, has great practical advantages in forcing the alkaline liquor into the interstices of the crude gum, and thereby bringing the liquor in contact with the foreign bodies more extensively than would otherwise be possible to accomplish. The said former specification also described the preparation and use of caustic alkali for cleansing the raw gum. But it has since been ascertained that carbonated alkali may, in many cases, be substituted for the caustic alkalies, and in the majority of cases the common carbonate of soda and carbonate of potash, the one or the other, may be substituted for the caustic alkali.

The first step in the improvements upon the cleaning process patented by the patentee in 1855 consists in the method of reducing or disintegrating the crude commercial gum, by passing it in pieces of from six to thirty pounds weight between toothed rollers, by which the gum, instead of being cut into shreds, as described in the specification of the aforesaid patent, is drawn out into long sheets or webs—the rollers being plentifully supplied with water, which washes out and removes most of the earthy and much other foreign matter.

Without entering into a description of any special form or arrangement of rollers as a novelty in themselves, the patentee observes, that any toothed rollers arranged either in pairs, or otherwise, the one travelling a little faster than the other, and a space of a quarter of an inch more or less being allowed between their peripheries, will answer the purpose of breaking down and "sheeting," as it is called by the workmen, the crude gum, preparatory to the second step of the cleaning operation, that is to say, the exhausting or alkaline treatment.

Under the before named patent, the patentee only used exhaustion in connection with the usual pressure of the atmosphere; but he has since ascertained that, when to such alternation of exhaustion and pressure of the atmosphere there be added to the pressure of the air within the cylinder some two or three or even more atmospheres, that is, some thirty, forty-five, or more pounds of additional pressure on the square inch, and operating the alternate exhaustion and pressure by several repetitions, though one repetition may generally answer the purpose, that the liquid more readily finds its way to the finest pores of the crude rubber or other gum than it could when using only exhaustion, as described in the specification aforesaid. The additional pressure here referred to and described may be had by leaving or allowing a small space in the upper part of the exhausting cylinder to be filled with air, first closing all the stop-cocks leading to it, and then working the force pump (used to force in liquid) till the pressure within shall be sufficient to force the liquor into the smallest cavities of the gum. The same result may be obtained by forcing air into the cylinder after the first exhaustion, producing the additional pressure by means of the air force pump, or any other equivalent apparatus. The devices used to effect the alternate exhaustion and compression are well known, and need not be particularly described. In the use of the carbonated alkali in place of the caustic alkali, described in the specification aforesaid, the patentee remarks, that when caustic alkali is used, the strength need not be greater than 12° to 20° Baume's hydrometer; but when carbonated alkali is used, as a solution of sal-soda (carbonate of soda), the strength should be 15° to 25° Baume's hydrometer. The material having been treated in the manner above described, is transferred to the toothed rollers again, where it is repeatedly pressed, crimped, and washed, to remove the alkali; after which it is finally taken to a drying chamber, for the purpose of being dried and seasoned.

The second part of this invention relates to what are usually called *hard rubber* manufactures, by way of distinguishing them from the more common India-rubber goods, which are soft and flexible. This part of the invention embraces three points, viz., a composition of matter, a process of heating, and a circulation in the heater. Hard compounds are generally made from rubber, sulphur, and some earthy or oxide base, such as lead or lime; sometimes the rubber ingredient is dispensed with, and its place supplied by an equivalent proportion of gutta percha or jintawan, or other vulcanisable gum; and it has been found, that in nearly all the articles composed of the vulcanisable gum and sulphur united, with some earthy or other base, the composition is liable to become brittle, and thus be diminished in value. To remedy this evil, it is proposed to employ a new composition of matter, the manufacture of which requires a special method of operating. This composition is composed as follows:—Having thoroughly cleansed any of the crude gums of commerce, whether caoutchouc, gutta-percha, jintawan, or other crude gum, the patentee mixes the purified gum with sulphur in the following proportions:—If the gum be Para rubber, 1 lb. of rubber with 8 oz. of sulphur; if East India, 1 lb. of rubber with 8–10 oz. of sulphur; if Guayaquil or Carthagena, 1 lb. of rubber with 6–8 oz. of sulphur. The last two being a harder species, require less, while the East Indian or African being soft, require more sulphur than the Para article. The mixture may be prepared in any of the modes of mixing the gum and sulphur known to manufacturers. In all cases where India-rubber proper is used, the Para article is the one referred to as the standard by which to compare other gums. But the medium proportion of ingredients is—gum 1 lb., and sulphur ½ lb. The gum and sulphur being thoroughly mixed, and the articles to be manufactured duly formed, they are placed in a steam chest or heater, usually made of cast-iron, and of suitable size to contain the articles to be vulcanised, and of sufficient strength to resist the internal pressure of steam at a heat of 275° to 310° of Fahrenheit's thermometer, or thereabout, as supplied from any convenient boiler, and let in upon the goods, which are protected in dust or in any other way known to the workers of hard compounds. Before stating the details of running the heat, the time and degree of heat are to be considerably varied with the size or thickness of the goods to be heated. Thus it has been ascertained that the union of perfectly pure rubber and sulphur takes place in such compositions, as claimed herein, very slowly and at a very high degree of heat only, and that during the whole time in which the materials are combining, a continued discharge of sulphuretted hydrogen and sulphuret of carbon is found to take place through the dense pores of the articles; and the thicker the articles to be vulcanised the greater the heat, and the longer the time required to expel the eliminated gases, as the pores of the compound are exceedingly fine, and the escape of the gases proportionally slow and difficult; whilst in a vulcanising compound containing an earthy base the base itself furnishes porosity, and consequently easy escape of gases. Hence it requires less time to vulcanise and less heat; but at the same time the product has less toughness and strength, and, moreover, becomes brittle by age.

The composition of gum and sulphur having been fixed upon, the time and the degree of heat must be adapted thereto to produce the article sought; therefore the composition of matter, the time of heating, and the temperature, constitute a new and distinct process. The following are examples of the details of running the heat, showing the range of temperature and time required for vulcanising this composition of matter. In the first case, the articles are supposed to be, say a quarter of an inch in thickness, and to require ten hours for vulcanising.

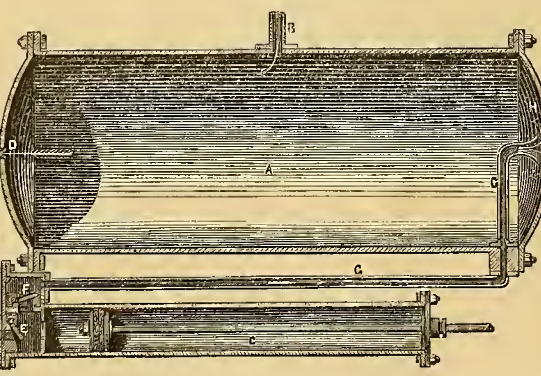
1. The heat is run directly to 275° for four hours, then to 280° for two hours, then to 290° for two hours, then to 295° for one hour, then to 300° for one-half hour, then to 305° for one-half hour.

2. Articles five-eighths of an inch in thickness, time 13½ hours—Heat run directly to 275° for six hours, then to 280° for three hours, then to 290° for two hours, then to 295° for two hours, then to 300° for one-half hour.

3. Articles five-eighths of an inch to one and a-half inches thick—Heat run directly to 275° for six to twelve hours, then to 280° for four hours, then to 285° for four hours, then to 295° for four hours.

These examples are given to show the general range of heat and the time required for vulcanising hard gum compounds; but the patentee does not confine the process to the exact steps, nor to the exact temperatures, nor yet to the precise length of time, so long as he embraces the high range of temperature and the prolonged time beyond what has been hitherto attempted.

It has been found by experience in the hard gum manufacture, that it is exceedingly difficult to maintain a uniform temperature throughout the heater during the process of vulcanising. Articles in one portion of the apparatus will be cured too much, or burnt, while those in another part will be cured too little. These imperfections have been greatly obviated by establishing an artificial circulation in the heater, which equalises the temperature in every part of it. This may be done by means of a double acting pump, or a rotatory fan, or other equivalent device, which shall draw out the steam and air from one end of the cylinder, and transfer the same into the head of the opposite end, as shown in the accompanying drawing, which represents a longitudinal



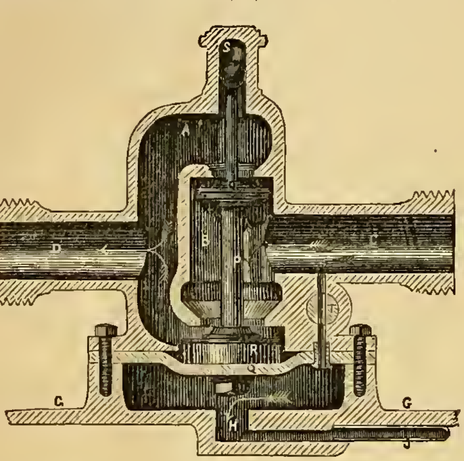
section of an ordinary heating cylinder lying on its side. A is the heating cylinder, which is supplied with steam for heating it under pressure by means of the pipe, B. The articles to be heated or vulcanised are placed in the cylinder, A, and supported on suitable iron trays resting on iron rails, and designed to be run in and out thereon. The circulation for the purpose of equalising the temperature in all parts of the heater is made by working the pump, C, or its equivalent, which draws the aerial contents from the one end, D, of the heater, through the valve, E, and forces it through the valve, F, and pipe, G, whence it strikes against the head or other end of the cylinder, and is distributed through the perforated plate, H, and thence through the body of the cylinder.

It is evident that a single-acting pump, or a double-acting pump, or a rotary pump, or a fan, could be used for this purpose. The patentee does not claim any special form of apparatus, as a variety of apparatuses might be used, and perhaps equally well. Even a current of steam forced in at one end and out at the other would aid in equalising the heat, although imperfectly.

APPARATUS FOR REGULATING THE FLOW OF FLUIDS.

John Hardie, *Stirling.—Patent dated July* 22, 1858.

The accompanying engraving is a longitudinal sectional view of one modification of the improved valvular apparatus for regulating the flow or passage of fluids. As arranged under this modification of the improvements, the valvular apparatus consists of a solid metal shell or valve-box, A, which is cast of a duplex figure, so as to form, internally, a kind of double chamber. The shell, A, is made with an internal valve-

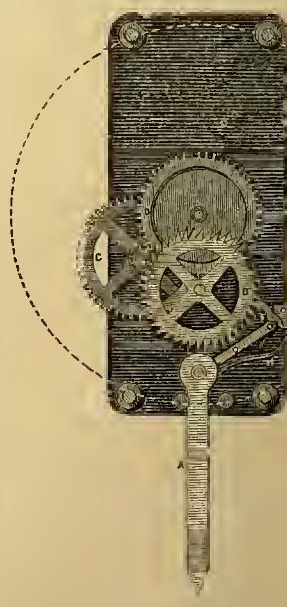


chamber, B, which has openings made in the metal forming the upper and lower parts of the chamber; the lower faces of these openings form the seats for the valves which control the passage of the water through the apparatus. The shell, A, is made with two lateral tubular openings, C and D, to which the extremities of the inlet and outlet pipes, E and F, are screwed or otherwise connected. The water enters by the tubular passage, C, and after passing through the valve-chamber, B, and the secondary chamber of the shell, A, escapes through the pipe, F, to the closet basin. The shell, A, is screwed down on to a metal base-plate, G, which is fitted on to the closet; the base-plate, G, has a recess or chamber, H, formed in it; this chamber has also a lateral tubular passage, I, extending outwards through the metal of the base plate, and downwards at right angles thereto. Through the outer end of the lateral passage, I, a valve spindle, J, enters so as to close, when required, the vertical portion of the passage. Between the face of the valve, J, and that of the passage, I, a disc of vulcanised India-rubber, or other elastic material, is interposed, which serves to close the passage water-tight, as well as to push back the valve, J, by its elasticity when the valve spindle is released. The spindle of the valve, J, is carried in a guide, K, which is screwed up to the under side of the base-plate, G, and the valve is kept up to the face of the base-plate by the pressure of the swell or cam, L, on its outer end. This cam is actuated by the spindle, M, to which the pan of the closet is attached. Between the shell, A, and the base-plate, G, a circular disc, O, of India-rubber is interposed, so as to form a flexible diaphragm between the interior of the shell, A, and the chamber, H. The spindle, P, of the duplex valves, Q and R, passes through the centre of the diaphragm, O, and is fastened up to the under face of the lower valve, R, by a nut which is screwed on to the spindle. The upper end of the spindle, P, is made with a small knob, which works up and down in the recess, S, which serves as a guide to preserve the perpendicular position of the spindle. The area of the openings in the valve-chamber, B, differ in size—the lower one being larger than the upper; these openings are closed by the upward action of the valves, Q and R. These valves are kept up to their respective seats on the under faces of the valve-chamber, B, by the pressure of the water on the under side of the diaphragm, O. The water is admitted to the chamber, H, by means of the tap, T, which, when opened, allows the water to flow from the inlet pipe, C, down into the chamber, H. The service water has also access to the valve-chamber, B, where its pressure acts upon the under side of the upper valve, Q, and the upper surface of the valve, R; the lower valve, R, being, however, of larger area than the valve, Q, the pressure of the water in the chamber, H, upon the diaphragm, is sufficient to prevent the opening of the valvular apertures in the chamber, B. The tap, T, is attached by a bell-crank lever, or other convenient means, to the horizontal spindle, M, so that when this spindle is turned upon its axis by the raising of the operating handle, the pan is inverted and the passage through the tap, T, is closed by the partial turning of the key. The motion of the spindle, M, about its axis depresses the upper end of the cam, L, so that the valve moves away from the face of the base-plate, G, and the water contained in the chamber, H, escapes through the downwardly directed opening of the passage, I. The upward pressure of the water upon the diaphragm, O, being thus removed, the valves, Q and R, are depressed, and the water from the supply-pipe, E, flows through the valvular openings in the chamber, B, and out through the pipe, F, to the basin of the closet, as indicated by the arrows in fig. 1. The flow of water in this manner will continue so long as the actuating lever is kept up. Upon depressing the handle of the closet so as to restore the pan, N, to its normal or horizontal position, the passage, I, is again closed by the valve, J, and the tap, T, is opened. The water from the inlet pipe, C, now flows through the tap, T, into the chamber, H, and the pressure of this water acting upon the diaphragm, O, the valves, Q and R, are again closed. This closing of the valvular openings is, however, accomplished in a gradual manner, by reason of the smallness of the aperture in the tap, T, so that the chamber, H, fills slowly, in order to gradually shut off the water, and thus allow a sufficient quantity to flow into the pan after the actuating handle has been depressed This afterflow of the water may be regulated to occupy more or less time, by making the chamber, H, more or less capacious, or by increasing or diminishing the area of the tubular passage through the tap, T. In lieu of the foregoing arrangement of the tap, T, it may be altogether unconnected with the actuating spindle, M; in this case the tap is opened to a certain extent, and left in that position, so that a slender stream of water flows through the chamber, H, during the time the pan, N, is inverted. When the passage, I, is closed by the depression of the handle, the water continues to flow through the tap, T, fills the chamber, H, and thus gradually close the valves, Q and R. This valvular apparatus may, with trifling modifications, be used for controlling and regulating the passage of fluids for purposes other than that described.

DISTANCE AND FARE INDICATOR.

Robert Clegg, *Islington.—Patent dated November* 18, 1857.

This invention consists in attaching to, or connecting with vehicles, machines, or parts of machines, or other objects, which, or parts of which, rotate or otherwise move certain apparatus or contrivances arranged and made to operate essentially as follows:—The patentee affixes to, or forms upon, an axle or other rotating part of a machine, vehicle, or other object, a pin, stud, or other equivalent contrivance, and upon a non-rotating part of such vehicle, machine, or other object, is centred a lever, one extremity of which lies within the range of such pin, stud, or other equivalent contrivance, as it rotates, and receives an intermittant motion therefrom. To the other end of the said lever, a short spring, lever arm, or other contrivance, is attached in such a manner that, when the first named lever is moved, it shall impart a corresponding motion to the ratchet wheel, against which the said spring, lever arm, or other contrivance, is pressed. With this ratchet wheel is combined another wheel or other wheels, which transmit motion intermittantly to a hand or hands moving in front of a suitable dial or dials. Each time the part which carries the pin, stud, or other contrivance rotates, the lever and its appendages move the ratchet wheel round one tooth, and when the ratchet wheel has thus been moved through a distance corresponding to any given number of its teeth, it moves the adjacent wheel round one tooth, and this wheel either carries the hand round with it, or moves a third wheel which does so, or a third wheel and other



wheels which do so. It is manifest, that by properly forming and adjusting the wheels, the hand may be made to move at any required intervals, and thus register or indicate fares, the distances passed over by vehicles, the revolutions of machines or parts of machines, and other similar quantities. The subjoined engraving is a view of the interior of the apparatus, with the dial and front plate removed. Upon the nave of the wheel is fixed at an angle, a jointed stud or pin, which is composed of two parts, connected by a pin, and furnished with a spring which, after the two parts have been folded together, presses them open again. The apparatus is attached, by any convenient means, to the body or other non-rotating part of the vehicle, and in such a position that as the nave revolves, one part of the stud comes against the end of the lever, A, and moves it in the direction of the arrow. This lever, A, moves about a pin, and carries at its upper end a short inclined arm, to which is pinned a pallet, F, which is pressed by a spring into the teeth of a toothed wheel, B, mounted upon a suitable axis or arbor. Upon the axis of the wheel, B, is a pinion, which gears into a toothed wheel, C. The axis of this wheel carries a second pinion, which gears into a toothed wheel, D, and the axis of this last wheel has pinned upon it a finger or pointer on the outside of the dial face. On the side of the wheel, B, opposite to that on which the pallet, F, is, a second pallet, attached to a spring, is applied, and when the lever, A, is moved, the two pallets drive the various wheels and pinions, after the manner of ordinary clockwork. The teeth of the wheels and pinions are so arranged and combined, as to the number and position, that while the vehicle is travelling one mile, the finger or pointer moves round from one of the figures upon the dial to the next figure, the figures upon the dial being arranged to indicate both fares and distances. Any code of fares may, of course, be employed, according to the place or service in which the vehicle may be employed. The object of jointing the stud or pin on the nave of the wheel, is, that when the vehicle is backed, one part may yield on touching the lever, A, and pass it without moving it. A spring, H, is applied to force the lever, A, back to its first position after it has been moved by the stud. An apparatus of the foregoing, or any equivalent or similar description, may be so arranged that the driver or other person may set it anew at each journey, or so that it shall be inaccessible to him, and under the control of the owner or other person in charge of the vehicle; or one of each kind may be applied, if desired, to the same vehicle.

Although the patentee has confined his description to an apparatus to be used with vehicles, he wishes it to be understood that the said apparatus may be varied as regards the arrangement of its levers, springs, and wheels, both in form and number, and that apparatuses of a substantially similar kind are to be applied by him to many other purposes, such as to printing presses, for registering the number of sheets, quires, or reams of paper printed; to calico printing machines, for registering the number of yards operated upon; and to any and all revolving and other machines, or parts of revolving and other machines, to which the same are or may be applicable.

MANURE.

Isaac Brown, *Carlisle, and* John Brown, *Notting Hill, Middlesex.—Patent dated March* 29, 1858.

The patentees' improvements relate to the application and use of a peculiar preparation in the treatment of existing manures, and in the manufacture or production of manure, whereby a superior fertilising agent is obtained by the conversion of the volatile ammonia into a fixed salt, and rendering the phosphates soluble. In carrying out the invention, the patentees employ a compound which they term "sulphuretted carbon," prepared by mixing sulphuric acid and charcoal, in proportions suited to the nature of the manure or fertilising agents to which this mixture or compound is to be applied; the admixture of the compound thus obtained with guanos fixes the volatile ammonia contained therein, and renders the phosphates soluble; at the same time, it improves the fertilising properties of such manures, and reduces the cost one-third. The patentees also apply this mixture ("sulphuretted carbon") to the dissolving of ground bones, bone dust, and other substances containing phosphate of lime, for the purpose of manures. The carbonaceous matter thus combined with the manure acts beneficially as an absorbent to the whole, and a distributor of the fertilising matter to the plant. Although the patentees prefer to use sulphuric acid, in the preparation of the "sulphuretted carbon," yet, they do not confine or restrict themselves to that acid, as any acid which is found to have the like effect upon ammonical matter, and phosphate of lime, when conveyed through the medium of charcoal or any other carbonaceous matter, may be employed, and constitutes the said invention.

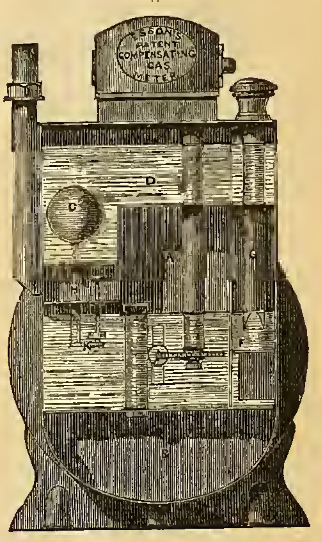
GAS METERS.

William Esson, *Cheltenham.—Patent dated August* 27, 1858.

In his present invention, Mr Esson has directed his attention to a highly improved point in the arrangement of wet meters; namely, that of maintaining the proper water level in wet gas meters, by compensating for the evaporation or other loss of the water in the meter. According to this invention, the upper part of the meter is furnished with an air-tight water supply tank, which communicates with the measuring chamber, by means of a feed or supply pipe, so disposed as to be always sealed. The supply tank is provided with an air-pipe, the lower mouth or orifice of which coincides, or nearly so, with the proper water level; and a float is contained therein, connected with the ordinary gas valve, for the purpose of shutting off the gas when the tank is empty, or the water therein, too low. The water is supplied to the tank by a supply pipe, which is kept constantly sealed When the water in the meter descends below its proper level, by reason of evaporation or other loss, it leaves exposed the lower orifice of the air-pipe, and allows the gas to ascend therethrough, and the water in the upper tank to descend through a pipe for that purpose, until the air-pipe is sealed again by the water in the meter regaining its proper level.

Fig. 1 of the accompaning engravings represents a vertical section of a wet gas meter, fitted with the improved compensating apparatus. Fig. 2 is a transverse section of the same. A is the front chamber, and B the waste box, arranged as in an ordinary "low spouted" wet gas meter, with the exception that the float, C, is removed from its usual position under the valve, and placed in the reservoir or water supply tank, D. This tank is supplied with water by means of the feed pipe, E, which is kept constantly sealed by the water in the surrounding closed pipe, F, within which the feed-pipe is enclosed. A sufficient opening or space is left at the top of the pipe, F, to allow the feed water, when poured in at E, to flow over the lip or edge of the pipe, F, into the supply tank, D. An air-pipe, G, forms a communication between the front chamber of the meter and the supply tank. The use of this air-pipe in combination with the supply tank, constitutes the essential feature of the invention, and the patentee, therefore, does not confine himself to the particular arrangement shown, where this pipe is represented as being soldered to, and forming part of the outer feed pipe, F, although the patentee prefers so to apply it, as it will be obvious upon explaining its action, that it might be applied in other parts of the tank and meter. H is a pipe which supplies, when necessary, from the tank, D, the requisite quantity of water, to compensate for loss by evaporation or otherwise, to the front chamber, A, of the meter. The tank, D, is made air-tight, and consequently no water can flow down the pipe, H, until air or gas is allowed to enter the tank. When the level of the water in the meter falls below its proper height, and below the lower mouth of the air pipe, it will unseal that pipe, and gas will enter the water tank, at the same time allowing a supply of water to descend the pipe, H, into the front chamber, and raise the water in the meter to the proper level, whereupon the air-pipe will be sealed again, and the further supply stopped until again required, by the descent of the water below the proper level. By placing the float, C, within the supply tank, in lieu of in the meter, complete security is given to the gas companies, as the emptying of the supply tank or reservoir will close the gas valve. The float is submerged some distance below the surface of the water in the tank, and consequently will not act upon the gas valve, I, until the tank is nearly empty. For convenience sake, the patentee passes the float spindle through the supply pipe, H, connecting it with the valve spindle, by a connecting arm, K. The patentee is aware that it has been previously proposed to compensate for the loss of water by evaporation or otherwise, in wet gas meters, by placing a supply tank or reservoir above the meter, and allowing a supply of water to enter the meter through a supply pipe, which, when unsealed, allows the gas or air to pass up therethrough into the tank, and a supply of water to pass down the same pipe; but this has hitherto been done in a manner entirely different from the patentee's system.

Fig. 1.



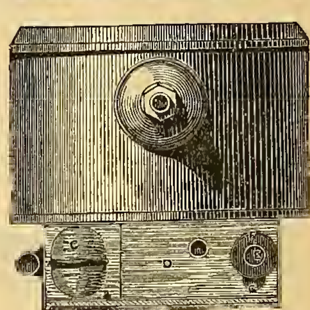


Fig. 2.

DISTILLING.

Edward Owen, *Blackheath.—Patent dated July* 14, 1858.

These improvements consist in submitting the body to be distilled, when in a liquid condition and in a state of very minute divisions, to the action of steam or some sufficiently heated gaseous vapour by which the act of distillation is effected. Fig. 1 of the accompanying engravings represents a vertical section of the arrangement of apparatus which the patentee prefers to use in carrying out this invention. The apparatus consists of a tall chamber, A, composed of wrought-iron, or other suitable material, and surrounded externally by a flue space, for the purpose of maintaining the temperature. It is closed at the top and bottom by suitable end plates or covers, B. Within this chamber is placed a second chamber, C, resting upon the bottom plate, B, but open at its upper end, and not quite reaching to the top plate, B, of the outer chamber, A. At the bottom of the inner chamber, C, is a reservoir or receptacle, D, for the liquids to be distilled, which liquids are supplied in drops or small streams from the feed-pipe, E; a lock, F, serving to assist or regulate the supply to the receptacle, D. Through the centre of this receptacle passes a peculiarly formed nozzle or steam jet pipe, G; the mouth being so constructed as to throw out a jet of steam of an angular form, as will be clearly understood on referring to the engraving, which shows the nozzle in section. H is a syphon or overflow pipe, which should be so disposed as to prevent the liquid ever rising much above the nozzle, G. On directing a jet of steam through the nozzle, the liquid will be caught up with the jet in small quantities, and dispersed in a finely divided state or spray, and intermixed with the heated vapour, whereby it becomes more or less volatilised, and the whole descends into the chamber, A, which is filled with coke for the purpose of arresting that portion of the liquid which may not have been vaporised, which liquid will collect at the bottom, B[1], of the chamber, and flow off by the discharge pipe, I, whilst the volatile vapours will pass off by the pipe, K, to any suitable or condensing apparatus, as is well understood by distillers. In treating liquids composed of bodies having different points of volatilisation, the chamber, A, may be purposely employed for their separation, the liquid collected from the discharge pipe, I, being again passed through the still, and submitted to the action of steam or suitable gaseous vapour of an increased temperature.

Fig. 1.

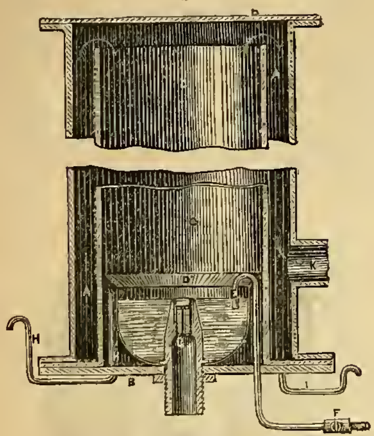
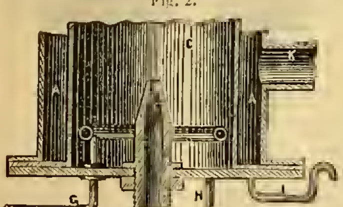


Fig. 2 represents another form of apparatus, slightly modified from the first. In this arrangement the receptacle, D, is dispensed with, and the liquid to be distilled is forced under considerable pressure, by the aid of pumps or other apparatus, through the jet pipe, E, fixed in the bottom of the inner chamber, C. This jet pipe is surrounded by an annular or spiral perforated steam jet pipe, G, which directs the steam, in the form of innumerable jets, against the spray forced through the pipe, E, and by mixing therewith, more or less volatilises it, the vapours passing off, as before, to a condenser. H is a pipe for carrying off any of the liquid not carried over into the chamber, A. The patentee recommends the temperature of the body or liquid to be distilled, to be raised to nearly a volatilising point previous to being forced into the distilling chamber.

Fig. 2.



TREATING INDIA-RUBBER.

N. S. Dodge, *London.—Patent dated July* 30, 1858.

The object of this invention is the utilisation of the scrap or waste pieces of vulcanised India-rubber which are produced during the manufacture of articles therefrom. According to one mode of treatment, the patentee first reduces the waste vulcanised India-rubber to a finely divided state, and then boils the reduced rubber in water, in order that the mass may be converted into a soft, plastic, or gummy condition, capable of being employed in the manufacture of vulcanised India-rubber articles. To produce such desired results, continue the boiling operation for about 48 hours; but the duration of such operation is dependent on the nature of the materials to be treated. Another method of treating waste vulcanised India-rubber, in order to produce a new material capable of being employed for the manufacture of various articles, consists, firstly, in desulphurating such waste vulcanised rubber, and then passing the reduced rubber through "mullers" or rollers (either heated or not, as may be found most convenient), so as to bring it to a sheet shape, in which state it is mixed with asphalte, coal tar, resin, pitch, shellac, or other resinous or bitumenous substance. The proportions of these ingredients may, of course, be more or less varied; but the patentee has obtained very good results by mixing ten parts of the rubber, resulting from the previous operations, with two parts of the resinous or bitumenous substance, but when coal tar is used, four parts of coal tar may be combined with ten parts of rubber. This admixture is effected by passing and repassing the material between the "mullers" or rollers, until a compound is obtained in a state or condition suitable for the manufacture of fabrics or other articles. In cases where cloth or fibrous materials are combined or mixed with the waste rubber to be operated upon, such fibrous materials may be destroyed, if desired, without injury to the rubber, by the employment of an aqueous solution of lime or alum, or of a diluted apricorn solution of sulphuric acid, or such acid solution may consist of about one part of sulphuric acid to nine parts of water.

ENGINE GOVERNORS.

J. H. Johnson, *London and Glasgow* (W. Wood *and* J. Rice, *Philadelphia, U.S.*)—*Patent dated August* 30*th*, 1858.

These improvements relate to the construction and arrangement of governors or regulators, applicable to either marine or stationary engines, whereby the action of the governor is rendered more sudden, sensitive, and powerful, than that of the ordinary description, whilst the governor itself will work equally well in a horizontal, vertical, or oblique position. This is effected by regulating the throttle valves of marine or stationary engines, by means of radial weighted rotating rods, carried in a suitable revolving box or casing, and connected with the periphery of a pulley or its equivalent, carried in the centre of the revolving casing. The weighted rods are so guided that, when acted upon by centrifugal force, they can move only in a straight line, radiating from the centre round which they revolve. These weighted rods are connected to the periphery of the pulley or its equivalent in such a manner, that when they move or slide outwards by the action of the centrifugal force, they cause the pulley or its equivalent to turn slightly on its axis, in a path at right angles to that in which the governor balls or weights on the rods rotate. The pulley or its equivalent is also connected at its periphery, by means of a link, to a sliding rod which actuates the throttle valve, a similar link and sliding rod, (the latter bearing upon a spring), serving to draw the weights inwards when not in motion, by imparting a slight rotatory motion to the pulley or its equivalent, in the contrary direction to that imparted to it by the outward motion of the weighted rods. Fig. 1, is a face view, illustrating the interior of the improved, direct-acting, compensating governor.

Fig. 1.

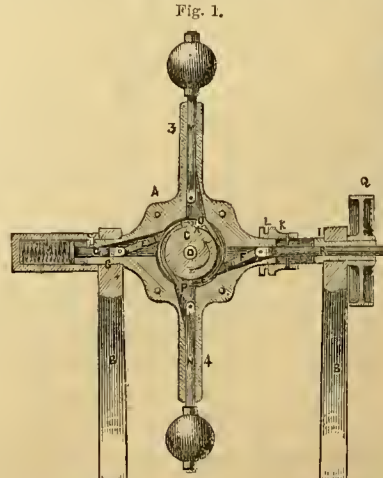
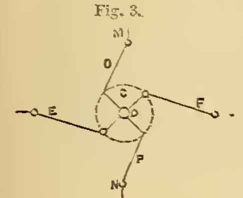


Fig. 2.

Fig. 2 is a section taken at right angles to fig. 1. Figs. 3 and 4 are diagrams illustrating the peculiar action and advantages of the governor. The body of the governor consists of a central box or casing, A, from which project, in contrary directions, but in a line with each other, the two arms, 1 and 2, and, at right angles to the latter, two other arms, 3 and 4. The two arms, 1 and 2, form the shafts or trunions, turning in suitable bearings on frames or standards, B. C is a pulley secured to, or forming a part of, the spindle, D, which turns freely in the opposite sides of the central box or casing, A, a recess being formed in the latter for the reception of the pulley and its appendages. The centre of rotation of the spindle, D, coincides with the point where a line, drawn through the centre of the arms, 1 and 2, intersects a line drawn through the centre of the arm, 3 and 4. Two links, E and F, are connected to pins attached to the pulley, C, at opposite sides of, and at equal distances from, the centre of the spindle, D. The rod, E, is jointed to a spindle, G, which passes through and is guided by the arm, 2, the end of the spindle being furnished with a disc, fitting into the cylinder attached to the end of the arm, 2, and between the end of this cylinder and the disc, intervenes a spiral spring, I. The end of the rod, F, is jointed to a spindle, R, which passes through and is guided by the arms, and to which is fitted a slide, K. The slide is furnished with the usual groove, L, for receiving the projections on the end of the lever, through which the motion of the slide is communicated to the regulating valve of the steam engine. A weighted rod, M, fits into the arm, 3, and a similar rod, N, into the arm, 4; both being arranged to slide freely backwards and forwards in their respective arms. To the end of the rod, M, is a band or chain, O, which partially surrounds and bears against the periphery of the pulley, C, to which the end of the chain or band is attached—the end of the rod, M, being connected by a similar band or chain, P, to the opposite edge of the pulley.

Fig. 3.



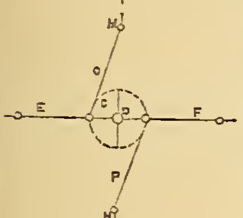


Fig. 4.

When the above described instrument is stationary, the operating parts will be in the position shown in fig. 1, the spring, I, having forced the rods, E and G, inwards, partially turned the pulley, C, and imparted a simultaneous inward movement to the rods, M and N. When the governor is caused to revolve, which may be effected by the pulley, Q, or by any suitable system of gearing or straps, the several parts will remain stationary, until the centrifugal force gained by the rotation of the weights attached to the ends of the rods, M and N, overcomes the resistance of the spring, I, when the weighted rods will fly out, and, through the bands or chains, O and P, partially turn the pulley, C, in the direction of the arrow, thereby forcing outwards the rods, F and R, and with it the slide, K, the motion of which is communicated to the regulating valve of the steam engine. The opening and closing of this valve is thus dependent upon two forces, one tending to counteract the other, namely, the force of the spring, I, and the centrifugal force acquired by the revolving weights. The amount of opening and closing of the regulating valve, therefore, depends upon the extent to which one of these forces exceeds the other, and, consequently, the speed of the governor and power of the spring must be regulated to suit the speed at which the engine is required to move. It is well known that a spring does not increase in resistance in an equal ratio to the distance to which it is compressed. Thus, if the spiral spring, I, were compressed to the distance of two inches, it would offer much more than double the resistance than that which it would do when depressed to half that distance, and so on. It is certain, therefore, that the action of the spring, I, cannot be equal in every position to which it may be compressed by the flying out of the weights; and, consequently, it is desirable that some means should be adopted to compensate for this variation in its resistance. It is true, that as the weights fly out, their centrifugal force must increase according to the extent of the path in which they move; and this increased force will, in some measure, compensate for the increasing resistance of the springs. The increased force thus obtained, however, is insufficient for the purpose. Hence the adoption of the peculiar devices illustrated, through the intervention of which, the centrifugal force of the weights is transmitted to the regulating or throttle valve. It should be understood that, in order to impart the desired movement to the latter, the pulley, C, has to move over one quarter of its circumference only. The force exerted by the outmoving weighted rods, to turn the pulley to this extent, is through a never-varying leverage. The leverage, however, through which the pulley transmits the force it has thus attained, diminishes as the pulley turns. Thus, the pin to which the end of the rod, E, is connected, is exactly the same distance from the centre of the pulley, as the band or chain, P; consequently, when the pulley is in the position shown in fig. 1, the leverage, through which power is transmitted to the pulley, is identical with that delivered by the pulley to the spring. But, when the pulley has been moved round in the direction of the arrow, to the extent of one-eighth of its circumference, as seen in fig. 3, the leverage, through which the power is transmitted from the pulley, has diminished, and will continue to diminish, until the pulley completes the desired quarter of a revolution and assumes the position represented in fig. 4, the leverage exerted to turn the pulley remaining the same throughout this movement. It will be obvious that the centrifugal force of the revolving weights is exerted on the spring, I, with a leverage constantly increasing to an extent sufficient to assist in counteracting the increasing resistance.

LAW REPORTS OF PATENT CASES.

FURNACES: OPPOSITION IN RE W. R. ALEXANDER'S INVENTION.—This opposition was before the Attorney-General, and was preferred by Mr. John Reid, of Glasgow, on the ground, as alleged, that Mr. Alexander was not the first and true inventor of the apparatus in respect of which he had applied for letters patent, but that Mr. Reid himself had invented the identical apparatus in 1849. Mr. Reid filed an affidavit of himself only, in support of his case, which, in substance, alleged, that in 1849 he exhibited in Demerara, drawings and a description of the identical apparatus sought to be patented by Mr. Alexander, and that a description appeared in the *Royal Gazette* of George Town, Demerara, in the same year; that at the time of this publication in Demerara, Mr. Alexander was a resident there; that he, Mr. Reid, and a Mr. M'Pherson, an engineer from Demerara, had recently inspected a model of the apparatus sought to be patented, and that Mr. M'Pherson had pronounced it to be identical with that of which Mr. Reid had given a description at Demerara, in 1849, and that Mr. M'Pherson had sailed for Demerara, and had promised to forward to England a copy of the *Royal Gazette* containing the article before referred to, and also drawings, those of Mr. Reid's invention. Mr. Reid described his invention in his affidavit, and also laid over a drawing of his apparatus, which drawing he admitted would not show the inventions to be similar, but alleged that, if time were allowed him to receive the drawings to be forwarded from Demerara by Mr. M'Pherson, he would show his invention to be identical with that of Mr. Alexander. Mr. Alexander, in his affidavit in answer, positively denied the existence of any analogy between the two inventions, and also denied that he had ever heard of Mr. Reid's. At the instance of the opposer, the Attorney-General adjourned the hearing for a week, without prejudice to the question of payment of the costs occasioned by the adjournment. The matter came on for hearing on the 12th April, 1859, when Mr. Sergeant Petersdorff appeared to oppose, and Mr. Lawson, of the Chancery bar, instructed by Mr. J. Henry Johnson, of Lincoln's Inn Fields and Glasgow, appeared in support of the petition for the patent. Mr. Serjeant Petersdorff applied for a further adjournment of the hearing until the middle of May, alleging, that without possession of the *Royal Gazette* of George Town, and the drawings exhibited in Demerara, he was not prepared to establish the opposer's case. After hearing counsel for the petitioner, the Attorney-General adjourned the hearing until the 18th May, conditionally, on opposer, within four days, undertaking to pay whatever damages the Attorney-General should award to Mr. Alexander, upon proof of such loss, by reason of the postponement. If no such undertaking was given within the time specified, then the patent to proceed. The opposer to pay the costs occasioned by the former adjournment. The opposer did not give the required undertaking and the patent has since been sealed.

INDIA-RUBBER PACKING: TUCK *v.* SILVER. — This was a motion for an injunction to restrain the defendant from an alleged infringement of the plaintiff's patent, in respect of India-rubber packing for pistons, piston rods, and valves. Letters patent were obtained by the plaintiff on the 25th of August, 1854, and in the specification, the invention of "improvements in packing for pistons, piston rods, valves, and other uses," was described, as intended to combine a flexible material of canvas, coated or saturated with a solution of India-rubber, or other suitable composition, with an elastic material, so as to cause the former to be constantly kept in contact with the rubbing or tearing surface by the elasticity of the latter, this object being accomplished by constructing the packing with a block or core of India-rubber, or other elastic material, surrounded by folds of flexible material. The packing manufactured in accordance with the patent, has acquired considerable reputation, and is known as "Tuck's Patent Elastic Core Packing." The defendants carry on business as outfitters and general merchants at Bishopsgate Street Within, and are also proprietors of a factory at Woolwich, known as "Silvertown Works." In August, 1856, the plaintiff, having discovered that the defendants were infringing his patent, wrote to them on the subject. On the 28th of August, 1856, the defendants replied, that they were not aware of the existence of the patent until they had received the plaintiff's letter, and that they had discontinued the manufacture and sale of core packing, and would on no account resume them. The plaintiff recently discovered that the defendants were selling elastic core packing, similar to that manufactured by him under his patent, at exactly half the price, under the name of "Silvertown Packing." To restrain this alleged infringement of his patent the plaintiff filed his bill, and now moved for an injunction. For the defendants it was contended that there had been no infringement; that the specification of the patent was vague, and did not state the employment of vulcanised India rubber, which was alone available for such purposes, and that the patent itself was of doubtful validity, and, at all events, ought to be legally established before the plaintiff could obtain an injunction in this court.—The Vice-Chancellor said, that upon the two grounds of long and uninterrupted enjoyment under the patent, and of the special circumstances of conduct by the defendants, the plaintiff was entitled to the interlocutory injunction. The enjoyment had been for five years without interruption and with acquiescence. But the conduct of the defendants was alone sufficient to induce the court to grant an injunction. After the assurance by the defendants, in August, 1856, that they would on no account resume the manufacture or sale of "core packing," the plaintiff had no reason to suppose that he would be undersold behind his back, nor that the defendants were going to set up an adverse right and dispute his patent. But for the assurance given by them, the plaintiff would have tried his right more than two years ago, and he had been grievously wronged by the representation then made to him. This was alone sufficient ground for granting the interlocutory injunction. His honour, after adverting to the arguments as to the patent being void for want of novelty, said that these were questions which would be for a jury to consider. There were material questions to be tried, and the plaintiff had established quite a sufficient *primâ facie* case to entitle him to an injunction until the hearing. With respect to putting him upon an undertaking, although the practice was modern, yet it was convenient and consonant with justice, more especially after the act of last year, which enabled the court to assess damages, and thus to complete justice between the parties. There would be an injunction until the hearing, the plaintiff undertaking to bring an action, and to abide by any order as to damages the court might make at hearing.

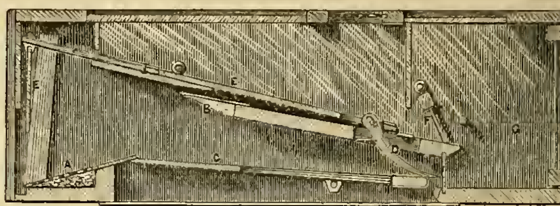
Mantilla Shawls: Norton *v.* Nicholls.—In this action, brought to recover damages for the infringement of the plaintiff's registered design for a mantilla shawl, the court had granted a rule for a new trial, or to enter the verdict for the defendant, and after argument, had taken time to consider. Lord Campbell now delivered the judgment of the court in favour of the defendant. On the part of the plaintiff, five points were made, in respect of each of which it was contended the design of the plaintiff's shawl was new. The design was registered under the 5th and 6th of Victoria, cap. 100, and it was contended that if the defendant had imitated the design in any one particular, the plaintiff was entitled to recover. The shawl was reversible, and had two sides, was scalloped, had a particular border, a particular configuration of the corner, and a newly invented fringe. The great merit of the shawl was, that it could be made into eight several shawls, all seeming to be different. The evidence showed that all the five points relied upon, were in public use before the registration of the plaintiff's design; but, it was contended, that the combination of all the five points in the plaintiff's shawl was new. The defendant's shawl was the same as the plaintiff's, only the colour was different. Thus the question arose, whether in respect of such an imitation the action could be maintained? The court were of opinion that it was not. The court did not deny that a combination might be a "design" within the meaning of the statute, but this was not so. The registration also was defective, consisting merely in leaving in the registry an entire shawl of the plaintiff's manufacture. That gave no notice of the nature of the plaintiff's claim. Nor had sufficient notice been given to the defendant of the plaintiff's exclusive right.—Rule accordingly.

REGISTERED DESIGN.

AUTOMATON MOUSE TRAP.

Registered for Mr. C. Pullinger, *Selsey, Chichester.*

The subjoined engraving represents a vertical section of an ingeniously designed mouse trap, invented by Mr. C. Pullinger, of Selsey, Chichester, who describes himself as following no fewer than forty-two distinct and separate occupations. The list is so long that we cannot well repeat it, but we may state that it begins with "contractor," and ends with "clerk to the Selsey Sparrow Club." The trap is of an oblong rectangular form. At the front part is a box, A, made of perforated zinc, to contain seed. The mouse tries to get at this seed, and failing in this, it endeavours to reach the bait, placed on the middle partition, B; this consists of some grease put on the under side of the partition. In doing this, it must step on the treadle, C, and the weight overbalancing it, releases the trigger, D, from the catch, which throws the trap, and the mouse is caught. As there is no escape at the entrance, the mouse climbs upon the balance board, E, (the position of which, when the door is closed, is the reverse of that shown in the engraving,) and, being attracted to the opposite end by the zinc grating at the top, the balance board descends, which raises the door, connects the trigger to



the catch, and the trap is re-set. The animal, finding the opening through which it got on the balance board again closed, pushes his way to the chamber, G, through the wire door, F, which falls when he has passed, and finally secures him. It is stated that these traps have met with extraordinary success in the neighbourhood of Chichester, and that they are very highly approved of by the agriculturists who have tried them. We have had an opportunity of practically testing the merits of this trap, and can speak of it with unqualified approval, for it cleared the place in which it was tried, catching the little animals in half dozens at once.

REVIEWS OF NEW BOOKS.

The Principles and Practice of Harmonious Colouring in Oil, Water, and Photographic Colours, especially applied to Photographs on Paper, Glass, and Silver Plate. Cassell & Newman, London. 1859.

Although photography is often in one sense untrue with regard to the relations of chiaro oscuro, and colour becomes a desideratum to supply the defects—the lover does not like his mistress's golden tresses to be painted, even by the sun, with raven blackness, or her blue eyes to "come out" a blank. But there are difficulties in the way of the colouring required, which are occupying much the attention of photographers at the present moment. The publishers of this pamphlet have caught hold of the fact, and hence this short compilation at a fancy price.

The peculiar and novel colouring required is as peculiar and novel as the disc to be coloured; and this disc, again, is so variously acted upon by different chemical applications, as to very greatly restrict the colourist in the use of colours, which, on common paper or millboard, are so abundantly open to him. He finds that he cannot paint with what colours he pleases, but that he has to attend to certain requirements, and these are now the problem of the day. There is no doubt that since colour has been applied to photographs, photographs have been improved considerably. The colourist found that his better effects could alone be produced on the better photograph; and there are few now produced which are not sufficiently perfect.

"The first step in preparing the photograph is to mount it on cardboard. For this purpose, a solution of gelatine or clean fresh glue should be used; paste or gum water should be avoided, as it is apt to generate acid, which would injure the photograph. The gelatine or glue should be brushed over the back of the photograph, which should then be laid on the board. A sheet of clean paper should now be laid on the surface, and then pressed firmly and gently down; the picture should then be put under a weight." This trifling direction is one of the best given; and the following may not be amiss to bear in mind:—

"Many photographers in fixing and washing their prints on salted paper wash them in boiling water, and thus entirely discharge the size from the paper, whilst others do this in a partial degree. The effect of this is, that water colours applied to the unsized surface are at once absorbed, rendering it impossible to work with them. To apply water colours to paper with any facility and effect, it is necessary that it possess a hard surface, on which the colours wash easily, sinking in just sufficiently to allow other colours to be worked over them without washing up. To obtain this surface, the photograph will almost invariably require some preparation. Some colourists have recommended the use of parchment size, with the addition of a little alum."

But altogether this is a mere trade list. If you want, it says in almost every page, real good colours, and of such and such shades and descriptions, go to Newman's; and so as to brushes and *sic omnia.* This is not the thing at all, and a respectable house ought to repudiate such a course.

We observe that a great deal is said in tho text about a certain novel "preparation," to be used preparatory to colouring photographs, and "our preparation" is the indispensable. Desirous to try this at all events, we inquired for it at "our establishment," but we were actually told, that the preparation had been tried and had failed!

The Life-Boat, or the Journal of the National Life Boat Institution. (Annual Report.) 8vo. Pp. 52. London: 1859.

This report is truly a national one, for its subject-matter may be said to directly affect every dweller in our island. No one can look upon our annual wreck chart without being horror-struck at the picture of fatalities which it affords; and certainly no one can glance at the operations of the National Life-Boat Institution without a feeling of deep thankfulness that we possess so noble and so disinterested an association—but without, at the same time, a serious regret that its operations are not on a more extended scale. So long as we see whole tracts of northern coast in some of the most exposed parts quite unprovided with life-boats, and mark the casualties occurring there, we cannot but feel that the coast life-boat system has but made a beginning. For instance, Fraserburgh and Lossiemouth are the only two Scottish stations in the list before us. And yet what a noble beginning has been made, considering the short time during which the system has been in operation. The institution now possesses eighty-one life-boat establishments thoroughly equipped; fifteen of these have been added during the last twelve months. During the past year the committee of the institution have been engaged in completing and re-organizing the several life-boat stations on the Norfolk coast—the Norfolk County Association having merged into the institution. The Tees Bay Life-Boat Society has also united itself with it, and its three establishments have also been re-organized and equipped. New life-boats have been stationed in England at Cromer, Mundesley, Bacton, Winterton, Yarmouth (2 boats), Aberdovey, and Fleetwood; in Ireland—at Dundalk, Carnsore, Tranmore, Dungarvan, and Newcastle, the last-named in lieu of a previous boat; and in Scotland—at Fraserburgh and Lossiemouth. New boats are also ready to be sent to Exmouth and Kilmore. All these boats are on the self-righting principle. The committee continue to receive the most satisfactory reports of this class of life-boats, many of which have rendered important services during the past year. One instance has occurred of a single-banked self-righting boat having been upset, by broaching-to when running before a heavy broken sea on her return from a wreck off Dungeness. Although this accident occurred in the middle of the night, and at some distance from the land, yet the whole of the crew regained their boat after she had self-righted, which she immediately did, and not one of them was even hurt on the occasion: a striking proof of the value of the self-righting principle adopted by the institution, and of the efficiency of the life-belts with which the crews of its boats are all provided, and which they are compelled to wear whenever they are on service.

The Duke of Northumberland, the energetic president of the institution, has most generously forwarded drawings of these boats and their carriages all over the world, in order to make their self-righting properties properly known. The life-boats of the institution have saved 110 lives during the past year; and they have also put off on twenty-nine occasions to the assistance of vessels in distress, when the crews have either been enabled to remain on board, or reach the shore by their own or other boats. The number of shipwrecks during the past year, as we have already noticed, has been about the same as that of the year before, or 1,170 in all; but they have been differently distributed, a much smaller proportion than usual having occurred on the east coast, owing to the prevalence of westerly winds. The total number of lives saved from shipwreck on our coasts during the past year is as follows:—

By life-boats,	206
By luggers, coastguard boats, and small craft,	719
By assistance from shore with ropes, mortar apparatus, &c.,	210
By ships' own boats and steam-vessels,	394
By individual exertion of a meritorious character,	26
Total,	1,555

The report before us gives very ample details of the whole proceedings of the institution: amongst which are a statement of the whole of the boats belonging to, or in connection with the institution, with their localities, and the secretaries' names; the rewards voted for services during the past year, and the services themselves; a list of the gold and silver medals voted for intrepid exertions since 1824; and full financial details of the undertaking. The report is illustrated with engravings of the life-boat and carriage of the institution. It should be read by all who wish to aid the good and great cause which it advocates, either by pecuniary contributions or by scientific suggestions for the improvement of the boats.

A Memoir of Thomas Uwins, R.A. By Mrs. Uwins. 2 vols. London: Longman & Co. 1858.

Nothing could be worse than the arrangement of these volumes. They form a work totally undigested and unmethodical. No pains have been taken as in a literary labour for the public, which the public in anything published has a right to expect. First we have a "memoir" extending some 150 pages, then a list of exhibited works, next an outline of the Sketching Society, afterwards a series of letters from Italy, and concluding with the painter's correspondence with Sir Thomas Lawrence, Joseph Severn, Sir Charles L. Eastlake, Abraham Raimbach, Robert Roffe, B. T. Wyatt, Miss Whyte, and Sir William Gell—each as they are here severally mentioned, and each set of correspondence in chronological order. Hence nothing could be more confusing when it is required to see the man progressing from youth to old age. The materials collected are unquestionably interesting, but they are little else except barren materials. By dint of persevering thought we may come to some indefinite imagination of what *the man* was; but how he got to be such, what were his stumbling-blocks, and how he strode over them, what were his aids, and how he took advantage of them, are scarcely ever touched upon—often the more interesting and always the more useful part of biography. Neither does any discrimination appear to have been exercised as to the contents of the several letters. They all come higglety, pigglety before us, just as they were written, and sometimes with positive offence. This obliquity of performance starts up before us at very short intervals, and makes us the more regret the absence of a consecutive history.

Born on the 24th of February, 1782, and living till the 26th August, 1857—a long life of seventy-five years and upwards—Thomas Uwins passed through an eventful period in the world's history and in that of arts; and he managed to acquire the honours and do some work which *bona fide* entitled him to them. In the prime of life, as to age, he acquired considerable reputation as a portrait painter. Designs for booksellers being also about this time great part of Mr. Uwin's employment. Elected an Associate of the Academy in 1833, he attained its higher honour in 1838, being the first painter whose diploma was signed by Queen Victoria. Perhaps he was not the worse for this, although his long residence of many years in Italy may be said to have made what subdued fame he acquired. His journeyings at home and abroad were not many. Short visits to the lakes of Scotland, a shorter one to the south of France, and a lengthened journey of several years in Italy, make up the sum. He died the same month and the same day of the month, but in another year, as his mother.

His letters are certainly very delightful compositions, written off without elaboration. They far outshine those of his correspondents, many of which are turgid, and some so flat, stale, and unprofitable, although abounding in words, as to induce a belief that they must have been printed by mistake.

We are afraid the volumes have inoculated us with the same desultory thinkings which they themselves exhibit, and we must be excused by our readers if, in our attempt in some degree to arrange the facts detailed, we ourselves exhibit a want of unity and arrangement.

In the letters from Italy we have some agreeable descriptions of the master painters' works, and we may well fancy the enthusiasm of Uwins on seeing "the Titians, Tintosets, Giorgiones, and Veroneses of Venice; the frescos of Julio Romano, at Mantua; the Correggios and Parmegianos, at Parma; and the renowned productions of Guido, Domenichino, and the Caracci at Bologna." We have also occasionally a word or two of sound criticism. Thus he writes of Giorgione:—"Giorgione never went much beyond a head or a group of heads, but what he did do seems to me very near perfection. There is a noble style and a grand conception of nature in his works that raises them above every other painter, Titian not excepted." This may be slightly exaggerated encomium, but it shows a just perception of the greatness of the old painter, at a time, too, long before it became, as recently, the fashion to like the real early masters.

In a letter to his brother David, in 1828, we read a very just remark:—

> "The truth is, coming to Italy will not give a man genius, and that is all that can be said about it; but it will give him experience; it will open to him a new field for the observation of nature, and, if he has any guts in his brains, he cannot fail of deriving benefit from it. There is one especial good I have found. The principles of the old masters were before often unintelligible to me, but the moment I came into Italy they became comparatively clear, from the analogy they bear to Italian nature. I could see Titian, Giorgione, and Paolo Veronese in every church, in every balcony, on every canal of Venice. Claude and the Poussins I could trace in Rome and Tuscany, and Salvator Rosa darts upon the mind in absolute reality at every step one takes amidst the enchanting environs of Naples. I might add the originals of Raphael and Michael Angelo's figures are to be found in every street, and under every porch."

This is excellent and leads to further excellence. It shows that nature-study—whatever and wherever it may be—makes and alone improves the artist. We believe many artists spoil themselves by travelling. Wilkie, even Wilkie, was within an ace of doing so. Pottering through the different "schools" where alone they may be studied, in their living places, the artist is struck with a beauty of one kind here, and of another kind there, and attempted imitation (which is always a failure) leads to the unconsciously stifling of personal genius. Uwins writes to Raimbach:—"It is humiliating to find that a very few names give the character to each school; the rest have sunk into merited obscurity." No doubt, and deservedly so. "A school," he goes on, "is scarcely formed, the lives of its founders have scarce expired, before it begins to degenerate; and the tide of bad taste once set in, nothing can stop it. It goes on '*di male in peggio*' till whole ages are occupied in multiplying insignificance, and giving birth to nothingness." An observation of the present President of the Academy, in a letter to Mr. Uwins, in 1830, is worthy of note in this place:—"Nothing," says he, "is more interesting in painting, next to the immense variety in nature, than the equal variety in the minds of her imitators (which, by the by, is so strong an argument against schools)." The words in parenthesis form the chief truth in this sentence, and Uwins himself re-echoes again and again the solid conclusion:—"They may talk of this school and that school, but a man of real genius is of no school; he stands alone." Again, "Nature keeps the noblest *school* after all. Her lessons never tire."

In his letters from Italy, his descriptions of the ceremonials in the Catholic churches are among the best and most *vraisemble* we have ever met with, but being half a Puritan, he is a prejudiced observer. But such are not the things we want to read of when we want to see the man obtruded upon us. We prefer such excerpts as the following. After feasting on nature for a few hours in the country, after a long fast, he exclaims, "Every thing I have seen gives the lie to pre-Raphaelitism," and then the very next day he says, "To-day I have begun to admire the pre-Raphaelites. I found the brook itself in which Ophelia floats, and could not help acknowledging the truth of Millais's representation. The girl herself was wanting, but the water-plants and the flowers, and the dark, dark stream were there. It is this young man's genius that has found how to treat such subjects. In his hands it is original and as wide off Giotto and Cimabue as if such persons had never existed." This is criticism. In such appreciation of genius, genius itself is exhibited, and it is truly pitiable when we see it, as we usually do, associated with frailties, or a large frailty of some sort. Look around and think, and many examples unpleasantly intrude. Mr. Uwins had a mind too sensitive and too retentive of first impulses. Thus we are told that George Combe, seeing an unfinished portrait of Dr. Uwins (brother of the painter), with whom he was unacquainted, gave an accurate description of his characteristics, and Mr. Uwins warmly embraced the science of phrenology; and yet he says, "I know myself not to be courageous;" calls himself "a slow, timid man;" and talks of his "shy and retired habits." Again, "That timidity which has marked my course in life has made me shrink from opportunities." "I might work with some effect in privacy and retirement, but when a great responsibility is to be undertaken, the result of which is to depend on my powers, the very parade and ceremony of the thing would render me impotent." "What I want is what the French call *l'art de se faire valoir*, and this want is fatal to me." "My want of self-estimation is no mock modesty, it is a deep feeling of mental impotence." "If it (some light thing or another) make me—melancholy me—cheerful, it must go near to make the light hearted mad." Such things lead to worse. "I have always a terror about me of writing after a long cessation of communication—there seems time for so many dreadful things to happen." Again, "It is said (1852) that more rain has fallen in the last two months than, &c. . . . The astrologers say it is the commencement of evil days which are to overwhelm the country." And then we read of him telling "what wonders the mustard seed has wrought on me." At another time, even so late as 1851, we find him writing:—"I still believe in the efficacy of mesmerism, the value of hydropathy, and the perfection of homœopathy." Again, "How my brain escaped (the effect of a fever) I know not, except by the immediate interposition of God." And there is much more of this. No wonder that such moral and mental dispositions should occasionally lead the owner into a state of mind not enviable. "My memory is so little retentive, that unless I set down things as they pass before me, I begin even myself to doubt their reality." And this is the excuse. "Mine was never a methodical head, and you must be content to take things just in the desultory way they come into it." "I certainly seem to have more like a plan in my proceedings than I ever had." But "the very name of plan alarms me."

Marrying for the first time at no less an age than sixty-eight, no wonder we should have such explosions as the following:—"A capital desert you gave me, dearest; two posts a day makes communication delightful. I shall not soon forget the sensation of first sitting down to write to you. Separated for the first time! I am heartily home-sick, that's flat." Poor good soul of a septigenarian. Surely the demonstration of such tenderness might well have been omitted. But, oh, "Hills, valleys, woods, avenues, and parks abound. The land improver, with his desolating schemes, has not shown his face in this neighbourhood, but beautiful as it is, all is flat and unprofitable without you!" This is simple dotage, and we regret it was inserted. There is a good deal of twaddle about royalty, too, which, well in its way, is profane in the lips of a man approaching the character of a genius. None of this is the sort of thing that we want. A biography should not point to obliquities but to excellencies. It is a new kind of "stocks" to thrust a man into, and we feel very sure that none of us living would like all these little escapades in familiar life to be stereotyped for ever. Let us have what was good and sterling and properly influential in the man. Let all else be buried with him. The envious may indeed experience an unwholesome pleasure in seeing blemishes disclosed, but there are others, and we hope the many, who shrink to see even frailties thus drawn from "their dread abode." Notwithstanding this, the critical judgment of a man must not be despised who, so long ago as 1815, could, in a letter to a friend, talk of "that greatest of all living geniuses, Turner." It was long before the public voice re-echoed this praise, although Turner was well appreciated by many others besides Mr. Uwins at this early period.

Perhaps no two men were more unlike each other in *choice* of subject than Uwins and Etty. And Uwins thus characteristically speaks of him:—"With all Etty's powers as a painter, and they are great, he has a radically bad taste about him, which is for ever thursting out the cloven foot." In colour almost alike; Etty on the whole more gorgeous; the subjects of their pictures differed almost as vice from virtue. The chastity of Uwins could not measure the boisterous passion of Etty, and it is singular that this difference between them should have resulted in an equal social difference.

There are a few amusing facts noted down in the volumes calculated to make us in these days rather stare and smile. We are told that at an inn at Cheines, Bucks, in 1852, the painter asked for a map of Buckinghamshire, and that they brought him a series of pictures, on one sheet, of all the capital cities in Europe. "They had no other map!"

Distance, says Uwins, very truly—distance from the metropolis seems almost equivalent to distance in point of time in the metropolis itself. Again, in 1817, he says, "I found all the places (in the diligence) taken for three days." Fancy our having to wait for places three days now at such a town as Calais! Writing from Naples in 1827, to request a letter of a friend in London, he says he has only to lay before him, some fine morning, a fair sheet of paper, fill up all the writable space, and then send it to Theobald's Road, and in sixteen days, at an expense, to him, of 1s. 2d., and to me, of 1s. 1d., I shall get," &c. We now should grumble had we to pay so much for such a letter, or did it take so long on its journey.

There is something not unlike truth, too, when writing on the subject of patrons of art, he says, "The old nobility and land proprietors are gone out. Their place is supplied by railroad speculators, iron mine men, and grinders from Sheffield, &c., Liverpool and Manchester merchants and traders. . . . The voluptuous character of Etty's works suits the degree of moral and mental intelligence of these people, and therefore his success!"

Such was Thomas Uwins, R.A., from all that we can make out. "Each man," as the preface has it, "finds his way into eternity by a path through the world essentially his own." And so assuredly did Uwins. Not great, never likely to be illustrious, he achieved a name and a certain degree of enviable fame. He exemplified what Archbishop Leighton has said, and which is quoted as the motto to the work, "He who works and knows he works, he who prays and knows he prays, has got the secret of transforming life-failure into life-victory." So, to a certain extent, did Uwins; but his *life*, if it be worth writing, has yet to be written.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ASTRONOMICAL SOCIETY.

March 11, 1859.

Mr. Main gave some biographical particulars about the late director of the Radcliffe observatory.

"On the silvering of glass specula," by Warren De La Rue, Esq., and Hugo Müller, Esq.

"Results of observations of small planets, made with the transit circle at the royal observatory, Greenwich, during the months of January and February, 1859," communicated by the Astronomer Royal.

"Extracts from a letter to Mr. Carrington, from Dr. C. H. F. Peters, of Hamilton College, U S."

"On the movement of the solar system in space," by G. B. Airey, Esq.

"Note on the development of the disturbing function in the lunar theory," by Sir J. W. Lubbock, Bart.

"Note on a group of solar spots observed on the 23d February, 1859," by W. R. Birt, Esq.

"On some indications of rotation in a solar spot," by W. R. Birt, Esq.

"Note on Saturn's ring," by the Rev. W. R. Dawes.

"Observations of Donati's Comet taken at Mussooree, in India," by Captain Tennant, R.E.

"Description of an improvement in the making of large reflecting telescopes with silvered glass specula," by M. Leon Foucault.

April 8, 1859.

The papers read were:—

"Elements of Europa," by M. Lepissier.

"Ephemeris of the variable stars for 1859," by Norman Pogson, Esq.

"Results of the observations of small planets, made at the royal observatory, Greenwich, in the month of March, 1859," communicated by the Astronomer Royal.

"On the secular variation of the eccentricity and inclination of the moon's orbit," by Prof. Adams.

"On the apparent projection of stars upon the moon's disc in occultations," by G. B. Airey, Esq.

"Results of a comparison of the lunar tables of Bruckhardt and Hansen, with recent meridional and extra-meridional observations of the moon, made at the royal observatory, Greenwich, with accompanying remarks by the Astronomer Royal."

"On the cause of irregularity in the rate of a chronometer," by A. Wackerbarth, Esq.

INSTITUTION OF CIVIL ENGINEERS.

April 12, 1859.

Discussion on Mr. M'Master's paper.

After the meeting, Mr. Curtis explained a system of axle boxes, in which, by centrifugal action, the oil was constantly thrown over the upper side of the axle, and descending slowly upon the axle was returned again to the oil chamber. As soon as it had passed the axle, a piece of thin pourous flannel, placed at the bottom of the oil chamber, was found in practice to answer as a filter to receive the parts of the metal, or other residuum, resulting from the working of the boxes. These boxes were now at work on eight railways in England and on one in France. They had been in use for upwards of eighteen months; in some cases they had run for two months without any oil being applied; but the ordinary practice was to introduce about a wine glass full of oil to each box once a-week.

April 19, 1859.

"Description of the entrance lock and jetty walls, with the wrought iron gates and caissons of the Victoria Docks, London," by Mr. J. W. Kingsbury.

May 3, 1859.

"On the Tyne Docks at South Shields, and on the mode adopted for shipping coals," by Mr. T. E. Harrison.

CHEMICAL SOCIETY.

April 7, 1859.

"On the action of boracic acid upon the salts of the more volatile acids at high temperatures," by Mr. N. Tate.

"On boric and silicic acids," by Dr. Odling, who advocated the recognition of a distinct class of tetra-basic ortho-silicates and borates, comparable with the terbasic phosphates.

"On the action of hydrochloric acid upon sulphide of mercury, in the presence of certain other substances," by Mr. F. Field.

April 21, 1859.

Messrs. J. G. Barford, W. T. Fewtrell, and E. C. Stonford, were elected Fellows.

"On the absorption by water of chlorohydric acid and ammonia," by Dr. H. Roscoe.

"On the polyatomic alcohols," by Dr. H. Debus.

He defined an alcohol to be a neutral compound of carbon, hydrogen, and oxygen, capable of uniting with acids to form neutral bodies by the elimination of water. In illustration of his views, the author referred principally to the compounds of glycol, glycerine, and mannitane.

ROYAL INSTITUTION.

March 18, 1859.

"On a new method of rendering visible to the eye some of the more abstruse problems of crystallography, hitherto considered only as mathematical abstractions," by the Rev. W. Mitchell.

"On the estimation of the organic matter of the air," by R. A. Smith, Esq.

April 12, 1859.

"Summary of the succession in time and geographical distribution of recent and fossil mammalia," conclusion of the twelfth lecture of a course, 'On fossil mammals,' by Prof. Owen.

May 2, 1859.

The annual report of the committee of visitors was read and adopted. The statement of sums received shows a steady and gradual increase in the yearly income. The amount of annual contributions of members and subscribers in 1858, amounted to £2109 9s., being more than had been received in any previous year; the receipts from subscriptions to lectures were £739 14s. 6d. The total annual income amounted to £5060 8s. 8d.

GEOLOGISTS' ASSOCIATION.

The ordinary monthly meeting was held at No. 5 Cavendish Square, London, on Monday evening, the 2d ult., the Rev. Thomas Wiltshire, M.A., F.G.S., president, in the chair. The paper read was by Mr. Mackie, F.G.S., on "The geology of the south-east of England." An interesting discussion followed, during which, attention was called by Mr. Charlesworth, F.G.S., to the rarity among the fossils of the chalk, of young specimens of *ananchytes ovatus*, and some other species of echinodermata; and it was also stated, as a curious fact, that groups of fossils lying together are uncommon in that formation. Some interesting fossils were exhibited by Mr. Charlesworth; among others, a jaw of an ichthyosaurus, measuring thirty-six inches in length, and only one inch and one-eighth at the base, and thus showing a most unusual degree of attenuation; the common proportion of length, to width at base, being about two and a-half to one. It was announced that Mr. Mackie, at the request of the Committee, had consented to deliver a course of twelve lectures on Geology, to the members of the Association, for the admission to which a small extra payment, sufficient only to meet the necessary expenses, will be required.

ROYAL SOCIETY.

March 31, 1859.

"On the higher theory of elliptic integrals," by Mr. F. W. Newman.

"On the comparison of hyperbolic arcs," by W. C. Merryfield, Esq.

"On the oxidation of glycol and on some salts of glyoxylic acid," by Dr. Debus.

May 5, 1859.

The following list of candidates, recommended by the council for election into the society, was read—S. H. Beckles, Esq., F. C. Calvert, Esq., H. J. Carter, Esq., D. Galton, Esq., W. B. Herapath, M.D., G. M. Humphrey, Esq., T. S. Hunt, Esq., J. D. Macdonald, Esq., W. Odling, Esq., R. Patterson, Esq., J. Penn, Esq., Sir R. Schomburg, T. Watson, M.D., B. Woodcroft, Esq., Lieut.-Col. W. Yolland. The election is fixed for the 9th of June. The following papers were read:—

"Propositions upon arithmetical progression," by Mr. T. Elefante.

"Sur les propriétés des corps insolans," by Prof. Matteucci.

"On the synthesis of acetic acid," by J. A. Wanklyn, Esq.

INSTITUTION OF MECHANICAL ENGINEERS.

November 3, 1858.

"On a safety hoist governor," by Mr. B. Fothergill.

"On the burning of Welsh steam coal in locomotive engines," by Mr. Joseph Tomlinson, of Cardiff.

"On a direct-acting expansive steam engine," by Mr. T. T. Chellingworth, of West Broomwich.

After the meeting, some specimens of boiler plates were exhibited by Mr. John Fernie, of Derby, for an improved construction of steam boilers, without angle iron and with increased strength at the rivet holes, by making the plates with the edges thickened, to admit of flanging over and punching, without any reduction of the strength at the joint below that of the body of the plate; specimens were also shown of worn and fractured plates of the ordinary make, taken from locomotive boilers.

May 4, 1859.

"On the pumping engine at the Newcastle Water Works," by Mr. R. Morrison, of Newcastle-upon-Tyne.

"On the construction of hot-blast ovens for iron furnaces," by Mr. Henry Marten, of Wolverhampton.

"On Jensen's marine engine governors," by Mr. Henry Maudslay.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

April 19, 1859.

The annual report was read, showing that the Society had never been in a more flourishing condition.

May 3, 1859.

"A notice of the geology of the Australian gold fields," by W. S. Jevons, Esq.

"On the effect of food on the re-action of the urine," by Dr. Smith.

"On experiments to determine the effects of different modes of treatment on cast-iron for the manufacture of cannon," by W. Fairbairn, Esq.

SOCIETY OF ARTS.

April 27, 1859.

"On the metallurgy of lead," by Mr. J. A. Phillips.

May 11, 1859.

"On the recognition of music among the arts," by Mr. H. F. Chorley.

GEOLOGICAL SOCIETY.

April 6, 1859.

"On the subdivisions of the inferior oolite in the south of England, compared with the equivalent beds of the same formation on the Yorkshire coast," by Thomas Wright, M.D.

INSTITUTION OF CIVIL ENGINEERS IN IRELAND.

April 12, 1859.

"On a new mode of shoring, adopted in removing two lower storeys of the Royal Bank, Dublin," by Mr. W. Anderson.

CORRESPONDENCE.

SELF-LUBRICATING AXLE BOXES.

In the *Practical Mechanic's Journal* for May, I see a paper has been read before the Institution of Engineers, by M. Alphonse de Brussaut, on a new system of axle boxes. Permit me to show, in a few words, that the system is not new; the same having been invented and applied by me in 1847, published in the *London Mechanic's Magazine* in 1849, vol. l., page 445. As an improvement, M. de Brussaut has substituted, for my thin iron rings, vulcanised India-rubber ones, to keep the rollers apart. How this may be an improvement, I leave your readers to judge.

William Hall.

Irvine, May, 1859.

MONTHLY NOTES.

MARINE MEMORANDA.

The whaling vessels, on which we had some notes last month, have met with many disasters this year. The *Narwal*, of Dundee, has returned from the Greenland seal and whale fishery, and reports heavy losses occasioned by stormy weather in the Arctic regions. In a severe gale last month the new steamer *Empress of India*, of Peterhead, which cost the owners £20,000, was totally wrecked. The *Alert*, of that port, and the *Melinka*, of Fraserburgh, were both lost; the *Kate* was stove, and the *Sophia*, of Aberdeen, suffered damage. The fishing thus far was a failure. Both the screw steamers, the *Volunteer* and *Empress of India*, fitted out at Newcastle, and despatched in the early spring, have also been lost in the ice.

Ice steamers have lately been tried with success in North America Perhaps they might be called with more propriety ice locomotives, as they travel upon the ice as upon a railway or hard and level road. We have ourselves tried the same thing in this country with manual power and with sails, and we are satisfied that, in countries where the winters are severe, nothing but the power of steam is required for insuring the success of this class of conveyance. It is clear that steam locomotion on ice will render the rivers and canals of Canada, the United States, and the northern countries of Europe, during the close of navigation, travellable, competing in speed with the railways, at one-tenth the expense. The winter will be the pleasantest time for travelling between the Atlantic and Pacific to reach the gold fields.

As an instance of what may be done by shipowners of enterprise and energy, we may mention that the American ship *Florence*, the first modern trading vessel visiting Japan, at once obtained a cargo of 10,000 piculs of vegetable wax—equal to about 1,320,000 pounds weight. The cost was 29s. per picul, and the selling price in Europe from £3 15s. to £4 3s. The cargo gave a clear gain of about £25,000. Will not our shipowners send some more of their idle vessels to Nagasaki?

What is called the upper navigation of the Clyde, or the portion of the river between Hutchesontown bridge and Rutherglen quay, has now upon it a steamer of really important size. She is named the *Royal Reefer*, and was built by Mr. Seath at Rutherglen. Her length is 135 feet; breadth, 13 feet; and depth, 7 feet; and has diagonal engines of 50 horse-power, and feathering paddle-wheels. By a very simple arrangement, the master can both steer and act as engineer at the same time.

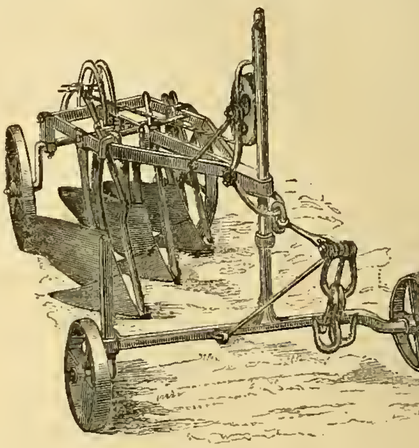
Messrs. Caird & Co., of Greenock, have just launched a Clyde river boat, the *Windsor Castle*, built of the Blochairn Iron Company's steel plates. She is 190 feet long, 20½ feet beam, and 7½ feet deep in the hold. Her plates are five-sixteenths of an inch at the keel, decreasing to one-eighth of an inch at the top. She is to have inclined engines of 100 horse power. Her launching draught was but 21 inches. When completed, it is expected that she will not draw more than 3 feet.

The eight large steam vessels of the European and American Steam Company have at length been definitely purchased on speculation by Mr. Lever and Mr. Thomas Howard, of Manchester.

Deaths of Humboldt and Dr. Lardner.—The public prints have, some time since, announced the death of the venerable philosopher Humboldt, but we feel that the end of the great author of *Cosmos*, ought not to escape notice in the pages of the *Practical Mechanic's Journal*. Alexander von Humboldt was born at Berlin in 1769. He became an under-graduate of Göttingen, and after leaving that university, he went to Frankfort-on-the-Oder—geography and geology always being his leading studies—and his government did not overlook the possession of so ardent an inquirer, and so gifted an observer. In 1795 he was sent by the Prussian Government to study the nature of the volcanic eruptions of Vesuvius. Humboldt's mind took a wider range. He aspired to investigate regions unknown. Africa was his object. He went to Marseilles and joined Bonpland, who was on the point of starting on a similar mission, with the intention of accompanying him. This plan failed, but through the interest of Baron Forell, the Saxon Ambassador, Humboldt obtained permission and authority to make a scientific tour of Spanish America. During eighteen months, Humboldt examined geologically and geographically every part of Venezuela, the Orinoco, and the Rio Negro. He afterwards visited Bogota, the Cordilleras, and Quito. At this latter place Humboldt, at great personal risk, investigated the volcanic mountains. He spent some time at Lima. In August, 1804, Humboldt landed at Havre, rich in experience, and with an invaluable collection of specimens of geological and botanical interest. Humboldt fixed his residence at Paris, taking an occasional trip to London; but Prussia could not spare so valuable a man, and the King requested Humboldt to return. He wished to explore the Andes and the Himalayas, to make a comparison of their respective dimensions. This plan failed. He, however, succeeded in another. He started for Siberia, and then visited the chief cities of Russia. There is not one branch of science to which Humboldt has not contributed something—nay, much. His life presented one long scene of mental and bodily activity well combined. In losing him, Europe has indeed lost a most wonderful man—wonderful not alone for what he accomplished during the first eighty years of his life, but still further, perhaps, on account of the fact of his immense power of converting his vast stores of information into a useful and ending form, even up to his ninetieth year. His last words were—"Wie herrlich diese Strahlen; sie schemin die Erde zum Himmel zu rufen!" [How grand these rays; they seem to beckon earth to heaven!]

At the risk of a charge of coupling comparatively small things with great ones, we add a few words on the death of Dr. Dionysius Lardner, which has occurred in Paris, since our last publication. Dr. Lardner, whose voluminous works attest, at any rate, his great industry, was the son of a Dublin Attorney; and after working at legal matters in his father's office, he entered himself at Trinity College, Cambridge, where he commenced his unwearied exertions as a scientific compiler—relinquishing them only with his last breath. He died at the age of 66.

Paring Plough.—Our perspective sketch represents a new paring plough just introduced by Mr. C. L. Perry, of Sheepstead Farm, Marcham, Abingdon. It differs from previous paring ploughs in as far as, instead of merely cutting off the turf and laying it down again in the same place, it turns the turf over so as to afford the sun and air a chance of pulverising it, and thus so materially



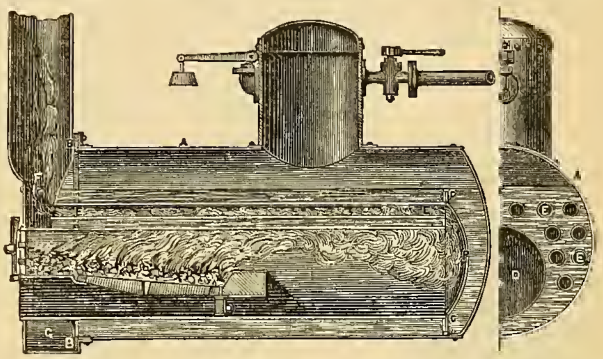
aiding the tillage of the soil. The implement is so constructed as to carry three shares in one frame, each share cutting twelve inches of ground in width, so that the three clear a yard wide. With four horses the implement will pare eight acres per day, requiring only a man and boy to attend it.

New Substance Analogous to Gutta Percha.—The *achras balata*, which Linneas called *achras dissecta*, belongs to the family of *sapotées*, and to the group known in the colonies by the name of *balatas*. The name *achras*, signifies in Greek, a wild pear tree, and it has been given to the tree in question by reason of the form of its fruit. This tree grows in Guiana, Martinique, and all the Antilles, where it is worked as a constructive timber. Mr. Roy's work on the "French Colonies in 1858," mentions the balatas as forming part of the forests of Martinique, but without referring to the purposes to which they were applied. It is only quite recently that the governor of Guiana sent to the exhibition of colonial products in France, a peculiar substance called "*balata sap*," a specimen of which was sent to M. Serres, a French philosopher, to examine into. This sap has the appearance of a spongy mass, of a pinky white colour, crumbling under the pressure of the fingers; the surface of the cake at the exhibition is covered with a substance similar to curdled milk, the external portion of which, or that in immediate contact with the atmosphere, being composed of a thin pellicle of a reddish colour. The first experiments which M. Serres made on this substance were fruitless. The sap softened in hot water and was easily made into thin sheets, but these sheets had no power of resistance in any direction, and it was found impossible to cement them to each other, so as to form a compact mass. A closer observation has caused M. Serres to suppose that the presence of some fatty matter peculiar to the *balata sap* was the cause which produced this division into thin sheets, and militated against the union of these sheets into a homogenous mass. His efforts were then directed to the removal of this matter, and the satisfactory results obtained has confirmed his previous impressions. M. Serres has made a rod of the thickness of the finger, of the balata sap, of which he thus determines the physical characters:—a paste finer than that of gutta percha, more suppleness and elasticity, less resistance to traction or tensional strain than gutta percha. It softens at a higher temperature than gutta percha, and does not, like it, become brittle, even when subjected to various and sudden changes of temperature. According to this chemist, balata would be preferable to gutta percha in all cases where the articles to be manufactured are not required to resist strong traction. It could be advantageously applied to the covering of submarine cables, by reason of its non-liability to become brittle like gutta percha, and finally, it is better adapted than gutta percha for the manufacture of articles by the plastic process, from the fineness of its paste. M. Serres points out the importance attached to this substance as an essentially French production, capable, in time, of enriching not only the colonies where it is grown, but the town in which it may be manufactured, and likely to elevate the trading standard in gutta percha, which is now found to be so much adulterated, and for the quality of which there exists really no guarantee, on account of the numerous hands through which it must pass owing to its far off growth.

Floral Hall in Covent Garden.—This long delayed structure has at length been commenced. It is intended to be parallel with the Opera House filling up the space between that great building and the actual area of the market. It is being built by Mr. Henry Grissell, of the Regent's Canal Iron Works, from the designs of Mr. M. Barry, and is entirely of iron. It has a frontage of 75 feet to Bow Street, on which looks the *façade* of the Opera House, and its length will be 280 feet. It has a central avenue of 50 feet in width, and two side passages of 12 feet 6 inches. The central avenue, or nave, is being covered with a large semicircular-headed arch, which will be entirely composed of iron and glass, and when completed, will be an admirable piece of construction in these materials. The height from the floor to the under side of the ribs, is 50 feet, in addition to which, on the crown of the arch, a lantern light roof, 6 feet wide, runs the whole length. The basement underneath the principal floor is 16 feet 8 inches in the clear. It will thus be seen, adding the lantern light, that the total height from the basement floor level to the apse of the lantern roof ridge, will be about 70 feet. The main roof is to be composed of 11 principal ribs, which will be 21 feet 5 inches centre and centre; these will be connected with light purlins. The ribs will be supported by 24 columns, extending from the basement, which in the hall, at the springing of the arches, will have enriched capitals. The side avenues have "lean-to" roofs, and are connected with the principal roof by elegantly designed spandrels. The supporting columns rest on York stone slabs, 2 feet 6 inches by 2 feet 8 inches in thickness, underneath which is a solid body of concrete, 2 feet in thickness. The floor of the hall, when completed, will form an excellent example of iron construction. It will consist longitudinally of 32 arched girders of great strength, with 200 others intersecting them transversely; these are flanged and adapted to have hollow tile arches turned between them. The longitudinal girders are 18 inches in depth, and the transverse ones, 13 inches. The whole of the roofs are to be covered with bent glass, 21 ounces to the foot. At the Bow Street end of the new structure, abutting against the Opera House, within the entrance, a highly ornamental iron staircase is being constructed, to communicate with the hall of the grand staircase. The *façade* of the building in Bow Street is of a highly ornamental character, and is already in an advanced state of progress. It is designed in five compartments, the central one being the most important, and is crowned by a circular-headed arch, having its face above the springing line divided into 13 radiating panels, with a rim of circles round its lower line, similar circles being introduced to divide the different compartments on each side of the great central opening, which thus produce an agreeable harmony of design. The minor portions, on each side of the great arch, are also circular-headed, and have their spandrels filled with pierced ornamental work, of excellent design and workmanship. Over these are circles of laurel wreaths, having *pateræ* in their centres. The extreme compartments at each end of the front are to be used as entrances, and are each about 9 feet in width, the chief one in the centre being about 32 feet wide in the clear. The building promises to be a most excellent example of modern iron architecture; and it will furnish a house for fruits and flowers far beyond anything else which London at present possesses.

Tower Kiln for Drying Grain.—What may be called the "shot tower" system, has lately been applied in the process of kiln drying grain for grinding. This is the scheme of Messrs. Kennedy and Armstrong, who have erected a tower in connection with the grain lofts at the Lisburn Flour Mills, in Ireland. Commencing from the upper storey of this tower, there is a series of perforated plates, which admit heated air to pass through the grain. These plates run in a zig-zag direction from the top to the bottom, where there is placed a discharging wheel, to be afterwards noticed. Down these plates the grain passes, and by a very ingenious contrivance placed at each of the zig-zag corners, the grain is turned in its passage downwards, so that all is alike affected by the hot air acting on the plates. There are, also, mechanical contrivances which regulate the passage of the grain, and regulate the rate of speed by which it passes along the plates. At the foot of the tower there is a furnace so constructed in connection with the hot air-chamber, that the heat passes underneath each plate in regular succession. The discharging wheel before alluded to, is turned by the gravity of the grain, and, connected with that wheel, there is placed a pendulum; the length of the rod regulating the speed in the delivery of the grain from the kiln. A second advantage of the pendulum and wheel is, that they can be made to act as a meter, by which the quantity of grain discharged can be accurately ascertained. Under the ancient process there was considerable labour and much time required to remove off the kiln head the grain that was ready for the grinding department. In that part of the operation, the work was not only very severe, but exceedingly injurious to the health, as well because of the immense heat, as in consequence of the gaseous vapours arising from the coal burning under the floor of the kiln. The new arrangement promises well, both as regards economy, rapidity of effect, and the improvement of the health of the workmen.

Improved Steam Generator.—M. Perignon has introduced a new form of boiler, which is represented in two vertical sections in the subjoined engraving. The new generator is tubular, but the part which carries the tubes is generally made separate from the other portion of the apparatus. The general arrangement of the boiler is as follows:—We will suppose that a horizontal boiler is required, although the system is equally applicable to vertical boilers. A first cylinder, closed at one end by a riveted cover and open at the other, is placed horizontally, the open end carrying a flange, so arranged as to make part of a joint. A second cylinder, of a smaller diameter than the first, contains the furnace, and should be introduced into the first cylinder. It is closed at the end corresponding to the closed end of the first cylinder, by a cap so arranged as to constitute a smoke-box. At its other end it is provided with a cover of sufficient size to correspond with the flange of the first cylinder, and which is united with the said flange in any convenient manner. Around the external surface of the second cylinder, are arranged one or several ranges of tubes of about an inch and a half in internal diameter, penetrating at one end into the smoke-box arranged at the end of the second cylinder, and at the other, passing through the cover at the other end, and by introducing into it, at the opposite end to the cylinder, C, another cylinder, similar in all respects to the first internal cylinder, a double boiler is obtained, with two furnaces acting independently of each other. The boiler may be furnished, if requisite, with a horizontal cylinder arranged above it to

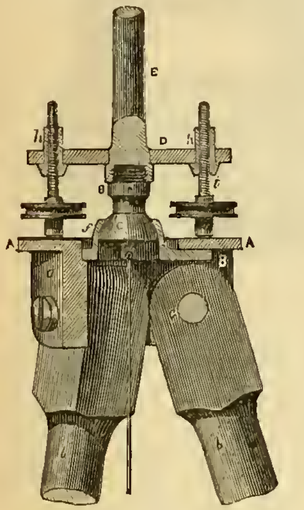


act as a steam receiver, and two stages of boilers, one above the other, may also be arranged, if it be found desirable. By employing with this description of boiler, a horizontal steam engine, or by fixing a vertical engine in a box, formed, so to speak, by the prolongation of the boiler, a new and extremely convenient arrangement of engine would be obtained, since neither a foundation nor the elaborate masonry furnace would be required for it. The engine may be either expansive or not, but in either case it may be advisable to make the use of a case or jacket, enclosing the bottom, the cover, and the cylindrical channel in which the steam circulates at the boiler pressure. It will also be found advantageous to adopt the expansive principle. This kind of engine, which may be of a power up to 50 horse power, or even more, if its velocity is increased, will be found to be of great use, either as a permanent or temporary auxiliary engine in manufactories. By placing this apparatus upon four wheels, or upon two for certain countries, a locomotive engine is obtained. In this case even more than in the preceding one, it is necessary to enclose the engine and put it out of the influence of temperature and dust. If a horizontal engine is required, two cheeks or frames of cast-iron are bolted on to the boiler, between which the steam cylinder is suspended—the cheeks at the same time serving for the guides for the piston rod, and for the bearings for the shaft. The fly wheel is arranged outside the cheeks or frames. In order that the motions may not be concealed, glass is let in at various portions of the frame; a cover resting on the top of the two cheeks or frames, completes the enclosure of the machine. If a vertical engine is required, it is placed behind the boiler in a box of sheet or cast-iron, portions of which are prolongations, so to speak, of the boiler. The steam cylinder is placed at the bottom, or is suspended to the sides of the box, the stuffing box being reversed; but in any case, the piston acts directly upon the shaft. It is necessary with locomotives as with fixed engines, to enclose the steam cylinders and all parts of the apparatus through which the steam circulates. The power and velocity of these locomotives are the same as those in ordinary use, while an economy is obtained in steam with the same weight of boiler, and an increase in the nominal and real power is produced, without any sensible augmentation in the weight of the rolling material.

New French Gas Burner.—This is a new arrangement by M. Morrier, a French inventor, who applies to the top of the ordinary cylindrical porcelain tube, a grating of fire-clay, the tube being soldered to a double rod of enamelled copper. The support for the shade and the gallery consists of a metallic bracket. The gallery is composed of three parts. The upper portion receives the globe; the middle portion, perforated with air holes, receives the chimney; and, lastly, the bottom is a cone with a crown or top. Independently of the elegance of the arrangement, and the facility afforded for cleaning the glass as compared with the copper, the invention affords a peculiar advantage as regards the air supply. In place of passing directly into the flame, as in ordinary burners, the air passes first between the globe and the chimney, where it becomes heated, and after passing through the holes in the gallery, it arrives at the flame in excellent condition for producing perfect combustion, with a superior intensity of light. Photometric experiments have clearly proved the value of the new plan, and that there is a saving in the consumption of gas of thirty per cent., as compared with the common burner.

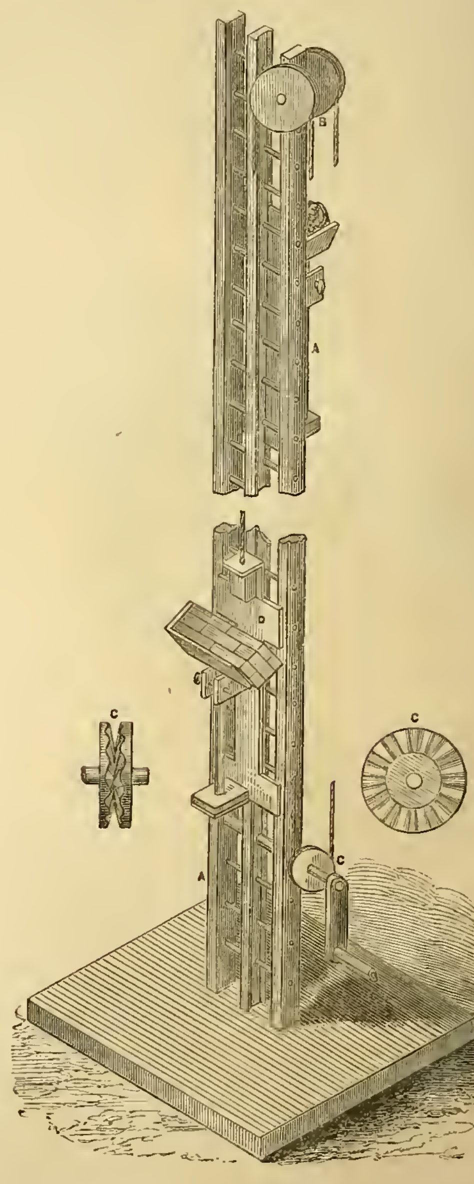
Production of Aluminium.—The curious metal aluminium, has lately been produced directly from the clay, by M. Corbelli. The raw clay is first washed and purified from all foreign matter, such as stones, leaves, and pieces of wood. This purified clay is well dried and submitted to the action of a suitable acid, for the purpose of removing any iron contained therein. For this purpose the clay is dissolved in six times its weight of concentrated sulphuric acid, or, if preferred, hydrochloric, nitric, or other acid, may be employed. After the solution of the clay in the acid, the earthy matter is allowed to subside, and the clear liquid is poured off. The deposit is again dried and heated to a temperature of from 450° to 500° Cent., a quantity of yellow prussiate of potash, well dried and pulverised, is then mixed with the clay, in the proportion of two parts of the potash to one of the clay; but the proportion may be varied according to the amount of silica contained in the clay. To this mixture there is added marine salt, in the proportion of one and a half parts to one of the clay, and the whole is placed in a crucible and heated to a white heat, the aluminium being found, when cool, at the bottom of the crucible.

Surveyors' Tripod Heads.—Mr. Young, of Philadelphia, has lately introduced a new form of tripod head, such as is used for theodolites and other instruments. The invention consists in so constructing the heads, that the upper portion of the same to which the instrument and plumb-rule are attached shall be separate from, and adjustable longitudinally to, the lower portion, to which the legs are jointed; the usual levelling screws being used as a means of binding the above mentioned portions of the head together after adjustment. The object of the invention is, to dispense with the usual process of moving and depressing one or other of the legs in order to bring the plumb-line to the desired position. The lower portion of the head consists of an annular plate, A, from which project six flanges, G. These combined form three recesses for the upper end of the legs, B, which are hung to pins, C, attached to the flanges, G. The upper portion of the head consists of the circular plate, D, to the centre of which is secured the pin, E, for receiving the theodolite or other instrument. To the pin, E, on the under side of the plate, D, is secured the end of the stem, E, which projects from and forms a part of the hemisphere, C, the latter fitting into the concave socket, F, on the plate, B, this socket projecting through the central opening in the annular plate, A, of the lower portion of the head. The plate, B, consists of three plain projections, each of which bears against the under side of the annular plate, A, in one of the recesses formed by two of the flanges, G. Four nuts, H, are secured to the plate, D, and into these nuts screw the ends of the levelling screws, I, the lower ends of which bear on the surface of the plate, A, the screws being furnished with the usual discs with milled edges, so as to be easily turned by the finger and thumb of the operator. The plumb-line is attached to a pin, J, which projects from the under side of the hemisphere, C. As far as regards the upper plate, D, with its pin, E, the hemispherical coupling and levelling screws, I, the arrangement is similar in construction and operation to that of tripod heads in common use. The socket, F, however, has hitherto either formed a permanent portion of that part of the head attached directly to the legs, or a portion of a plate rendered adjustable horizontally by means of screws independent of those used for levelling purposes. If arranged in the former plan, the operator must resort to the usual tedious process of moving in or out one or other of the legs, B, or depressing the same before he can bring the plumb-line to coincide with a given point in the ground. Should the latter be of a stony nature, the difficulty and delay attending the adjustment would be increased. The mode of adjusting the upper portion of the head by means of horizontal slides and screws, a plan sometimes resorted to, requires a manipulation almost as tedious as that just described. In Mr. Young's improved tripod head, the opening in the plate, A, is larger in diameter than the socket, F, which projects through the opening, and each of the three projections which form the plate, D, is narrower than the recesses formed by the flanges. Consequently, when the levelling screws, I, are turned to an extent sufficient to relieve their lower ends from contact with the plate, A, the plate, D, with its pin, E, the instrument attached to the latter, the levelling screws, I, the hemisphere, C, its plumb-line, and the plate, B, all of which appertain to the upper portion of the head, may be moved horizontally on the lower portion, in any direction, to a limited extent. After being adjusted to the desired position, the screws, I, may be turned until their lower ends bear on the surface of the plate, A, and force the hemisphere, C, tight within its socket, F, when the two portions of the head become firmly bound together. This form of head affords facilities for rapid and exact adjustment of the instrument to the desired position, after the tripod has been placed in proximity to the point in the ground, with which the plumb-line must coincide.



The British Post-Office.—There are now 11,235 Post-Offices in the United Kingdom, being an increase of 134 upon the number of the year before, whilst wayside letter boxes have been largely provided in aid of the increasing wants of the country. The total number of letters delivered in the United Kingdom during 1858 was as follows:—England, 428,000,000; Ireland, 44,000,000; Scotland, 51,000,000—making in all 523,000,000. As compared with 1857, this shows an increase of 19,000,000; and, as compared with the year previous to the introduction of the penny postage (1839), an increase of 447,000,000. Of the whole number of letters which passed through the Post-Office last year, nearly a fourth were delivered in London and the suburban districts. The number of registered letters last year was nearly 1,300,000, or one registered letter to about 400 ordinary letters. The number of newspapers delivered in Great Britain last year was about 71,000,000, much the same as in the two previous years. The number of letters returned to the writers from inability to decipher them was about 1,700,000, or at the rate of one in every 300 of the whole number. From the same cause about 570,000 newspapers remained undelivered. During the last year, 127 new money-order offices were opened—viz., 104 in England and Wales, 14 in Ireland, and 9 in Scotland—making the whole number 2,360. The gross revenue of the year 1858 was £3,100,939, being an increase of £82,792 upon that of 1857. The expenditure for 1858 amounts to £1,926,045. The nett revenue—that is to say, the difference between the gross revenue and expenditure—was £1,330,385, or an increase of £25,714 upon 1857. The total number of persons in the employ of the Post-Office was 24,372 on the 31st of December, 1858, and 23,731 on the 31st of December, 1857. In the chief London office there are now above 1,700 officers; in the whole London district, 3,300. The British Post-Office is certainly a wonderful institution; without it, where would our commerce be?

Builder's Hoist.—The accompanying engraving is a perspective elevation of a highly ingenious hoist, the invention of Mr. George Johnson, of East Hill, Wandsworth. The labour and expense of carrying bricks every builder well understands. Hence, "runs," "horse runs," and "Frenchmen," or "Jacob's ladders," have been resorted to in London and elsewhere, for easing the men's



shoulders and saving time; but the advantages of any of these methods are not such as to recommend them for general application, and the labourer is still seen slowly toiling up the ladder with his hod, carrying at the rate of about 1,000 bricks per day. To meet a requirement of long standing in the trade, the new hoist for general use has been introduced. This hoist consists of an ordinary ladder, A, fixed perpendicularly and edgewise to the ledgers rising up through the scaffolding to the highest point of the building. At the top of the ladder are fixed two plain sheaves or gins, B, and below is one of Johnson's patent corrugated wheels, C, mounted on an axle with a winch handle. The patent corrugated wheels are also shown in edge and front views in the two smaller figures. The rope is rove through the corrugated wheel and over the sheaves at the top, the ends being attached to slides, D, which work up and down on both sides of the ladder. The slides in form resemble the letter H, they are buttoned on to insure their moving with regularity and precision, carrying up a hod filled with bricks, mortar, &c., on one side, and letting an empty hod down on the opposite side, and *vice versa*. One man at the winch will raise 1,000 bricks 50 feet high in an hour, or 10,000 per day, two men will do double this quantity. In large contracts where "runs" or hoists have been used of an expensive character, they have produced a concentration of materials to one point, which required other labourers for their redistribution; a very great saving can be effected by having a number of these light and inexpensive machines placed at different points round the building, to supply materials direct to the workmen on the scaffold.

SEDGFIELD'S LANDSCAPE AND ARCHITECTURAL STEREOGRAPHS.—A set of by far the best stereographs are now before us. They are by Mr. Sedgfield, and are published by Mr. Bennett, whose excellent stereoscope we have elsewhere illustrated in the present pages. We may instance eight of these photographic pictures, as being the most admirable practical exponents of stereographic art yet produced. The first of these, in order of merit, is probably "Dungeon Gill Force, Westmorland," which is an admirable stereograph, whether considered as regards its minuteness of detail, its massive and well-balanced effect, or its delusive depth of view. The splendid narrow gorge, with its rugged sides lined with feathery ferns and underwood, with the bold rocky front peeping here and there, and in the far-off distance the thin cataract in its dark setting, with a peep of sky above, combine to produce a picture which we have never yet seen nearly approached. The peculiarity of this stereograph is, that without any strong contrasts of light and shade, Mr. Sedgfield has given us a picture of extraordinary depth, and as nature-like as if the observer was really looking up the well-known ravine. To all admirers of landscape stereographs, we say, by all means, secure this beautiful specimen.

Of the other landscapes, the "Ford and Footbridge" possesses, perhaps, the greatest number of excellencies in combination—and yet the materials are of the plainest. We have a wooden foot-bridge supported on stilt-like pillars, and with some figures upon it and upon its approaches—whilst on the descent towards the ford, we have a traveller in his "Whitechapel" cart, on his way to cross the stream. Beyond, is the continuation of the road, some farm buildings and trees, around all which there is thrown the true aerial perspective. The minuteness of the foreground is such that we can almost make out whether the young lady in the round hat is pretty or not. "Pont Y. Lledr, North Wales," is a river view of a very different character. Here we have in the foreground, the rugged bed of a mountain torrent—a mass of boulders, some of them square enough to show that their external appearance is well supported by their actual hardness. Further on we have the river, pouring on beneath an ivy-mantled bridge with an elegant elliptical arch, with masses of dark foliage on each side, and an uneven mountain face beyond. The relative tones of this beautiful view are admirably kept. Of still another class, is a landscape in which the principal ingredients are a group of Southdown sheep, amongst hurdles and pens. One of the sheep has apparently stood up before the artist with the intention of getting a good portrait of himself. The wool is most beautifully given; in fact the animals do really, but in another than the ordinary sense of the expression, "look alive." The picture, however, is not a mere picture of sheep—it is a landscape of a high order of general effect, and is certainly to be classed amongst the best of its kind.

"Llyn Ogwen, North Wales," is a fine mild lake scene, and more successful than is usual in pictures of this kind, where a wide, flat expanse of placid water has to be treated. It is a lake with a rugged promontory running far into it, the view beyond being shut out by a chain of mountains of different perspective depths. A figure on the extreme jutting end of the promontory, lights up the scene and redeems it from that feeling of utter desolation which would otherwise hang around it. "The Wye, at Tintern, from Chapel Hill," is a quiet peep into a deep valley, round which the river courses. It tells in the stereoscope only in virtue of its immediate foreground of shrubs, through which we peep beneath. "The Choir and Altar Screen, Winchester Cathedral," is a fine example of what may thus be done for architecture; and so also is "The Transepts, Salisbury Cathedral, looking south." The photographer has many difficulties in his way in taking subjects such as these, for interiors are almost always bad subjects to manage; but Mr. Sedgfield has apparently surmounted them, and has given us such a development of architectural beauties as is rarely to be seen. The series is altogether a very beautiful one.

PERMANENT FIRE EXTINGUISHER.—Mr. W. B. Ritchie, of the Royal Arcade, Glasgow, has proposed to us a very effective arrangement of fire extinguisher, for buildings—such as is capable of being completely carried out in every situation where the main pipes of water works are within convenient reach. In this plan, the inventor carries a distinct water pipe, of about three-quarters of an inch bore, from the main into each of the apartments of a house, or range of houses. The terminal portion of each branch is fitted with a perforated metal ball, placed in the corner of each room, near the roof. Each branch has, of course, its own special stop-cock, the series for any suit of rooms being disposed in a row above the door, or in the hall in any convenient place. With this arrangement, whenever a fire takes place, the persons in attendance can at once attack the disaster at its seat, by turning on the particular stop-cock of the room where the fire has broken out. Each stop-cock would be numbered in correspondence with the rooms, and thus there would always be a certainty of attacking the evil immediately, and at its core.

OUR COAL SUPPLY.—The coal fields of Great Britain yield nearly 70,000,000 tons per year. A better idea of the immense commerce of England could not be formed than by stating the fact that at Manchester and its environs a motive steam power equal to 1,200,000 horses is constantly maintained, to support which there are consumed 30,000 tons of coal per day, or 9,500,000 a year. In the manufacture of salt alone about 3,000 tons are consumed per day, or 950,000 a year. The Transatlantic steamers from Liverpool and other ports consume 700,000 tons per year, and the manufacture of gas absorbs at least 10,000,000 tons per year. The export of coal from England reached, in 1858, 6,078,000 tons. It is estimated that England alone could furnish enough coal for the consumption of the whole of Europe for the space of 4,000 years.

LONDON BRIDGE TRAFFIC.—Every one who has even once crossed the Thames by London Bridge, knows well the wondrous spectacle of life there presented. Few, however, even of old passengers, will have guessed at the enormous sum total of the daily traffic, as given to us by actual counting, for twenty-four hours. During the twenty-four hours, ending at six p.m. on the 17th of March, 4483 cabs, 4286 omnibuses, 9245 waggons and carts, 2430 other vehicles, and 54 horses led or ridden—making a total of 20,498—passed over the bridge. The passengers in the same period were, in vehicles, 60,836; on foot, 107,074: total, 167,910. Well may this extraordinary thoroughfare be crowded, and well may the route from St. Paul's to the Brighton and Dover stations, be a miserably long one.

CONSERVATORY OF ART AND SCIENCE AT BOSTON, MASSACHUSETTS.—The Boston labourers in art and science have lately aroused themselves for the purpose of forming a conservatory of art and science on a permanent basis, and several meetings have been held in support of the movement, which promises to be completely successful. The chief men of the country have come forward in the matter, and if energetic action can secure the end, the Boston citizens may count the battle won. As an instance of their earnestness, we may mention, that a "*Conservatory Journal*" has actually been started for the furtherance of the great object.

TEMPERATURE RANGE IN APRIL, 1859.—It is a curious fact, that although we have had such a wet and backward season, the extremes of April temperature were never known to range so widely as during the present year. In the very centre of England, on the 1st of April, the temperature fell to 21·8° in the air, and to 20° on the glass. On the 7th it rose to 78° in the shade, thus giving a range of 56·2°. However glad we may be to see such fine days as occurred in April, in a spasmodic fashion, we are forced to the conviction that such quick transitions must be anything but wholesome, either for man or vegetation.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded March 3.

572. William Mitcalfe, Coal Exchange—Improvements in discharging cargoes, and in raising and lowering bodies.

Recorded March 5.

588. Richard Leake and Matthew Sykes, Barnsley, Yorkshire—Improvements in furnaces for consuming smoke and generating heat, parts of which improvements are applicable to furnaces generally.

Recorded March 9.

616. John Cooke, Cheltenham, Gloucestershire—Improvements in apparatus for giving signals on railways and vessels, and other such like uses.

Recorded March 16.

662. Henry Ambler, Halifax, Yorkshire—Improvements in breech-loading ordnance, and in the means of producing part or parts thereof, which improvements are also applicable to what are called small arms.

Recorded March 17.

680. Alexander Mein, St. Rollox, Glasgow—Improvements in making glass bottles, and in the apparatus connected therewith.

Recorded March 23.

740. Benjamin Browne, 52 King William Street, London Bridge—A new method of working or operating switches and signals on railways by improved apparatus for that purpose.—(Communication from Victor A. Prou, Rue de Sevres, Paris.)

Recorded March 26.

762. William Redgrave, Tavistock Street—An improved pillow travelling cap.
764. Samuel Dreyfous, Guy Richer, and Edouard Cormier, Paris—Improvements in preserving eggs.

Recorded March 30.

790. Walter Brown, Bolton-le-Moors, Lancashire—Improvements in manufacturing clog soles, and in the machinery employed therein.
792. John W. Hadwen, Kebroyd Mills, Halifax, West Riding, Yorkshire—A new art or manufacture for converting certain kinds of silk waste into yarns or threads.

Recorded March 31.

806. Thomas Ivory, Edinburgh—Improvements in steam boilers and furnaces for the same.

Recorded April 1.

815. Isidor Sigismund, Hull, Yorkshire—Certain improvements in the manufacture of artificial teeth, and in the apparatus connected therewith.—(Communication from Simon B. Sigesmond, New York, U. S.)
816. Richard A. Brooman, 166 Fleet Street—Improvements in machinery for solidifying, pressing, and moulding.—(Communication from Felix Dehaynin, Paris.)
817. Richard A. Brooman, 166 Fleet Street—A new preparation of indigo for dyeing.—(Communication from Messrs. Depoully Freres, Paris.)

818. William E. Newton, 66 Chancery Lane—Improvements in cricket bats.—(Communication from Michael Doherty, Boston, U. S.)
819. William E. Newton, 66 Chancery Lane—An improved process of manufacturing sulphate of lead, carbonate of lead, nitrate of potash, and sulphate of soda.—(Communication from Samuel Cooper, Boston, U. S.)
820. John J. Davies, Percival Street, Clerkenwell—An improved pad, applicable for inking, damping, and other like purposes by hand.
821. William Tod, Glasgow—Improvements in marine steam engines.
822. Yves M. Thomas, 45 Essex Street, Strand—An improved propeller for ships, vessels, boats, and water wheels.

Recorded April 2.

823. Joseph D. Seant, 4 South Street, Finsbury—An improved gas burning and lighting apparatus.
824. Abraham Ripley, 21 Bridge Street, Blackfriars, and John Roberts, Nelson Square, Bermondsey, Surrey—Improvements in machinery for striking or scraping leather and tanned or untanned hides.
825. John Hall, Queen's Road, Chelsea, and John S. Sparkes, St. John's Wood—An improved application of machinery for the purpose of hoisting, lowering, pulling, or drawing weights.
826. Anthony Bessemer, Tavistock Terrace, Upper Holloway—Improvements in furnaces to be employed in the manufacture of iron and steel.
827. Spendlove Desborough, 24 Noble Street—Improvements in making up needles, steel pens, and other small articles for sale.
828. Joseph Skertchly, Ashby-de-la-Zouch, Leicester—Improvements in apparatus for regulating the pressure of gas.
829. William Mather, Manchester—An improved apparatus for catching and destroying flies and other insects.
830. Arthur Paget, Loughborough, Leicester—Improvements in machinery or apparatus for the manufacture of looped fabrics, and in the manner of constructing the same.
831. Michael Scott, 26 Parliament Street, Westminster—Improvements in diving apparatus.
832. Michael Coupland, Haggerstone—Improvements in furnaces.
833. Thomas Richardson and George W. Jeffrey, Hartlepool, Durham—Improvements in the arrangements and construction of harbours of refuge, breakwaters, sea walls, or barriers, and other like structures.
834. Thomas Williams, Aberdaron, Caernarvonshire, and John H. Fuller, 70 Hatton Garden—Improvements in screw stocks and dies.

Recorded April 4.

835. Ferdinand Potts and Robert Brough, Birmingham—Certain improvements in the manufacture of calico printing rollers or cylinders, also in the machinery and apparatus for performing certain parts of the same, and which said apparatus are also applicable, separately or conjointly, to the manufacture of parallel and other metallic tubes, and the rolling of the metal for the same or other purposes.
836. Joseph Eccles, Blackburn, Lancashire—Improvements in machinery for making bricks, tiles, and other articles formed of plastic materials.
837. Charles F. Kirkman, Argyle Street, Regent Street—Protecting telegraphic wires, and in using them for subterranean and submarine purposes.
838. Charles F. Kirkman, Argyll Street—Improvements in the manufacture of cocoa nut fibre yarn and matting.
839. William Brown and Charles N. May, Devizes, Wiltshire—Improvements in haymaking machines.
840. James H. Burton, Enfield Lock—Improvements in barrels for small fire-arms.
841. William E. Newton, 66 Chancery Lane—An improvement in ladies' hooped skirts.—(Communication from George Mallory, Watertown, Newhaven, U. S.)
842. Alfred V. Newton, 66 Chancery Lane—An improved construction of retarding apparatus or brake for railway carriages.—(Communication from Mr. Augustin Castellir, Saragossa, Spain.)
843. Champion Russell, Stubbers, near Romford, Essex—An improvement in the working of marine engines.
844. Matthew A. Crooker, New York, U. S.—Improvements in paddle wheels for steamers.
845. David B. White, Newcastle-on-Tyne—Improvements in arranging ships' and other pumps.
846. Elmund Morewood, Endfield—Improvements in coating metals.
847. David Sowden, Bradford, Yorkshire—Improvements in Jacquard machines employed for weaving figured goods or fabrics.
848. Andrew Stanks, 6 Robert Street, Adelphi, Westminster—Certain improvements in machinery for forging and stamping metals.

Recorded April 5.

849. George Haseltine, 4 Southampton Buildings, Holborn—Improvements in sewing machines.
850. Edward Fairburn, Kirklees Mills, Mirfield, Yorkshire—Improvements in machinery for carding wool and other fibrous substances.
851. Leonard Brierley and Henry Geering, Birmingham—A new or improved method of ornamenting metallic bedsteads and other articles of metallic furniture.
853. George F. Chantrell and Edward Dutch, Liverpool—Improvements in the apparatus for regulating the quantity of water to be used for the flushing of water-closets and other purposes.
854. Benjamin Browne, 52 King William Street, London Bridge—Improvements in propelling ships or other vessels through water.—(Communication from Philip K. Skinner, Bombay, East Indies.)
855. John Hetherington, Manchester, and Thomas Webb and James Craig, Tutbury, Derbyshire—Improvements in machinery or apparatus for spinning and doubling cotton and other fibrous materials.
856. Thomas Scott, Dundee, Forfarshire—Improvements in preparing, treating, or manufacturing fibrous materials, and in the apparatus employed therein.
857. Nicolas Libotte, 33 Boulevart St Martin, Paris—An improved safety apparatus to be applied to cages in the drawing of coals.
858. Francis M. Crichton, Stoke Abbey, Stock Bishop, Westbury-upon-Frym, Gloucestershire—Improvements in clocks or time keepers.

Recorded April 6.

859. Thomas P. Luff, Shepton Mallet, Somersetshire—Improvements in cheese vats.
860. Isaac Adams, Massachusetts, U. S.—An improved tubular chain cable guide for vessels' bulwarks.—(Communication from Alfred S. Phillips, Boston, Massachusetts.)
861. Jean A. H. Ballande, Paris—An improvement in the preparation of writing paper, and ink to be used thereon.
862. William Owen, Rotherham, Yorkshire—Improvements in the manufacture of railway wheels and tyres and in the apparatus employed therein.—(Communication from Robert Owen, San Geronimo, Central America.)
863. Joseph Rogers, 9 Queen Square, Bartholomew Close, and Edward J. Tweed, 22 Castle Street, Falcon Square—Improvements in coating conducting wires used for electric telegraphic purposes.
864. John Scoffern, 4 Barnard's Inn—Improvements in lubricating projectiles and cartridges.

Recorded April 7.

865. David Moseley, Chapel Field Works, Ardwick, Manchester—Improvements in the manufacture of cards for carding cotton and other fibrous materials.
866. Alexander Chaplin, Glasgow—Improvements in steam boilers.
867. Robert Postlethwaite, Liverpool—An improvement in harness pads for horses.
868. Robert Wardell, Stanwick, and Henry Kearsley, Ripon, Yorkshire—Improvements in reaping machines.
869. George Champney, Halsham, East Riding, Yorkshire—Improvements in reaping machines.
870. John Lakin, the younger, Hall End, near Tamworth, Warwickshire—A new or improved agricultural drill.
871. John Carrett, Arundel Place, Haymarket—Improvements in the construction of goblets, jugs, and other like articles.
872. James Rawlings, Carlton Hill East—Improved construction of boot tree.

Recorded April 8.

873. John T. Pitman, 67 Gracechurch Street—Improvements in the construction and use of fire-works for signals.—(Communication from Martha J. Coston, Washington, U. S.)
874. William H. Smith, Philadelphia, Pennsylvania, U. S.—Improvements in the construction of cartridges, and in the fire-arms for using the same.
875. John Bindley and Joseph L. Hinks, Birmingham—Improvements in rotatory steam engines and pumps, a portion of which improvements may also be applied to the bearings of shafts or axles, and other rotating bodies.
876. William Champion, Nottingham—Improvements in machinery for the manufacture of looped fabrics.
877. Matthew Wheeldon, 174 Liverpool Road, Burslem, Staffordshire—An improvement in looking-glasses and mirrors.
878. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved articulated joint for water, gas, and steam pipes.—(Communication from Victor Dore, Paris.)
879. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—Improvements in the treatment of mineral phosphates of lime.—(Communication from B. de Siebenthal, Paris.)
880. Nicolas A. Ginmel, Paris—Improvements in dying cotton, wool, silk, flax, and other fibrous materials or fabrics.
881. William Hooper, Mitcham, Surrey—Improvements in insulating and protecting telegraphic conductors.
882. William Hooper, Mitcham, Surrey—Improvements in re-working and re-manufacturing compounds of India-rubber and sulphur.
883. William Henderson, Alderley Edge, Cheshire—Improvements in treating certain ores and in obtaining products therefrom.
884. William E. Newton, 66 Chancery Lane—Improvements in telegraphing and in telegraphic apparatus.—(Communication from Mr. A. Wilson, New York, U. S.)
885. Elias R. Hancock, 23 Norfolk Street, Strand—Improvements in steam and other motive power engines.
886. Thomas Spencer, 192 Euston Road, Euston Square—Improvements in the economical treatment of refuse or waste matter containing sulphur.

Recorded April 9.

887. Edward J. Hughes, Manchester—Improvements in the manufacture of woven fabrics.—(Communication from Edward Davies, Boras, Sweden.)
888. Thomas Barnett, Oldham, Lancashire, Henry T. Sourbuts, and William Loynd, Hyde, Cheshire—Improvements in steam engines.
889. James H. Young, 66 Great College Street, Camden Town—Improvements in setting-up (composing) and distributing types.
890. John Hawkins, Lisle Street, and Walsall Street, Staffordshire—Certain improvements in the manufacture of stirrups, bits, spurs, buckles, and other such like articles connected with harness and saddlery.
891. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in the manufacture or production of the ferrocyanide and cyanide of potassium.—(Communication from Jean V. Lucas, Paris.)
892. Richard J. Desham, 46 Redcliffe Street, Bristol, Somersetshire—Improvements in cheese vats.
893. John Martin, 4 Buckingham Street, Islington—Improvements in the materials used in the manufacture of bonnet fronts and ruches.
894. Charles F. Vasserol, 45 Essex Street, Strand—A new motive power applicable to tanneries.—(Communication from Jean P. Lucet, Fontenay-le-Comte, Vendee, France.)
895. William E. Newton, 66 Chancery Lane—Improvements in steam engines and boilers.—(Communication from Ernest G. X. Boileau, Paris.)
896. Henry F. Gardner, Boston, U. S.—Improvements in machinery for blocking or crimping the uppers of boots and shoes, and in treeing boots.—(Communication from William Willmott and Philander Shaw, United States of America.)
897. Robert Brown, 5 St. Paul's Churchyard—Improvements in stoves and apparatus for warming and ventilating appartments and buildings.
898. Benjamin Banch, Bradford Street, Birmingham—Certain improved arrangements for working fly presses by steam, water, or other power.

Recorded April 11.

899. Rudolph Wappenstein, Manchester—Improvements in cop tubes, and in machinerg or apparatus for placing the same on the spindles used for spinning and doubliny fibrous materials.
900. William Schofield, 13 Thomas Street, Stamford Street, Blackfriars Road—An improved effervescing lemonade.
901. James Anderson, Liverpool—Improvements in the construction of the furnaces of baker's ovens, for the purpose of consuming smoke, which improvements are also applicable to the consumption of smoke in other furnaces.
902. William Boaler, Manchester—Certain improvements in the manufacture of soap.—(Communication from Allan Hay, New York, U. S.)
903. Leopold Wimmer, Vienna, Austria—An improved preparation for killing beetles.
904. Alfred Bower, Liverpool—Improvements in or applicable to the keels of navigable vessels.
905. William Rowan, Belfast, Antrim—Improvements in spinning flax, hemp, and other fibrous materials.
906. Richard A. Brooman, 166 Fleet Street—Improvements in candle moulds.—(Communication from Auguste Godchaux, Paris.)
907. William S. Clark, Aberdare, Glamorganshire—Improved means of loading ships or vessels with coal, and of separating or removing small coal therefrom.
908. William H. Barlow, Great George Street, Westminster—Improvements in beams and girders.

909. John Marland, Southport, Lancashire—An improvement in the manufacture of cop tubes.

Recorded April 12.

910. William Clark, Langhaugh, Galashields, Scotland—An improved safety block to be used for lowering ships' boats, the same being applicable to other like or analogous purposes.
911. David Doig, Manchester—Improvements in the construction of gas lamps.—(Communication from William G. Ginty, Rio de Janeiro, Brazil.)
912. Patrick Aitchison, Sheffield, Yorkshire—Improvements in taps.
913. George J. Johuston, Ashley, Cambridgeshire—Improvements in drills, for drilling of corn, seeds, and manure.
914. Eugene T. Noualhier, Paris—An improved ventilator.
915. William E. Newton, 66 Chancery Lane—Improvements in the manufacture of iron.—(Communication from William Kelly, Pittsburgh, U. S.)
916. Philip Hill and John Moore, Salford, Manchester—Improvements in weaving double pile fabrics.
917. Charles Burrell, Thetford, Norfolkshire—Improvements in apparatus for screening corn and seeds.
918. Mathieu Castay, Paris—Improvements in metallic bridges.
919. James Crossdale, Rotherfield Street, Lower Islington—Certain improvements in boots and shoes.
920. Joseph Ward, King's Norton, Worcestershire—An improvement or improvements in working fly presses used for raising metals, coining, and other like purposes.
921. Richard A. Brooman, 166 Fleet Street—Improvements in the preparation of red dyes.—(Communication from Messrs. Renard Freres, Lyons.)
922. Samuel Tatton, Leek, Staffordshire—Improvements in preparing and treating silk, and improvements in dyeing silk.

Recorded April 13.

923. Richard Emery, 6 King Street, St. James's Square, Westminster—Certain improvements in carriages for common roads.
924. William A. Martin and James Purdie, Woolwich, Kent—Improvements in fire-bars.
925. Heinrich Eckhorn, 24 Cranbourne Street, Leicester Square—Improving and regulating the production of light in lamps, to which he gives the name of "Universal Lamp Regulator."
926. Richard Coleman, Chelmsford, Essex—Improvements in agricultural implements.
927. James Apperly and William Clissold, Dudbridge, Gloucestershire—An improved construction of fulling machine.
928. William Craft, 12 Cambridge Road, and Thomas Wilson, Bradmore House, Chiswick—Improvements in the manufacture of pinafores and bibs for children.
929. Alfred R. Johnson, St. John's Wood—An instrument for damping, severing, and affixing postage and other like stamps.
930. John A Coffey, 4 Providence Row, Finsbury—Improvements in apparatus for heating liquids.
931. William A. Gilbee, 4 South Street, Finsbury—Improvements in the construction of the axles of railway and other carriages.—(Communication from M. Tenting sen., Paris.)
932. John L Stevens, 1 Fish Street Hill—Improvements in the fire grates of locomotive, marine, and other furnaces.
933. John Hughes, William Williams, and George Leyshon, Brockmoor Works, Brierly Hill, Staffordshire—Improvements in the manufacture of tin and terne plates.
934. John Gillett, Upper Brailes, Warwickshire—An improved mill used for grinding, crushing, and reducing bones and other mineral and vegetable substances.

Recorded April 14.

935. Joze Luis, 1B Welbeck Street, Cavendish Square—A new cooling apparatus for liquids, especially beer.—(Communication from Jean L. Baudelot, 10 Rue Magador, Paris.)
936. Thomas Bird, Manchester—Improvements in the application and use of a certain natural product or products in the manufacture of pickers for looms, drawing rollers for spinning machinery, cop tubes, and for steps and bushes generally where lubrication is required.
937. Hiram C. Coulthard and James Jordan, Blackburn, Lancashire—Certain improvements in steam engines.
938. Joseph Beattie, Lawn Place, South Lambeth, Surrey—Improvements in the means of preventing locomotive engines and carriages in motion on railways leaving or running off the rails.
939. Ebenezer Partridge, Stourbridge, Worcestershire—An improvement in the manufacture of "pipe" boxes for cart and waggon axles.
940. William Barnes and Samuel Pickering, 127 Brick Lane, Spitalfields, and John Roberts, William Street, Limehouse—Improvements in retarding and stopping railway locomotives and trains.
941. Edward Dowling, Little Queen Street, Holborn—Improvements in parts of scales or weighing machines, and in balance weights used for those articles, which are also applicable for other purposes.
942. William Sinnock, Brompton, Kent—Improvements in submarine and subterranean electric telegraph cables, and in machinery for the manufacture thereof.
943. Alexander M'Dougall, Manchester—Improvements in coating metallic surfaces.
944. Lindley J. Higham, Edmund Place—Improvements in billiard tables.
945. Stephen Barnwell, Coventry, Warwickshire and Alexander Rollason, Birmingham—Improvements in the manufacture of umbrellas, parasols, hats or hat covers, caps, capes, coats, mantles, dresses, gloves, and other similar articles.

Recorded April 15.

947. William A. Gilbee, 4 South Street, Finsbury—Improvements in the construction of buffers for railway and other carriages, also applicable to other purposes where springs are employed.—(Communication from M. Tenting sen., Paris.)
948. John Chapman, Wolverhampton, Staffordshire—An improvement or improvements in the manufacture of angle iron.
949. George Ashcroft, Cardiff, Glamorganshire—Improvements in working presses and other hydraulic machines.
950. Robert Boot, Hill Street, Surrey—Improvements in treating sheep or other pelts, so as to give them the appearance of rough calf.
951. Hugh A. Silver, Cornhill and Bishopsgate Street Within—Improvements in insulating wire for electric telegraphs.

Recorded April 16.

952. Henry Barrow, Birmingham—A new or improved fastening for fastening trunks, boxes, and articles of dress, and for such other purposes as the same is or may be applicable to.
953. Thomas White, Edgbaston, near Birmingham—An improvement or improvements in frames or stands for holding liquor bottles, pickle jars, cruets, and castors, and for holding bottles and vessels generally.
954. John Glasgow and Samuel Hand, Manchester—An improved variable circular motion applicable to slotting, shaping, and planing machines, or similar purposes.
955. Luke Collier, Rochdale, Lancashire—An improved feeding apparatus, applicable to grain, loaf sugar, drugs, or other similar materials.
956. William Clark, 53 Chancery Lane—Improvements in apparatus for separating metals from their ores and other matters.—(Communication from Henri F. Toussaint and Louis N. Langlois, Paris.)
957. William E. Newton, 66 Chancery Lane—Improvements in the manufacture of alumina.—(Communication from Mr. Le Chatelier, Paris.)
958. John Hamilton, 8 Exchange Square, Glasgow—Improvements in apparatus for regulating prime movers driven by water.
959. Alfred Courage, Bagillt, Flintshire—An improved method of obtaining the metallic particles contained in fumes or vapours from led and other smelting work.
960. Henry Harrison, Blackburn, Lancashire—Certain improvements in looms for weaving.
961. John Sidebottom, Broadbottom, near Mottram, Cheshire—Improvements in the construction of tubes and partial tubes, and in machinery or apparatus for placing them on the spindles of machines used in spinning, doubling, winding, and warping, also improvements in machinery for making such tubes and partial tubes.
962. Henry H. Vivian, M.P., of Swansea—Improvements in smelting copper.
963. Nelson Kenward, Sutton, Surrey—Improvements in machinery for obtaining motive power by fluids.
964. George B. Cornish, New York, U. S.—Improvements applicable to fog horns.
965. William Walker, Liverpool—Improvements in rocket guns.—(Communication from Thomas W. Roys, Southampton, Long Island, New York, U. S.)

Recorded April 18.

966. John Moule, Seabright Place, Hackney Road—A new compound liquid for illuminating purposes.
967. Joze Luiz, 1B Welbeck Street, Cavendish Square—An improved machine for raising water.—(Communication from M. Dupre, 10 Rue Mogador, Paris.)
968. Robert Warry, Chatham—Improvements in breech-loading ordnance and its projectiles.
969. William Prosser, 24 Dorset Place, Dorset Square—Improvements in apparatus employed in the production of light.
970. George Porter—Improvements in valves or cocks.
971. John Whitaker, Bedford Mill Iron Works, near Leigh, Lancashire—Improvements in mowing machines.
972. Joseph Seaman, Linslade, Buckinghamshire—Improvements in agricultural implements for working or cultivating the soil.
973. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved disinfecting compound.—(Communication from W. E. Lynen, Marseilles, France.)
974. John C. Wilson, Wood Street—A reversible shawl cloak.
975. Joseph Izod, 58 High Street, Hoxton—A safety cigar, vesuvian, or fusee box or case.
976. William E. Gedge, 4 Wellington Street South, Strand—An improved safety apparatus for clearing off condensed steam from steam engines.—(Communication from Augustin Morel, Roubaix, France.)
977. John Freer, Rothley, Leicester—Improvements in machines for planting grain and seed, and an improved seed feeder and meter for planting machines.
978. Joseph Morton and Henry S. Morton, Sheffield, Yorkshire—Improvements in hearth-plates or ash pans.
979. Alexander Dalrymple, Sheffield, Yorkshire—Improvements in the mode of covering crinoline, and in machines used in connection therewith.
980. George Collier, Harlow, Essex—An improved mowing machine.
981. Frederick Edwards and William Edwards, Coventry—Improvements in looms for weaving ribbons and other like goods.
982. William Parsons, Pontar-Tawe, near Swansea, Glamorganshire—Improvements in preparing sheet iron and other metal sheets for japanners and other uses.
983. James Boydell, Gloucester Crescent, Regent's Park—Improvements in the apparatus applied to the wheels of locomotive traction and other carriages to facilitate the draught.

Recorded April 19.

984. William Gosling, 82 Wellington Street, Woolwich, Kent—Improving rifle cannon and projectile.
985. Peter Reynolds and James Reynolds, Belfast, Antrim, Ireland—Improvements in machinery or apparatus for hackling flax and other fibrous materials.
986. Christopher Batty, Manchester—An improved means or apparatus for effecting instantaneous communication on railways between passengers and officials.
987. Isaac Dutton, Tipton, Staffordshire, and Robert Martin and Thomas Phillips, Dudley, Worcestershire—New or improved machinery for preventing accidents in coal or other mines, by the drawing of skips or cages over their pullies.
988. Alexander W. Williamson, University College—Improvements in making extracts from liquorice roots.
989. Oliver Maggs, Bourton, Dorsetshire—Improvements in cheese presses.
990. John W. Matthews, High Street, Poplar—An improvement in the manufacture of hats and other coverings for the head.
991. Alfred V. Newton, 66 Chancery Lane—Improved machinery for weaving seamless bags or other articles with hemispherical or regular or irregular ends or forms. (Communication from John Pender, United States of America.)

Recorded April 20.

992. Quin Beck, Belfast, Antrim—Improvements in stoves.—(Communication from James Cherry, Vermont, U. S.)
993. Job Wotton, Birmingham—An improvement or improvements in raising or shaping metals.
994. John M. Johnson and Edmund Johnson, Castle Street, Holborn—Improvements in the production of ornamental surfaces suitable for advertisement tables, plates for shop fronts, and for other uses.
995. Alexander W. Williamson, University College—Improvements in obtaining extracts from liquorice root.
996. Henry Rawson, Leicester—Improvements in machinery for combing wool and other fibres.
997. Lucius P. Porter, New York, U. S.—Improvements in knitting machinery.—(Communication from Joseph R. Kilbourn and Edward E. Kilbourn, Norfolk, Litchfield, Connecticut, U. S.)
998. James Apperley and William Clissold, Dudbridge, Gloucestershire—Improved apparatus for oiling wool.

Recorded April 21.

999. Andre F. Vanhulst, Brussels, Belgium—An improved kiln for drying malt.
1000. Edward Cottam, Pimlico—Improvements in apparatus employed for cutting or sawing metals and other substances.

1001. Thomas Dawson and John Avery, 32 Essex Street—Improvements in pencil-cases, watch seals and keys, toothpicks, and other like articles of jewellery, lockets, penknife handles, porte-monnaies, and other like articles.
1002. James Napier, Partick, near Glasgow—Improvements in producing figures or representations upon glass.
1003. John Allison, Hainault Forest, Essex—An improved instrument for extirpating thistles, docks, and other deep-rooted weeds.
1004. John Davies, Tetbury, Gloucestershire—A new or improved apparatus for ringing door bells, and a bolt to be used with the same apparatus, and for other purposes to which the said bolt is or may be applicable.
1005. David Auld, Glasgow—Improvements in machinery or apparatus for supplying steam boilers with water.
1006. Richard A. Brooman, 166 Fleet Street—Improvements in knitting frames.—(Communication from Madame H. L. A. Hammerlin, Paris.)
1007. Edwin Lewthwaite, Halifax, and George Ambler, Queenshead, near Halifax, Yorkshire—Improvements in clocks, watches, chronometers, and other timekeepers.
1008. Edward Clark, Morley's Hotel, Westminster—Improvements in sewing machinery.—(Communication from Isaac M. Singer, New York, U. S.)
1009. George Roberts and John Bridges, 20 Ponsonby Place, Vauxhall Bridge Road—Improvements in the manufacture of candles.
1010. Thomas S. Truss, Darlington, Durham—Improvements in the construction of pipes and in the mode of joining the same.
1011. John H. Pepper, Morton House, Kilburn Priory—Improvements in apparatus for showing stereoscopic pictures.

Recorded April 23.

1013. Robert Gray, Sheffield, Yorkshire—Improvements in crinoline skirts.—Communication from Jonathan Hobson, New York, U. S.)
1014. Charlotte Mansel, Plymouth, Devonshire—A folding travelling case.
1015. John Edwards, 77 Aldermanbury—Improvements in the manufacture of buttons.
1016. John Armstrong, Sunderland, Durham—Improvements in drying and preserving timber.
1017. James Gillies, Glasgow—Improvements in branding or marking wood for casks, barrels, and other purposes.
1018. John Angus, Glasgow, Lanarkshire—Improvements in saddles.
1019. William Dicks and William Hopwell, Leicester—Improvements in machinery for making screws, and applying them in fixing the soles of boots and shoes.
1020. Pierre L. M. Debain, Paris—Improved means for transmitting motive power to ships, pumps, and other arrangements by which the displacement of fluids is effectuated.
1021. Pierre F. Mutel and Lucien H. Blanchard, Paris—Improvements in gas burners.
1022. Pierre L. M. Debain, Paris—Improvements in making heat subservient for producing motive power.
1023. William Gibson, St. Leonards Road—Improvements in steering apparatus.
1024. Richard A. Brooman, 166 Fleet Street—An improvement in the manufacture of woollen cloth.—(Communication from Louis V. Lemaignen, Liseux, France.)
1025. John Marshall, jun., Selby, Yorkshire—Improvements in filtering and depurating fluids.
1026. William Moxon, Parliament Street, Westminster, and Joseph J Bennett, Homer Terrace, Victoria Park—Improved apparatus for raising or lifting and lowering heavy bodies.
1027. Frederick C. Maguire, Stamford, Lincolnshire—Certain improvements in the utilisation of sewage manure.

Recorded April 25.

1028. William Stevenson, Johnstone, Renfrewshire—Improvements in spinning, doubling, and manufacturing cotton and other fibrous materials.
1029. William P. Bilfern and Murdoch M'Kay, Hammersmith—The manufacture of sweet figged soft soap.
1030. James Higgin, Manchester—Improvements in treating madder, and plants of the same family, and preparations therefrom.
1031. George Warn, Blackburn, Lancashire—Improvements in machinery or apparatus for making healds.
1032. John Owen and Hindle Duckworth, Blackburn, Lancashire—Improvements in machinery or apparatus for leasing yarns.
1033. Thomas A. Weston, King's Norton, Worcestershire—A new or improved pulley.
1034. Thomas Buckham, Gloucester—An improvement in railway switches.
1035. James Holmes, Street, Somerset—Improvements in applying eyelet holes to boots and shoes, and in binding boots and shoes.
1036. Augustus W. Gadesden, 56 Leman Street, Goodman's Fields—Improvements in producing solutions of sugar.
1037. Edward Humphrys, Deptford—Improvements in steering apparatus.
1038. William E Newton, 66 Chancery Lane—Improvements in sewing machines.—(Communication from Robert H. Moreford and Anthony D Moreford, New York.
1039. Henry C. Hurry, Wolverhampton, Staffordshire—Improved means of and apparatus for obtaining motive power.
1040. William Warne, John A. Fenshawe, James A. Jaques, and Thomas Galpin, Tottenham—Improved compounds applicable for packing the joints of steam or other pipes, which compounds are also applicable for packing or lining parts of machinery in general, or parts of ships, bridges, tanks or railways.
1041. Samuel L. Taylor, Cotton End, Bedfordshire—Improvements in agricultural implements in obtaining motive power.

Recorded April 26.

1042. Thomas Holt, Lower Place, and John Brown, Oxford Street, Well Field, Rochdale, Lancashire—Improvements in apparatus, or an improved apparatus, for heating water for the supply of steam boilers, which improvements or apparatus are also applicable in some cases for the prevention of incrustation in steam boilers.
1043. Herbert Allman, Mornington Place, Hampstead Road—Certain improvements in the construction of window blind mountings, and in apparatus connected therewith.
1044. William Mackenzie, Glasgow—An improved method of printing impressions upon an enlarged or reduced scale, either from engraved plates, electrotypes, blocks, drawings, or other surfaces.
1045. William E. Newton, 66 Chancery Lane—Improvements in the manufacture of nitric acid, and its application for the production of artificial nitrous or nitric salts.—(Communication from Madame Lefebvre, Paris.)
1046. Robert Main, Birkenhead, Cheshire—Improvements in wheels for carriages.
1047. William Marshall, Leith Walk, Mid-Lothian—Improvements in steam engines.
1048. Richard A. Brooman, 166 Fleet Street—Improvements in vulcanizing and colouring caoutchouc, and in the preparation of caoutchouc paints and colours.—(Communication from Theophile J. Laballe, Paris.)
1049. Richard A. Brooman, 166 Fleet Street—Improvements in steam boilers.—(Communication from Theodore N. Meynier and Louis A. Le Bleu, Paris.)
1050. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in machinery or apparatus for combing wool and other fibrous substances.—(Communication from Cullen Whipple, Providence, Rhode Island, U. S.)
1051. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in machinery or apparatus for grinding and polishing knives and other articles of cutlery and tools.—(Communication from James Dodge, Waterford, Saratoga, New York, U. S.)

Recorded April 27.

1052. Jean M. Ciroux, Brussels, Belgium—Improvements in lamp-glasses and shades, applicable to gas-burners, light-houses, and railway signals.
1053. George Pearson, Bugbrook, near Weedon, Northampton—Improvements in apparatus for cutting and shaping trenails.
1054. Joseph Hyde, Hollingworth, near Mottram, Cheshire—Certain improvements in steam boilers.
1055. Henry R Fansdawe, 13 Russell Place, Old Kent Road, Surrey—Improved apparatus or mechanism for drawing-off, filtering, and guaging liquids in butts, barrels, casks, and such like vessels, preserving the contents from deterioration from contact with atmospheric air.
1056. John Stuart and William Stuart, Musselburgh, Mid-Lothian—Improvements in machinery or apparatus for manufacturing nets for fishing, and for other purposes.
1057. James R. Smith, Glasgow—Improvements in obtaining motive power.
1058. Robert J. Laing, Independent Gas Works, Haggerstone—Improvements in wet gas meters.
1059. Charles Hamp, Harrow Road—Certain improvements in locks.
1060. James Holroyd, Leeds, Yorkshire—Improvements in machinery used for finishing woollen and other cloths.
1061. Thomas Lacey, Grafton Street, Westminster—Improvements in gas regulators.
1062. Sir Thomas T. Grant, K C.B., 20 Chester Terrace, Regent's Park—Improvements in ships' cooking apparatus.
1063. Thomas Gauntley, the elder, High Pavement, Nottingham—Improvements in the manufacture of fringes.

Recorded April 28.

1065. Charles Randolph and John Elder, Glasgow—Improvements in steam engines and boilers.
1066. Richard Jones, New Kent Road, Surrey—An improved safety-lamp.
1067. Robert Harrington, 3 Colonnade, Albany Road, Camberwell, Surrey—Improvements in umbrellas and parasols.
1069. Nathaniel J. Holmes, Glasgow—Improvements in electric telegraphs and apparatus connected therewith.
1070. Eugene Lardenois, Brussels, Belgium—Improvements in the manufacture of pulp for paper, pasteboard, and other like articles.—(Communication from Bonnet F. Brunel, Brussels.)
1071. Thomas Clarke, Hackney—Improvements in sheaves or pulleys for paying out and hauling in ropes, chains, and cables, for communicating motion to machinery, and for other useful purposes.
1072. John Wheat, Hinckley, Leicester—Certain improvements in drilling machines employed for agricultural purposes.
1073. William A. Thompson, 18 Cecil Street, Strand, and Weston Green, Thames Ditton, Surrey—Improvements in apparatus for applying liquids to the throat and air passages for medical purposes.
1074. Arthur Boyle, Birmingham—Improvements in the manufacture of certain parts of umbrellas and parasols.

Recorded April 29.

1075. William M Cranston, 11 New Broad Street—A grass cutting machine.—(Communication from Walter A. Wood, Hoosick Falls, Rensselaer, New York.)
1076. William Corbett and William Carmont, Clayton, near Manchester—Certain improvements in the construction and arrangement of furnaces employed in the manufacture of iron and steel, and for other similar purposes.
1077. John W. Welch, Manchester—Improvements in sizing or dressing yarns or threads for weaving.
1078. Heny Bosshard, Paris—An improved mechanism for obtaining and imparting motive power.
1079. Edgar A. Portens, 18 Warwick Square, Paternoster Row, and William H. Burke 79 Cannon Street West—Improvements in printing and other presses.
1080. Simon de Cazenave, 189 Regent Street—An improved lubricating compound.
1081. Thomas Smith, Bredfield, Suffolkshire—Improvements in cultivating implements.

Recorded April 30.

1083. Joseph Toussaint, 1B Welbeck Street, Cavendish Square—A new process of modelling and moulding for galvano-plastic.
1084. John Darlington, 36 Cannon Street—Improvements in zinc retort furnaces.
1085. Edward Francis, Wrexham, Denbighshire—Improved apparatus applicable to the treatment of tea and other useful purposes.
1086. James Morrison, sen., and James Morrison, jun., Paisley, Renfrewshire—Improvements in looms and in apparatus connected therewith.

☞ *Information as to any of these applications, and their progress, may be had on application to the Editor of this Journal.*

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 14th April to 7th May, 1859.

April	14th,	4165	William White Rouch, 180 Strand, W.C.—"Photographic portable dark operating tent."
	20th,	4166	Howard Ashton Holden, Birmingham.—"Roof Lamp for Railway and other Carriages."
	21st,	4167	George Henry Ellis, Malton, Yorkshire.—"Washing machine and churn.
	27th,	4168	John Young, Vulcan Foundry, Ayr.—"Parts of an apparatus to be used in sowing mangold-wurzel or turnips."
	29th,	4169	Garton and Jarvis, Exeter.—"Latch lock."
May	4th,	4170	Cottam and Company, 2 Winsley Street, Oxford Street, W.—"Cottam's saddle and harness airing and drying horse."
	7th,	4171	Brigg and Millikin, 9 St. Thomas's Street, Borough, S.E.—"An artificial breast."

ELECTRO-MAGNETIC MOTIVE POWER.

An efficient mode of employing electro-magnetism as a motive power has been long and eagerly sought for by numerous ardent cultivators of practical science. For, in spite of the oft-repeated objection that the expense of the metal consumed would counterbalance the benefit derived from the machine, it is easy to show that there are situations where, and purposes to which, the electro-magnetic engine may be applied with advantages which would far outweigh the cost of the zinc employed. We are, therefore, always glad to record the efforts of intelligent men who strive to render electro-magnetism a source of useful mechanical power. The engine to which we now direct the attention of the reader is the invention of Mr. Andrew Barclay, the engineer of Kilmarnock. In arranging the parts of this machine, Mr. Barclay has adopted what may be termed the galvanometrical principle—that is to say, the moving parts of the engine consist of one or more series of permanent magnets fitted upon a horizontal shaft, the arms of the several magnets diverging radially and equidistantly therefrom. These magnets rotate with the shaft, and pass between stationary electro-magnets arranged parallel to them; these are so disposed that they alternately attract and repel the magnets, and thus produce a rapid rotatory movement of the main shaft, which motion is communicated to the machinery to be driven or other purpose the power is to be applied to.

In the subjoined illustrations we have shown one arrangement of Mr. Barclay's new electro-magnetic engine. Fig. 1 is a partially sectional elevation; fig. 2 is a sectional end view. The framing of the electro-magnetic engine consists of a pair of open standards or side frames, A, formed face of the rail; within these bushes are arranged the adjustable bearings, G, in which the tapered journals of the horizontal shaft, H, work. Both extremities of the shaft, H, work out beyond the side frames, A, and to one of these projecting ends is fitted the pulley, I, which imparts motion to the machinery to be driven. The other extremity of the shaft, H, carries the commutator or "make and break" contact apparatus, which will be referred to after describing the electro-magnetic arrangement in connection with the shaft. There are six of the transverse stays, E, arranged equidistantly around the circular frame, A, each stay having three holes in it, these holes are made to receive the ends of the round iron rods, J, which are firmly secured thereto by means of nuts. The rods, J, form the cores of a series of stationary electro-magnets, being flattened at the central part so as to lie closely together; they are arranged crossing each other, and a nut, K, is fitted to pass through the central apertures of the three; one end of the nut is made to press against the outer rod, J, and the other end has a thread cut in it, to which is adapted a nut, L. By screwing up the nut the rods are firmly compressed against each other, each set of three rods thus forming a single electro-magnet, or series of electro-magnets. The three rods or electro-magnets, J, extend outwards in a radial direction to the six transverse stays, E, and in the modification we have shown there are three series of these radial electro-magnets; but the number may be increased according to the power required from the engine. A brass ring, M, is slipped over each rod, J, down to the central part, and a corresponding ring, N, is fitted at the upper end of the rod or core close up to the transverse stay, E. These rings, M and N, form flanges between which a continuous length of insulated wire, O, is wound upon the rods, commencing at the north pole and ending at the south; the wire is then

Fig. 1.

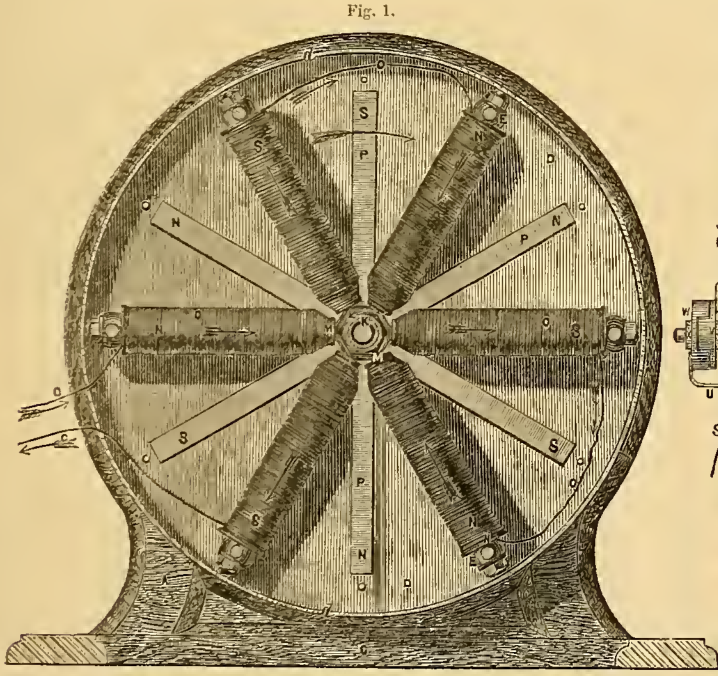
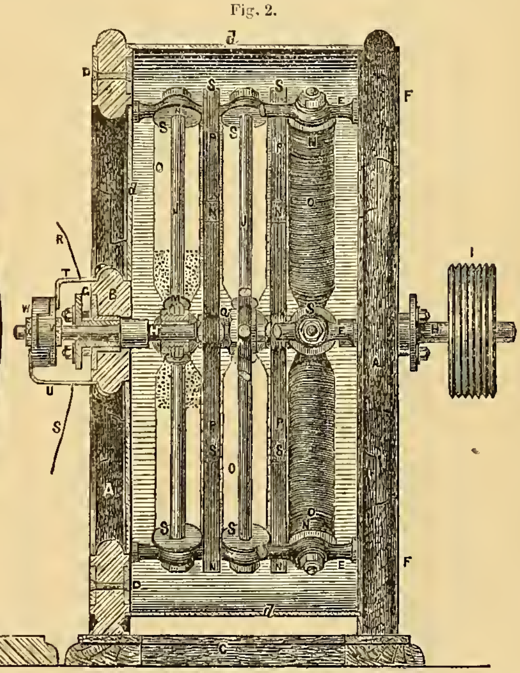


Fig. 2.



of oak or other suitable material. These side standards consist of a strong frame of a circular figure, having a horizontal rail or rib, B, extending across the central part of the ring; the lower part of the frame diverges outwards in a lateral direction on each side where it joins the base or sole plate, C. Each frame is strengthened by a brass ring, D, which is let into the face of the frame and is riveted thereto. The two side frames are arranged parallel to each other, and are united by means of the transverse stays, E, the ends of which pass through the side frames, and are fastened by nuts. A circular aperture is made in the centre of each of the cross rails, B, in which a brass bush is fitted and let into the carried from the first rod, J, to the next, and then to the third, thus forming a connected series of stationary electro-magnets. From the first series of electro-magnets, the wire, O, is carried to and wound upon the contiguous rods, J, these rods being in like manner covered with a coil of wire, commencing at the north pole and passing off at the south. The wire passes from the second series of electro-magnets on to the third series of cores, J, round which it is wound to correspond to the two contiguous sets of electro-magnets. Instead of continuing onwards from one core to another throughout the series, the coil on each core, J, may be separately connected to the battery, or each coil may have a battery appropriated to it. And where it is desired to increase still further the power of the engine, the ends of the coil on each half of the cores, J, may be separately connected to a powerful battery; in this manner an enormous quantity of electricity may be caused to pass through the several coils of the engine, a corresponding amount of mechanical force being evolved. The three series of stationary electro-magnets, J, being arranged equidistantly upon the shaft, H, the intervening spaces are occupied by two series of rotatory magnets, P. In this arrangement, the magnets, P, consist of flat bars of magnetized steel, each magnet consisting of six or other number of these bars laid together, the central part of each bar being enlarged laterally to allow of an aperture for passing them on to the shaft, H. Three sets of the bars, P, are passed on to the shaft, H, to form one rotatory magnet, and they are tightened up and made to revolve with the shaft, by means of the right and left handed nuts, Q, which fit corresponding threads cut on the shaft. The rotatory magnets are arranged with their arms diverging equidistantly from the centre, and the stationary magnets, J, are placed at such a distance apart, that there is just sufficient space for the magnets, P, to rotate freely between them. The wires, R and S, proceeding from the positive and negative poles of the battery, are connected to the springs, T and U, these springs are secured to the cross rail, B, of the said frame. The wire, R, is connected to the upper spring, T, which is in metallic contact with the inner part, V, of the contact breaker or commutator. The lower spring, U, to which is attached the wire, S, presses against the outer part, W, of the commutator—the current of electricity passing into the machine from the battery, through the wire, R, and returning by the wire, S. The commutator for rapidly breaking and renewing the contact, consists of a ring of brass, which is divided into two separate rings, V and W, the inner edges of which are cut in a notched or zig-zag form. These two rings are mounted and set at a little distance asunder, upon a small wooden cylinder, X, which is fitted on to the shaft, H, so as to rotate therewith. The commutator rings, V and W, are put in connection with the coils of the series of electro-magnets, by means of two pulleys, one arranged at each side of the commutator so as to press on the rings, V and W. The wire proceeding from the north pole of the series of electro-magnetic coils, is attached to the carrying spindle of one of the pulleys, whilst the wire from the south pole of the coils is similarly attached to the other. The current from the battery passes along the wire, R, to the ring, V, from this surface to the pulley, and thence by the wire, O, to the north pole of number 1 electro-magnet, throughout the coils of this magnet, and passes off by the south pole. The current now enters by the north pole of number 2 electro magnet, and after traversing it, goes to number 3. From the first series of electro-magnets, the current passes by the wire to the second series, and thence to the third series, whence the wire, O, carries it to the spindle of the pulley, which is in contact with the ring, W. This ring being in metallic connection with the wire, S, the electricity flows back to the battery, thus completing the circuit. As the current flows through the coil or coils of the electro-magnets, a powerful attractive and repulsive force is alternately exerted upon the rotatory magnets, P. The north pole of each electro-magnet attracting the contiguous magnet, P, towards it, whilst the south pole of the electro-magnet behind it is repelling it. This powerful attractive force, it will be observed, is exerted along the whole length of the electro-magnets, being greatest at the extremity of each electro-magnet, and decreasing gradually towards the centre, where its absence is of no material importance. The rotatory magnets, P, being thus attracted towards the north poles of the electro-magnets; if now, these poles be reversed, a contrary effect takes place, and the north poles being now south, they repel the magnets, P, whilst the electro-magnets in advance, being also changed in polarity, attract them. In this manner the magnets, P, are successively drawn towards the electro-magnets in advance, and as soon as they reach them, they are repelled and attracted by the next in advance. By this means, a continuous and very rapid rotation of the magnets, P, is obtained; and these being fast to the shaft, H, it causes the pulley, I, to rotate at a corresponding velocity, the motion of which is conveyed to the machinery to be driven, or for other purposes for which the power is required. The rapid changing of the poles of the electro-magnets being effected by the arrangement of the rings, V and W, the interlocking serrations of which cause the pulleys connected with the coils of the electro-magnets to be alternately in connection with the positive and negative poles of the battery. The rings, V and W, are arranged a short distance asunder, so as to secure an effectual break of contact at the same time; whilst the peripheries of the pulleys, Y and Z, are clear of the surface of one of rings, V or W, the interval, or space between the rings, is so short that the pulleys are again in metallic connection with the other ring, before any variation or irregularity of the rotatory motion of the engine can take place. In order to reverse the motion of the engine, so as to cause the rotatory magnets or electro magnets to move in the opposite direction, it is only necessary to reverse the positions of the wires, R and S, which are connected with the battery, so as to cause the wire, R, to touch the ring, W, and the wire, S, the ring, V. The magnetic forces are now exerted in the opposite direction, and the full power of the engine is counteracting the momentum of the moving parts, and then causes them to turn in the opposite way. Precisely the same effect is produced if the wires connected to the pulleys, Y and Z, are reversed, and this reversal of either pair of wires may be effected by means of any simple mechanical contrivance adapted to the purpose. In order that the engine may move with as little external obstruction as possible, it is enclosed in an air-tight case. This casing consists of a closed cylinder, *d*, made of zinc, or other suitable material; the two end discs of the casing are fitted to, or just inside the side frames, A. The edges of the discs are turned inwards, and to the surface thus formed, the enclosing band or cylinder is soldered or otherwise fastened thereto. An air-pump is arranged in connection with the interior of the casing, *d*, so that the air contained within the chamber and surrounding the working parts of the engine, may be readily and conveniently exhausted therefrom. The air is pumped from the chamber, *d*, so that the engine works in a vacuum and free from any atmospheric obstruction. But if air is allowed to remain within the casing, the communication is shut off externally, and the quantity of air thus confined is speedily put in motion by, and moves in unison with, the rotatory magnets or electro-magnets. By means of these arrangements of electro-magnet or electric engines, a rapid and powerful rotatory motion, which may be continuously kept up, is readily obtainable, and may be applied with advantage to the propulsion of vessels and machinery, and also to a great variety of purposes in the arts and sciences.

STEAM HAMMERS.

By W. Naylor, Esq., 3 *Old Broad Street, London.*

(*Illustrated by Plate* 242.)

Mr. Naylor has been an indefatigable worker for the improvement of steam or mechanically acting hammers, and we have already placed some of his results before the readers of the *Practical Mechanic's Journal.* We now add two other distinct arrangements of steam hammers which he has recently perfected—one being of the overhanging frame and cylinder form, and the other, for larger work, with the well-known open framing. We can do no more this month than introduce them. In our next part we will go into their details in the fullest manner.

LIFE-BOATS OF THE ROYAL NATIONAL LIFE-BOAT INSTITUTION.

Of late years the subject of life-boats has attracted considerable attention, from the circumstance of the increasing number of wrecks, consequent on the rocky nature of our shore, and the vast and increasing amount of our commerce. The exertions, too, of the National Life-Boat Institution, have had a powerful influence in directing attention to this subject, as we showed in our review of the report of the institution last month.

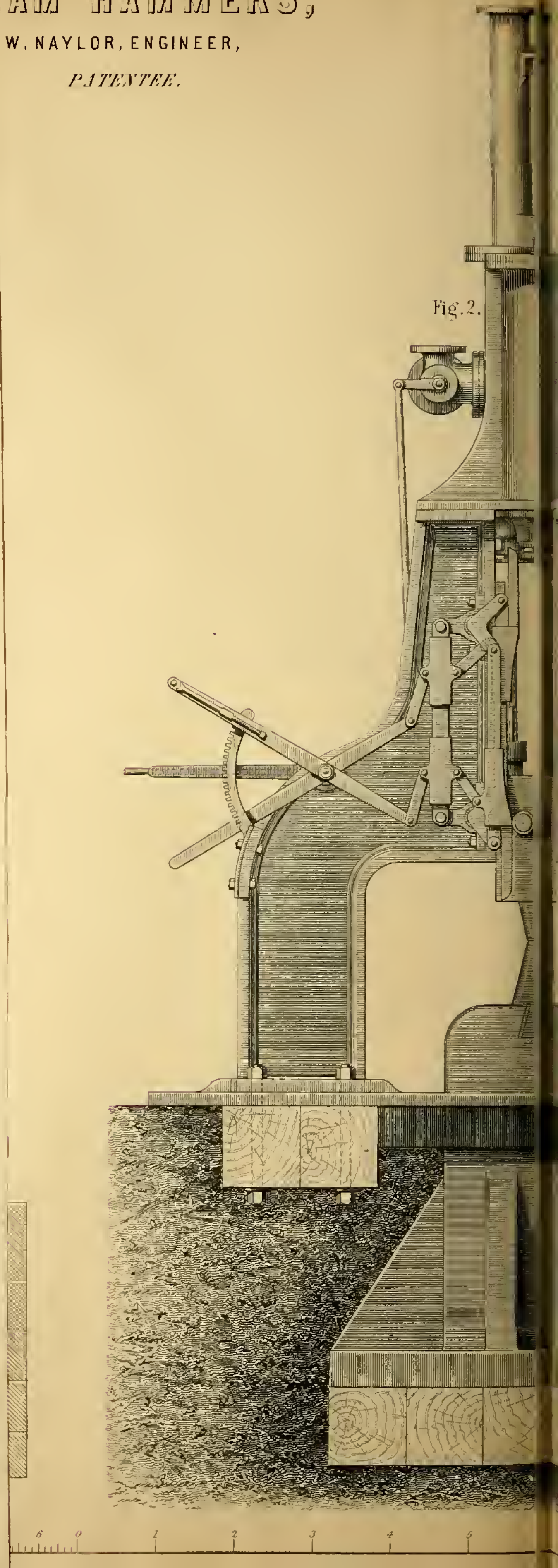
To a nation so devoted to maritime enterprise—so maritime in its tastes and sympathies; with such an extent of ocean-beaten coast—with a people that link all their glories with the sea; to England, in a word, everything that concerns the mariner, that can aid him in his

AM HAMMERS,

W. NAYLOR, ENGINEER,

PATENTEE.

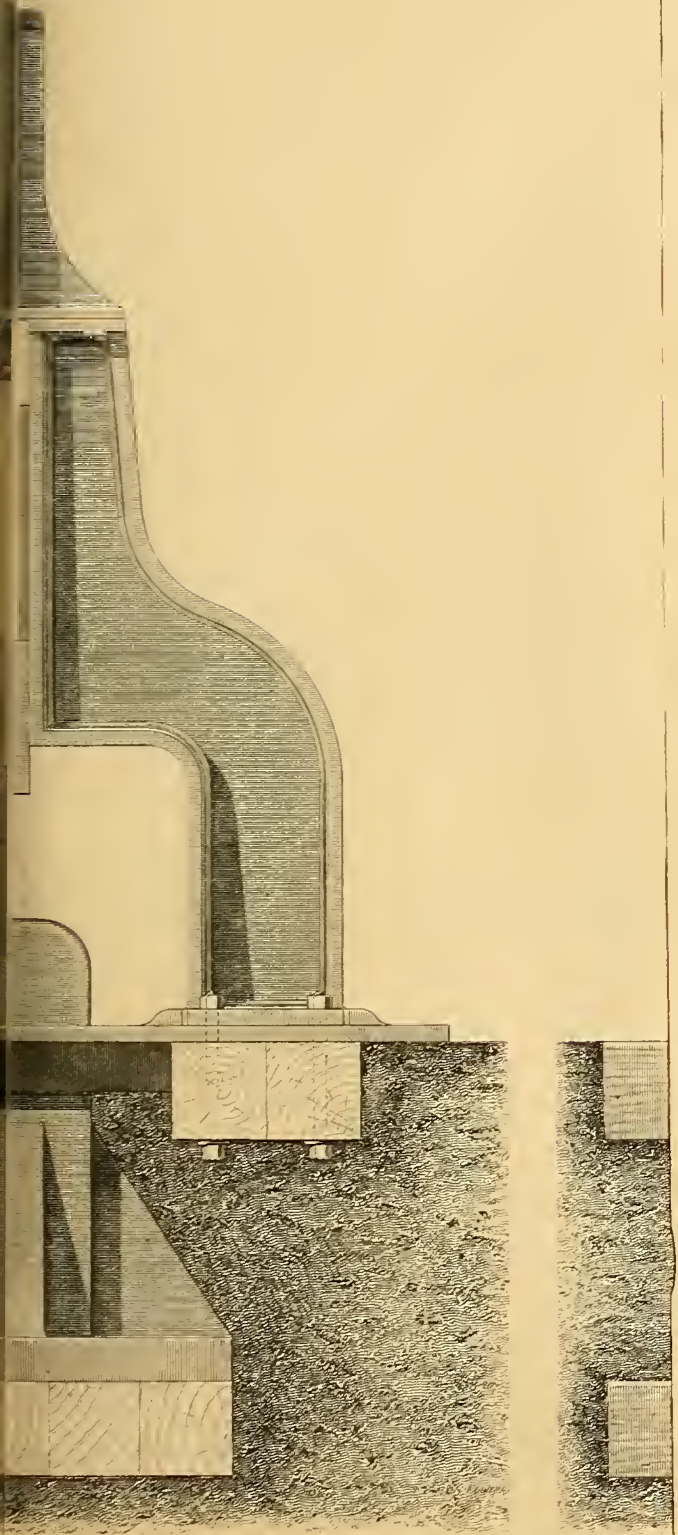
Fig. 2.



MADE BY THE

KIRKSTALL FORGE COMPAN

LEEDS.



STEAM HAMMERS,

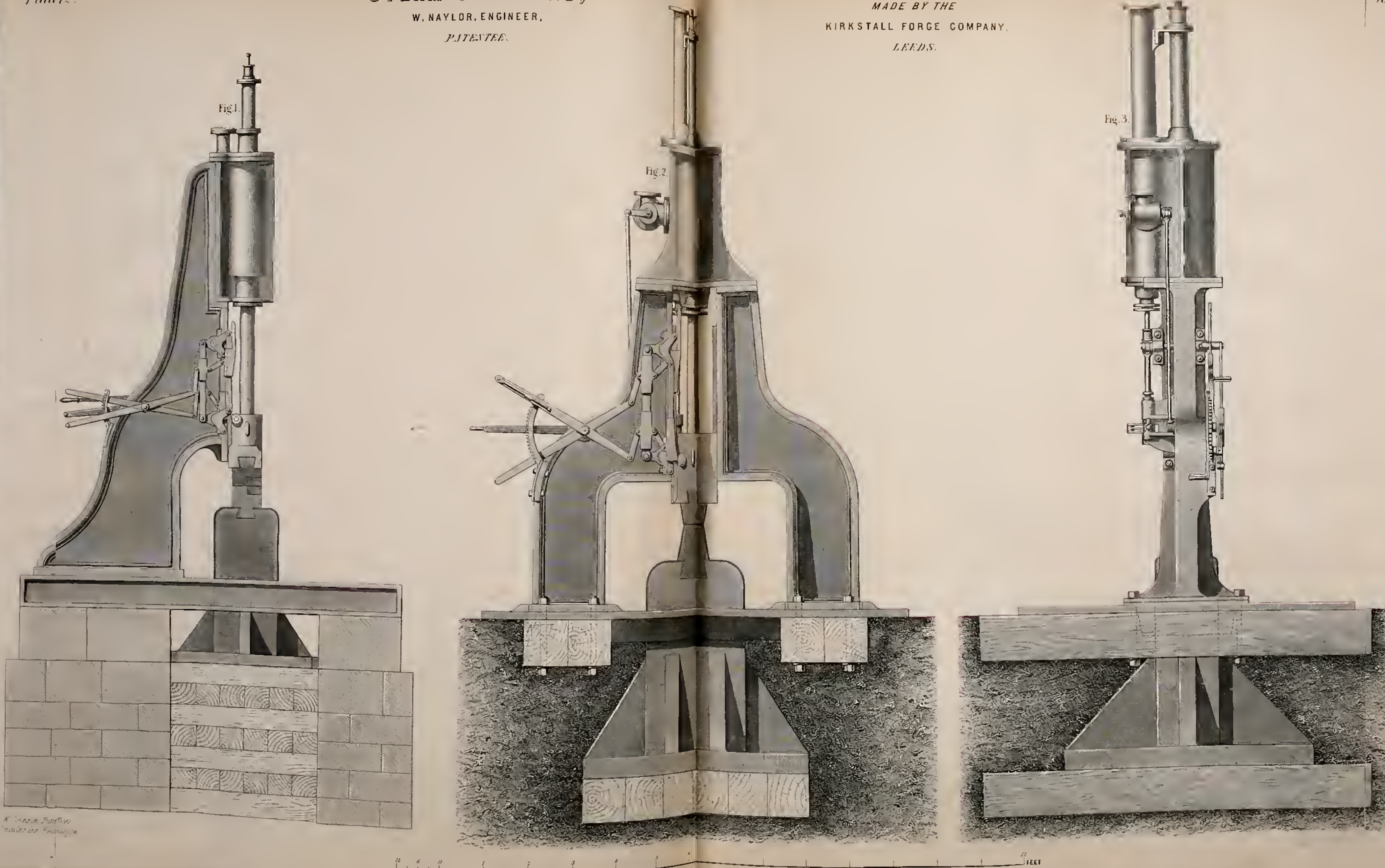
W. NAYLOR, ENGINEER,

PATENTEE.

MADE BY THE

KIRKSTALL FORGE COMPANY,

LEEDS.



perilous toil, or when he struggles with the fury of the restless, seething, stormy waves, must naturally possess a peculiar interest. Two-thirds of our population are more or less connected with the sea, and their interests are more or less affected by the results of our maritime enterprise; so that we find in one year (1858), no less than 1170 wrecks occurred upon our coasts, with the loss of 343 persons. These fearful calamities have taken place on the coasts of the most busy maritime island in the world, where, if there be liability of disaster through the vast congregation of shipping, there ought, on the other hand, to be a supply of invention and good sense sufficient to check such disasters.

A few years ago, a lamentable accident occurred to a South Shields life-boat, whereby twenty pilots were drowned. This induced the Duke of Northumberland to offer a reward for the best model of a life-boat. This offer was responded to by boatbuilders and others from various parts of the kingdom, as well as from France, Holland, Germany, and America, so that 280 models and plans were sent in. About fifty of the best of these were exhibited by his Grace in the Great Exhibition of 1851. He also caused a report to be prepared, accompanied by plans and drawings, with a view to elicit the best form of life-boat; for, although the prize of £100 was assigned to Mr. Beeching, of Great Yarmouth, it was considered that a better boat might still be produced. Accordingly, Mr. James Peake, assistant master shipwright in Her Majesty's dockyard at Woolwich, was requested to furnish a design for a life-boat which might combine as many as possible of the advantages, and have as few as possible of the defects of the best of the models examined by the committee. A boat was accordingly designed by Mr. Peake, in Woolwich dockyard. Some modifications were from time to time made in her, in consequence of various experiments, and a trial of her capabilities made in a gale of wind at Brighton. In the course of the winter several life-boats on this model were taken afloat on trial by the Life-Boat Society's Inspector, Capt. Ward, R.N., some of them in heavy seas and gales of wind, and the result of the trials was considered to be highly satisfactory. Other boats were therefore built on the same plan, and we may, therefore, consider this as the model life-boat. These boats have been for the most part of two sizes, viz., 27 and 30 feet in length, with $7\frac{1}{2}$ to 8 feet beam, and rowing from 8 to 12 oars double-banked; their weight averaging two tons. But as such boats have been found too heavy to be managed in some localities, where boatmen are few, boats of less beam and weight, rowing six oars single-banked, but on the same design in other respects, have been built under the denomination of small life-boats. The former class of boats have also been somewhat modified and lengthened since the description of the boat was first published, so as to be reduced somewhat in beam, and to have less height and greater sharpness of bow and stern, to enable them to be rowed with greater speed against a head gale and heavy sea. They are also built of fir, upon the diagonal principle of double planking without timbers, whereas the earlier boats were of elm, and clenched, or clinker built.

Fig. 1.

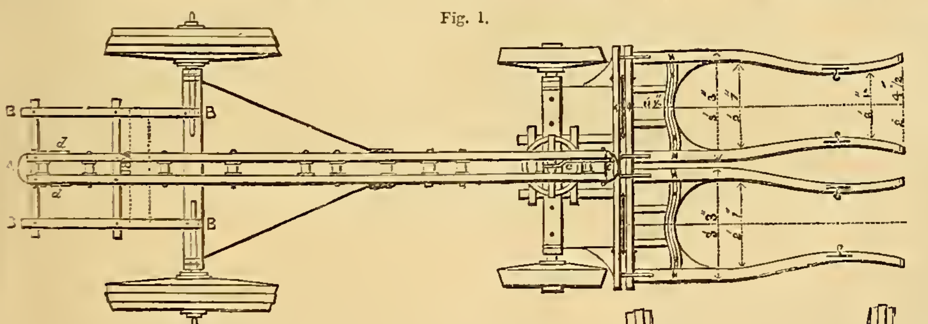


Fig. 3.

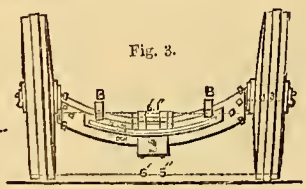
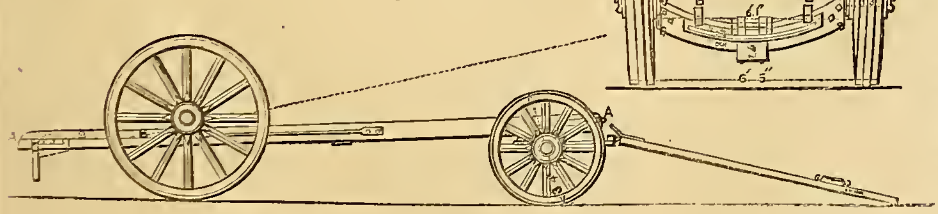


Fig. 2.



Our engravings, figs. 1, 2, and 3, exhibit respectively a plan, longitudinal elevation, and end view of the life-boat transporting carriage adopted by the institution. The carriage consists of a fore and main body. The latter is formed of a keelway, A, and of side or bilgeways, B, in rear of the main axle, the boat's weight being entirely on the rollers of the keelway. Its leading characteristic is, that on the withdrawal of the long forelock pin, C, the fore and main bodies can be detached from each other. The advantages of this arrangement are, that the weight of the boat, when she is launched from the rear end, forms an inclined plane by elevating the keelway, yet without lifting the fore body off the ground, whilst to replace her on the carriage, she can be hauled bow foremost up the fore end or longer incline. The bilgeways, B, are needed at the rear end, that the boat may be launched in an upright position, with her crew on board; but they are not required at the fore end of the carriage. The boat is hauled off the carriage and launched into the sea by a rope on each side of the boat, rove through the sheeve, D, having one end hooked to a self-detaching hook at the boat's stern, and the other manned by a few persons on the shore, who thus haul the boat and her crew off the carriage and launch them afloat at once, with their oars in their hands, by which means head-way may be obtained before the breakers have time to beat the boat broadside on to the beach. The accompanying figures show the general form, the nature of the fittings, and air-chambers of one of these boats, 30 feet in length and 7 feet 6 inches in breadth. In figs. 4 and 5 (the elevation and deck plans), the general exterior form of the boat is shown with the sheer of gunwale, length of keel, and rake or slop of stem and stern-posts. The dotted lines of fig. 4, show the position and dimensions of the air-chambers within board, and of the relieving tubes. In fig. 5, A represents the deck, B the relieving tubes (six inches in diameter), C the side air cases, D the end air chambers. In fig. 6, the exterior form of transverse sections, at different distances from stem to stern, is shown. Fig. 7 represents a midship transverse section, A being sections of the side air-cases, B the relieving tubes, bored through solid massive chocks of wood of the same depth as the space between the deck and the boat's floor. C, are spaces beneath the deck, filled up over six feet in length, at the midship part of the boat, with solid chocks of light wood, forming a portion of the ballast; D is a section of a small draining-tier, having a pump in it, by which any leakage can be pumped out by one of the crew whilst afloat. The festooned lines in fig. 1 represent exterior life-lines attached round the entire length of the boat, to which persons in the water may cling till they can be got into the boat; the two central lines are festooned lower than the others, to be used as stirrups, so that a person in the water by stepping on them, may climb into the boat.

This life-boat possesses in the highest degree all the qualities which it is desirable that a life-boat should possess:—

1. Great lateral stability.
2. Speed against a heavy sea.
3. Facility for launching and for taking the shore.
4. Immediate self-discharge of any water breaking into her.
5. The important advantage of self-righting if upset.
6. Strength.
7. Stowage-room for a number of passengers.

The Royal National Life-Boat Institution has been organised for the purpose of lessening the great evil of a want of sufficient means to save life in the case of shipwreck, and its usefulness cannot be over estimated. This institution has still in use, in some localities, life-boats from the designs of various parties, but all life-boats now constructed by it are on Mr. Peake's plan. The average cost of these boats with their various fittings and gear, and life-belts for their crews, is about £160 each. The life-boats' transporting carriages cost from £80 to £160, and the boat-houses from £50 to £100. It will be thus seen that a complete life-boat establishment will cost about £400.

In addition, there must be a crew of trusty men, able and willing to brave a raging sea, strong and resolute to pull the oar under any stress of weather, and there must be a master or coxswain, exercising sufficient control to command the men and direct their energies in a proper channel. It is in this direction, quite as much as in the provision of life-boats, that the life boat institution has rendered good and efficient service. A system of payment, partly in the nature of a salary, and partly as a reward, is adopted, such as may induce steady men to render aid; and honorary local committees assist in collecting the means whereby the outlay is to be defrayed, and in the general management of the life-boat establishment.

The institution now numbers eighty-one life-boats in connection with it. To maintain these boats in a state of thorough efficiency, requires a large permanent outlay. Last year the life-boats of the society, and those of local bodies, rescued 206 persons from shipwreck on our coast, and during the last last three years, 967 persons were, by the same invaluable means, rescued from a watery grave. On the other hand, it is lamentable to add that, during the same short period, 343 poor creatures perished on our coasts from these sad disasters. It is believed that a considerable proportion of this large number might have been preserved to their families and to their country, if additional life-boats were ou the coast.

In the event of fatal accidents happening to the crews of its life-boats, or to those of shore-boats, while attempting to rescue shipwrecked persons, the institution votes gratuities varying from £5 to £50 to widows and other dependents. Thus the institution holds out every inducement, as far as the means placed at its disposal by the public admit, to parties to exert themselves to save life from shipwreck. The total number of persons saved from shipwreck since the first establishment of the Royal National Life-boat Institution, by its life-boats and other means, and for rescuing whom the committee have granted honorary and pecuniary rewards, is 10,902. The operations of the institution may be thus briefly stated. Since its establishment it has expended upwards of £29,000 on life-boats and their appurtenances; and has voted eighty-one gold medallions and 629 silver medals for distinguished services for saving life, besides pecuniary rewards, amounting to £11,651. And yet, from the last annual report of the society, we find that its expenditure in providing new life-boats, maintaining life-boat stations, and in granting rewards and medals, exceeded its income by £2,586—while between sixty and seventy additional new life-boats are reported by official persons to be needed on the coasts. As so valuable an institution appears by the foregoing statement to be in want of funds, surely England will not fail to render it effectual aid, as it possesses so many claims upon the country's liberality. We therefore confidently believe, that when its appeal for help is thoroughly known, it will be liberally responded to.

At the last meeting of the members of the institution, a reward of £5 was voted to a coastguard boat's crew of five men, in acknowledgment of their very laudable services in putting off and rescuing the crew of four men of the schooner *Amelia*, of Salcombe, which was recently wrecked off Cardiff during an easterly gale. The thanks of the institution, inscribed on vellum, were voted to Captain Ellison and Mr. M'Lellan, and a reward of £1 10s. to some men who had courageously exerted themselves in saving ten men from the brig *William Sortie*, of Glasgow, which during a heavy gale of wind was wrecked off Barra, on the Western Islands. A reward of £2 10s. was also voted to a boat's crew of five men for putting off in a boat and recovering, amid considerable danger, the crew of fifteen hands of the steamer *Preston*, of Liverpool, which, during thick and blowing weather, was wrecked on the Anglesey coast. Anglesey lies immediately in the track of all vessels passing to or from the important port of Liverpool, the arrivals and sailings at which alone exceed 40,000 vessels every year. Many parts of the island are bounded with precipitous rocks, without for many miles an inlet for shelter, except for boats of very small size. On this dangerous coast the National Life-boat Institution has at present five efficient life-boats. A reward of £4 was likewise voted to a boat's crew for putting off and saving the crew of five men from a French vessel, named the *Bon Calais*, of Bayonne, which, during a gale of wind and thick weather, was recently wrecked in Dundalk Bay. Several other rewards of money were also voted to the crews of different boats for their praiseworthy exertions in saving life from various wrecks on the Irish coast.

With eighty-two life-boat stations on the British and Irish coast, the institution must necessarily be desirous of extending its work of usefulness to the coast of Scotland, which is 1,500 miles long, with hardly half-a-dozen efficient life-boats, that every part of the United Kingdom may be provided with the means of affording succour to those unfortunate persons who, by the violence of the storm, are cast away, and must too often otherwise perish on its shores.

At the meeting referred to, great commiseration was expressed in the case of the emigrant ship *Pomona*, on the Blackwater-bank. An offer has been made by the institution to the locality, of a large, powerful 39-feet life-boat, to afford assistance in such lamentable catastrophes in future. The institution has also recently sent a new life-boat and transporting carriage to Exmouth. During the past month three new life-boats, on Mr. Peake's plan, and built by the Messrs. Forrest, have been sent to the Emperor of Russia. They are to be stationed in the Gulf of Finland. A Russian steam-packet company has likewise purchased from the builders two life-boats of the same class, to be stationed at Odessa. A life-boat has also been forwarded to the Russian Government.

Fig. 4.

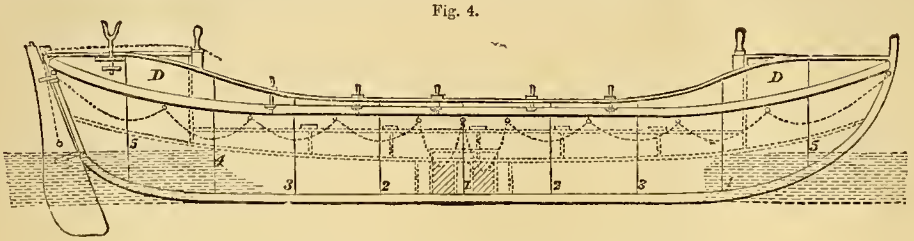


Fig. 6.

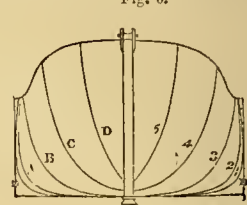


Fig. 5.

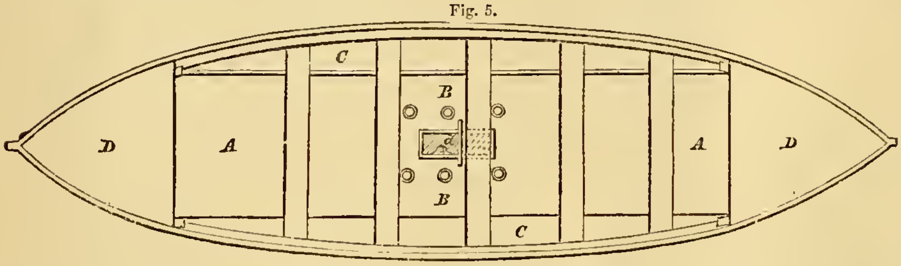
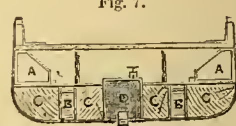


Fig. 7.



These proceedings show that active life pervades the undertaking, and we hope that it will meet with its reward.

Let us write a word or two for the especial attention of our northern friends. How is it that, up to the present time, the institution cannot succeed in persuading Scotchmen to help in providing the 1,500 miles of Scottish seaboard with half-a-dozen life-boats? Surely there ought to be more consideration for these rocky and fearfully dangerous shores. Let us hope that what we have said in behalf of an association which is plainly fostered by a few energetic individuals upon the most disinterested grounds, may induce some Scotchmen at least to put themselves in communication with Mr. Lewis, the secretary, who is to be found at 14 John Street, Adelphi, London.

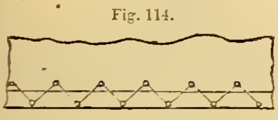
HISTORY OF THE SEWING MACHINE.

ARTICLE XVI.

Mr. Hughes, who appears to have been rather favoured with foreign communications from inventors of sewing machines, obtained another patent on the 27th of December, 1853, embracing various modifications and improvements in these machines. The first portion of this invention relates to various modifications in the construction of the needles of sewing machines formed with bearded or spring eyes, the object of these improvements being the preventing the thread from slipping out of the eye of the needle, and also to prevent the beard from injuring the material under treatment whilst passing therethrough. Another portion of Mr. Hughes' invention consists in obtaining a cam motion from the rim of the fly-wheel, in connection with two vertical bearded needles and one sewing thread, the action of one needle being to draw the thread upwards through the fabric, and of the other to draw it down again, so as to produce a stitch similar to that made by hand. A third part of this invention consists of a modified form of machine for making the stitch last referred to, the two bearded needles being used in connection with improved thread guides and feed motion. A fourth part of the invention relates to producing various forms of what is known as "back stitching," by means of one thread and one bearded needle For this purpose, a lateral as well as vertical motion is imparted to the needle, so as to cause it to descend in the same place only at every alternate descent. In connection with the needle is used a thread guide for supplying the thread to the hook of the needle, and a hooked arm for the purpose of catching the loop and drawing it entirely through the fabric on the underside thereof. An intermittent feed motion is employed for moving the cloth in alternately opposite directions, one motion being equal to the length of a stitch, and the other a shorter distance in the contrary direction. By these means, the specification avers that all kinds of back stitching or sewing may be accomplished. Mr. Hughes also describes an improved feed motion, which is applicable generally to all sewing machines. Another portion of this voluminous specification describes a mode of using two needles and two thread guides, or one needle and one thread guide. Each needle is formed with a large slot or eye near the point, through which a thread guide or hook passes whenever the eye of the needle has advanced through the fabric, and draws the thread through the eye. When two such needles are used, one needle is placed below and the other above the fabric, each needle when in action moving between springs (one pair placed below and another pair above the fabric), which springs serve to hold the thread whilst the thread guide is taking it through the eye of the needle. When sewing, the lower needle rises between its springs, and through the fabric, until the eye is above the latter; the upper guide then catches the thread which is held by the upper pair of springs, and draws it through the eye of the needle; this being accomplished, the needle passes back out of the fabric and from between the lower springs, carrying with it the thread, which is caught and held by the lower springs. The upper needle now descends between the upper springs and through the fabric, and the thread is drawn through its eye by the lower thread guide: after which the needle ascends, and, drawing the thread through the fabric, completes the stitch. A needle of the above kind, with its thread guide, may be substituted for the hooked needle and hook or thread guide previously described, producing a stitch similar to that made by hand.

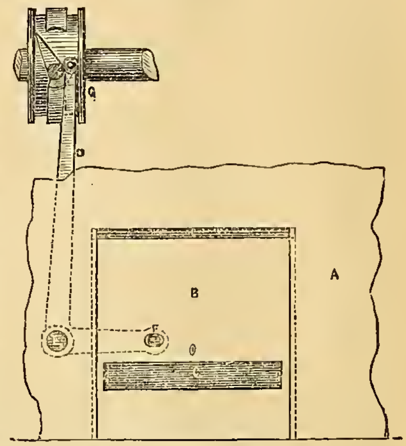
Julian Bernard, Esq., obtained a patent on the 31st of December, 1853, for "improvements in stitching and ornamenting various materials, and in machinery and apparatus connected therewith." Mr. Bernard's invention is comprised under five different heads. *First*, the production, by means of machinery, of a peculiar kind of stitch, somewhat similar to that known as "herring bone" stitch, which stitch is used for uniting materials and sewing their edges, and also for ornamenting the same, to which the inventor gives the name of the "diamond stitch." *Second*, the production of another improved form of stitch, suitable for uniting and ornamenting materials and sewing their edges, and applicable also to the stitching of button holes. *Third*, the production of another improved stitch, and part of the means employed therein, which is similar, to a certain extent, to that known as crochet, tambour, or chain stitch, but unlike it, in so far that the tendency to unravel or rip out will be diminished or entirely prevented. *Fourth*, a peculiar arrangement and construction of mechanism for "hemming," or sewing the edges of materials. *Fifth*, placing or securing on one common bed-plate two or more sets of mechanism, each having independent needle mechanism for sewing or stitching. In producing the "diamond stitch," a diagram of which is given at fig. 114, an alternate lateral motion or side travel is imparted to the material to be stitched or ornamented, in conjunction with the usual forward travel or feed, which compound motion has the effect of presenting the material beneath the needle in such a manner as to produce the peculiar arrangement of stitch shown at fig. 114. A portion of a sewing machine, with the arrangements adapted thereto for producing the stitch above mentioned, is shown in plan at fig. 115. In this figure, A represents a portion of the bed-plate of the machine, B a moveable plate, which gives the lateral motion to the feeding wheel or friction band, C. This band is passed through slots in the plate, B, and travels over its surface much in the same way as is shown in the arrangement illustrated at fig. 111 of our last article. It is actuated by wide driving pulleys, which are not seen in the cut; or the pulleys which carry the band may be made to slide to and fro laterally along fixed stud centres. D is a bell crank lever, working on a fixed centre at E, in the underside of the table or bed-plate, and connected by a pin and slot at F with the plate, B. The longer arm of this lever is actuated by the double grooved cam, G, which is provided with a moveable director or guide hinged between the two grooves, for the purpose, during the rotation of the cam, of guiding the end of the lever from one groove to the other, thus producing a lateral or vibratory motion at each turn of the cam, which motion is imparted by the smaller arm of the lever to the plate, B. The needle of the machine works in an elongated hole or slot in the plate, B, so as to allow for the lateral traverse thereof. In stitching or ornamenting by this machine, the needle with its thread is brought down through the cloth, and the thread is retained therein by any suitable mechanism; the needle then rises, and the material is traversed forward and laterally, so as to bring a different

Fig. 114.



part of its surface under the needle, which again descends and rises, and the material is again traversed forward and laterally the extent of the stitch to be produced. The apparatus required for the production of the "diamond stitch" being of such a simple nature, it may obviously be adapted to most of the ordinary sewing machines, and used when required—it being solely requisite, in throwing it out of gear or action, to withdraw the stud pin at F, when the plate, B, will remain stationary, and the machine may be used as an ordinary sewing machine. This adaptation is a most ingenious contrivance, and one tending to extend the use of the sewing machine, as it is obvious that when one machine is made to perform several varieties of stitching without materially complicating its mechanism, a great step is made towards the general applicability of this modern wonder. As regards the novelty of Mr. Bernard's stitch and apparatus, we think there is no question of a doubt. Mr. Bernard, we see, does not propose to confine himself to the imparting of a lateral motion to the fabric, as such may, in some cases, be imparted to the needle. This would certainly answer the same end, but would rather tend to detract from the simplicity of the machine.

Fig. 115.



In that part of Mr. Bernard's specification which relates to the securing of the edges of materials and the stitching of button holes, he describes an ingenious combination of instruments for effecting that operation. In carrying out this part of the invention one or more threads are employed, and the thread is turned in a double or looped form from the one side of the material to the other, so as to overlap the edge thereof, and the needle is then inserted through the loop so turned over. This turned-over loop, when two threads are used, is obtained from the second or under thread, which is carried and passed by a suitable instrument or "opener" through the loop formed by the needle thread beneath the material. The loop of the second thread having been inserted through the loop of the needle thread, is caught by a forked instrument or "returner," which extends it and raises it above the edge of the material, and, when in this position, it is laid hold of by a spring rod or "finger," which draws it over the upper surface of the material in a proper position for the next descent of the needle, so that the needle may pass through it and through the material. When only one thread is used the "opener" does not carry a separate thread, but merely catches the loop of the needle thread below the material, and by a lateral or partial circular motion expands the loop, and admits of the entrance of the "returner" therein. This loop is then carried up by the "returner" and laid over the edge of the material by the "finger," as before described. The needle then passes through the turned-over loop and through the material, when a second loop is formed, and the operations are repeated.

Fig. 116.

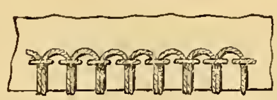


Fig. 117

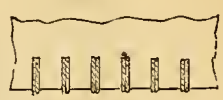
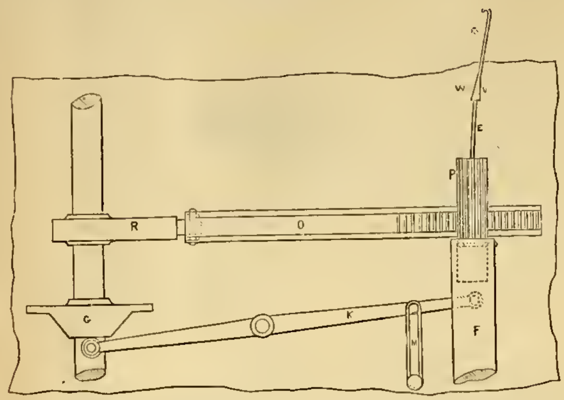


Fig. 116 represents an enlarged diagram of the two-thread button hole stitch, and fig. 117 is a diagram of the one-thread stitch, which, on its opposite side, is similar to that shown in fig. 116.

Fig. 118 represents a plan of the underside of a portion of a machine for producing the improved crochet or tambour stitch. The principal or main feature of this stitch is, that the loop, previous to the passage of the needle through it, is twisted or turned once or twice, so that the stitch will afford greater resistance to being drawn out or unravelled. The loop of the needle thread, on being passed through the material, is caught by the hooked instrument, E (fig. 118), previously brought into a position to receive it. On seizing the loop, the hook commences to revolve by the rack, O, being brought into action and gearing with the long pinion, P. This has the effect of imparting a more or less twist to the loop The needle then rises out of the material, and the latter is fed forward in readiness for a succeeding stitch, when the operations are repeated. The hook is carried by the slide, F, a grooved boss being formed on the base of the hook, which enables it, with its pinion, to revolve freely in the slide, whilst a pin, fitting into the annular groove, keeps it in its place. The slide is worked to and fro longitudinally by the lever, K, actuated by the cam, G, an India-rubber spring, M, serving to draw tbe lever and slide back after each impulse of the cam. The

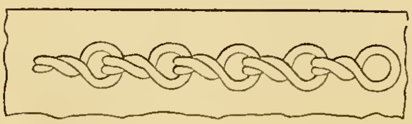
Fig. 118.



rack, O, is worked by the cam, R. An enlarged side and edge view of the hook is given at fig. 119, in order to show the guiding slot or groove, which is formed on the crown of the hook, for the purpose of partly guiding the needle so as to enter the loop held by the hook, the hook during the descent of the needle being always vertical. The needle having entered the loop, the hook makes a slight turn and simultaneously moves forward, the length of the pinion allowing for such forward mo-

Fig. 119.

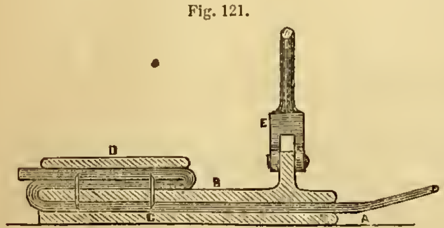
Fig. 120.



tion, thereby releasing the loop, and passing beyond the needle in a position in readiness for taking a second loop therefrom. In order to enable the hook to pass beyond the needle, it must move to one side slightly so as to avoid the needle in passing, and this lateral motion is obtained from the swell or incline, U, on the shank of the hook acting against a fixed pin, W, the inherent spring of the shank admitting of this lateral displacement. Fig. 120 is an enlarged diagram of this twisted loop or chain stitch.

The fourth part of Mr. Bernard's invention, which relates to tbe "hemming" of tbe edges of materials, will be clearly understood on referring to the illustration (fig. 121), which represents in transverse section the blades employed for holding the fabric in a proper position for being hemmed. A is tbe surface of the bed-plate or table of any convenient sewing machine. The material to be "hemmed" is doubled over the edge of the blade, B, which answers the

Fig. 121.



purpose of the finger of tbe seamstress. The material having been folded over the blade, B, is laid upon the lower blade, C, and is firmly held between these two blades by the points in the underside of the blade, B. It is then turned over the rounded edge of the blade, B, and is doubled back over the top of the blade, aud there held by the points therein. A portion of the material is then doubled back again according to the breadth of hem required, and its extreme edge is made to project slightly beyond the part turned over the rounded edge of the blade, as shown in the figure, and is held down by the top blade, D. The vertical lines represent the position and direction in which tbe needle enters the material In hemming, the needle first penetrates the top fold, aud then passes through the turned over portion of the material; but, in place of passing close up to the edge of the blade, it passes through the centre of the thickness of the material, so as to leave no traces of the thread on one side of the material when finished. The several plates, B, C, aud D, are guided during the traverse or feed motion of the material by two forked guides, E, which are rigidly secured to the bracket of the needle mechanism, and embrace a longitudinal rib formed on the surface of the plate, B. When a curved travelling motion is required, this guiding rib must be correspondingly curved.

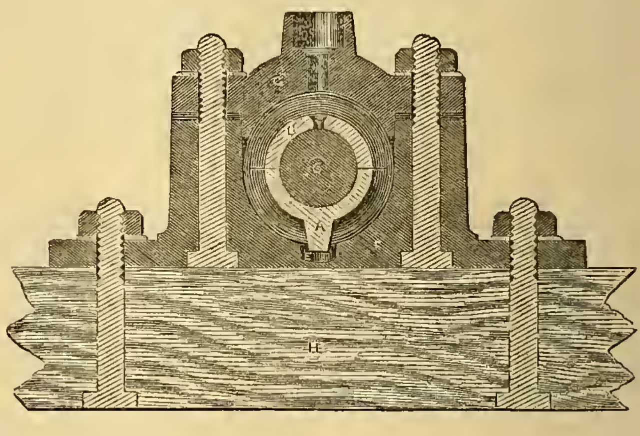
SOCIETY OF ARTS EXHIBITION.

II.

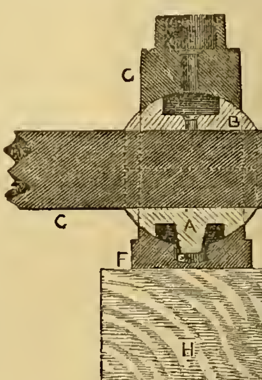
The "circonvertem" or rolling action axle box, of M. de Brussant, was described by us last month. A letter in our pages of last month speaks against its novelty. The main idea, however, is at any rate good.

Mr. West, of Shalls Moor, Sheffield, shows a guard for water taps, especially intended for public drinking fountains and similar purposes. It is a simple and useful contrivance.

In the mechanical department is also exhibited, the patent self-adjusting spherical bearings, by Messrs. Wallis & Haslam, of North Hants Iron Works, Basingstoke. This bearing forms a ball-and-socket joint,

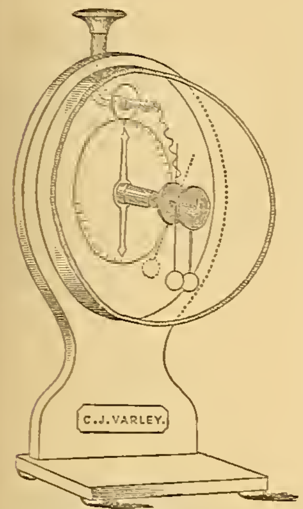


which adjusts itself to the direction of the spindle passing through it, thereby doing away with the liability to heat or wear crosswise. The subjoined engravings represent a sectional elevation and cross section of the arrangement. The brasses, A and B, after being bored in the usual manner, for the reception of the shaft, C, are turned externally to form a sphere. The seat or block, F, and the cap, O, are also turned internally, as to form a spherical cavity corresponding to the periphery of tbe brasses, A and B, lateral openings being left in the block and cap for the shaft to pass through. The parts when fitted together, form a species of universal joint, which within certain limits has free motion in any direction. The brasses are prevented from rotating with the spindle by a nipple on the lower brass, which fits loosely into a socket in the bottom of the block, but which allows suf-



ficient motion for the bearing to adjust itself to any variation in the position of the shaft. They may be applied to railway carriage axles, as they will allow the wheel to rise or fall with the inequalities of the rail, without at all affecting the bearing. The bearing has a channel cast round the exterior of the brasses, in order to lighten tbem, but this does not affect the working of the ball-and-socket joint. The improvement appears to be one in the right direction.

Mr. Cornelius Varley, of York Place, Kentish Town, exhibits an electrometer which gives exact measures of electrical intensity, referable to a constant and easily obtained standard, so as to make observations taken at different places, with different instruments, comparable witb each other. It consists of a dial insulated aud supported on a glass rod, the whole being capable of turning on its axis. Our engraving represents the instrument in perspective, complete. From the front of the dial two arms are suspended, one being a fixture to the dial, and the other moveable on an axis. Both these arms are terminated with pith balls, between which the electrical repulsion takes place when the instrument is charged. The two upper quadrants of the dial are divided, the right hand one into 90 degrees, to measure the motion of the moveable index, and the left-hand quadrant into 100 unequal parts, to represent 100 equally increasing sines. These latter are pointed out by the fixed index. The whole instrument is enclosed in a glass case, and all the glass supports varnished for better insulation. The mode of working it is as follows:—The instrument is to be so adjusted that when the zero on the dial plate is under the fixed index, the two pith balls hang just in contact. When the instrument receives an electrical charge, the moveable ball is repelled to distances varying with the intensity of the charge; the moveable index therefore shows, by the degree it points to, the difference of intensity in a rough way, though by experiment the exact value of each degree may be ascertained. To measure the force exactly, turn the dial round by the handle at the back till the fixed ball gradually approaches and just touches the moveable one. In this position the gravity of the moveable ball is just equal to the repulsive power of the electricity, and as the gravitating force of a pendulous body is in proportion to its distance from the perpendicular (or in other words, as the sine of the angle), the sine of the degree indicated by the fixed index, exactly represents the amount of electric force with which the instrument is charged. The instrument which is considered the standard has the balls half an inch in diameter, and the moveable one so counterpoised as to preponderate with a force of one-tenth of a grain, but in an observatory there should be several instruments of different degrees of sensitiveness, some for measuring the more powerful charges, and the others for measuring the faintest electrical indications. It will be obvious that any number of instruments can be adjusted in the same way, and therefore the results of different observatories would be perfectly comparable—an important result which has not been obtained by any other instrument, at least in the same degree. This instrument has further the advantage of being able to be carried about without deranging its adjustment, and is not liable to injury from an accidental overcharge.



Messrs. Parkins and Gotto exhibit specimens of the cheap and portable writing case, suitable for the use of soldiers, sailors, and emigrants. This case obtained the prize of £20 (placed at the disposal of the council of the Society of Arts, by the Rev. F. Trench and J. MacGregor, Esq.,) and the Society's silver medal. The case is made of a waterproof material, and, when closed, is of the ordinary note paper size. The edges of the case fold over throughout its entire length, and are retained in their position by elastic bands, similar bands being also employed for holding the envelopes, pens, &c., in their position. The case contains a blotting-book, note paper, envelopes, an indelible pencil, four pens and a pen-holder. The retail price of the case will be 1s. 6d., and the additional cost of the contents will not exceed 6d.

Mr. J. D. Morrison, of Edinburgh, surgeon dentist, has deposited in the exhibition his apparatus for the painless application of cold, electricity, and heat, as remedial agents, and for producing local *anæsthesia*; a full explanation of this invention was given in our *Journal* for August, 1858, Vol. III., 2d series, p. 127.

Dr. Scott Alison, of Park Street, Grosvenor Square, exhibits some valuable instruments for assisting the medical man in his examination of the human frame. These consist of sphygmoscopes, cardiac and arterial, for indicating the pulsations of the heart and arteries. Differential double stethoscope or stethophone:—This instrument is provided with two apertures for collecting different sounds at two different parts of the body at the same time, and conveying them separately to the ears. The stethogoniometer, or chest goniometer:—This is an instrument for measuring the angles of the chest and the angles of tangents to curves. It takes cognizance of the configuration of the chest, and the inclination of one plane to another in disease. The hydrophone:—This is an instrument for increasing the amount of sound obtained from solid bodies. It is placed at the further extremity of a hearing tube, between its aperture and the solid body. The hydrophone increases the amount of sound from solids in the case also of the naked ear—the natural hearing tube. It consists simply of a thin vulcanised India-rubber bag, partially filled with water, and has much the size and shape of a moderate-sized watch. By fitting well upon the apertures of hearing tubes, including the ear, the hydrophone increases the amount of sound which reaches the internal ear, for it closes the opening and confines the sound like the microphone of Wheatstone.

Messrs. Moseley's fountain pen is the first really satisfactory instrument of the kind which we have seen. Our engraving represents it full size and partially in section. It consists of a silver barrel, A, the lower end of which carries a socket made of hard rubber or caoutchouc for receiving the pen. In this barrel there is a tube of vulcanised India-rubber, the upper end of which is attached to the spindle of the screw, B. When the pen is to be filled with ink this screw is turned back, so as to twist the flexible tube and expel the air. The pen is then dipped in the ink, and the screw is turned the other way, when the ink at once rushes up into the flexible tube, and supplies a sufficient quantity for an entire day's consumption. A small valve pin is fitted at C, when the pen is held in its socket for the purpose of keeping the passage free—a point which has always been a difficulty in fountain or reservoir pens. When in use, the thumb of the writer comes upon the flexible tube, as exposed through a hole in the barrel at D, and the consequent pressure secures a constant flow. The ink never drops from this pen, and as it is in contact only with the caoutchouc it cannot corrode. It is a very good contrivance. In another arrangement of this pen, the ink is supplied to the point by sliding forward a centre pin in the barrel, by means of a ring and slide attached to it; but this is only necessary when the point gets dry. When out of use, the pen itself is covered up by a small, hard, India-rubber shield, and when writing, this shield is removed and slipped upon the head of the screw, B, to bring the holder to a convenient length.

Among the agricultural implements, we observed Mr. Collinson Hall's patent windlass and steam plough and implement gear. The object of this mechanism is to render effective the whole power of engines used in drawing ploughs or other implements in tilling land. This is accomplished by carrying the wire rope in the form of the figure 8 round horizontal drums fixed (so as to be easily removable) under the engines. In the new arrangement the solid drum is constructed with several grooves, while the other is composed of as many independent pulleys as there are grooves in the drum. The upper or lower pulley, as the case may be, revolves in one direction, while the remaining ones revolve in the opposite direction. The solid drum only is driven directly by the engine, while the pulleys revolve by frictional contact, and thus all slipping is avoided. In this gear, little or no framing is required. The axes being bolted to the bottom of the boiler, a rod or beam retains them in a vertical position. The gear may be fitted and again unshipped from an engine (by means of keys through the axes, by which the gear is retained in place) in less than ten minutes.

Mr. B. Samuelson, of Banbury exhibits his self-raking reaping machine. The peculiarity in this machine is a self-acting apparatus for raking the sheaf off the platform, this is affected by means of a rake bead fitted on a crank. As the cut corn falls upon the platform, the rake descends upon it near the knife, sweeps it with a circular movement to the rear of the near side of the machine, and drops it in the form of a bundle ready for the binder. It is stated that a boy old enough to drive a pair of horses can manage this machine, and cut from 12 to 15 acres a day with it.

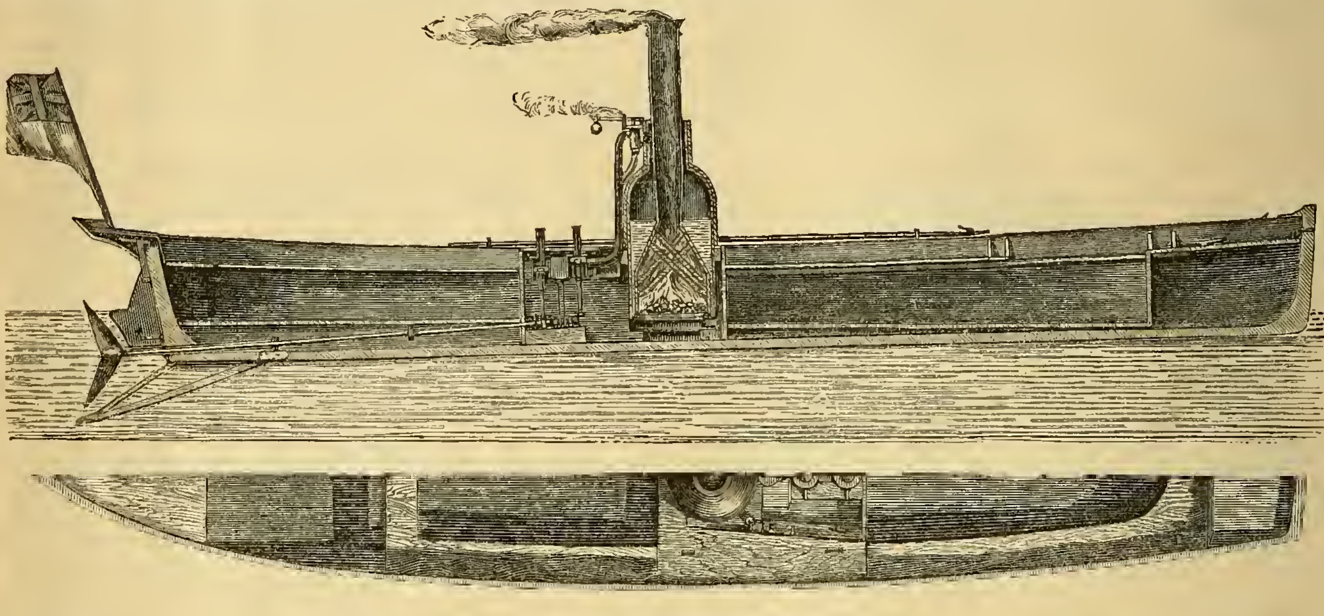
Some good arrangements of stove apparatus, for fumigating and destroying mildew in greenhouses, vineries, etc., are shown by Mr. E. Spray, of the Queen's Graperies, Brighton.

Mr. G. W. Baker, of Park Farm, has shown an ingenious horse and cattle fastening. The object of this invention is to facilitate the release of cattle in case of fire. By its means, a single person without entering a building, is enabled to release a whole shed of animals at once. This is done by means of a lever at the end of the building outside, which when pulled, opens all the fastenings simultaneously. The animals are released with their ties on, so that they can be led away to any convenient place and tied up, instead of being turned loose in the country. The idea is an exceedingly good one.

Mr. Geyelin, of Bagnigge Wells Road, has a useful appliance in his patent gas burner regulator, in which a diaphragm of flexible material is placed below the burner. This diaphragm is weighted, so as to modify the pressure of gas as required. There is also Mr. H. W. Hart's economising gas burner, in which the gas passes slowly through a thick woollen wad, giving a steady supply to the burner. We have heard the improvement highly commended.

SCREW STEAM YACHT ON THE CLYDE.

That speed can be got with steamers of small size, has just been proved by Messrs J. & W. Young, ship plumbers, of Glasgow, who, with a wooden hull, 30 feet long, have obtained nine miles an hour. This little vessel, built at Glasgow, and now on the Clyde, is represented in our engravings in longitudinal section and half plau. Her length over all, is 30 feet; keel, 27 feet 6 inches; beam, 5 feet 3 inches; depth, 2 feet ½ inches; wood in hull, ⅜ths of an inch. She has a pair of inverted direct-acting engines made of brass, with cylinders 4½ inches diameter, and the same stroke—all being entirely below the gunwale level. The connecting rods work directly upon a pair of cranks on the forward end of the screw shaft, which is slightly inclined aft to the keel line, so that the outer end, carrying the screw propeller, comes out at the very bottom of the stern and beneath the rudder. The screw is of the "fish-tail" form—a form which has been arrived at by successive experiments, and agreeing



with the results of the recent Government tests, wherein, by cutting away the driving edge, by far the best effect has been secured. It is, in fact, uothing but the common two-bladed screw with the front edges cut away, to bring it to the fish-tail or "butterfly" form. It is 2 feet 6 inches in diameter, and 5 feet pitch. As this is fitted, one-half of the screw is entirely below the keel line, and the blades are consequently protected by an open iron fender attached to the keel. The boiler, which is of the upright cylinder kind, is of copper. It stands immediately in front of the engines, and is only 2 feet diameter and 3 feet 6 inches high. It is fitted with inclined or diagonally disposed flue-tubes and a super-heating dome, and works to a pressure of 35 lbs. The weight of engines, shaft, and screw, is only 2 cwt., boiler, 3 cwt., water in boiler, 1½ cwt., and the fittings, 1 cwt. The consumption of fuel for ten hours' sailing, is about 4 cwt., and with this the craft sails close upon nine miles an hour, her draught of water being 12 inches aft and 3 inches forward. The engines and boiler, being entirely of brass and copper, their weight is but oue third of what it would be if iron were used—and hence the boat sails on a much lighter draught. She sails this summer on the Clyde as a pleasure yacht, and will, no doubt, attract some attention from marine engineers and builders. The advantages which steam affords for yachting purposes are now beginning to be generally felt and appreciated, and this year numerous miniature steamers have been, or are in process of being built. This is particularly the case at Greenock, where even the working engineers of that famed marine engineering place, have set resolutely to work for the combination of the pleasures of the yacht style of sailing, with the speed securing advantages of steam.

STRENGTHENING JOINT FOR BOILERS AND BOILER FLUES.

By Messrs. Benjamin Hick & Son, *Soho Iron Works, Bolton-le-Moors.*

(*Illustrated by Plate* 243.)

This joint is intended for the purpose of strengthening the internal flues of steam boilers, so as to prevent collapse by great external pressures; whilst the arrangement, at the same time, answers as the connecting joint for each plate of the structure.

Fig. 1, on our plate 243, is a longitudinal section of a cylindrical boiler, showing the internal flue as fitted up with a "T" iron composite stay and plate joint-piece round it. Fig. 2 is an end elevation of the flue ou a larger scale; and fig. 3 is a longitudinal section of a single joint, corresponding. It is applicable for either the ordinary longitudinal riveted joint, or for flues made in short lengths, with longitudinal welded joints, made perfectly cylindrical, and of any convenient length and diameter, according to the pressure and size necessary. A space is left between the edges of the plates at the joints, of sufficient length to give access for caulking; and the "T" iron may be caulked in the usual manner; of course this "T" iron may be of any transverse section which may be required, under specific circumstances. This system of jointing also possesses the power of converting the flues, when put into the boiler, into rigid longitudinal stays, as in the ordinary riveted two-flued boiler overlap joints. The joint is also applicable to the external sheets of boi'ers, used either externally or internally with it; a plate, much thinner than is usual, may be employed for the flues and other parts. The "T" iron may also be put in the inside of the flues if required. The arrangement, simple as it is, must add very much to the safety of steam boilers.

RECENT PATENTS.

RAILWAY BRAKES

J. H. Johnson, *London and Glasgow* (Y. Hopper, *Newark, U. S.*)—*Patent dated August* 7, 1858.

According to this invention the brake blocks, which may be suspended in the ordinary manner to the whole or any number of the carriages of a train, are connected to suitable brake rods, which are disposed longitudinally beneath the carriage framing, and are worked by T headed levers with the T piece downwards. The two opposite ends of the lower arms of this T piece being connected by suitable links with the brake rods, whilst the upright arm of the lever is connected with a main actuating rod which extends from end to end of each carriage. These actuating rods are coupled in a peculiar manner, and may be actuated from either end of the train. It is preferred, however, to work the brakes from a small steam cylinder for that purpose, fitted beneath the foot plate of the engine.

Fig. 1 of the subjoined engravings represents a longitudinal section of a portion of the framing of two railway carriages or trucks, fitted with the improved brake actuating mechanism. Fig. 2 is a plan of the same. A is the main framing of the carriage, and B the brake blocks, which may be suspended therefrom in the ordinary manner. The patentee proposes to adapt two pairs of brakes to each carriage, each pair being actuated by links. One of these links is connected at one end with the

Plate. 243. STRENGTHENING JOINT FOR BOILERS & BOILER FLUES,

MESSRS B. HICK & SON,

BOLTON LE MOORS.

Fig.1.

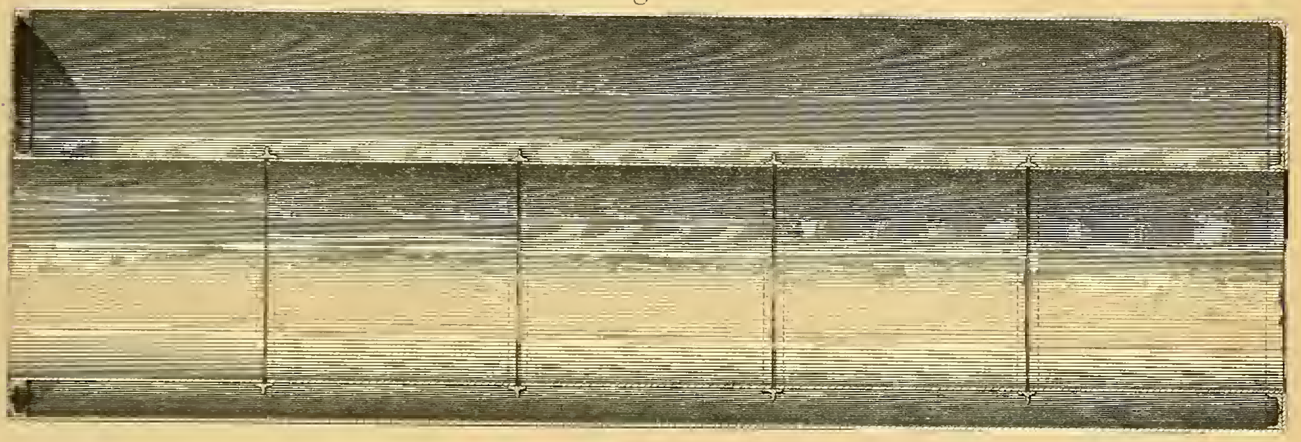
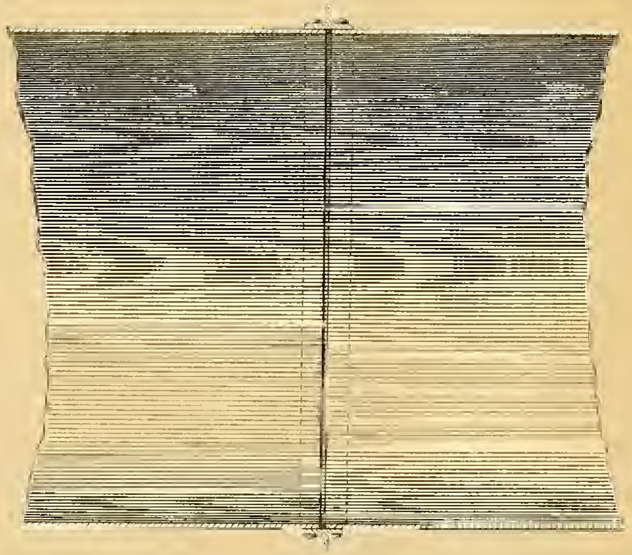


Fig.2.

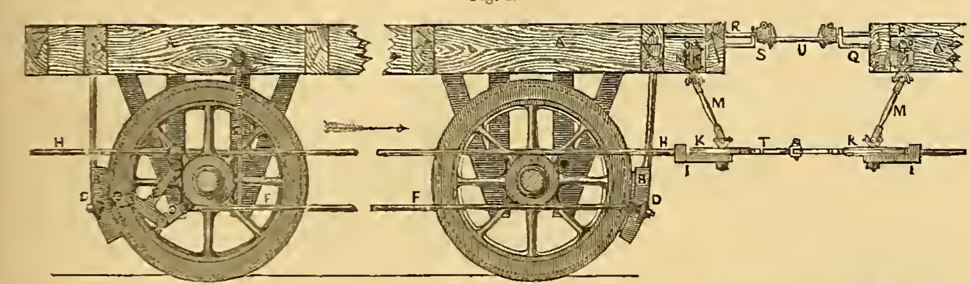
Fig.3.



W. Johnson, Patent Offices,
47 Lincoln's Inn Field & Glasgow.

cross bar, D, of one pair of the brakes, and at the opposite end to one of the lower arms of the ⊥ shaped lever. E the other or corresponding arm of this lever being connected to a short link, which is again connected to one end of the rod, F, the other end of this rod being connected with the cross bar, D, of the second pair of brakes. The rod, F, is supported by a shaft or bracket, G, depending from the underside of the framing. The vertical arm of the ⊥ lever is connected at its upper extremity with the main brake actuating rod, H This rod, if found desirable, may be suspended from the carriage framing or supported in any other convenient manner, so as to take off its weight wholly or partially from the ⊥ levers, and at each extremity it is connected by means of a coupling piece, I, to a pin in the under side of an eccentric, K, one of such eccentrics being situate at each end of the carriage. Each of these eccentrics is connected by any convenient form of universal joint, to an intermediate hanging shaft, M, which is connected at its upper end by a second universal joint, to a short vertical stem or spindle, N, carried in a suitable bearing, O, bolted to the carriage framing. By this arrangement it is obvious, that on imparting a rotatory or partial rotatory motion to the stem or spindle, N, a corresponding motion will be transmitted to the eccentric, K, through the two universal joints and hanging shaft, M, whether such shaft, M, be in a perfectly vertical posi-

Fig. 1.



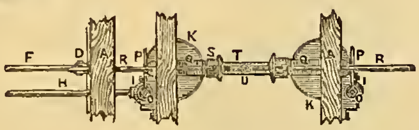


Fig. 2.

tion or at a considerable angle. A lever arm, P, (fig. 2) is keyed on to the upper end of the short stem or spindle, N, and this arm projects in front of the inner end of a slide, Q, connected with the draw bar, R. So long as the distances or spaces between the carriages remain unchanged, the lever arms, P, spindles, N, shafts, M, and eccentrics, K, are maintained stationary as regards any rotatory motion, but so soon as any decrease in the intervening spaces between the carriages takes place, by the shutting off of the steam or other retardation of the front portion of the train, causing the carriages to crowd upon each other, the slides, Q, will be pushed inwards by the heads, S, of the draw-bars, and will actuate the lever arms, P, and turn more or less the eccentrics. The contiguous eccentrics of each two carriages are connected by the rods and straps, T, which latter fit into circumferential grooves made in the eccentrics, the two rods being united by a bolt or pin, as shown, or in any other convenient manner. On the intervening space between the carriages being increased, as at the starting of the train, or by reason of a partial separation of the carriages, then the opposite result will be obtained, that is, the slides, Q, will be forced out, either by springs for that purpose, or by being connected to the draw-bar heads, and the eccentrics will turn in a contrary direction. The space between the carriages may thus be allowed to vary, as by the turning of the eccentrics such variation of the space will be compensated for, which is the sole object of the eccentric and universal joint arrangement. The pin, *i*, in each eccentric forming the connection for the main actuating rod, H, is placed in the centre of rotation of the eccentric, and will not, consequently, be influenced by any rotatory motion thereof. The connecting straps and rods between the eccentrics, in combination with the main actuating rods of the several carriages, establishes a continuous communication or connection from end to end of the train, from either end of which the several brakes may be applied, by moving the rods, H, in the proper longitudinal direction. The mode the patentee proposes to adopt for actuating the rod, H, is to employ a steam cylinder, fitted to any convenient portion of the engine or tender, and supplied with steam direct from the boiler, the piston rod of the cylinder being connected with the front main brake actuating rod of the train. Other means may, however, be employed for actuating the main brake rods, such as screws or hand levers, but it is preferred to employ the direct action of steam on a piston. On a longitudinal motion being imparted to the main actuating rod, H, in the direction of the arrows, the ⊥ levers, and their connecting links, by being partially turned over, draw the brakes in each carriage towards each other, and thereby apply them on to the wheels. Should the coupling bolt at U, be accidentally broken, the connections of the continuous main actuating rod, H, will still prevent the total loss or severance of the train at that point, whilst the consequent drag or strain on the rod, H, will tend to apply the brakes, and so intimate the fact to the guard and driver of the train.

FURNACES AND BOILERS.

DAVID AULD, *Glasgow.—Patent dated November* 13, 1859.

MR. AULD'S improvements under the present patent relate, in the first place, to the so arranging the furnaces or fire-places of steam boilers, as well as furnaces for other purposes, that economy in the consumption of fuel is secured, along with the prevention of the emission of smoke, and the obtainment of a superior amount of steam or working effect. In applying this portion of the invention in practice where the furnace is inside the boiler, a narrow vertical water space of metal is fitted along each side of the furnace, running from back to front. This water space extends upwards from the level of the grate bars, or from any desirable lower level to the flue plate above, an air space being left between the exterior of the water space or hollow diaphragm and the shell of the flue. At intervals throughout the length of these water spaces, water connecting tubes form communications between the upper parts of the water spaces and the main body of the boiler through the flue shell, so that the steam formed in the side water spaces can find a free exit from them to the upper part of the boiler, and thence to the steam chamber or dome. In addition to this provision, each water space is fitted with a series of transverse stay tubes, opening up thoroughfares between the spaces inclosed by the water diaphragms and the main body of the furnace. The atmospheric air necessary for the combustion of the fuel in the furnace is supplied by an air thoroughfare regulated or governed by the tumbling sand box valve, for which Mr. Auld has obtained British Letters Patent,* or the air may be governed as to its inlet by other means. The air so supplied is passed in through a hollow or cellular bridge at the back or other part of the furnace, provision being made for the discharge of the air from the bridge on each side into the back portion of each space inclosed by the side water diaphragms. The air thus flowing into these spaces then finds its way in divided streams through the lateral tubes of the diaphragms or water spaces into the furnace on each side, and thus the air is supplied to the burning fuel in a heated state and in a properly subdivided condition, so as to embrace the whole of the burning mass upon the furnace bars. In this way the wasteful emission of smoke is prevented, and combustion is maintained in a most efficient manner. Instead of having two side water spaces, one hollow central one may be used, the hollow in the centre of the water space being in communication with the air inlet at the bridge or otherwise, and air tubes being fitted into the section of the water space on each side, for the transit through of the air into each division of the furnace. This central water space is obviously of a hollow saddle form, or, in other words, it is a water space bent so as to form two parallel divisions for water, with an air space in the centre.

According to another modification of this general arrangement, the air spaces at the sides of the furnace or at the centre thereof, are formed by vertical walls or fire-brick work, with openings therein for the passage through of the air.

This latter modification may be used whether the furnace is inside or outside the boiler. In constructing new boilers according to this general system, flue tubes may be passed laterally from any outside or other flue through the boiler shell and flue plate for the passage through of air to the furnace.

This invention relates, in the second place, to a mode of increasing the efficiency of steam by passing it on its way from the boilers to the working cylinders of the engine or other apparatus, through an arrangement of pipes disposed in the discharge flues of the boilers. The heating

* Vide *Practical Mechanic's Journal* for May, 1859, p. 35.

pipes are kept free from carbonaceous or other deposit by any convenient mechanical worker or scraper. In this way the steam is dried or superheated, and rendered more serviceable than usual by what would otherwise be wasted heat.

One modification in the patentee's improvements in smoke consuming apparatus, is shown in figs. 1 and 2 of the accompanying engravings. Fig. 1 being an end elevation partially in section, and fig. 2 a corresponding longitudinal section of a portion of the boiler and furnace. The brickwork, A, in which the boiler, B, is set, is built in the usual manner. At the front extremity of the furnace, D, the fire bars, E, are supported in the ordinary manner upon the dead plate, F, and upon the fire bridge, G, at the backward end. The air to be supplied to the upper part of the furnace, passes along the air channels, H, through the external valvular doors, I; the air channels are formed in the brickwork, A, and by preference two compartments or chambers. The air escapes from the longitudinal channels, H, through the lateral apertures, K, into the furnace, D. Access is obtained to these air channels through a balanced door or valve, I, which is hung upon its centres at the front extremity of each air channel; the doors, I,

Fig. 1.

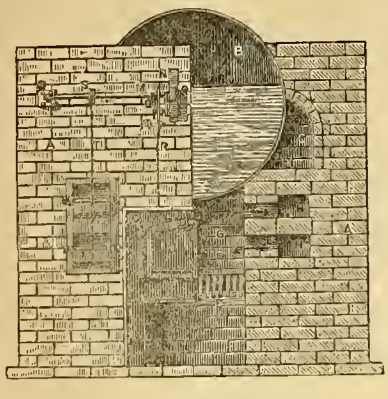
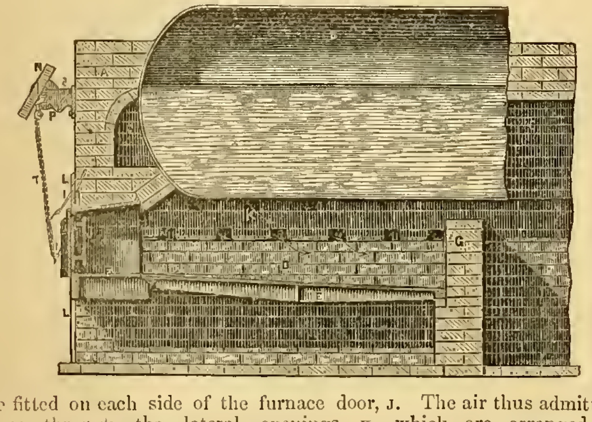


Fig. 2.



are fitted on each side of the furnace door, J. The air thus admitted, flows through the lateral openings, K, which are arranged in parallel rows, and serve to convey the inflowing currents of air directly in contact with the burning fuel, and with the smoke as it is evolved therefrom. The valvular doors, I, are fitted in the door plate, L, which is bolted to the front end of the boiler, and the doors are hung upon laterally projecting studs, so as to swing to and fro with great freedom. Above the furnace door is arranged the self-acting apparatus for regulating the opening and closing of the doors, I, this apparatus consists of the horizontal shaft, M, the journals of which are carried in brackets projecting from the end plate of the boiler; the shaft, M, has fast to it a tumbling sand-box, N, the motion of which about its axis gradually closes the valvular doors; the box, N, is of a rectangular figure, and, by preference, is made of iron; it has within it near the upper part, an angularly projecting shelf or partition, which forms a sort of pocket or holder to receive a quantity of sand which is placed within the box. The lower part of the slanting shelf, near the back of the box, is perforated to allow the sand to fall slowly down to the bottom of the box. A valvular box, constructed upon a plan similar to this, is described in the specification of British Letters Patent granted to Mr. Auld, and bearing date the 29th of April, 1858.* Each time that the furnace door is opened for the purpose of supplying the fire with fuel, the sand box, N, is turned over, so that the sand is thrown from the lower part of the box to the upper part thereof, where it falls behind the projecting angular shelf; this is effected by the mechanical arrangement connected with the sand box, N; the shaft, M, has keyed to it a pendant lever arm, O, the free extremity of which rests upon, or is in close contiguity with a roller, which is fitted on a stud projecting laterally from the lower and free extremity of the bent lever, P; this lever is centred on a stud which is fixed in the bracket, Q. The backward end of the lever, P, is curved upwards towards the front part of the boiler, and it has attached to its extremity a chain, R, which is carried downwards and under a pulley on the fire door plate, L, and is made fast to the door, J. On the shaft, M, and parallel with the lever, P, is keyed a pulley, S, to the periphery of which is fastened one extremity of the chain, T, the other end of this chain being fast to an eye on the lower part of the valvular door, I. When the furnace door is thrown back, the chain, R, is drawn downwards, by which means the lever, Q, is inverted. The sudden inversion of the lever, P, throws up the lever arm, O, thereby causing the shaft, M, to turn upon its axis and suddenly invert the sand box, N, so that the sand is thrown to the upper part of the box. When the fire is supplied with fuel, and the door, J, is closed, the chain, R, is released, and the lever, P, is restored to its normal position by the counterweight on the extremity of the vertical arm; in this position of the parts, the box, N, is in an angular or diagonal direction, and the doors, I, are in equilibrio, or very nearly so, in order that the full current of air may be admitted through the air channels and tubular passages, K, to the green or fresh uncarbonised fuel, thus allowing the largest amount of oxygen to enter the furnace during the time that the carburetted hydrogen is being evolved with great rapidity from the burning fuel. The effect of these streams or currents of air passing through the tubular passages, K, is, that the combustible gases are fully and effectually ignited at the instant they are evolved, so that the emission of visible smoke is prevented, and the consumption of fuel economised. The valvular doors, J, are caused to close gradually as the emission of the combustible gaseous matters ceases, and the fuel attains a bright red heat; this gradual closing of the valvular doors, is effected by the flowing of the sand contained within the box, N, through one or more apertures made for the purpose in the lower part of the angular shelf. As the sand falls to the bottom of the box, the gradually increasing weight causes it to slowly assume a vertical position. The rotation of the box, N, about its axis, carries with it the shaft, M, and pulley, S, the rotation of which draws up the chain, T, so as to close the doors, J, in a ratio corresponding to the movement of the sand box. The velocity with which the sand is allowed to fall to the bottom of the box, N, is regulated by a screw or screws, by which the aperture or apertures at the bottom of the angular shelf, may be more or less closed.

Another modification of the patentee's improvements is shown in fig. 3 of the accompanying engravings. In this arrangement, the air is admitted through a central vertical channel, which is formed between the parallel walls of a single water space, that is to say, the water space, H, is formed by continuing the boiler plate downwards from the crown of the cylinder, C, as low as the fire bars, E, or below them, and then upwards again to the crown; in this manner the water space forms a double wall, which encloses a central air passage or channel, I The inflowing air passes from the channel through the lateral passages, K,

Fig. 3

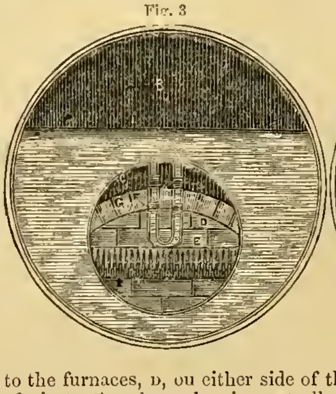
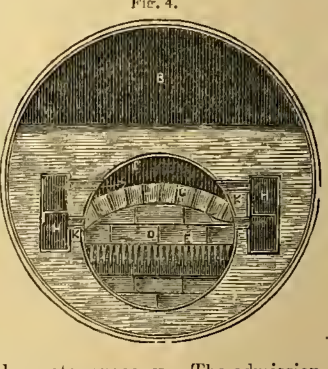


Fig. 4.



to the furnaces, D, on either side of the water space, H. The admission of air to the channel, I, is controlled by means of a valvular door, I, similar to those shown in figs. 1 and 2; the motion of which about its axis is regulated by an arrangement of a self-acting tumbling sand box, similar to that before described.

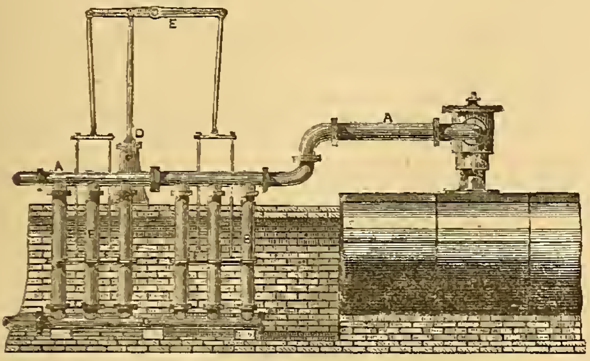
Another modification is shown in fig. 4. In this arrangement the air channels, H, are formed outside the central flue, C, but within the boiler, B. The air channels are rectangular tubes, formed of boiler plate, arranged one on each side of the cylinder, C, and extending backwards parallel to the furnace, D. As arranged in fig. 4, the air channels, H, are divided by a transverse partition, which separates the channel into two parts or chambers, or one division only may be used if convenient, and the mouths or openings to the channels are closed by duplex valvular doors, so that the upper chambers may, if required, be closed before

* *Vide Ante*, p. 35.

or in advance of the lower ones, or *vice versa*. The air admitted to the chambers, H, passes into the furnace, D, through the lateral passages, K, and by so regulating the external valvular doors it may be caused to flow through either chamber at pleasure.

These several improvements afford the means of retarding or facilitating the passage of currents of air to the furnace with great ease, so that the quantity admitted thereto may be duly regulated in proportion to the gaseous matters evolved, and thus effect the highest practicable economy in the consumption of the fuel as well as preventing the injurious emission of smoke. The last part of the present invention refers to a mode of economising the otherwise waste heat which ordinarily escapes into the shaft or chimney. An arrangement for effecting this object is shown in fig. 5, which is a longitudinal elevation partially in section. As here arranged, the waste heat is applied to the heating of the steam on its way from the boiler to the engine or to other apparatus, according to the purpose to which it may be applied. The steam passes

Fig. 5.

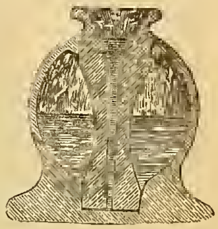


from the boiler along two parallel steam pipes, A, which extend along above the flue in which the superheating apparatus is arranged. From the under sides of the pipes, A, there spring a number of elbow branches, to which are connected the series of vertical pipes, B. These pipes are carried down through the brick-work of the flue, and are united to a corresponding number of branches projecting from the pipes, C. The lower pipes, C, are supported on fire-clay lumps placed on the floor or sole of the flue, and the front ends of these pipes are closed by blind flanges, and at the backward ends either cocks may be fitted thereto to draw off the water of condensation, or if the position of the flue does not admit of this arrangement, the pipes, C, may be continued upwards, and any water of condensation which may collect on the cooling of the apparatus will be driven through by the steam. The steam pipes, A, are stopped at their mid-lengths by a solid diaphragm or partition in each, so that the steam flows down the first series of vertical pipes along the pipe, C, and up the second series of pipes, and so away to the engine or other appliance. In this manner the series of pipes, B, absorb the heated gaseous matters evolved from the burning fuel, and which would otherwise pass off unutilised. To prevent the pipes, B, from becoming coated with carbon or soot, which would thus impair the conducting power of the pipes, an apparatus is fitted so as to constantly move up and down their peripheries. A pair of pedestal bearings is arranged upon the brickwork of the flue, and these bearings support a horizontal shaft, which derives its motion from the engine. The shaft has keyed to it a crank, to the pin of which is attached the lower end of the connecting rod, D. The upper extremity of this rod is connected to the beam, E, which is carried upon a transverse shaft, or in any other convenient manner. The two extremities of the beam, E, have attached to them rods, the lower ends of which are jointed to the cross heads; these cross heads each carry two rods, which pass down through small holes made for the purpose in the brickwork. The rods are secured at their lower ends to two iron frames, F, which are made so as to closely encircle the pipes, B, but not so as to interfere with their reciprocatory movement. A slow and continuous rotatory motion is imparted to the shaft, so that the beam is caused to alternately elevate and to depress the scrapers. By this means the pipes are at all times kept entirely clear from soot or oxide, and are thus maintained in the best condition for receiving the heat of the outflowing gaseous matters.

INK STANDS.

J. H. Johnson, *London and Glasgow* (G. M. Prentiss, *Massachussets.*) *Patent dated August 3*, 1858.

The construction and form of these inkstands may be considerably modified, but the essential feature of this invention is delineated in the subjoined engraving, and consists in the application and use of a tubular piston or plunger, fitting air and fluid-tight (by grinding or packing) into a corresponding well-formed cavity in, or at the bottom of the main receptacle for the ink, and provided with a stopper at its upper end, which stopper fits air-tight into the neck of the inkstand, so as to exclude all external air from the main body of ink and prevents evaporation. The object of the tubular piston or plunger and well, is to raise a small quantity of ink, when required for use, into an expanded dipping cup formed at the upper end of the plunger. This raising of the ink is accomplished by the mechanical pressure of the descending piston or plunger upon that portion of the ink contained within the well, such portion rising up the hollow of the piston and filling the dipping cup. The capacity of the well should be made to suit the capacity of the dipping cup and tubular passage leading thereto, so that the piston or plunger can never displace more ink than the dipping cup and passage leading thereto can contain. In the side of that portion of the piston, which works within the well, there is made a notch extending about half way down the working portion of the piston, and a similar notch is formed about half way down one side of the well, so that when the piston or plunger is turned, so as to cause these notches to coincide, there is a free communication between the main body of the ink in the stand, and that contained within the tubular piston and dipping cup. A similar arrangement of notches is made in the neck and stopper, and in such a position that they will coincide at the same time that the notches below coincide. The object of this arrangement is to allow the ink in the dipping cup to descend when the ink stand is not required for immediate use, and this is accomplished by simply turning the piston or plunger, without raising it, until the several notches coincide, whereupon an air vent is formed in the upper part of the inkstand, and a communication made between the ink in the dipping cup and that in the main body of the stand or receptacle; consequently, the ink in the dipping cup and tubular piston or plunger falls until it finds the level of the main body of the ink. As the slots extend only over half the contact surfaces, the tightness of the joint remains intact when such slots are turned so as not to coincide with each other; and, therefore, by turning the piston or plunger slightly after the ink has descended, the whole will be rendered perfectly air-tight again. To raise the ink again, it is simply necessary to elevate slightly the piston or plunger, and depress it again into the well. In order to prevent the ink from forming a jet or spirting up over the dipping cup, as it would be liable to do on depressing the piston suddenly, it is proposed to make the bore at the bottom of the piston for a short distance very much smaller than at the upper portion, and to make the dipping cup of a trumpet-mouth form—that is, expanded outwards at its lip. The same results may be obtained by modifying the form of the apparatus; as, for example, the lower portion of the plunger may be expanded and provided with a small nipple, which latter only would require to be ground to fit a corresponding depression in the bottom of the well, or the construction may be reversed by forming a cylindrical opening or chamber in the underside of the piston, which chamber fits fluid-tight over a nipple or piston formed on, and projecting internally from, the bottom of the inkstand.



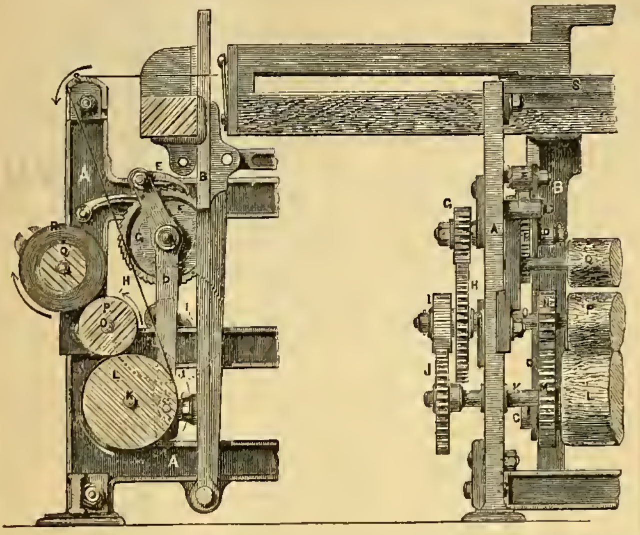
Inkstands of this description may be made wholly or partially of glass, or metal, or any other material suitable for the purpose; but the patentee prefers to make them entirely of glass.

WEAVING.

Charles Parker, *Dundee.—Patent dated Nov.* 25, 1858.

The improvements specified under these Letters Patent, relate to the arrangement, construction, and working of looms of various kinds, as regards the "take-up" motion for winding up the cloth upon the cloth beam as it is woven. The improved taking up apparatus, consists entirely of plain rollers which may be covered with woollen cloth or other elastic substance, operating by a combination of tension and frictional contact upon the woven cloth, so as to take it up uniformly as it is produced by the weaving action. This roller arrangement is disposed in the loom, at the front or usual place of the take-up, it being preferred to use a series of three rollers working in concert. These rollers are carried by their spindles in end bearings in the loom framing, and they are placed one above the other, but so that a line drawn down transversely through their centres, will form a considerable angle with the vertical line, say an angle of 45 degrees. As the woven cloth leaves the breast beam, it passes down beneath the lowest rollers of the series and round it, and then between the upper part of that roller, and the lower part of the second, or intermediate roller. From this part it passes round or over the top of the intermediate roller, and thence between it and the top roller or cloth bearer, round which it is wound up. The gearing of the take-up motion may be of any convenient kind, the motion from it being communicated to the bottom roller of the series, which roller again is geared by spur pinions, with the second or intermediate roller. The third, or top roller runs loose, and is driven simply by frictional contact with the intermediate roller. Instead of three rollers, any other suitable and convenient number may be used. Fig. 1, of the subjoined engraving, is an end elevation of a loom partially in

Fig. 1. Fig. 2.



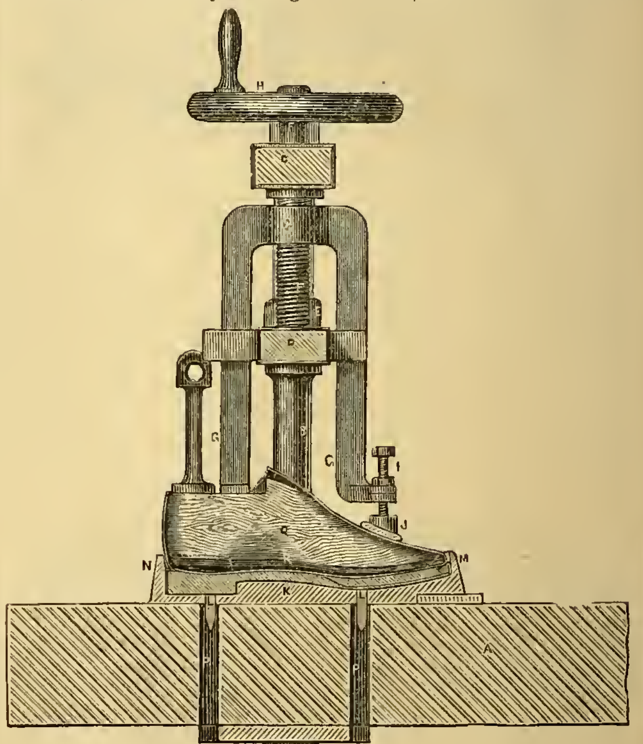
section, and showing one arrangement of improvements applied thereto. Fig. 2, is a corresponding front view or elevation. The framing, A, of the loom is of the usual kind, as is also the arrangement of the lathe swords, B, and the upper parts connected therewith. To the lower part of the left hand lathe sword, B, there is affixed an outwardly extending bracket, C, the free extremity of which is bent at right angles, and carries a stud, which works in a slot made in the lower end of the lever, D. This lever is centred upon a stud, which projects laterally from the inner face of a bracket that is bolted on to the side standard of the loom framing. The upper and shorter arm of the lever, D, has fitted to its extremity a stud, which carries the pawl, E, the free end of which falls into the teeth of the ratchet wheel, F. This wheel rotates upon the stud that carries the lever, D, and the outer extremity of the stud has fast to it the pinion, G, through which rotatory motion is imparted to the gearing of the "take-up." The pinion, G, drives the wheel, H, the stud of which is carried in a slot, cast in a bracket that is bolted to the middle rail of the side standard, A, so that the wheel, H, may be changed to vary the speed of the take-up. The wheel, H, has fixed on it a shifting pinion, I, which gives motion to the wheel, J, that is fast to the spindle, K, of the roller, L. The roller, L, is of wood, and extends across the loom, having at each end of it, on the spindle, K, the wheels, M. These wheels give motion to the pinions, N, on the spindle, O, of the intermediate roller, P, which is fitted between the roller, L, and the cloth beam, Q. The spindles of the three rollers, L, P, and Q, are carried in bearings which are arranged in the end standards, A. The intermediate roller, P, is caused to rotate son.ewl at faster than the roller, L, by varying the pitch lines of the wheels, M, and the pinions, N, in relation to the diameter of the rollers. The pitch line of the wheel, M, is somewhat larger, say to the extent of a tooth, than the circumference of the roller, L, whilst the pitch line of the pinion, N, is as much smaller than the roller, P. The two rollers, L and P, are arranged at a considerable angular deviation from the cloth beam, Q, that is to say, the roller, P, is fitted behind and lower down than the beam, Q, so as to form an angle of about 45 degrees therewith; the roller, L, being again below the roller, P, and somewhat in the rear, so that its axis is in an angular direction with the roller, P, as shown in the sectional view, fig. 1. The reciprocatory motion imparted to the lathe swords, B, from the crank of the loom, moves the lever, D, to and fro, which through the pawl, E, gives motion to the ratchet wheel, F, as the cloth is woven. The pinion, G, on the stud of the wheel, F, drives the wheel, H, which, through the pinion, I, drives the wheel, J, on the spindle of the roller, L. The cloth, R, passes from the breast beam, S, downwards, beneath the roller, L, thence round the outer face and round the back of the roller, P, from which point the cloth is carried round the front of the cloth beam, Q, and is wound thereon. This arrangement of the rollers and cloth beam, causes a very effective strain to be exerted upon the web as it is woven, which straining action, is in part owing to the mode of disposing the rollers, L and P, in relation to the cloth beam, and partly to the causing the roller, P, to rotate somewhat faster than the lower roller, L. The increase of speed of the roller, P, imparts a strong drag upon the cloth, which tensional action is however perfectly uniform throughout. The cloth beam, Q, is driven solely by the frictional contact with the roller, P, the spindle of the beam rising up the slots of the supporting brackets as the cloth is wound upon it. With these several modifications, the effective action of the "take-up" of the loom is greatly improved and rendered more satisfactory.

BOOTS AND SHOES.

J. V. Scarborough, *Belfast.—Patent dated December* 7, 1858.

The improvements introduced by Mr. Scarborough relate to the manufacture of what are known as gutta percha boots and shoes. According to these improvements the sole and heel of the boot or shoe are moulded by means of an improved apparatus, in such manner as not to require any subsequent trimming off. The moulding apparatus so far finishes the boot or shoe, that when it is removed, nothing more is required that to blacken the edges of the sole and heel, and put in nails if necessary.

Our engraving is an end view partially in section of one modification of the machinery or apparatus used in the manufacture of boots and shoes according to the improved system. The apparatus consists of a mechanical arrangement for subjecting the last and upper to pressure, to ensure the adhesion of the insole to the softened gutta percha, as well as to mould the gutta percha to the desired figure. This pressing and moulding apparatus is intended to be fitted in series along counters or benches arranged for the purpose. To the counter or bench, A, is bolted the standards, B, which carry the longitudinal rails, C and D. These rails are



secured to the standards, B, by the nuts, E, which fit the threads cut on the standards. At uniform distances asunder are arranged a series of the vertical screws, F, the upper parts of which work in collars fitted in the rail, C, whilst the lower extremities are made somewhat smaller in diameter, and rotate in holes made for the purpose in the lower rail, D. Each of the screws, F, passes through the bent presser bar, G, the horizontal part of which has an internal screw tapped in it to correspond to the screw, F; by this means, as the screw is turned the presser bar, G, is raised or depressed according to the direction in which it is caused to rotate. The upper extremities of the screws, F, are squared, and upon this part a hand wheel, H, is fitted, by turning the handle of which raises or depresses the presser bar. The front end of the presser bar, G, is bent outwards, and forms a right angle with the vertical part of the bar; a screw, I, passes through this outwardly bent part, which screw carries the front presser piece, J. This presser piece is curved to an arched form, which is made to fit the front part of the last, so as to press closely and firmly down upon the "upper," without indenting or marking it. The backward end of the presser bar, G, is widened out laterally to obtain a good firm bearing on the upper part of the last on which it bears. The mould, K, is by preference cast in lead or other similar soft metal. The interior of this mould is shaped to the exact configuration to be given to the intended sole and heel, and the surface of the bottom of the mould on which the gutta percha sole lies is made quite smooth to give a good surface to the finished sole. Two holes, L, are made through the metal of the mould, K: these apertures are for the purpose of allowing the confined air to escape when the softened gutta percha is put into the mould, and to admit of any superfluous gutta percha being squeezed through them, so that a fair and perfectly formed sole is moulded at one operation. The edges of the sole are formed by the moulding brasses, M and N; these consist of thin strips of brass, which are bent to fit closely to the walls of the mould, K. These moulding brasses are formed in two pieces, one of which extends from the "waist" of the boot or shoe, round the front or toe part, and backwards to the waist, the ends of the brass being turned outwards for the convenience of holding the brass when it is to be removed. The other brass, N, extends round the heel of the mould, the extremities abutting against the front brass, M. At the parts where the ends meet, each brass has attached to it a small laterally projecting piece, O, which extends outwards over the edge of the mould on each side; these projecting parts serve as handles to lift the brasses out of the mould before removing the boot or shoe therefrom. The brasses, M and N, fit closely to the vertical parts of the mould, and the lower edges sink into a groove made for the purpose round the edge of the sole part of the mould. The upper edges of the brasses, M and N, are turned over and inwards at right angles to the vertical portion; this inwardly turned part moulds the upper edges of the sole and heel, forming a neat finish at the part where the sole and heel join the "upper." The moulds are arranged in a row or series on the bench, A, one under each screw presser, the apertures, L, in the mould being brought over the vertical orifices, P, which are made through the bench to allow the surplus gutta percha to pass through the holes, L, without impediment. The last, Q, is made of wood in the ordinary manner, excepting that round the edge of the sole a groove is formed, in which a strip of vulcanised India rubber or other elastic material, R, is laid. This strip or band of India-rubber is secured in its place round the groove by means of brass clipping pieces, which are screwed to the bottom of the last; the ends of the central piece are filed up to a point, and are then turned in, so as to penetrate the India-rubber. The margin of the toe piece presses tightly down upon the band, R, a portion of the front part being turned over on to the upper part of the last, and is there screwed down; this overlapping part serves to confine the two ends of the band, R. The heel piece extends a little beyond the inner edge of the band, the margin of the heel piece being hammered down upon the band; the elastic material is securely held round the heel part of the last. To the upper part of the heel of the last is screwed the metal upright, T, which has an eye formed in its upper extremity; this eye serves to pass a short bar of round iron through for the purpose of getting a hold upon the last to remove it and the completed boot or shoe from the mould. The "upper," having the "insole" attached to it in the ordinary manner, is put upon the last, and the insole is smeared over with a solution of gutta percha dissolved by heat. A gutta percha sole and heel piece in a softened state are then pressed into the mould, corresponding to the size of the "upper" The gutta percha sole is pressed down upon the surface of the mould, to cause it to take the shape of the sole part, which is formed to the required figure. It may be here observed that the moulding brasses, M and N, are fitted into the mould prior to putting in the softened gutta percha. The last and upper, with its adhesive coating of gutta percha, are now placed in the mould, and the presser bar, G, is screwed down upon the last, which is kept in a vertical position by the upright, T, the upper end of which passes between the guide through which the backward part of the presser bar descends. The steady pressure of the presser bar, G, through the agency of the screw, F, forces the last down, and causes the insole to adhere to the gutta percha in the mould. The pressure serves also to force the softened gutta percha into all parts of the mould, so that it fills up accurately the angles of the moulding brasses, M and N, producing a neat and well finished edge to the sole. The elastic nature of the band, R, presses the "upper" well into the moulding brasses, and thus avoids any escape of the India-rubber along the upper edge of the sole. The surplus gutta percha is forced by the pressure of the bar, G, down through the holes, L, in the mould. The boot or shoe is allowed to remain screwed down in the apparatus until the gutta percha is quite solid, and the "insole" is firmly cemented to the "upper." When the cooling and solidification is thoroughly effected, the screw, F, is raised, the moulding brasses are removed, and the boot or shoe is lifted out of the mould by passing a piece of iron through the eye of the upright, T. The edges of the sole having been properly formed in the mould, nothing more is required than to cut off any superfluous gutta percha that may have exuded through the holes in the mould, and to blacken the edges of the sole, which completes the manufacture of the boot or shoe.

PRINTING BLANKETS

Joseph Walker *and* James Barnes, *Oakenshaw, Lancaster.—Patent dated September* 2, 1858.

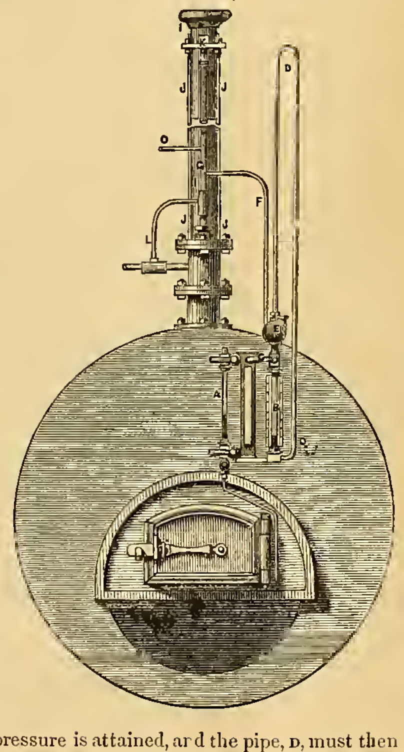
The patentees' invention relates to the application and use, in the processes of machine and block printing, of an improved blanket or lapping, to be substituted for the ordinary blanket, felt, or other lapping usually employed in printing machines and tables. According to this invention they propose to employ a blanket or lapping, having a cotton pile pressing surface, in lieu of the ordinary plain cotton surfaces hitherto used. These improved blankets or lappings, may be constructed by cementing together, by means of India-rubber solution or other waterproof cement, two or more thicknesses of cotton fabric, the outer or pressing surface of such combined fabric, having a pile raised thereon by any of the well known methods adopted for pile raising. The patentees' do not confine themselves to any particular mdoe of constructing or applying the blanket, so long as the main feature of their invention be adhered to, namely, the use of a cotton pile or raised surface formed on a cotton blanket. The chief advantage to be derived from the use of pile surface blankets in machine and block printing, is increased elasticity in the direction of the thickness of the blanket, whereby a more yielding and even pressure is distributed over the surface of the "form."

BOILER APPARATUS.

Thomas Greenhalgh, *Lancaster.—Patent dated January* 7, 1859.

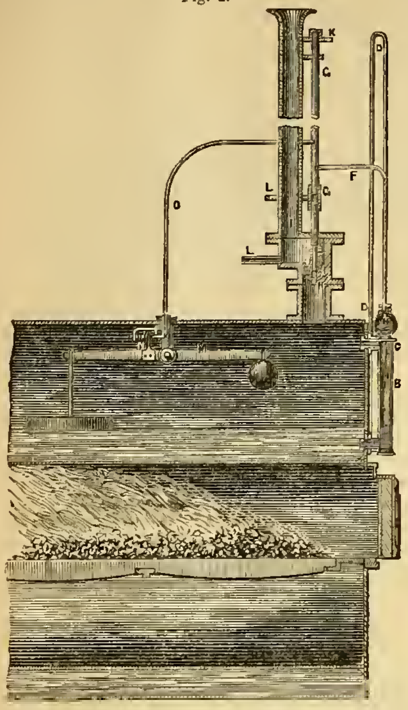
The object of the first part of this invention is to admit feed water into the boiler. The apparatus consists of a pipe of about twelve feet in length, or more or less, one end of which passes into the boiler a little below the required level of the water; the other end of this pipe is in communication with a valve through which the feed water has to pass. This pipe may be supported between stay rods or otherwise. As long as the water remains at the proper level in the boiler the pipe is kept cool, and the valve remains closed, but as soon as the water descends sufficiently to uncover the end of the pipe, the steam passes through the pipe, thereby heating and elongating it; this expansion of the pipe opens the valve, and the feed water then passes through the valve, and through a pipe into the boiler. The patentee's improvements also relate to a mechanical arrangement for allowing the steam to escape when the pressure is greater than desirable, and, lastly, to apparatus for giving notice when the water in the boiler descends below a certain predetermined level. Fig. 1 of our engravings is an end view of a boiler showing these improvements applied thereto, and fig. 2 is a partially sectional elevation of the same.

Fig. 1.



A is the ordinary glass tube to indicate the level of the water in the boiler; and B is a mercury guage of the usual construction; connected thereto by the three-way cock, C. To the lower end of the mercury guage is attached the pipe, D, the lower portion of which with the tube of the mercury guage form a syphon. The tube, D, after rising the required height (which depends upon the pressure at which the steam is worked) is bent down, and the end is secured to the top of the vessel, E, to which a second pipe, F, is secured; this second pipe is connected to the tube, as seen best in fig. 1. Between the vessel, E, and the mercury guage, is the three-way tap, C. When the boiler to which the improved apparatus is applied is at work, the pressure of the steam is indicated as usual by the mercury guage; if it is decided to work the steam up to thirty-five pounds pressure on the square inch, then the mercury should be at the bottom of the guage when that pressure is attained, and the pipe, D, must then be about seventy inches in height, so that when the steam exceeds the said pressure, the mercury is forced out of the guage, through the pipe, D, and into the vessel, E. When all the mercury has passed into the vessel, E, the steam from the boiler is at liberty to pass through the pipes, n, and F, to the tube, G, which it heats and expands, thereby forcing the valve, H (see fig. 2), off its seating, and allowing the steam to blow off. When the pressure in the boiler is sufficiently reduced, the attendant turns the handle of the three-way tap, c, until the passage between the vessel, E, and the mercury guage is opened; the mercury then drops into the mercury guage, and the tap, c, is brought again into the position it was in before, consequently, the steam in the boiler is then brought to act on the mercury, which shuts off the communication between the boiler and the tube, G; this tube then cools, and in contracting allows the valve, H, to be closed by the steam. The steam in escaping from the vessel, E, may be made to sound a whistle or other alarum, instead of being conveyed to the tube, G, as above described; by this means the mercury guage would answer as a safety valve possessing this advantage, that when the mercury was collected in the vessel, E, the steam would escape without the resistance offered by safety valves of the usual construction. The vertical tube, G, is twelve feet more or less in length. To the upper end of the tube is fixed the crosshead, K, supported by the stay rods, J, the lower ends of which are secured to the lid of the valve box; this valve box is bolted to a short pipe fixed to the top of the boiler. The upper end of the tube, G, projecting through the crosshead, K, is furnished with a regulating cap, which has a hole through it for the escape of steam. The stay rods, J, are supported above by a bracket fixed to the pipe, I, through which the steam from the valve, H, is carried off. The seating of the valve, H, is fixed in the valve box; the spindle of the valve is acted upon by a rod fixed to the end of the tube, G. The pipe, L, is to carry off the water from the tube, G, and the lower pipe, L, is to carry off the water from the pipe, I.

Fig. 2.



The mode of operation is as follows:—When the water in the boiler is at its proper level, the lever, M, is held about horizontal by the float, and the valve is kept closed by a spring coiled around its shank, consequently no steam can pass up the tube, O, to enter the tube, G, which remains cool, and the valve, H, is kept closed by the pressure of the steam; but as soon as the water in the boiler descends to the level below which it is unsafe to work, the float causes the lever, M, to assume an angular position; the valve within the boiler is then moved off its seating by a projection acting on the shoulder of the valve, and the steam passing through the pipe, O, to the tube, G, heats this tube until it is sufficiently elongated by expansion to force the valve, H, off its seating; the steam then makes its escape up the pipe, I, and it may be made to sound a whistle or other alarum, if necessary, to attract the notice of the attendant. The steam will continue to blow off, until the level of the water again rises sufficiently to allow the spring to close the valve in the boiler, when the tube, O, in cooling will contract, and the steam acting on the valve, H, again closes it. The pipe, O, may be brought from the tube, G, into the boiler, the end of the pipe being open and placed at the level below which it is considered unsafe to work; the steam entering the pipe, O, when the water is too low, would, in this case, heat the tube, G, as above described. The patentee prefers, however, the use of a float as being more certain in its action.

LINEN AIRER.

James Soutter, *Edinburgh.—Patent dated December* 18, 1858.

We have engraved two modifications of Mr. Soutter's improved linen airer. Fig. 1 of the subjoined engravings, is an elevation of one arrangement of the improved linen airer, and fig. 2 is an elevation of another style or form. A compact mode of arranging the improved kind of airer is shown in the elevation, fig. 1. In this modification the feet are connected with each other by longitudinal rails, the feet having fitted into them three vertical and pillar pieces or standards. The outer end standards on each foot are made to correspond with each other in height; the central standards are, however, prolonged upwards above the outer ones. The main standards are connected with each other, and strengthened by means of a central rail. A pair of rails is fitted to the upper extremities of the outer standards, and advantage is taken of the upward prolongation of the central end pillars to fit thereto the upper longitudinal rail, which completes the series. This modification of the linen airer has one or two rails less than the arrangement shown in fig. 2, but is more compact, and occupies less space than the modification with the duplex end standards. Fig. 2 represents another form of the linen airer, in which the parts are slightly modified from the arrangement shown in fig. 1. In this modification there are two end transverse rails, the extremities of the rails being connected by short pillar pieces. The upper pair of the laterally projecting rails support the turned uprights, which carry the lower longitudinal rails, on which the linen is hung. The two main pillars which spring from the feet, likewise carry two horizontal rails; these are arranged above the outer horizontal rails, and are intended in like manner to receive the articles to be aired. The patentee also arranges the improved linen airer upon a circular stand or base, in which is fitted a foot piece carrying the end standards and longitudinal supporting rails. The foot piece and the upper parts are made to rotate upon a pivot, which works in the stand or base. In this manner the linen airer is readily turned round upon its centre, so that the outer sides of the articles arranged upon the rails may be easily exposed to the fire, without shifting them from one rail to another.

Fig. 1.

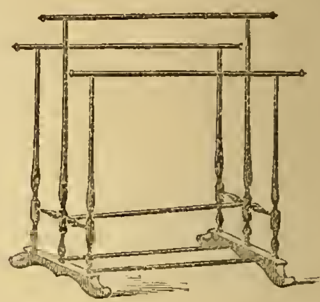
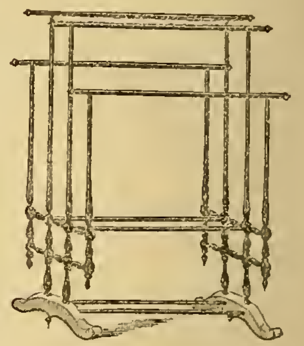


Fig. 2.



PRINTING SURFACES.

J. H. Johnson, *London and Glasgow* (J. M'Elheran, *Brooklyn, U. S.*) *Patent dated April* 16, 1858.

The improvements specified under these letters patent have reference to certain novel systems or modes of producing and preparing picture types or other raised surfaces to be printed from, for the reproduction of landscapes or other drawings or designs; also to an improved system or mode of preparing typographic printing surfaces, whereby the ordinary printing type is entirely superseded, and the tedious processes of setting and distributing the same consequently dispensed with.

In carrying out the first part of this invention, the inventor employs the electrotype process for depositing metal on to suitably prepared surfaces, whereby the required surface for printing from is obtained. The design to be reproduced is made in outline upon paper or other suitable transparent material, which should then be fastened to a plate of glass, previously coated with wax on the opposite side to that on which the design is attached. The wax should be applied with great care, for which purpose the plate should be well cleaned, and then submitted to the action of gentle heat, so as to expand the pores in a uniform manner over the entire surface of the glass. The wax, which should be perfectly clean and free from any colouring matter, is then applied over the whole surface, and will adhere thereto by entering the pores of the glass. The heat of the plate, however, should not be too great, as the wax in cooling would become brittle or fragile, and would not combine as intimately as is requisite with subsequent layers of wax, and consequently such layers would chip off under the engraver's tool. The lines of the design are traced through on to the wax, and, with a brush, more wax is applied over the lights in the drawing, the thickness of such layers of wax depending on the greater or less intensity of the lights: thus the higher the lights the greater should be the thickness of the wax over them. The patentee observes that, for very thick layers, it is proposed to employ a mixture of Canada balsam and wax, as the balsam renders the wax more ductile, and consequently easier to be worked. Over those parts in the design which are finely lined or deeply shaded, the wax is to be scraped away to a thin layer. The most isolated lines at the broad lights may be cut out with the graver, which should have a broad shoulder formed upon it, then more wax is brushed over. This will produce a deep, transparent furrow, ready to receive the finishing cuts. A ridge of wax is finally built round the design, and the whole waxed surface, which, at this stage of the process, is in a very uneven state, is passed lightly over the flame of a spirit lamp, for the purpose of partially blending and smoothing the irregularities of the surface. The operation up to this stage will not occupy more than a few minutes. The fastening of the drawing to the back of the glass plate or other transparent medium employed, is a substitute for the processes of tracing, drawing, and shading on the wood or metal. The filling up of the lights with melted wax obviates the necessity for cutting away as in wood engraving, or in etching as in other methods. By this peculiar method of preparing a transparent engraving plate the inventor is enabled to produce a fine and perfectly graduated relievo before the engraving is commenced. This constitutes a feature in the invention, and offers many advantages, since the drawing, tracing, and engraving, are all effected simultaneously; and the plate, when thus prepared, is perfectly ready for the electrotyper without the necessity for rolling or etching, or even for taking a plaster or other cast, as in the case of wood cuts. Should white lines or dots be required on any dark part of a drawing, then a plaster cast may be taken from the wax, and these lines or dots put in, or they may be made with less trouble on the electrotype itself. In order to produce a beautiful and delicate drawing in white lines on a perfectly black ground, as in stereoscopic views, it is only necessary that the surface of the wax be left perfectly level, and a plaster or other cast taken thereof, which cast will contain the lines, previously traced in the wax, raised on its surface. An electrotype or metal casting of the plaster cast completes the process, and presents a printing surface which will produce white lines on a black ground. It is obvious that the finer and more delicate the lines of the drawing or engraving to be copied and reproduced are, the thinner should be the glass plate or other transparent medium employed. For very fine work it is proposed to use such plates of glass as are employed for microscopic purposes; the object of using this glass is to obviate the inconveniences attendant on the refraction of the rays of light, which in very minute lining might prevent perfect accuracy of copying. The following is the method preferred for coating such thin glass with wax:—Place the sheet of thin glass upon a perfectly even but rather heavy plate of glass or metal, which should be somewhat larger than the thin sheet, so as to allow the latter to be pasted round the edges by means of strips of paper, which will secure it to the large plate. The two plates thus fastened together are then to be gradually heated, and melted wax is poured over the thin glass and allowed to spread evenly all over its surface. When cool, the thin glass is to be detached from the larger or bed-plate, when the process of preparing the surface and of copying the design is proceeded with in the manner before described. Care should be taken to lay the sheet of thin glass when tracing on a perfectly level surface, otherwise it will be liable to accidental fracture. In most cases of copying or tracing it will be found sufficient merely, in the first instance, to make a general outline of the design, the minute lines being filled in at leisure. For all ordinary illustration the common one-eighth of an inch plate will serve the purpose. This process is applicable to the production of copies of all kinds of pictures, provided such pictures are drawn, printed, or otherwise provided upon a sheet of paper or other level surface, so as to be capable of being placed under the prepared glass. When copies of what are known as ambrotypes are to be made, the inventor uses the same plate or glass into which the picture is etched as the base plate for the matrix, which plate is coated with wax in the manner above described.

The advantages to be derived from this process are, that it enables the artist to trace or draw and engrave simultaneously, that more correct work is produced, as the true lines of the drawing are always presented, and facility is afforded of repairing broken lines, or redrawing incorrect ones by simply drawing a flat instrument over the objectionable part, when it will be perfectly obliterated and ready to be corrected. Finer lines or touches may be applied also, than in any ordinary method at present in use, since the parts which are very finely shaded are seen not on, but through the wax, which can be laid on in such quantities as will suit the fineness of the lines at that particular part of the work. Coarser lines, with broader lights, can be produced by one cut of the graver or instrument, better than by any other method, as the broader lights and coarser lines are most clearly seen, and therefore the thicker may be the coating of wax at those parts.

Another important application of this process consists, in simultaneously copying and engraving objects from nature, by means of a camera obscura, wherein the ground or sheet of paper, is replaced by a glass plate coated with wax or other transparent and ductile material. The view, whatever it may be, will be thus reflected on the wax surface, and may be traced therein by a graver. By this method a more just proportion of parts is preserved, and a clear perspective panoramic view of the whole is obtained, as the focus of the lenses can always be adjusted to take in successively the various distances between the back and foreground. This method will also be found of great service in reducing maps, portraits, &c., to a given standard, whilst drawing and engraving them at the same time, thereby saving time and preventing errors arising from recopying or retracing the design. A mirror may be attached to the outer opening of the lens at an angle of 45°, whereby the object will be brought right side up, and the plate still kept horizontal.

According to another method of producing or preparing picture types, wherein lined or granulated effects are desired. The inventor proposes to deposit metal by means of the electrotype process, into a matrix prepared in the manner hereinafter described, whereby certain artistic effects may be produced with the greatest facility and rapidity, which in the ordinary process would require considerable skill, labour, and time. In this process also, like the former, the lines of the drawing are produced in alto, similar to wood cuts and impressions, and may be taken in an ordinary typographic printing press, with or without acccompanying text. According to this process a thin sheet of glass or other suitable transparent material, is coated over with some adhesive and transparent substance, such as bees' wax. The original drawing is then placed beneath, and its lines are traced in the wax by the aid of suitable engraving tools. The broad lights are then filled up with fresh layers of wax as hereinbefore described, and a plaster cast taken of the whole, which cast when dry, is to be varnished with cement over those parts that are intended to have a fine grain; and fine silex powder or ground glass, sand, or other similar material is then thickly applied to the varnished parts. When dry and perfectly hard, the loose grains are blown or brushed off. Cement is then applied to such parts only as require a coarser texture or grain, as for example, the foliage of trees, drapery, foreground, etc., and a correspondingly coarser grained sand applied at such parts. It is thus obvious, that any desired variety of texture may be produced in the same picture. Before cementing and sanding, however, the surface of the plaster cast should be taken down, by filing or scraping at the edges of broad lights, or wherever a certain amount of faintness or dying away in the impression is desirable. The sand or other grainy material should be repeatedly and carefully sifted, in order to ensure as much as possible a uniformity in size of the compound particles or grains of each layer. The cementing and sanding operations having been completed, a facsimile is produced in metal by the ordinary electrotype or stereotype processes, and impressions taken therefrom in the common typographic printing press.

A number of these picture types may be made to represent various portions of one picture, and when properly granulated as above described, and impressions taken in different colours, the same effect can be produced as in chromo-lithography. The chief advantages arising from the adoption of this peculiar system, a mode of preparing printing surfaces and using the same, are the obtainment of a sharper grain in a much shorter time than can be accomplished by the old process of grinding the surface of the lithographic stones—the substitution of a granulated metallic surface for a stone surface, which latter quickly wears out when printed from—whilst facility is afforded for printing these "granotypes" along with letter-press in an ordinary typographic printing machine. The beauties and advantages of lithography and typography are combined, and various parts of the same picture can be differently grained, which is altogether impracticable in lithography. The inventor observes that this peculiar process of graining is equally applicable to any other method of preparing the matrix, wherein the drawing is not required to be seen, for the purpose of being copied through a transparent substance, in which case an opaque plate may be substituted for the glass, and any non-transparent substance or composition employed in lieu of wax.

The second portion of this invention, which relates to the preparing of typographical printing surfaces, consists in the application and use of letter dies, for the purpose of producing the impressions of letters on the surface of a metal plate or other suitable material of a softer nature than the impressing dies. In carrying out this portion of the invention, an apparatus is employed and so arranged, that the impressions will all be sunk to an equal or uniform depth in the plate, in order that a cast or electro-type may be taken thereof for the purpose of printing therefrom in an ordinary printing press. The plate in which the letters are impressed may either be as hard, or harder, than the dies, and covered with some soft material, as bees' wax for example, the dies being sunk into and through the wax covering down to the surface of the plate; or the plate itself may be of a softer nature than the dies, suitable means being employed for causing a uniform penetration of the dies into the plate.

For certain kinds of work, the letters may be engraved in alto, or sunk into the dies, so that the impression will produce a counterpart of each letter raised, or in relievo, with regard to the surface of the plate. In this case, a plaster cast is to be taken previous to the stereotyping or electrotyping.

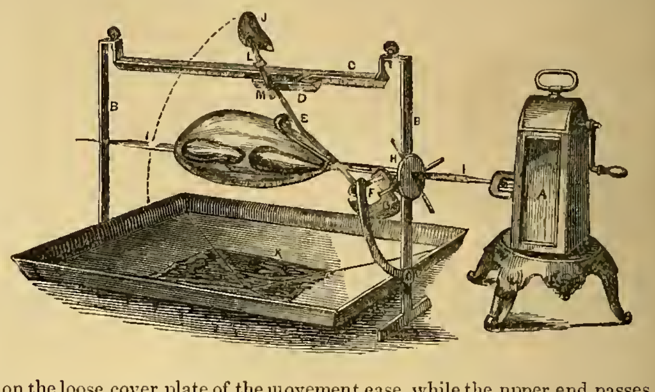
One of the numerous devices which may be employed in carrying out the principle of this part of the invention consists of a series of radial arms or spokes, which are secured to a central disc, free to rotate horizontally. These arms may either be made slightly elastic, so as to be capable of deflection and of resuming their normal positions again, in which case they may be rigidly secured to the central disc, or they may be severally jointed to such disc, and be held up by springs for the purpose; but, for the sake of simplicity, the inventor prefers the former arrangement. Each arm is bent downwards, in the form of an elbow, at the extremity, and on the under face of such bent portion is engraved a letter, figure, or other typographical character. The plate or surface in which the letters are to be impressed is carried by a block, which is capable of being moved laterally step by step, between guides, by means of a screw spindle, each movement being equal to the space between each letter. The guides are attached to a block, which can be traversed by means of a screw between the guides fast on the bed-plate or stand of the apparatus, whereby the impressed surface may be moved longitudinally so as to space out the proper distance between each successive line of letters. The arms carrying the letters or dies required to be impressed upon the plate, so as to form the words and sentences of the text, are successively brought over a slot or notch in a bridge piece, and are then pressed downwards so as to imprint the letter in the plate or prepared surface. This depression may be effected either by hand or by any convenient mechanical arrangement suitable for the purpose. The width of the slot corresponds to the width of the arms, and its depth is such, that when the arm touches the bottom of the slot the letter die has just penetrated the proper distance into the plate or into the coating thereon. After a letter has been thus impressed upon the plate, the plate is moved laterally the proper distance between the successive letters, and another arm, with its corresponding letter die, is brought over the slot and pressed downwards. On the completion of a line, the plate is moved longitudinally the requisite distance between two lines, by the actuating screw for that purpose, and back again laterally, so as to commence a fresh line. In lieu of screws worked by hand for traversing the plate or impressed surface, a self-acting apparatus might easily be substituted. The central disc, with its set of radial arms, may be so constructed as to be capable of being readily removed and replaced by a fresh disc, if requisite, with little loss of time. Each disc may comprise a complete set of letters of a certain class—as, for example, "primer," with capitals, italics, stops, &c., so that when a different class of type is required, the corresponding disc and set of arms can be immediately adapted to the apparatus. By the use of this apparatus and method of producing typographical printing surfaces, a great saving of time and labour is effected; and, after a cast or electrotype has been taken, the plate may be recoated with wax and used over again.

ROASTING APPARATUS.

J. W. Schlesinger, *South Lambeth.—Patent dated Aug.* 2, 1858.

The invention consists of a spit turning horizontally, driven by a spring acting through a train of wheels, as hereafter explained, and provided with the following apparatus for basting. A spoon or ladle turns upon an axis at right angles to the spit. On the axis is a cam, upon which arms fixed on the spit act. These arms are fixed like spokes of a wheel upon the end of the spit. As each of the arms acts upon the cam it raises the ladle or spoon, which empties its contents into a reservoir over the spit, from which the liquor or gravy descends through perforations upon the food on the spit. The ladle or spoon descends into the well or recess in the pan, to be raised again when the next arm acts on the cam. The train of wheels and spring which actuate the spit may be readily connected with and disconnected from it, and a governor on the train of wheels moderates the rate of motion, and also gives notice when the spring requires to be rewound by striking upon a bell. The arm or lever carrying the ladle or spoon is jointed near the bowl of the ladle or spoon, and the spoon is thereby so far inverted, when it is raised to its full extent, as to be emptied.

Our illustrative engraving represents the apparatus complete. A is an ornamental stand, bolted to and supporting the movement case; this case, is fitted with a moveable end or cover plate fastened to it by four small bolts, and is also provided with a hinged door at the side, to inspect the movement when desired. The movement revolving in the case consists of a spring box, inside of which is an ordinary timepiece spring, the spring being wound up in the usual way; on the other side is the arbor, fastened to the spring box, and attached thereto is the main driving wheel, having about sixty-eight teeth giving motion to a spindle through a pinion, and thus driving the second motion wheel, which has about seventy teeth. This wheel in its turn drives the third motion spindle through a pinion; on this third motion spindle is fixed a worm wheel with about forty-four teeth. All these first, second, and third motion spindles revolve horizontally; the worm wheel drives a screwed worm spindle standing upright, its lower end working in a foot or bracket cast



on the loose cover plate of the movement case, while the upper end passes through a bearing in the top of the movement case, and carries the balance or fly wheel where such a regulator is required.

The whole apparatus stands on a sole plate of cast or wrought iron, and to which it is attached; the uprights, B, having bearings in which the spit, I, revolves; the uprights also carry the perforated trough, C, having a sloping branch, D, for receiving the gravy first from the spoon and running it into the perforated trough, C. The pan, K, lies on the sole plate, and is retained in its place by guides fitting into corresponding recesses in the pan; these guides slide vertically on the uprights, and are fixed thereto at pleasure by thumb-screws pinching against the uprights; the well in the pan for collecting the gravy is fitted with a tap or cock to draw off any excess of liquor.

The right-hand bracket, which partially supports the spit, has an open bearing for the better getting in and out of the spit, and is fitted with an arm for carrying the cam shaft, to which is attached the cam, F, that is actuated by the arms or spokes revolving with the spit; this cam is of an elongated sweep or configuration, so that it keeps pressing against the revolving spoke as it recedes, and thus hinders a sudden descent of the spoon into the well, and prevents splashing; E is the jointed lever carrying the spoon, J, which, when raised to its extreme height, catches against the stop, L, so as to tilt the spoon. The connection of the spit to the clock-work movement is by means of the shaft, L.

LAW REPORTS OF PATENT CASES.

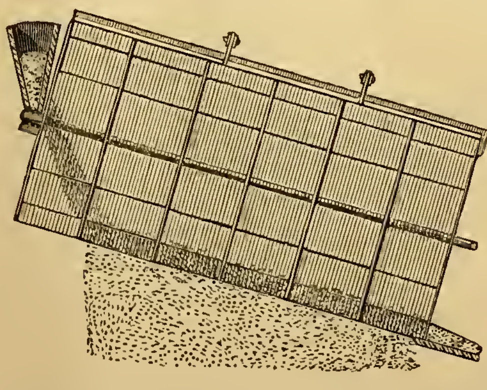
Bottle Capsules: Betts *v.* Menzies.—This is another of those cases which seem to afford endless food for our courts of law. Although we have already repeatedly reported the legal proceedings in the matter, yet as they have dragged on so long, it will be necessary that we should briefly repeat something of what has passed. The case then, is an action in which the plaintiff Betts, the inventor of what is called Betts' metal, sued the defendant to recover damages for the infringement of his patent granted to him in the year 1849, for "a new manufacture of capsules, and of a material to be employed therein, and for other purposes." The action had been twice tried, on the last occasion before Mr. Justice Erle, at the sittings after last Hilary Term, when the trial lasted six days. The verdict on that occasion, as at the previous trial, was found for the plaintiff; but, subsequently, a rule was granted to enter the verdict for the defendant, upon the following among other grounds—viz., 1. That the plaintiff manufactured large quantities of the capsules for sale before the date of the patent, and that the invention was not a new manufacture at the time of the grant; 2, that plaintiff's invention as claimed, or some material part of it was included in the specification of Thomas Dobbs's patent, granted in 1804. According to the plaintiff's specification, his patent metal consisted of lead and tin, which in the first instance were cast in ingots, and separately rolled out till the tin became about one-twentieth part of the thickness of the lead, and both were of a thickness suitable for making the patent metal required. The two metals, being thus reduced to their proper relative thicknesses, were laid on each other, and pressed between rollers, the effect of which was that the two metals were combined into one by the pressure, and so became in effect one sheet of metal, with a coating of tin on one or both sides, as might be required. Of the metal thus formed, the plaintiff's patent capsules were manufactured and sold in large quantities, and the manufacture had also been extensively applied to many other purposes of ornament and utility. The plaintiff, in his specification, claimed, first, "the manufacture of the new material, lead combined with tin on one or both of its surfaces, by rolling or other mechanical pressure, as herein described; and, secondly, the manufacture of capsules of the new material of lead and tin combined by mechanical pressure, as herein described." It was proved at the trial that before the plaintiff's patent was sealed, a large number of capsules had been manufactured by the plaintiff for sale, but not sold, and it was contended, on the part of the defendant, that this invalidated his patent. It was also contended that the plaintiff's invention as claimed, or some material part of it, was included in the specification of Thomas Dobbs's patent, granted in 1804, for what he termed "Albion metal," and which was produced by the union of tin with lead by means of mechanical pressure. Lord Campbell said he did not think that the fact that the plaintiff had manufactured his capsules before the patent was sealed invalidated his patent. There was some delay in granting the patent, and the plaintiff had manufactured the capsules, but the invention was known only to the plaintiff and his partner, and none were sold until the patent was granted. On the other point, his lordship said he had entertained great doubt, and had deliberated fully, and, in the result, he was of opinion that the plaintiff's patent was bad. If the plaintiff had limited his claim to the particular proportions specified, his lordship thought the patent might have been good, but, on looking at his claim, it appeared that he claimed "the manufacture of the new material, lead combined with tin, on one or both of its surfaces, by rolling or other mechanical pressure, as herein described," the combination of the two metals by pressure being the subject of Dobbs's patent. The plaintiff's patent was therefore invalid, and the rule to enter the verdict for the defendant must be made absolute. Mr. Justice Wightman, Mr. Justice Erle, and Mr. Justice Crompton expressed themselves to the same effect. Rule absolute to enter the verdict for the defendant. The result of this was, that the counsel for the defendant moved in the Vice-Chancellor's court, that the injunction awarded against them on the 21st of March, 1857, by this Court, to restrain them from importing and selling metallic capsules of the same or the like material as that described in the specification of the plaintiff's patent might be dissolved, and that an inquiry might be directed as to the damages sustained by the defendants by reason of the injunction, and that the amount might be paid to them by the plaintiff. For the plaintiff it was contended, that matters ought at least to be left *in statu quo*, until the plaintiff's appeal from the Court of Queen's Bench to the Exchequer Chamber had been decided. They also contended that the legal question had been left undetermined by the Court of Queen's Bench, the defendants having raised an extraneous issue upon the construction of the rival specifications of Dobbs and Betts, upon which question alone that court had given judgment, without adverting to the more material issues in the cause which had been decided by a jury in favour of the plaintiff. The Vice-Chancellor said that *primâ facie* there were the strongest possible grounds for dissolving the injunction, but the question in reality was whether, until the decision of the appeal from the Court of Queen's Bench, which would be heard in December next, there was such a case on the part of the defendant as would induce the court to dissolve the injunction in the meantime. The plaintiff, by the concurrent decision of judge and jury, was admitted to be plainly and clearly the inventor of the process. He had also enjoyed for a long time an undisputed possession, until one of his own servants found his way to Belgium, and there described the process. It subsequently appeared, that some 45 years before, a patent for a similar invention had been taken out by one Dobbs, but everybody supposed that it was the patent of the plaintiff which was being invaded, and the defendant, it would seem, thought so too. There was considerable contest as to whether Dobbs ever did make any use of the invention which he wrote down on paper. It was said that he nor any one else could avail himself of the invention, as he had described it, until Betts took out his patent. There was evidence on both sides; but, at any rate, the issue was very distinctly raised as to whether Dobbs ever invented it all, and the jury found that he had not. His Honour, after adverting to the proceedings upon the various trials at law, said that, with respect to the recent judgment of the Court of Queen's Bench, it was a matter that weighed greatly with him. He was not sitting to review that decision, nor even to express any opinion on it; but was there such a *bonâ fide* ground for an appeal that he ought to allow things to remain *in statu quo* rather than dissolve the injunction? Unless there were strong grounds for showing that the appeal was frivolous and merely interposed for purposes of delay, the court must uphold the injunction until the trial at law was concluded, and that it was finally concluded could not be said until the appeal was determined. If the case were appealed to the House of Lords the question would be different, as there would then be a delay of two years. He was not in the slightest degree saying that the judgment of the Court of Queen's Bench might not be followed by the Exchequer Chamber; but it was to be observed that Lord Campbell stated, that it was "after great doubt and deliberation" that he had come to his decision. Then, he confessed, he was unable to follow his Lordship's language in a part of what he stated as a matter of fact upon the specification. He should at once submit to his lordship's judgment as a matter of law, but he could not but think that there had been some misappropriation of facts, or error in the notes of the judgment, and further, that the attention of the judges had been directed to the question of construction of the specifications and that only. As the matter would merely remain undecided for some six months longer, while the plaintiff was confessedly the inventor and had had the sole enjoyment for a long period, he should not dissolve the injunction. His Honour, after adverting to the circumstance that the defendant was resident abroad, and that with the exception of Clifford, who employed the process for the ornamentation of coffins, there was no one else to be found who was infringing the patent, directed the motion to stand over until the hearing of the appeal in the Exchequer Chamber.

Hills *v.* the London Gas Light Company.—This was an action for infringing a patent, tried before Mr. Baron Bramwell, at Guildford, during the summer assizes last year, when a verdict was found for the plaintiff. A report of this action will be found in our August and October parts, 1858, at pages 134 and 194, and the plaintiff's action against the Equitable Gas Light Company. The patent was obtained for certain improvements in the manufacture of gas by taking the sulphates, the oxychlorides, or the hydrated or precipitated oxides of iron, either by themselves or mixed with sulphate of lime, or sulphate or muriate of magnesia, baryta, strontia, potash, or soda, and absorbing them into or mixing them with sawdust, or peat charcoal, or breeze, or other porous or absorbent material, so as to make a very porous substance easily permeable by the gas. The material was to be put into a purifier and the gas passed through it, depriving it of its sulphuretted hydrogen, cyanogen, and a part of its ammonia, which would be absorbed into the porous material, water being at the same time formed by the union of the oxygen of the oxide and the hydrogen of the sulphuretted hydrogen absorbed. The patent also claimed renovating the material, after it had ceased to purify the gas, by exposure to air. A rule was moved for and obtained upon several grounds:—1. That the plaintiff's invention was not new, by reason of Croll's and Laming's patents, and the disclosures made by their respective specifications. 2. That the plaintiff was not the inventor on similar grounds. 3. That the plaintiff's specification was insufficient and bad, for not specifying which hydrated oxides of iron would answer the purpose, or for claiming all hydrated oxides of iron, though some would not purify gas. 4. That the mere application of hydrated oxide of iron to absorb sulphuretted hydrogen from gas was not the subject of a patent, its properties and effects with reference to sulphuretted hydrogen being previously well known. 5. That the renovation of hydrated oxide of iron by exposure to air being previously well known, its application to purifying gas was not the subject of a patent. At the trial several points were raised by the learned counsel for the defendants, and the most important was, that the subject-matter of the plaintiff's patent was not new, it having been disclosed to the world by Mr. Croll, who, in the year 1840, took out a patent for the purification of gas, by the use of black oxide of manganese, or the oxide of zinc or the oxides of iron; and also by Mr. Laming, who, in 1847, took out a patent for arriving at the same result by chloride of calcium. On the part of the plaintiff, it was argued that to invalidate a patent on the ground of a prior publication in a specification, the prior specification must so disclose the invention, that the public (that is, that portion of it acquainted with the subject) would be able to practise it without an experiment. If it included, in general terms, matters or processes, some of which would succeed, and others which would not, then it was not such a publication as would avoid a subsequent patent for the material or process which would have succeeded. In the present case, Croll had used the term oxides of iron. Admittedly some of them would succeed, but others would not—that was not disclosing to the public which of the oxides would succeed; and, therefore, if there were no public uses, the public were thrown upon experiment. The plaintiff had discovered the particular oxide that would succeed, and was therefore an inventor, and entitled to Letters Patent for his invention. If it were otherwise, a person, by the widest claim or mere assertion, might stop any future inventor from patenting anything within the generality of the assertion. The second specification relied on by the defendants (Laming's), did not indicate that precipitated oxide of iron would purify coal gas; he gave and claimed a mixture as such, in which, if taken to operate in the liquid way, precipitated oxide of iron was one of the ingredients; but although he might be entitled to the mixture, he had not given to the public the knowledge that precipitated oxides alone would succeed, or were, indeed, the active ingredients, and therefore he could not go beyond the mixture he claimed. The plaintiff made the discovery of what really would succeed, and disclaimed Laming's mixture. The plaintiff had really invented and first published an invention which had not been indicated to the public by Laming. That both Croll's and Laming's specifications, when read as a whole, indicated the preparations by the dry way, and therefore anhydrous oxides—that was contradicted by the defendant's witnesses at the trial, but the question was one entirely for the jury to decide, therefore, the court ought not to enter a verdict for the defendants, or direct a non-suit.

When the plaintiff's counsel had concluded bis argument, the Lord Chief Baron said that it had made a great impression upon the minds of the Court. The counsel for the defendants contended that the plaintiff's specification was too large, and had been anticipated by both Croll's and Laming's specifications. Tbe Lord Cbicf Baron said that the Court was unanimously of opinion that a non-suit ought not to be entered, and inquired whether the defendants contemplated appealing against the ultimate decision of the court, by taking the case up to the Exchequer Chamber? In reply, it was stated that if the court granted a new trial, the defendants would go down and try the cause again in preference to appealing against the decision, as it was clearly the proper course to be adopted after the opinion expressed by the court. The case will now be argued upon the second part of the rule—viz., that the verdict was against tbe weight of evidence.

Winnowing Machines: Nalder *v.* Clayton and Shuttleworth.—At page 319 of the last volume of this *Journal*, will be found a report of the trial of this action, at the sittings after last Hilary Term, when a verdict was entered for the plaintiff, in respect of the two patents mentioned in that report, granted respectively in 1853 and 1855, leave being reserved for the defendants to move that the verdict might be entered for them. In pursuance of the leave reserved, in Easter Term last, the defendants obtained a rule calling upon tbe plaintiff to show cause why the verdict should not be entered for the defendants, or why a nonsuit should not be entered, on the ground that there was no infringement of any part of the alleged inventions, for which there was a subsisting valid patent; and also, that the plaintiff was not the true and first inventor, that the said alleged inventions, or some part or parts thereof, were published prior to the dates of the said Letters Patent in the specifications and books following, namely, Ewbank, 1819; Wilson, 1826; Lucas and Ewbank, 1827; Newton, 1841; Royce, 1848; Hodge, 1850; Burch, 1852; and Engineer and Mechanics' Encyclopedia; that the said inventions or some material part or parts thereof were comprised in the models and machines and drawings following, or some of them, namely, Slater's, Dixon's, Garrett's, Ferrabies', City Mills', Waltham Abbey Powder Works'; Deptford Victualling Yard; and New Crane Mills', Shadwell, and that the claims in the specifications of the patents in the declaration mentioned were too large. This rule was argued in Trinity Term. The defendants not having included in their combined apparatus the plaintiff's *peculiar* hummeller, but having used merely a *common* hummeller, by arrangement this part of the case which related to the question whether the defendants had infringed the plaintiff's patent of 1855 was not argued, but the verdict on the issue raised by the plea of not guilty entered for the defendants, and the jury discharged as to the other issues. The argument on the rule was, therefore, confined to tbe issues raised in relation to the patent of 1853, and the objections mentioned in the rule were in consequence confined to those which will be hereinafter particularly referred to. The specification of the patent of 1853 describes the invention to be of "improvements in winnowing and dressing corn," and states, that the invention consists in the "*substitution* of a revolving screen, which is a *cylinder* of wire or other suitable material," and, referring to the drawings, continues:—"Fig. 1 on the accompanying drawings *represents* a side elevation of *our improved winnowing machine*, with a portion of the side broken away to *show* the *points of novelty*." From other parts of the specification and from the drawings, the plaintiff's invention is clearly described, and shown to consist in an inclined revolving cylindrical screen of circles of wire

Fig. 1.

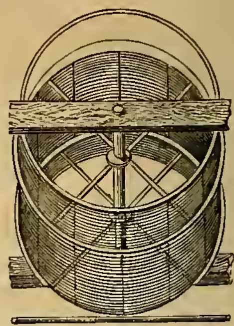


or other suitable material, or wire or other suitable material wound spirally round with spaces between, and divided into two or three degrees of fineness, and the claim made is in these words:—"The application and use of a revolving cylindrical screen for the purpose hereinbefore described."

Figs. 1 and 2 of the subjoined engravings represent the plaintiff's screen. The screens which the defendants made, used, and sold, and the making, using, and selling of which constitutes the infringement complained of in tbe action, are exactly similar in arrangement.

The case which the plaintiff endeavoured to establish was that upon the true construction of his specification, *aided* by the drawings, he claimed, as of his invention, an *inclined* revolving cylindrical screen, made of circles of wire, or other suitable material, or of wire or other suitable material wound spirally round with spaces between, and not revolving cylindrical screens *in general*. The defendants contended that the plaintiff's invention, as specified, included *all* revolving cylindrical screens, whether inclined or horizontal, and whether made of circles of wire or wire wound spirally round with spaces between, or of punched metal, wire cloth or gauze, or any other material, and they relied upon the several screens presently illustrated and referred to, as evidence of the prior publication of the plaintiff's invention. The first objection in point of date relied on by the defendants were the specifications of Henry Ewbank's invention, of 1819, and of Lucas and Ewbank's invention, of 1827, for machinery for dressing paddy, a rough rice. These specifications disclose an inclined revolving cylindrical screen, made of wire *cloth*, and divided into two or three degrees of fineness, its purpose being the dressing of paddy rice. There is no drawing to either of these specifications.

Fig. 2.



We regret we have not sufficient space for the remainder of this report, which we shall conclude next month.

Printed Zebra Goods: Macnee *v.* Nimmo.—When we last reported the progress of the litigation in this case, we left it with the result, that a verdict had been obtained for the defendant The case however went to the Court of Queen's Bench, (on a motion on behalf of tbe plaintiff for a new trial,) before Lord Campbell and Justices Erle, Crompton, and Wightman. Tbe court ordered the verdict obtained by the defendant to be set aside, and a new trial between the parties.

MECHANIC'S LIBRARY.

Arithmetician, Complete Practical, Key, new edition, Maynard, 6s. Keith.
Arithmetic, Key to Elements of Commercial, new edition, 3s. 6d. Tate.
Art, Lessons on, second edition, imp. 8vo, 15s. cloth. Harding.
Barges, Book of, oblong, 2s. 6d. sewed. Wolfe.
Coinage, Remarks on, with decimal coinage, 4to, 1s. sewed.
Defences of Great Britain and Ireland, 8vo, 1s. 6d. Kennedy.
Farm of Four Acres, Our, second edition, crown 8vo, 2s. boards.
Gothic Ecclesiastical Architecture, tenth edition, 7s. 6d. cloth. Bloxam.
Laboratory and Workshop, Heroes of, illustrated, 2s. 6d. Brightwell.
Measuring, Tables for, new edition, oblong, 3s. 6d. boards. Hoppus.
Mental Arithmetic, 18mo, 1s. 3d. boards. Reid.
Navies of the World, post 8vo, 7s. 6d. cloth. Busk.
Peaks, Passes, and Glaciers, edited by Ball, illustrated, crown 8vo, 21s. cloth.
Problems of Maxima and Minima, 8vo, 7s. 6d. Rainchunard.
Rifle, and How to Use it, fourth edition, fcap. 8vo, 2s. 6d. half-bound. Busk.
Rifle Target Register, 8vo, 1s. sewed. Busk.
Scientific Inquiry, Manual of, third edition, by Main, 9s. Herschel.
Signals, Commercial Code of, by Larkins, second edition, 7s. Forster.
Telescope Teaching, imp. 16mo, 7s. 6d. cloth. Ward.

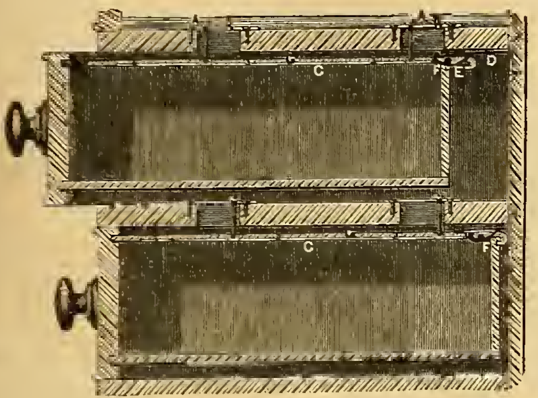
REGISTERED DESIGN.

AIR-TIGHT SLIDE COVER.

Registered for Messrs. W. Larke & Son, 17 *Little Moorfields, City, London.*

The title given by the inventors to this useful little contrivance can convey no idea of its real intent to the general reader. By the term "slide-cover," they mean an arrangement applied to drawers of all kinds to render tbem air-tight, and invulnerable by damp aud dust, even when left open to any desired extent; whilst the whole of the contained goods can be seen at one time, and tbe drawer being closed at any given distance, the cover comes forward, and makes it air-tight, without any attention on tbe part of the user.

Our engraving represents two drawers in a tier, the upper one slightly out, and the other shut full in. A is the screw on whicb the cover slides, being suspended by it when the drawer is out; B is the plate on which the heads of these supporting screws work; and C, the metal plate wbich prevents the cover from casting or splitting, nuts being attached to this plate for the screws to hold the suspended cover by; at D is a stop catch to prevent the cover from going back, until the drawer front comes up to the cover. It is fixed to the back of the drawer structure, by a metal plate, a rise and drop catch, E, is worked by the drawer back,



lifting it to such a height, that the catch goes down, and lets the stop-catch pass over it—and by this means the cover goes back into its proper position: at F is a plate on the top edge of the drawer back, for the drop-catch to work on, and at G, the cover works in grooves.

REVIEWS OF NEW BOOKS.

The Truck System; a Book for Masters and Workmen. By David Bailey. 8vo. Pp. 24. London: Pitman, Paternoster Row. 1859.

What is slangishly, and, as it appears to us, illogically, called the "truck" system, or the screwing out of vile profits on the masters' side, by paying men's wages in goods on which an exorbitant profit is taken, is still alive here and there in spite of legislative interference, and the general indignation of the country. That it still flourishes, is, we suppose, principally owing to the fact, that many mean subterfuges are resorted to by employers, to enable them to practise the great wrong, and yet keep out of the fangs of retributive justice. Mr. Bailey has here devoted fourteen chapters of a pointedly written pamphlet to an attempt to arouse the industrially connected members of the world, to a proper consideration of the subject. The chapters discuss:—The contract between master and workman—the abstract right of a master to keep a shop or a public house—where their is no claim, legal or moral, their is no ground for expectation—a master has no right to expect his workmen to buy of him—the peculiar liability of tommy-shops to foster wrong notions—the temptation to oppression on the part of truck-paying masters—the improbability of fair dealing in a truck-shop—workmen are compelled to deal with their masters—the truck-paying master fulfils his contract with his workmen in the letter, but not in reality—inconvenience to workmen's wives: hurry and insult—the unfairness of confining whole families to one shop for their necessaries—direct imposition by the truck system—results of the system—and, excuses offered by truck-paying masters. When the workman is paid in hard cash for his services, he, of course, knows precisely what he is about; but when a fictitious medium comes into play, in the form of food and necessaries, it is impossible that he can see his way clearly. Mr. Bailey is apparently well acquainted with the whole system as between employer and employed, and he argues convincingly upon its gross injustice.

Mental Arithmetic: containing the principles of Arithmetic for the Learner, and numerous Exercises, with the answers for the Teacher. By Hugo Reid. Duod., pp. 120. London: Longmans. 1859.

The practical eminence of Dr. Reid has been so often exemplified in literary efforts, that it is perhaps unnecessary for us to remind any but our young readers, that his authority is of value. The present little work has been schemed to suit both teacher and learner, and it is confessedly aimed at the smoothing of the way for the introduction of the decimal system. It embraces notation, addition, subtraction, multiplication, division, vulgar fractions, decimal fractions, ratio and reduction;—and an appendix goes into the subjects of decimal currency, costs of numbers, of articles of multiplication, practice, dozens and scores, winding up with interest, and profit and loss. The arrangement and nomenclature are particularly clear, and the book will certainly do much to ease the pains of the arithmetical student of tender years, whilst it will be a safe book of reference for mature heads.

On Health, as Depending on the Condition of Air; and on a Patent Process for the Purification of Air. By J. White. 8vo. Pp. 32. Wood Engravings. London: Hamilton, Adams, & Co. 1859.

We can never pay too much attention to the state of the air we breathe, as affecting the functional actions of the human body—and Mr. White does good service in reminding us of the serious nature of the subject, in very clear and emphatic language. In addition to pointing out what must be the inevitable result of the use of bad air, he gives us some practical remedies for the evil, and shows how good air may always be secured, with little trouble and expense. In one of his inventions, now in use at the Church of the Holy Trinity, Finchley, he uses a purifying apparatus, consisting of an elevated water tank, from which a pipe passes down to a vessel with a perforated bottom. In this way he obtains a constant shower of water, through which the air used in the building is passed. This system is represented as carried out under various forms, both in connection with breathing apparatus, and alone; and much ingenuity has apparently been exercised in designing similar apparatus for general domestic use.

The only Solution of the Difficulty; or, Sewage, its Arterial Utilisation, for the benefit of all and prejudice of none. By F. C. Maguire. 8vo. Pp. 14. London: Gilbert, Paternoster Row. 1859.

Mr. Maguire, who writes from Stamford, claims to be the originator of the project for "forcing the sewage of towns through what may be termed the main arteries and veins of nations; or, in other words, along the various lines of railway or roadway, for the purposes of irrigation and fructification." He proposes to force the matter along pipes by the agency of steam, into air-tight depots, stationed at convenient distances apart, for use in fertilising the country. The subject has already received a vast amount of useless discussion; but whoever has not yet thought about it, may usefully see what Mr. Maguire has got to say upon it.

Report of the Committee on Shipping Statistics, presented to the British Association, September, 1858. 8vo. Pp. 12. London. 1858.

This report originated in the appointment, by the British Association, of a committee to inquire into the statistics of shipping, with a view to rendering statistical record more available as data conducive to the improvement of naval architecture, as respects the adaptation of the form of ships to the requirements of sea service. It is reproduced in this pamphlet form, in order that those who are interested in the matter, may have the fullest access to it, and the duty of the reviewer with regard to it, may be said to end with this announcement.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

INSTITUTION OF CIVIL ENGINEERS.

May 10 and 17, 1859.

The discussion upon Mr. Kingsbury's Paper "On the Victoria (London) Docks," and upon Mr. Harrison's Paper "On the Tyne Docks," occupied both evenings.

May 24, 1859.

"On the manufacture of malleable iron and steel," by Mr. Henry Bessemer.

Attention was directed, in the early part of the paper, to the ordinary mode of manufacturing iron by the puddling process. When Mr. Bessemer first proposed to convert crude pig iron, into malleable iron, while in a fluid state, and to retain the fluidity of the metal, for a sufficient time to admit of its being cast into moulds, without the employment of any fuel in the process, his proposition was looked upon by many as a chimera, or as the mere day dream of an enthusiast: but it was nevertheless fully recognized and supported by many of the scientific men of the day. The same deep conviction of the truth on which the new process was based, and which led Mr. Bessemer to bring it before the British Association, in 1856, had since determined him (in spite of the opinions then pronounced against the process) to pursue one undeviating course, until the present time, and to remain silent for years, under the expressed doubts of those who predicted its failure, rather than again bring forward the invention until it had been practically and commercially worked, and there had been produced by it both iron and steel, of a quality which could not be surpassed by any iron, or steel, made by the tedious and expensive processes now in general use. The want of success which attended some of the early experiments was erroneously attributed, by some persons, to the "burning" of the metal, and by others, to the absence of cinder, and to the crystalline condition of cast metal. It was almost needless to say, that neither of the causes assigned had anything to do with the failure of the process, in those cases where failure had occurred. Chemical investigation soon pointed out the real source of difficulty. It was found, that although the metal could be wholly decarbonised, and the silicum be removed, the quantity of sulphur and of phosphorus was but little affected; and as different samples were carefully analysed, it was ascertained that red shortness was always produced by sulphur, when present to the extent of 1-10th per cent., and that cold shortness resulted from the presence of a like quantity of phosphorus; it, therefore, became necessary to remove those substances. Steam and pure hydrogen gas were tried, with more or less success, in the removal of sulphur, and various fluxes, composed chiefly of silicates of the oxide of iron and manganese, were brought in contact with the fluid metal, during the process, and the quantity of phosphorus was thereby reduced. Thus many months were consumed in laborious and expensive experiments; consecutive steps in advance were made, and many valuable facts were elicited. The successful working of some of the higher qualities of pig-iron caused a total change in the process, to which the efforts of Messrs. Bessemer and Langsdon were directed. It was determined to import some of the best Swedish pig-iron, from which steel of excellent quality was made, and tried for almost all the uses for which steel of the highest class was employed. It was then decided to discontinue, for a time, all further experiments, and to erect steel works at Sheffield, for the express purpose of fully developing and working the new process commercially, and thus to remove the erroneous impressions so generally entertained in reference to the Bessemer process.

In manufacturing tool steel of the highest quality, it was found preferable, for several reasons, to use the best Swedish pig-iron, and, when converted into steel by the Bessemer process, to pour the fluid steel into water, and afterwards to re-melt the shotted metal in a crucible, as at present practised in making blister-steel, whereby the small ingots required for this particular article were more perfectly and more readily made.

It was satisfactory to know, that there existed in this country, vast, and apparently inexhaustible, beds of the purest ores, fitted for the process. Of the Hematite alone, 970,000 tons were raised annually, and this quantity might be doubled or trebled whenever a demand arose. It was from the Hematite pig-iron, made at the Workington Iron Works, that most of the larger samples of iron and steel exhibited were made. About 1 ton 13 cwt. of ore, costing 10s. per ton, would yield 1 ton of pig metal, with 60 per cent. less lime, and 20 per cent. less fuel, than were generally consumed when working inferior ores; while the furnaces using this ore alone yielded from 220 to 240 tons per week, instead of say 160 to 180 tons per week, when working with common iron stone. The Cleator Moor, the Weardale, and the Forest of Dean Iron Works, also produced an excellent metal for this purpose.

The form of converting vessel, which had been found most suitable, somewhat resembled the glass retort used by chemists for distillation. It was mounted on axes, and was lined with "Ganis cr" or road drift, which lasted during the conversion of 30 or 40 charges of steel, and was then quickly and cheaply repaired or renewed. The vessel was brought into an inclined position, to receive the charge of crude iron, during which time the tuyeres were above the surface of the metal. As soon as the whole charge was run in, the vessel was moved on its axes, so as to bring the tuyeres below the level of the metal, when the process was at once brought into full activity, and twenty small, though powerful, jets of air sprung upwards through the fluid mass; the air, expanding in volume, divided itself into globules, or burst violently upwards, carrying with it a large quantity of the fluid metal, which again fell back into the boiling mass below. The oxygen of the air appeared, in this process, first to produce the combustion of the carbon contained in the iron, and at the same time to oxydise the silicum, producing silicic acid, which, uniting with the oxide of iron, obtained by the combustion of a small quantity of metallic iron, thus produced a fluid silicate of the oxide of iron, or "cinder," which was retained in the vessel and assisted in purifying the metal. The increase of temperature which the metal underwent, and which seemed so disproportionate to the quantity of carbon and iron consumed, was doubtless owing to the favourable circumstances under which combustion took place. There was no intercepting material, to absorb the heat generated, and to prevent its being taken up by the metal, for heat was evolved at thousands of points, distributed throughout the fluid; and when the metal boiled, the whole mass rose far above its natural level, forming a sort of spongy froth, with an intensely vivid combustion going on in every one of its numberless, ever changing cavities. Thus by the mere action of the blast, a temperature was attained, in the largest masses of metal, in ten or twelve minutes, that whole days of exposure in the most powerful furnace would fail to produce.

The amount of decarbonisation of the metal was regulated, with great accuracy, by a meter, which indicated on a dial, the number of cubic feet of air that had passed through the metal; so that steel, of any quality or temper, could be obtained, with the greatest certainty. As soon as the metal had reached the desired point (as indicated by the dial), the workmen moved the vessel, so as to pour out the fluid malleable iron or steel, into a founder's ladle, which was attached to the arm of a hydraulic crane, so as to be brought readily over the moulds. The ladle was provided with a fire-clay plug at the bottom, the raising of which, by a suitable lever, allowed the fluid metal to descend in a clear vertical stream into the moulds. When the first mould was filled, the plug valve was depressed, and the metal was prevented from flowing, until the casting ladle was moved over the next mould, when the raising of the plug allowed this to be filled in a similar manner, and so on, until all the moulds were filled.

The casting of large masses of a perfectly homogeneous malleable metal, into any desired form, rendered unnecessary the tedious, expensive, and uncertain operation of welding now employed, wherever large masses were required. The extreme toughness and extensibility of the Bessemer iron was proved by the bending of cold bars of iron, 3 inches square, under the hammer, into a close fold, without the smallest perceptible rupture of the metal at any part; the bar being extended on the outside of the bend from 12 inches to 16¾ inches, and being compressed on the inside from 12 inches to 7¼ inches, making a difference in length of 9½ inches, between what, before bending, were the two parallel sides of a bar, 3 inches square. An iron cable, consisting of four strands of round iron, 1½ inch diameter, was so closely twisted, while cold, as to cause the strands, at the point of contact, to be permanently embedded into each other. Each of these strands had elongated 12½ inches in a length of 4 feet, and had diminished 1-10th of an inch in diameter, throughout their whole length. There were also exhibited some steel bars, 2 inches square and 2 feet 6 inches in length, twisted cold into a spiral, the angles of which were about 45 degrees; and some round steel bars, 2 inches in diameter, bent cold under the hammer, into the form of an ordinary horse-shoe magnet, the outside of the bend measuring 5 inches more than the inside.

The steel and iron boiler plates, left without shearing, and with their ends bent over cold, also afforded ample evidence of the extreme tenacity and toughness of the metal; while the clear, even surface of the railway axle and piece of malleable iron ordnance, were examples of the perfect freedom from cracks, flaws, or hard veins, which formed so distingui hing a characteristic of the new metal. The tensile strength of this metal was not less remarkable, as the several samples of steel tested in the proving machine, at Woolwich arsenal, bore, according to the reports of Colonel Eardley-Wilmot, R.A., a strain varying from 150,000 lbs. to 162,900 lbs. on the square inch, and four samples of iron boiler plate from 68,314 lbs. to 73,100 lbs.; while according to the published experiments of Mr. W. Fairbairn, Staffordshire plates bore a mean strain of 45,000 lbs.; and Low Moor and Bowling plates a mean of 57,120 lbs. per square inch.

There was also another fact of great importance, in a commercial point of view. In the manufacture of plates for boilers and for shipbuilding, the cost of production increased considerably with the increase of weight in the plate; for instance, the Low Moor Iron Company demanded £22 per ton, for plates weighing 2½ cwt. each, but if the weight exceeded 5 cwt., then the price rose from £22 to £37 per ton. Now with cast ingots, such as the one exhibited, and from which the sample plates were made, it was less troublesome, less expensive, and less wasteful of material, to make plates weighing from 10 to 20 cwt., than to produce smaller ones; and indeed there could be but little doubt that large plates would eventually be made in preference, and that those who wanted small plates would have to cut them from the large ones. A moment's reflection would, therefore, show the great economy of the new process in this respect; and when it was remembered that every riveted joint in a plate reduced the ultimate strength of each 100 lbs. to 70 lbs., the great value of long plates for girders and for shipbuilding would be fully appreciated.

It would be interesting to those who were watching the advancement of the new process to know, that it was already rapidly extending itself over Europe. The firm of Daniel Elfstrand and Co., of Edsken, who were the pioneers in Sweden, had now made several hundred tons of excellent steel by the Bessemer process. Another large manufactory had since been started in their immediate neighbourhood, and three other companies were also making arrangements to use the process. The authorities in Sweden had fully investigated the whole process, and had pronounced in favour of it. The large steel circular saw plate exhibited was made by Mr. Göranson, of Geffle, in Sweden, the ingot being cast direct from the fluid metal within fifteen minutes of its leaving the blast furnace. In France, the process had been for some time carried on by the old-established firm of James Jackson & Son, at their steel works, near Bordeaux. This firm was about to manufacture puddled steel on a large scale. They had already got a puddling furnace erected and in active operation, when their attention was directed to the Bessemer process, the apparatus for which was put up at their works last year; and they were now extending their field of operations, by putting up more powerful apparatus at the blast furnaces in the Landes. There were also four other blast furnaces in the south of France in course of erection, for the express purpose of carrying out the new process.

The irons of Algeria and Saxony had produced steel of the highest quality.

Belgium was not much behind her neighbours; the process was now being carried into operation at Liège, where excellent steel had been made from the native coke iron; while in Sardinia preparations were also being made for working the system. Russia had sent to London an engineer and a professor of chemistry to report on the process; and Professor Müller of Vienna, and M. Dumas and others from Paris, had visited Sweden, to inspect and report on the working of the new system in that country.

That the process admitted of further improvement, and of a vast extension beyond its present limits, the author had no doubt; but those steps in advance would, he imagined, result chiefly from the experience gained in the daily commercial working of the process, and would most probably be the contributions of the many practical men who might be engaged in carrying on the manufacture of iron and steel by this system.

CHEMICAL SOCIETY.

May 5, 1859.

"On bases produced by nitrous substitution," by Mr. C. S. Wood. The author described a new crystalline base of a dark carmine colour, that he had obtained by treating an alcoholic solution of dinitro-naphtalin with sulphide of ammonium.

"On the commercial est'mation of nitre," and "On the manufacture of sulphate of copper," by Mr. J. S. Blockey.

"On the saline atomic volume of lithium," by Dr. Odling. He estimated this volume at 6·4, the primitive volume being 11·0.

GEOLOGISTS' ASSOCIATION.

June 6, 1859.

"On the eastern boundary of the North Wales coal field near Oswestry," by Mr. Davies.

"On some peculiar markings occurring occasionally on the broken surfaces of flints," by Mr. Wetherell.

"On the fossil remains of the mammoth found in the bed of the German Ocean, on the east and south-east portions of England," by Mr. Charlesworth.

ROYAL SOCIETY.

MAY 19, 1859.

"On the anatomy of *Victoria Regia*," by A. Henfrey, Esq.

"On the specific gravity of alloys," by A. Matthiessen, Esq.

Professor Thomson, of Glasgow, exhibited and explained his marine signal and testing galvanometer apparatus, used in laying down the Atlantic telegraph.

ASSOCIATION OF FOREMEN ENGINEERS.

MAY 7, 1859.

"On the concussion of water," by Mr. John Briggs, of Messrs. Tylor and Sons' works.

JUNE 4, 1859.

Discussion on the "Concussion of water." Afterwards, Mr. Briggs read a supplementary paper on "Hydraulics."

SOCIETY OF ARTS.

MAY 25, 1859.

"Some remarks on the application of definite proportions and the conic sections to architecture, illustrated chiefly by the obelisk, with some history of that feature of art," by Mr. J. Bell.

MONTHLY NOTES.

MARINE MEMORANDA.

The operative chainmakers of England, Scotland, and Wales, have issued the following well-intended circular, addressed to the directors of marine insurance associations, merchants, ship-owners, and others concerned in shipping, with regard to the general character of cables and chains now in use in the merchant service. They state:—"As practical workmen daily occupied in the manufacture of chains, we have been made painfully aware, during the past few years, of the great increase in the manufacture of inferior cable and topsail sheet chains in many parts of the kingdom; thus proving that their use is not alone confined to the fitting out of vessels in England, but that large quantities are also exported to all the principal shipping harbours in the world. The consequence is, that ships constructed with all the improvements that mechanical science can devise, and laden with valuable cargoes, are often totally lost from the insufficiency and inferiority of their cables and other chains. Men's lives are sacrificed, merchants sustain severe losses, marine insurance societies have their profits diminished, and a portion of the wealth of the nation is annually destroyed by the continued use of bad chains. This evil has of late so much increased, that it is gradually becoming more difficult for the honest manufacturer, who employs first-rate workmen and uses a good quality of iron in the manufacture of his chains, to bear up against the unprincipled trader, who supplies a valueless article at cheaper rates and upon false representations. It is not at all an uncommon practice for dealers in chain to give certificates to the buyer to the effect, that the article supplied has been properly proved, when, in reality, although it has gone through the machine, yet the proper weight has not been put upon it. In many chain works, where the buyer is determined that the chain purchased shall bear Admiralty weight, an additional sum beyond the regular price is paid to the workman; thus proving that it is an uncommon practice for them to prove their chain according to Admiralty weight. From inquiries recently made at the Liverpool public test, it was ascertained that a short time ago, some captains (who during the voyages had lost their anchors), with a view to know whether their cables were reliable or not, brought them to the machine, when they broke to pieces with several tons less weight than they ought to have borne. In some chain works a certain description, named by the workmen 'boiler chain,' is made in large quantities, the agreement between the employer and the workmen being, that it is neither to be examined nor proved, but taken from the 'block' of the workman direct to the 'boiler' where it is coated with tar, and sent into the market utterly valueless for any purpose for which chain ought to be used. Instead of receiving assurances upon trust, merchants should be thoroughly satisfied that the chains which they purchase are proved in a proper manner, as not one-half of those represented to be so really are, and marine insurance societies should decidedly refuse to insure either ships or cargoes, without the owner of the vessel can produce a proper certificate that his chains have been properly proved. For the greater security of shipping property, it has become an absolute necessity that in all large ports, a public test should be erected, and a duly qualified inspector appointed to take charge of the machines. We have been emboldened to send these circulars to those interested in the matter in every large shipping port in the kingdom, and also to the principal harbours abroad, because we are firmly convinced, from our practical knowledge, that if such steps as we have suggested be acted upon, they would be found very materially to diminish casualties at sea."

The series of screw trials concluded by the *Doris* government steamer are the most important that have yet taken place since the introduction of the screw for the propulsion of our steamships of war. These trials were designed to test the relative qualities of the Admiralty or common screw and Griffiths' patent propeller. Similar trials were carried out in 1853 on board the *Conflict* and *Fairy*, resulting in favour of the Griffiths' patent propeller, since which time the Griffiths' has been constantly used by the *Fairy* when under way. The immense power of the engines, now in use by our steamships of war, has given an opportunity of testing the merits of the two screws with the certainty of obtaining more practical results, more especially as effecting the vibration and steering of the ship, than could be arrived at with vessels of the *Conflict* and *Fairy's* class; hence the present trials. The forms of the screws may be thus described:—The blades of the Admiralty screw consist of a sixth part of the whole screw or helix; the centre of the Griffiths' propeller is a sphere of one-third the diameter of the screw, with the blades made tapering. The driving surface of the Admiralty lies at the extreme ends of the blades; in the Griffiths it lies at the centre nearest the sphere. The first trial with the Admiralty screw was with a diameter of 18 feet, her speed being 11·823 knots. On the second trial, with the diameter increased to 20 feet, the speed realised was 11·826 knots, with a great increase of vibration. On the third trial the "leading" corner of each blade was cut off, and in this form the common screw attained its greatest speed, giving a result of 12.032 knots. On the fourth trial both the corners of each blade were cut off, when, with a greater number of revolutions, less speed was made, being 12·012 knots. Its last trial, with the "following" corner of each blade cut off, but the screw restored to its perfect form in every other respect, gave a result of 11·815 knots. The first trial with the Griffiths' propeller—20 feet diameter and 32 feet pitch—gave 11·981 knots. The second trial, with a 26 feet 5 inch pitch, gave 12·269 knots; and the third trial, with a medium pitch, which concluded the series, gave 12·158 knots, with $53\frac{3}{4}$ revolutions of the engines, and less vibration than on any former trial. Several important features connected with the screw propeller have been proved by these trials. Firstly, that the leading edge of the screw is the part that mostly affects the steerage of the ship, and also causes the greater part of the vibration. Secondly, that increased diameter of the screw is better than increased pitch to reduce the speed of the engines, but it considerably increases the vibration with the common screw, whereas with the Griffiths' it did not produce that effect, in consequence of its chief propelling surface being towards the centre. The common screw, when its blades are cut to the form of Griffiths', is not so effective as when the centre sphere is applied to them; the power required to obtain the same speed is considerably reduced by its application. The power required to obtain 12 knots without the sphere was 2,920·32 indicated horse-power, while the same form of blade and pitch with the sphere took only 2,825·6 indicated horse-power.

The Peninsular and Oriental Steam Company deserves the name of wonderful in more senses than one. It is a wonderful undertaking, as well by reason of the great convenient and punctual carrying powers which it has always displayed; and it is certainly wonderful on account of its splendid steam fleet. This fleet is now thus composed:—

	Tons.	H. P.		Tons.	H. P.
Simla (screw)	2,440	630	*Valetta* (paddle)	832	260
Columbian, (screw)	2,306	500	*Cadiz* (screw)	816	220
Bengal (screw)	2,185	465	*Aden* (screw)	812	210
Alma (screw)	2,164	450	*Nepaul* (screw)	796	200
Colombo (screw)	2,127	450	*Tagus* (paddle)	782	286
Nubia (screw)	2,095	450	*Azoff* (screw)	700	180
Ceylon (screw)	2,020	450	*Chusan* (screw)	699	80
Nemesis (screw)	2,018	600	*Formosa* (screw)	675	155
Hindostan (paddle)	2,017	520	*Manilla* (screw)	646	60
Pera (screw)	2,014	450	*Alhambra* (screw)	642	140
Candia (screw)	1,982	450	*Granada* (screw)	561	160
Bentinck (paddle)	1,974	520	*Shanghai* (screw)	546	100
Indus (paddle)	1,950	450	*Rajah* (screw)	537	80
Malta (screw)	1,942	500	*Canton* (paddle)	348	150
Ripon (paddle)	1,925	450	*Union* (screw)	340	60
Oriental (paddle)	1,787	420	*Sir Jamsetjee Jejeebhoy* (paddle)	126	30
China (screw)	1,750	400			
Orissa (screw)	1,646	300	*Mazagon* (paddle)	86	45
Jeddo (screw)	1,632	450	Chartered Vessel.		
Ellora (screw)	1,607	300	*Panther* (paddle)	701	320
Behar (screw)	1,603	300	Ships Building and under Alteration.		
Emeu (screw)	1,538	300	*Delta* (paddle)	1,935	400
Benares (screw)	1,491	400	*Massalia* (paddle)	1,919	400
Salsette (screw)	1,491	400	*Euxine* (paddle)	1,165	400
Pottinger (paddle)	1,350	450	*Vectis* (paddle)	785	260
Northam (screw)	1,330	400	Transport, Store, and Coal Ships.		
Ottowa (screw)	1,274	200	*Precursor*	1,817	—
Ganges (paddle)	1,190	470	*Fort William*	1,800	—
Singapore (paddle)	1,190	470	*Santa Ana*	1,500	—
Bombay (screw)	1,186	275	*Haddington*	1,460	—
Madras (screw)	1,185	275	*Zenobia*	900	—
Pekin (paddle)	1,182	400	*Ariadne*	900	—
Sultan (screw)	1,124	210	*Clara Symes*	900	—
Norna (screw)	969	230			
Malabar (screw)	916	200	Total,	84,326	18,381

Here we have a fleet of 84,326 tons, and a steam power of 18,381 horses, all in the hands of a single undertaking. The Paddle ship *Valetta*, which formerly had engines of 400 horse power, now does the same duty with 260 horse power, her steam being worked on the super-heating plan. The saving in coal is very large, and the importance of this at the present time, may be estimated from the fact, that owing to the rise in transport charges, the cost of coal supplied in the past six months was £62,100 more than in the previous six. The expenditure for coal, if the rise in freight continues, this year will be about £614,000, against £490,000 in 1858. The prosperous condition of the company is shown in the fact, that at the last meeting, a dividend of $3\frac{1}{2}$ per cent. was declared for the past half-year, with an additional half per cent. free of income tax.

The 6,000 ton war ship *General Admiral*, just completed at New York, for the Russian Government, is the largest wooden steamer afloat. She has cost about £264,000 exclusive of her complete armament; two Dahlgren shell guns only having been put aboard her at New York. The *General Admiral* will carry 90 guns. She has a pair of horizontal back-action engines; cylinders 84 inches in diameter, with 45 inches stroke of piston. The shaft has a diameter of 17 inches in the journals, and weighs about 27 tons. The propeller is wholly of brass, is two-bladed, and weighs 13 tons. The other brass work connected, such as chains, hoisting frame, &c., weighs 12 tons more. The whole length of the line of propeller shafting is 124 feet. The air pumps are worked direct from the pistons, and are arranged with rubber foot and delivery valves. There are six horizontal tubular boilers, with 38 furnaces, having in the aggregate 21,000 square feet of fire surface, and 700 feet of grate surface, and comprise not less than 15,960 brass tubes. The aggregate weight is 240 tons, and the water filling them weighs 300 tons more. All the boilers are connected by one telescope smoke-pipe, 11 feet in diameter. Besides, there are one donkey boiler for driving two donkey steam pipes and blowing the furnaces. There are also hose connections on every deck, for extinguishing fires; and Dr. Reed's ventilating apparatus, by which all parts of the ship timbers and cabins are effectually purified, is supplied with power from the same source. These engines are from the Novelty Iron Company's works in this city, and are believed to equal any marine machinery before made in America. The hull is from the eminent builder W. H. Webb. Its length over all is 325 feet, breadth of beam, 55 feet, depth of hold, 35 feet. On her trial trip, she was at one time worked up to 10 knots, with forty revolutions of her engines. The Americans appear to be reasonably proud of this fine steamer.

The first of the three great steam-ships, the *Paramata*, the *Shannon*, and the *Seine*, which the West India Royal Mail Company, are about adding to their fleet, has just been completed for active service, showing on her trial run an average rate of 14 knots an hour, with 17½ revolutions of her engines, a steam pressure of 17 lbs., and a vacuum of 26½ inches. The *Paramata* is to run on the trunk line of the company, from Southampton to the West Indies. She has accommodation for 274 first class, and a proportionate number of second class passengers. Her dimensions are:—Length of the main deck, 340 feet; ditto, load line, 330 feet; breadth, 43 feet 9 inches; ditto over paddles, 77 feet; depth of hold, from floor to spar deck, 33 feet 6 inches; horse-power of engines, 800; builders' tonnage, 3,092; registered tonnage, 2,186; displacement at launching line, 2,215 tons. The engines are Maudslay and Field's patent double cylinder, taken from the *Orinoco*, and fitted to the *Paramata*, with several improvements. She has four boilers of a combined weight of 220 tons. The paddle-wheels are 38 ft. 6 in. diameter over the floats; diameter to the centre of pressure, 34 feet 3½ inches. There are 24 furnaces, and the ship has stowage capacity for 1,500 tons of coals.

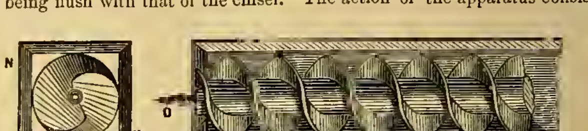
Manchester Association for the Prevention of Steam Boiler Explosions.—At the monthly meeting of the committee of management of this association, held on the 31st of May, Mr. H. W. Harman, the chief inspector, reported that he had under inspection 558 mills and other works, and 1563 boilers, being an increase since the 22d of April of 9 mills and other works, and 35 boilers; and had made 272 visits, and examined 738 boilers and 531 engines. Of these, 7 visits were "special," 9 boilers specially, 20 boilers internally, and 37 thoroughly examined. 90 diagrams had been taken from 50 cylinders. Of this number 4 cylinders and 7 diagrams have been "additional." The number of boilers found defective are as follows:—

From Corrosion, ...	20	2 Dangerous.
" Fracture, ...	11	2 "
" Safety-Valves Extra and Over-weighted, and otherwise out of Order and Faulty, ...	39	
" Pressure Gauges Incorrect and out of Order,	20	
" Water Gauges " " ...	31	
" Feed Apparatus " " ...	6	
" Blow-off Cocks " " ...	18	1 "
" Deficiency of Water, ...	1	
" Collapse of Flues, ...	3	
Total, ...	149	5

43 boilers are without "back-pressure valves;" 24 boilers are without "glass water gauges;" 4 boilers are without pressure gauges; 2 boilers are without safety valves; 10 boilers are without blow-off "cocks;" 2 fusible plugs in wrong places, and scaled over; 3 safety valve spindles "packed;" 3 safety valve spindles with stuffing boxes, but not "packed;" 1 safety valve with spindle well coated through guide with white lead; 2 safety valves with spindle fast through corrosion. Since the last report there have been three cases of collapse of "internal flues," one owing to the plates becoming over-heated from shortness of water, the attendant being deceived by his glass gauge, through the taps opening and shutting the wrong way, and from the circumstance of one of the handles becoming bent; the other, it is believed, from the plates getting covered with scale, and hence also getting over-heated, and coming down with the ordinary working pressure. In the third instance, a complete collapse of the flue (a single one) took place from the back of the brick bridge to the back end of the boiler, for about twenty-two feet in length, occasioned by simple over-pressure, added to the weak form of flue, presenting considerable flat surface. The collateral circumstances, however, were these:—The safety valve, it is believed, was screwed by "Salter's balance" to more than double the pressure the boiler was equal to, and the self-acting feed valve and gear wedged down so as to be no longer self-acting, and the lower tap of glass water gauge probably stopped up—under these circumstances the water would get low, the plates over-heated, and the gradual admission of steam of considerable pressure from an adjoining boiler, completed the managements for the mishap. Fortunately, in the above instances, no lives were lost, and not much injury done to property, but it might have been otherwise; and these circumstances, coupled with the numerous defects we constantly meet with, renders it doubly necessary that attention should be called to the importance of providing all steam boilers with the most approved and efficient mountings, and, when so provided, to the necessity of keeping them in proper working order. In former reports occasion has been taken to animadvert on the negligence of boiler attendants in not seeing that the steam, water, and other gauges, are kept free from dirt and other hinderances to a truthful indication of the purposes required. Frequently do we find water gauges with the passages partially stopped up, when a few minutes' attention would keep them clear, and with the holes in the taps bored the wrong way, so that the handle standing horizontally when open will fall down by the force of gravitation and close them, locking up, as it were, water in the glasses when there may be a deficiency in the boiler, and so deceiving where all might be secure; with steam gauges placed in wrong positions, with columns of water upon them as well as steam; with throw-off "cocks" insufficient in size; with the plugs fastened in by a single screw underneath, to contend with steam of the highest pressure, instead of securing them by methods adequate to the steam which they have to undergo, or by substituting other well-known forms of valves for properly effecting the same object. One of the sub-inspectors, as well as the man attending him, lately had a narrow escape from being scalded to death, by means of one of the plugs flying out when "blowing off," the steam pressure being 32 lbs. per square inch at the time. There is a prevalent practice of extra weighting safety valves by means of additional loose weights; and although no accident may follow when they are applied by a careful man, who has duly calculated on the consequences—yet, while one such case may be allowed for, a hundred are met with, who, regardless of all results, do not scruple to adopt the same plan without thinking at all. In every instance, therefore, where levers are used, there should be but one weight, and that fixed, and no surplus length of levers. If the load is to be increased, let it be done by authority, and after due consideration. The use of "spring balances" to safety valve levers where they may be screwed down and the resistance increased *ad libitum*, is very objectionable, as affording facilities for putting on and relieving pressure at the will and caprice of any of the men in charge—no inspection can guard against this danger. There have been many cases of this kind, and therefore it is advisable to use a fixed weight, which cannot be so readily tampered with. The explosions of boilers during the past month have been unusually numerous, showing how necessary it is to use every care. As amongst other remedies, "fusible plugs," of a variety of designs, are sometimes employed. We would guard those using them against allowing them to become coated with scale, as in that condition they will not act, and only create a false confidence. Some of them have been found with a head of metal left standing up above the surface of the box containing them: this should not be, as they serve as reservoirs to supply the place of the metal melted below, which should at once leave an aperture for escape and alarm.

American Wood Working Machinery.—Mechanical appliances for working in wood, have always been subjects for deep consideration amongst American engineers, and the United States are still far ahead of us, in all, or nearly all that relates to this section of our mechanical aids. Our engravings represent two ingenious American wood working contrivances, recently brought to this country. A hollow conical lathe centre for turning wood, and an auger and box chisel for boring square holes. The lathe centre is the very reverse of our solid conical point, as it is an internal cone in the end of the mandril, the base of the cone at the extreme end of the mandril, being a sharp edge, A; when this comes to be pressed hard up against the revolving wood, a hard centre is formed within the cone, by the compression of the wood, and thus the wood itself forms what is the metal centre in our lathes. This arrangement is well adapted for retaining the oil, and it continues uninjured for a very long time.

The square hole or mortise borer is a square box chisel, N, with a screw auger, O, working within it. The chisel forms a square socket of the same external dimensions as the required square mortise, having its four cutting sides chamfered inwards. The revolving screw auger in the interior, has an independent rotatory motion, its cutting edge being flush with that of the chisel. The action of the apparatus consists,



in forcing the square chisel against the wood, with a pressure sufficient to make an incision, and the auger drills out about seven-eighths of the required hole, whilst the chisel makes the round hole square, and its bevilled edges push the chips against the running auger, along the screw threads of which they are withdrawn. This combined action is very ingenious, but when we dissect it, we see that is excessively simple, for it is really nothing more than the boring of a hole, somewhat smaller than is required, and the simultaneous squaring off of the bore by a traversing chisel.

Radial Plate Fire-grates.—Mr. John Little, of Glasgow, has lately shown in efficient action, a novel arrangement of open fire-grate, having vertical radial plates attached to its front, as a means of obtaining a superior amount of effective and available heat, and improving the draught. The plates or metal surface pieces, may be attached edge on to the bars of the grates or fire-places in various ways. According to one arrangement, the plates are thin cast-iron pieces, or slips of metal of any heat or ornamental form, extending downwards from the level of, or above the top horizontal bar of the grate, to the lowest bar thereof, or beneath that level. They are set pretty close together, at regular intervals apart, being hooked, or otherwise attached by notches to the upper and lower bars of the grate. The front of the grate thus presents an arrangement of broad projecting pieces of metal, extending radially from the grate bars. These pieces of metal, absorb the heat from the burning fuel, and radiate it directly into the apartment to be warmed, thus enabling the grate or fire-place, to give off effectively a very much larger proportion of the heat arising from the burning fuel, than is obtained by the ordinary grates. These plates have also the effect of improving the draught of the fire-place, by causing a strong rush of cold air, to make up for the ascent of the heated air. Thin, flat, vertical radial pieces of metal are preferred to be used in carrying out this invention, but other forms and sections may be used. For instance, plates or pieces of a V or angular section may be adopted, the hollows or concavities being next the grate, and the central prominent edge or angle outwards.

The same arrangement, or modifications thereof, may be used in gas-stoves, or heating apparatus. It is also capable of adaptation to common stoves, and other heating apparatus. In the case of the ordinary cylindrical stoves, the cylinder is open all round, or partially so, being fitted with the vertical metal slips on the exterior. The arrangement is indeed applicable to most varieties of heating apparatus, the direct heat of the burning fuel being always exercised, or directed upon, the metal pieces employed for radiating the heat into the room. The same arrangement of radiating slips or pieces of metal, may also be applied, according to this invention, in the construction of radial ash pans, the pieces of metal being continued downwards, and at an angle so as to form the radial cover pieces of the ash-pan or otherwise.

Instead of fitting the radiating metal pieces in separate and distinct sections, they may be cast in a solid piece, either with, or separate from, the grate itself. The pieces, or radiating mass, may also be made of wrought iron.

Fig. 1. Fig. 2. Fig. 3.

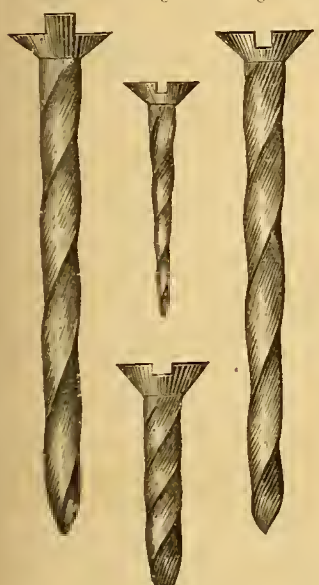


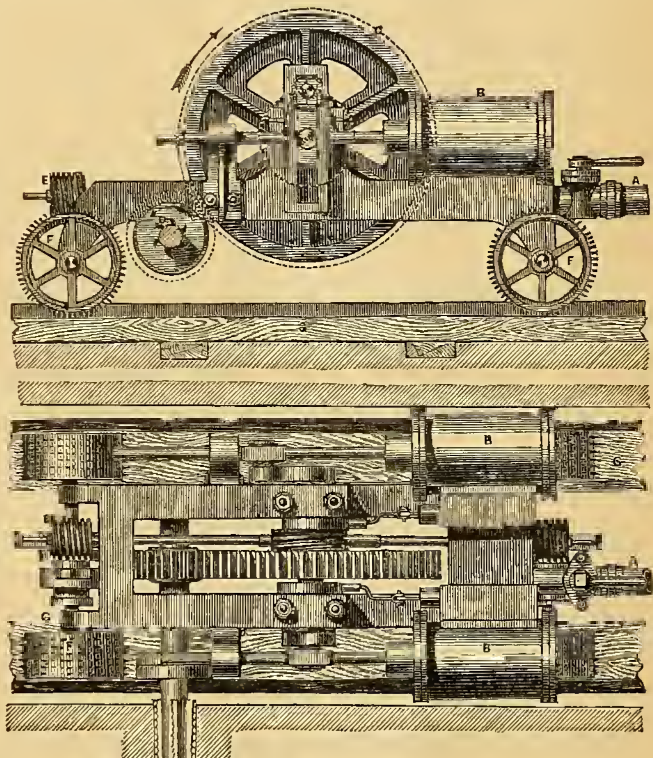
Fig. 4.

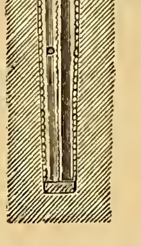
Twisted, or Spiral Fluted Driving Fastenings.—These driving articles or fastenings, the invention of Mr. Montagne Wigzell, of Friar's Green, Exeter, are a mean between the ordinary driving nail and screw. Our figs. 1, 2, 3, and 4, represent so many modifications of the fastenings, they are made of circular iron fluted, or with sharp edges. They can be driven in, and twisted out of wood, without the necessity of making any hole previously, and they will not split the wood. They prevent timber from starting, and can be used when made large, instead of bolts for railway sleepers, and similar purposes. Mr. Wigzell has also introduced nails of various sizes on the same principle. If they can be made sufficiently cheap, they must be very serviccable things.

Maclehose's Stereoscope.—A very efficient apparatus for exhibiting stereoscopic pictures, has lately been introduced by Mr. Robert Maclehose, of Ayr. It is in the form of a deep rectangular box, fitted at one end near the top, with the usual stereoscopic glasses. In the line of sight, and between the glasses, and the extreme back of the box or case, there is placed an open drum or roller, having four or other convenient number of sides. This cylinder, or open drum is arranged to work upon a horizontal spindle, to which, is attached a projecting handle for turning it by. Behind this drum or cylinder, and in the end of the case, there is a hinged door folding downwards, and fitted with a mirror for throwing light into the interior of the case. The pictures are disposed in the chain form, over the drum or roller, and so arranged that one end of the chain can fall down into the bottom of the case at the front, and the other at the back portion of the case. With this arrangement, as the drum is turned, the pictures are successively drawn up from the back section of the bottom of the case, passed over the faces of the drum, on the vertical side of which, for the time being, they are successively displayed, and then passed down in a zig-zag or regularly folded pile, in the bottom of the front portion of the case. The open form of picture drum, with the door behind, admits of transparences being viewed in this apparatus. The pictures are removeable by bottom doors at the back and front. Provision is also made for two parties to see pictures at once, by means of a set of stereoscopic glasses, fitted with folding tubes or sight channels, which separate glasses can be contained in the case, and set, when required, on the top of the back part of the case, to look in the reverse direction of the fixed glasses. The sight is in this instance directed upon a mirror inside a top horizontal folding door, which is set at such an angle, as to receive the image from the pictures, upon the drum beneath it. There is also another top horizontal folding door, near the front, fitted with an inside mirror, for improving the effect of the light; side doors are also fitted for taking in lateral light if required. After a picture has been seen and passed on, it can at once be brought back if necessary, and any picture seen by one viewer, can be passed on to be seen by the other.

Kilmarnock Farmers' Club Show.—This show was a very good one in all classes, the implements in particular being numerous and good. Messrs. Young of Ayr, exhibited a very ingenious turnip and mangold-wurzel sowing machine, a straw cutter, bruiser, and single cheese press; Messrs. James Donald & Co., Kilmarnock, exhibited a very good chaff cutter, belonging to Mr. Turner, and manufactured by Richmond & Chandler, Salford, Manchester, for whom Messrs. D. & Co. are agents; Mr. James Bicket, Kilmarnock, had a very handsome and useful looking boyne for the manufacture of Cheddar cheese, and also a curd cutter, and other milk vessels. The Kilmarnock Holm Foundry had a very good double cheese press, and a good straw cutter and oat bruiser; Mr. Wallace, Fenwick, had two turnip and mangold-wurzel sowing machines, one on a new principle likely to come very much into use. Mr. M'Kerrow, Beansburn, one of the society's members, had a large show of very useful improvements, consisting partly of single ploughs, one with a very simple way of altering depth and breadth, double ploughs for one and two horses, grubbers of all sizes, saddle harrows, sack-holders, and turnip sowers.

Compressed Air Coal Hewing Machine.—The cutting or hewing of coals by mechanical means has often been schemed at, but unless the machine which we are now about to describe, proves, in the long run, to be more successful than its predecessors, manual labour has still the advantage. The machine, of which we have given a side elevation and plan in our annexed engravings, is by Messrs. Johnson & Dixon, of Newcastle. A is the flexible tube supplying the compressed air from the air pumps to the two air cylinders, B. C is a toothed wheel on the main shaft for getting up the required speed of the cutter. D is the revolving cutter, projecting horizontally from the side of the machine; the teeth are of cast-iron chilled, and can be replaced when worn. The machine is advanced by means of the endless screws, E, worked from the main shaft and gearing into worm wheels fixed on the axles of the travelling wheels, F, giving a progressive forward motion along the wooden railway, G, laid down for the machine to travel upon. The machine is also provided with bearing wheels, for moving it about from place to place, the travelling wheels, F, being then





removed. The cutter, D, is made to revolve at the rate of 500 revolutions per minute, by means of the toothed wheel, C; and the machine travels forwards at the rate of 1 yard in six minutes, cutting the coal consequently at that rate; and the length of the cutter being 3 feet, and its diameter about 5 inches, it thus makes an excavation of 1 square yard and 5 inches deep in six minutes. In applying the machine, the cutter drills into the face of the coal the whole of its length, or 3 feet, and as near the thill or bottom of the seam as may be convenient; when the cutter is revolving rapidly, the self-acting feed motion is thrown into gear with the travelling wheels, F, by means of a clutch; and the machine then travels forwards, leaving behind it a groove extending 3 feet into the solid coal, and about 5 inches in height. The block of coal thus undermined is then either wedged up to prevent it falling until required to be taken down, or is brought down easily by inserting a wedge above.

This machine has been constructed and applied at Broomhill colliery, Northumberland, by permission of the owners, who granted the necessary facilities for proving its qualifications to such an extent, as to show that it was capable of performing all that was expected of it. The machine is constructed with the two cylinders, B, of 8 inches diameter each, and 12 inches stroke; the revolving cutter, D, is 3 feet long, the diameter to the tips of the teeth or cutters tapering from 5 inches to 4 inches at the extremity; it is grooved lengthways to receive the cutters, which slide into it and fit, the grooves being dovetailed. The size of the machine is 6 feet length, 3 feet breadth, and 3 feet height clear. It is worked by compressed air, supplied by an air pump situated above ground or in any other convenient place; the air is conveyed to the machine by 4 inch metal pipes, terminated with about 30 feet of stout flexible India rubber hose pipe of the same diameter, which allows the machine to travel over a certain space of ground without stoppage. The air pump consists of two cylinders, 2 feet 6 inches diameter, and 3 feet stroke, making 30 revolutions per minute, and maintaining a pressure when the machine is working of from 30 to 40 lbs. per square inch above the atmosphere. The air pump was worked by a steam engine above ground at Broomhill colliery, pipes being carried down the pit to the machine; the engine was of 10 horse power, which is ample for one coal cutting machine. A large iron boiler was used as an air reservoir connected to the air pump, for keeping up a steady supply of air, and was fitted with a safety valve showing the pressure; a pressure gauge was also fixed down the pit near to where the machine was working; and it was found in practice that no loss of pressure took place between the air-pump on the surface and the machine underground, the length of pipes between them being about 500 feet. The most efficient mode of applying this machine is to have the colliery laid out on what is called the "long wall" system of mining. The machine would then travel along the face of the wall, making a cut at the bottom into the solid coal along the entire length of the face. In the first opening of a mine in every case it will be necessary to have the space along which the machine is to travel excavated by manual labour, hence the advantage of its application to the long wall system, and the disadvantage of its application to the pillar and stall mode of working.. At Broomhill colliery the latter mode was in operation, and the inventors have not been able to have the machine applied to the long wall system. The experiments made with it show, that so far as the cutting of the coal extended, it answered thoroughly the purpose intended. It is therefore of some importance to have the machine fully tried in all its bearings on the long wall system.

In reference to the cost of working the coal cutting machine, some collieries might probably have as many as 6 or 8 machines at work, whilst smaller collieries might require but two. Taking the case of two machines being employed, the entire cost of two machines, including a 20 horse power steam engine with air pipes, &c., complete for working, may be estimated at about £1750. Then, supposing each machine to work only 7 hours per day of 10 hours, leaving 3 hours for stoppages, the double shift, or night and day work, will give 28 hours per day for the two machines; and since each machine will cut the coal at the rate of 1 square yard in six minutes, the two machines will cut 280 square yards per day, or 80,360 square yards in a year of 287 working days. Taking the seam of coal to average 4½ feet thick, and 1 cubic yard weighing 1 ton, the coal cut by two machines in a year will be 120,540 tons. The cost of working for the year, including attendance on the machines and engines, coals for the engine, and repairs, would be about £1580, or a little more than 3d. per ton of coal worked. Saving of coal is another advantage expected to be gained by the use of the coal cutting machine; for whilst by manual labour 14 or 15 inches height has to be carved out to bring the coal down, by using the machine only about 5 inches height is converted into small coals; and in the latter case the coal is also brought down in better condition, less shaken, and in larger blocks. It is expected, in consequence, that there will be a saving of solid coal of 6 inches thickness in the height of the seam, which, at 2s. per ton, the difference between the value of small and round coals, would amount to upwards of £1300, and upon 120,540 tons would be nearly 2¾d. per ton.

Glasgow Agricultural Society's Summer Show.—This show which took place during the past month, proved that the Society is in a high and rapidly advancing state of prosperity, the live stock in all sections was first-rate, a new feature being introduced in the shape of a class for hunters, of which there were 28 entries, most of them being remarkably fine animals. In farm implements there were 215 separate articles shown. The following is a list of the prize specimens, with their respective successful owners:—

Two-horse plough for general purposes.—John Gray & Co., Uddingston, Glasgow.
Double mould-board plough for forming drills.—Robert Law, Shettleston, Glasgow.
Two-horse grubber or cultivator.—Robert Law, Shettleston, Glasgow.
Drill grubber for green crops.—John Gray & Co.
Norwegian harrow.—John Gray & Co.
Consolidating land roller.—Alex. Jack & Son, agricultural implement makers, Maybole.
Harrows for heavy land.—E. H. Bentall, Heybridge, near Maldon, Essex.
Harrows for light land.—E. H. Bentall.
Common swing trees or draught bars.—Wm. Gray, Cambusnethan, Wishaw.
Equalising swing trees or draught bars.—Wm. Gray.
Broad-cast sowing machine for grain and grass.—George Finlayson & Co., Gighty Burn Machine Works, Arbroath.
Sowing machine for turnips.—Alex. Jack & Son.
One-row sowing machine for beans.—James Suttie, Inchture, Perth.
Straw cutter for hand labour.—Richmond & Chandler, Salford, Manchester.
Grain crusher, attachable to thrashing power.—John Gray & Co., and a special Silver Medal awarded as extra stock.—Picksley, Sims & Co.
Machine for digging potatoes.—Robert Law.
Machine for pulping turnips.—E. H. Bentall.
Feeding troughs for pigs.—Adam Jack, 3 West Nile Street, Glasgow.
Feeding troughs for sheep.—Thomas Perry & Son, 9 Renfield Street, Glasgow.
One-horse farm cart, without paint.—Robert Law.
Light spring cart, without paint.—Robert Law.
Harvest cart, without paint.—Robert Law.
Horse, stubble, or hay rake.—Richmond & Chandler.
Scythe for general purposes.—James Payne, Ironmonger, Kirkcudbright.
Dressing Fanners.—Robert Law.
Weighing machine for indicating measures and weights.—Heriot & Co, 115 Græme Street, Glasgow.
Churn worked by hand.—Alex. Jack & Son.
Churn worked by power.—David Cassels, Newton Mearns.
Cheese press.—J. & T. Young, Vulcan Foundry, Ayr.
Curd cutter, for dairy purposes.—William Wallace & Son, Cross Road, Kilmaurs.
Field gate, constructed entirely of malleable iron.—Thomas Perry & Son, 9 Renfield Street, Glasgow.
Iron hurdles for cattle fence.—Thomas Perry & Son—commended.
Iron netting for sheep fence.—Thomas Perry & Son.
Traverse divisions, rack and manger for farm stable.—Adam Jack.
Tiles and pipes for field drainage.—John Robson, Hurlford Fireclay Depot, 27 Cook Street, Glasgow.
Glazed socketed pipes for sewerage.—Patrick B. Mure Macredie, of Perceton, Irvine.
General set of hand implements for the farm.—William Miller, blacksmith, Roughazie, near Shettleston.

Extra.

Williamson Brothers, Canal Iron Works, Kendal—Three horse-power fixed steam engine—highly commended; four horse-power combined thrashing, shaking, and winnowing machine—commended; model of patent vortex turbine—an improved water wheel—Silver Medal.
William Wallace & Son, Crossroads, Kilmaurs—Turn-reist plough—commended.
Adam Jack, 3 West Nile Street, Glasgow—Cattle trough—commended.
Thomas Perry & Son, 9 Renfield Street, Glasgow—Corn rick stand, 12 feet diameter—commended; portable boiler and steaming apparatus, "Mason's patent"—commended.
Patrick B. Mure Macredie, of Perceton, Irvine.—Vases and other fireclay articles—commended.
Alexander Jack & Son, agricultural implement makers, Maybole—Set saddle-shaped zig-zag harrow for potato drills—commended.

It is now very noticeable with what eagerness farmers look into new mechanical appliances for agricultural purposes; and on this particular occasion, very great attention went in this direction. It is of course, in this way only, that mechanical men can look for inducements to work out those artificial aids which the tillers of the soil must want more and more each year.

Subsequent to the show a trial of the mowers took place in Mr. Menzies' farm, at Balernock. After a spirited contest the judges unanimously awarded the silver medal to Wood's patent machine, exhibited by Messrs. Thomas Perry & Son, of Glasgow. The judges also awarded a bronze medal to Messrs. Gardner & Lindsay, of Stirling, for their machine, which also performed its work in a very satisfactory manner.

Lawn Mowing Machines.—Messrs. A. Shanks & Son, the machinists of Arbroath, well-known as amongst the foremost makers, as well of lawn mowers, as of other ingenious implements, have recently introduced a new form of lawn mower, embodying some very important improvements. In it, the two driving rollers are loose on the shaft, and in the centre or nave of each roller, is cast or fixed a clutch or engager, which works into a clutch in the shaft, on which the two rollers revolve. These clutches are loose, and are prevented from turning round by means of a sunk key in each; between each clutch and in the centre is placed a spiral spring, composed of iron or steel wire, which is meant to keep the clutches always in gear, and at the same time, to allow the machine to turn easily, in consequence of the rollers being loose. This spiral spring may be placed at each end of the shaft instead of the centre as may be required. The spring may also be made spirally or otherwise. The spiral spring answers in place of the levers, and it is this spring which is the important feature of this part of the invention. The gear for shifting the machine to the required cut, consists of a bracket fitted to each side of the machine, a little in front of the cutter. A socket is cast on the bracket in each case, into which a spindle is fitted, having a forked end to contain a small pulley, and it is on these pulleys that the fore part of the machine rests. A toothed rack is fixed or cast in the bracket, into which a pinion is made to work. There is a pinion on each end of a shaft, stretching across the machine, in one end of which is placed a handle, so that by turning the shaft by the handle, the bracket is made to move upwards or downwards as may be required, in order to get the required length of cut. The mode of raising both brackets at one time, in order to insure perfect uniformity in the length of the cut by means of the shaft, with a pinion on each end to work into the toothed rack fixed or cast on the bracket, is the important feature in this arrangement. In the ordinary mowers the method of emptying the grass box is defective, in so far as it is necessary to stop the machine from working, and empty the box by means of the hand, or by two false ends placed in the box. This imperfection is remedied by the present invention, which consists under the third head, of an apparatus which will empty the box without the necessity of stopping the machine or leaving the handles for this purpose. The apparatus consists of a rod or lever, which is made to turn backwards or forwards on a pivot or other joint fixed on the back rail, or other part of the machine. One end of the rod is fixed by means of two or more joints, or otherwise, to a false end in the grass box of the machine. The other end is lengthened, till it reaches the stilts or shafts of the machine, and this end is made into a handle for the man working the machine to take hold of, so that by a simple throw of the handle from one side to the other, the grass is thrown out of the box by means of the travelling end.

Photographic Improvements.—The Committee appointed some time ago by the French Photographic Society, to award the prizes offered by the Duc de Luynes, have just published their decision. Of the 4,000 francs offered, 2,000 are to be withheld until July 1861, the other portion has been thus awarded:—A Gold Medal, of the value of 600 francs to M. Poitevin. A Silver Medal, of the value of 400 francs, to MM. Garnier and Salmon. A Silver Medal of the valne of 400 francs, to Mr. Pouncy. A Gold Medal, of the value of 600 francs, to MM. Davanne and Girard. As it may be interesting to know who were the actual competitors on this occasion, we may add, that the unsuccessful caodidates were M. Jobard, of Dijon, MM. Rousseau and Mussoo, M. Chambard, M. Homolatsch, of Vienna, Mr. J. Walsh, of London, M. Blanquart-Evrard, of Lille. M. J. Schaeffer, of Frankfort, M. Violio, M. Gaume. The prize awarded to MM. Devanne and Girard is for their valuable investigations in the Chemistry of Positive Printing, and the causes of fading of prints. Mr. Pouncy, the third on the list, is onr own countryman, the well known photographer and improver of carbon printing, of Dorchester.

Harbour Crane at Belfast.—Messrs. John Rowan & Sons, of York Street Foondry, Belfast, have just finished a very fine crane for the Prince's Dock, to lift 50 tons. It weighs itself a hundred tons, and is set on a foundation of masoory five feet thick, erected on piles of wood driven far into the substratum. On the top of the stonework four lines of rails are laid, each a huodred feet long. These form a double railway, at right angles with the line of the dock. On this railway the carriage of the train travels on sixteeo solid plate wheels of great strength. A provision is thus made for locomotion, the utility of which will be at once apparent, whether considered in regard to the shipping or discharging of goods. The carriage of the train is a very massive piece of work. In length, it is sixty feet, twenty-two feet wide, having longitudinal beams, and twelve crossbeams, all of pitch pine, framed, bolted together, and stayed by braces and diagoonals of malleable iron. At the end farthest from the dock is the hoisting apparatus, which consists of two distinct barrels — cast iron — 3 feet 6 inches, with a spiral groove round the surface of each to receive the chain as it is wound up. Each barrel has its independent train of wheels, so that either one or both may be used—the lifting power being the same, bnt the speed doubled, in the latter instance. The rates of the gearing, we nnderstand, are 230 to 1, or, taking the effects of the blocks into account, 920 to 1. The jibs are of malleable iron, 55 feet long, 30 ioches in diameter in the centre, and tapering down with a gradual curve to 20 inches diameter at the ends, which are inserted ioto cast-iron sockets. These jibs are, perhaps, the most remarkable portion of the entire machine. They look as if they were tnrned in a lathe, but they are of half-inch boiler plate, the joints being put together so that no rivets can be seen. The working trains of the crane were furnished by Mr. George Smith, the resident harbour engineer.

Alger's Elliptical Section Blast Furnace. — It is now sometime since practical iron makers were disturbed by the announcement that a new form of iron smelting furnace, calculated to sobvert in a great measure the established order of things here, had been introduced from America. In this particular instance the change proved to be of real importaoce, and Mr. Alger's furnace has oaturally gained the good opinions of our iron makers. Hitherto, smelting furnaces have always been made of square, polygonal, or cyliodrical sections, and as it is necessary that the air blast should penetrate the whole charge eqnally, the diameter of the furnaces has been restricted to about six feet; and even with that size, a very powerful blast has been found to be necessary. Mr. Alger, however, treats this difficulty by adopting the very simple plan of an elliptical cross section, so that whilst he secures all the economy and increased yield dne to a large furnace, he also works with perfect efficiency by restricting the mass operated npon, to the limits which practice has shown to be right. This is clear enoogh when we look carefully at the figure of the ellipse in connection with the subject. With the elliptical form, the furnace may obviously be of large size, whilst the blast will clearly operate npon the charge just as well as in ooe of smaller capacity. The change from the old form to the new one, is so simple, and withal so valuable io its results, that the iron trade must profit by it to a large extent. The patent is beiog worked out by a company whose offices are at 41 Parliament Street, Westminster.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When the city or town is not mentioned, London is to be understood.

Recorded February 21.

474. Peter Spence, Pendleton, Lancashire—Improvements in the manufactnre of alum, and in the mode of, and apparatus for, condensing or destroyiog gases arising therefrom.

Recorded March 11.

626. Robert Hellard, Taunton, Somerset—Improvements in reaping and mowing machines.

Recorded March 18.

658. Robert Clegg, Islington, and Richard Fell, St. Ann's Place, Limehonse—Improved apparatus for obtaining aerated fresh water from salt water.

Recorded March 22.

730. Thomas Manlove, Radford Grove, and William Hodgkinson, New Lenton, Nottinghamshire—A new method of mannfacturing plain, figured, striped, and plaited textile fabrics in imitation of loom-made fabrics.

Recorded March 31.

808. David B. White, Newcastle-npon-Tyne, Northnmberlandshire—Ao improved indicating gauge lead or plummet.

Recorded April 5.

852. Frederick C. Bakewell, 6 Haverstock Terrace, Hampstead—Improvements in open fire-places.—(Communication from Calvin Dodge, Pittsbnrg, North America.)

Recorded April 15.

946. Germain Abeillou, Toulouse, France—An extensible arching plane.

Recorded April 23.

1012. Henry Keach and George H. Farrington, Bush Lane—Improved advertising circulars.
1068. Nicolas Libotte, 33 Boulevard St. Martin, Paris—A steam brake for mines, which may also be worked by hand.

Recorded April 30.

1082. William Winstanley and Joseph Kelly, Liverpool—Improvemeota in pumps, and gearing and appliances for working the same.
1087. William Clark, 53 Chancery Laue—Improvements in ventilating or supplying air to diving bells aud divers, and in holding communication therewith from above.—(Communication from François A. Laurent, Paris.)
1088. Archibald M'Kechnie, Carron, Stirlingshire—Improvements in hammers and in apparatus for working the same.
1089. Joseph Bull, Port Street, Manchester—Improvements in apparatus used for securing bales of cotton and other substances.
1090. Charles H. G. Williams, 39 Regent Square, Gray's Inn Road—Improvements in the manufacture of colouriug matters, and in applying the same for dyeing and printing fabrics and materials.
1091. Joseph Souquiere, 29 Boulevart, St. Martin, Paris—A new or improved process for distilling coal.

Recorded May 2.

1092. Thomas H. Arrowsmith, Bolton, Lancashire—Improvements in carding engines.
1093. Ange Jumelais, Paris—An apparatus yielding illimited power, "so-called French movement."
1094. James Ferguson, Kilmarnock, Ayrshire, and James M'Gaveny, Glasgow—Improvements iu fasteners for shutters and for similar uses.
1095. William Bayliss, Monmore Green, Wolverhampton, Staffordshire—Improvemeuts in the manufacture of iron hurdles and fencing.
1096. Richard A. Brooman, 166 Fleet Street—Improvements in, and in connection with, electro-magnetic engines.—(Communication from Alexandre P. M. Darlu, Paris.)
1097. John Bassford, Brick Yard, Oundle, Northampton—An improvement in the apparatus used when expressing clay or brick earth through dies.
1098. James Childs, Windsor House, Putney, Surrey—Improvements in the manufacture of night light cases.
1099. William Gossage, Widnes, Lancashire—Improvements in the manufacture and useful application of certain alkaline silicates, and in the production of liquor silicis, or liquid flint.
1100. Daniel Moore, Brooklyn, New York, U. S.—Improvements in machinery for rubbing or dressing types.
1101. William Gossage, Widnes, Lancashire—Improvements in the manufacture of caustic soda and carbonate of soda, from certain alkaline liquors and salts.
1102. Charles Nuttall, Rochdale, Lancashire—Improvements in machinery or apparatus for grinding wire cards.
1103. Frederick W. Emerson, 110 Fenchurch Street—Improvements in treating ores to obtain a new metallic substance and its salts, and in the application of such matters, and also certain products of tungsten in dyeing, printing, and painting.

Recorded May 3.

1104. Abraham G. Franklin, 14 South Street, Finsbury—Improvements in the manufacture of crayons.—(Communication from M. Gotteliel W. Sussener, Nuremberg, Bavaria.)
1105. William Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in the manufacture or production of mineral oil and grease.—(Communication from François Schutze, Hemisem, near Anvers, Belgium.)
1106. Thomas W. Miller, Her Majesty's Dockyard, Portsea, Southampton—Improvements in apparatus for and mode of generating steam and economising fuel.
1107. William Clark, 53 Chancery Lane—Improvements in obtaining or extracting quinine and the principal organic alkalies.—(Communication from Lalonel de Sonrdeval, 22 Rue Bergere, Paris.)
1108. William Sellers, Philadelphia, Pennsylvania, U. S.—Improvements in couplings for shafting.—(Communication from Coleman Sellers, Philadelphia.)
1109. William Sellers, Philadelphia, Pennsylvania, U. S.—Improved machinery for making screw bolts and nuts.
1110. Jedediah Morse, Massachusetts, U. S.—An improved power printing press.
1111. Lyman R. Blake, Massachusetts, U. S.—A new and usefnl or improved machine for sewing a sole on a boot or shoe.
1112. Henry Chapman, Battlebarrow, Appleby, Westmorelandshire—An improved military camp cooking apparatus.
1113. Henry Chapman, Battlebarrow, Appleby, Westmorelandshire—Improvements in the construction of kettles.
1114. Edward W. Scale, Merthyr Tydvil, Glamorganshire—Improvements in railway signals.
1115. Robert Mushet, Coleford, Gloucestershire—An improvement in the manufacture of cast steel.

Recorded May 4.

1116. William H. Kingston, A.B., Trinity College, Dublin—Improved means of communication between the passengers and guards, and guards and engine drivers of railway trains.
1117. Charles F. Vasserot, 45 Essex Steeet, Strand—An improved form of tuyere for blast furnaces.—(Communication from François C. Bierlein, Lingolshein, Bas Rhin, France.)
1118. Joseph Adolphus, 1 Serle Street—An improvement in locks, bolts, and latches.
1119. William E. Newton, 66 Chancery Lane—Improvements in steam boilers.—(Communication from Samuel Pierce, Troy, New York, U. S.)
1120. Jacob G. Willans, 2 Clarenco Place, Belfast—Improvements in utilising bog stuff or peat, when applied for treating metals and certain mineral and alkaline substances.
1121. John C. Wilson, 1 Langley Place, Victoria Park, Manchester—Improvements in machinery for cleaning cotton.

Recorded May 5.

1122. Henry Tnrner, Park Street, Mile End—Improvements in steam-engines and apparatus connected therewith.
1123. Joseph F. Allender and Daniel Rowley, Brierley Hill, Staffordshire—Improvements in shears for cutting boiler plates and sheets, and for other like purposes.

1124. John Scholfield and William Cudworth, Milnrow, near Rochdale, Lancashire—Certain improvements in machinery or apparatus for spinning cotton and other fibrous materials.
1125. Henry Chapman, Battlebarrow, Appelby, Westmorelandshire—Improved means or appliances for protecting ships against injury from shots, shells, or other warlike projectiles.
1126. Henry Chapman, Battlebarrow, Appelby, Westmorelandshire—Improvements in the construction of fortifications.
1127. William F. Batho and Eugene M. Baner, Salford, near Manchester—Improvements in drills for recessing, cutting slots, keyways, and cotter holes.
1128. Edward T. Hughes, 123 Chancery Lane—Improvements in the manufactnre of sheet iron.—(Communication from David A. Morris, Pittsburg, Pennsylvania, U. S.)
1129. William Clark, 53 Chancery Lane—Improvements in seed depositors or drills.—(Communication from Louis A. Pruneau, Paris.)
1130. Andrew Knox, 2 Victoria Cottages, Hertford Road, Kingsland—Improvements in gas regulators.
1131. Henry Reynolds, Denmark Hill, Surrey—Improvements in refining sugar and other saccharine substances.
1132. Richard A. Brooman, 166 Fleet Street—Improvements in cannon and other fire-arms, and in projectiles, wads, and cartridges to be used therewith.—(Communication from John W. Cochran, New York.)
1133. Henry Fletcher, 42 Southampton Buildings, Chancery Lane—A machine for scutching and carding tow, oakum, or waste cordage.—(Communication from Frederick Maigron, La Cabucelie, St. Louis Ward, near Marseilles, France.)
1134. William E Newton, 66 Chancery Lane—An improved steam gauge.—(Communication from Anthoine E. Dupas, New Orleans, U. S.)
1135. William E. Newton, 66 Chancery Lane—Certain improvements in fish-hooks.—(Communication from Theodore F. Weil, New Orleans, U. S.)
1136. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in piano-fortes.—(Communication from George Vogt, Philadelphia, Pennsylvania, U. S.)

Recorded May 6.

1137. William Kellingley, 13 Mason Street, New Cross, Surrey—Improvements in the mode of lubricating the journals of the axles of locomotive enginea of carriages and machinery.
1138. Frederick Angerstein, Esq., Kennington, Surrey, Robert Clegg, Islington, and George Thorrington, Egham, Surrey—Improvements in apparatus for obtaining motive power.
1139. Frederick W. Hart, Horncastle, Lincolnshire—Improvements in photographic apparatus.
1140. Samuel Wright, Sudbury, Suffolkshire—An improved gas burner or regulator.
1141. James Dixon, the yonnger, Blackburn, Lancashire—Improvements in machinery or apparatus for staining paper.
1142. Thomas Jones, Liverpool—An improved apparatus and arrangement of flues for heating and ventilating buildings, ships, and other structures, and for causing draught in chimneys.
1143. William S Booth, Birmingham—A new or improved washing machine.
1144. John Frearson, Birmingham—New or improved fastenings for wearing apparel, and for such other purposes as the same are or may be applicable to.
1145. George T Bousfield, Loughborough Park, Brixton, Surrey—Improvementa iu apparatus for grinding grain and other substances.—(Communication from Pierre E. Brisson, Orleana, France.)

Recorded May 7.

1146. Julien Combe, 23 Rne du Champ de Mars, Paris—An improved plantoforme or apparatua for measuring the hoofs of horses for the purpose of forming their shoes.
1147. Joseph Bray, Staley Bridge, Cheshire, and James W. Harrison, Staley Bridge, Lancashire—Improvements in machinery or apparatus for spinning fibrous materials.
1148. Adam C. Bamlett, Middleton Tyas, Yorkshire—Improvements in reaping machines, part of which improvements is applicable to other agricultural implements.
1149. Michael Henry, 84 Fleet Street—Improvements in the manufacture and construction of locks and fastenings.—(Communication from J. N. Rebour, Paris.)
1150. Robert Mushet, Coleford, Gloucestershire—Improvements in puddling iron and steel.
1151. Robert Mushet, Coleford, Gloucestershire—Improvementa in the manufacture of iron.
1152. Charles Frost, Sun Tavern Fields, St. George's-in-the-East—Improvements in the construction of electric telegraph cables.
1153. Richard Pearsall, Smethwick, Staffordshire—Improvements in the manufacture of glass shades.
1154. William E. Gedge, 4 Wellington Street South, Strand—Improvements in the manufacture of steel.—(Communication from Claude J. Perinel, Fourvoiry, France.)
1155. Richard D. Kay, Accrington, Lancashire—Improvements in the preparation of certain colouring matters.—(Communication from Dollfus Mieg and Cie, Mullhouse, France.)
1156. Walter Jeffery, Eastegate Street, Gloucestershire—Rendering more convenient out-door manipulations on photography by means of an improved portable photographic tent and tent camera.

Recorded May 9.

1157. John Ramsbottom, Crawshaw Booth, near Rawtenstall, Lancashire—Certain improvements in machinery for printing fabrics.
1158. Joze Luis, 1B Welbeck Street, Cavendish Square—A self-regulating horse machine.—(Communication from P. Isaac Garin, 10 Rue Magodar, Paris.)
1159. Clement A. H. Marcoux, 71 Rue de Ruisseau, Montmartre, near Paris—A new impelling mover by the pressure of water.
1160. Frederick V. Hadlow, 8 Prince Albert Street, Brighton, Sussex—An improved stamp for marking linen and other wearing apparel.
1161. George G. Bussey, Dunn's Passage Factory, 485 New Oxford Street—An improved contrivance for carrying cartridges and to facilitate using them.
1162. Alfred V. Newton, 66 Chancery Lane—An improved construction of lamp.—(Communication from William H. Racey, St. Augustine, St. John's, Florida, U. S.)
1163. Alexander Morton, Morton Place, Kilmarnock, Ayrshire—Improvements in means or apparatus employed in the weaving of figured fabrics.
1164. Edward T. Hughes, 123 Chancery Lane—Improvements iu obtaining motive power.—(Communication from Aime F. Lapenc, Paris.)
1165. Thomas Green, jun., Old Broad Street—Improvements in apparatus applicable to steam boilers, to obtain greater security against explosion.
1166. Nicholson Barker, Heyford, and James A. Carter, Blisworth, Northampton—Improvements in apparatus for lubricating the pistons of steam engines.

Recorded May 10.

1167. William F. Nuthall, North Lodge, Kilburn—Improvements in ordnance and fire-arms, and in projectiles to be used therewith.
1168. Robert J. Lees, Woolley Bridge, near Hadfield, Derbyshire—Improvements in steam generators or boilers.
1169. William Wilkinson and Charles Whitley, Manchester—Improvements in buttons and fastenings for garments, harness, and other similar purposes, and in the method of securing the same.
1170. Moss Defries, Houndsditch—Improved apparatus for regulating the pressure of gas.
1171. John Norman, Glasgow—Improvements in furnaces.
1172. Robert Thomson, Glasgow—Improvements in shuttles.
1173. George Bell, Wandsworth, Surrey—Improvements in matches or fusees.
1174. Michael Henry, 84 Fleet Street—Improvements in heating and in supplying air, and in the apparatus employed therein, part of which improvements is also applicable to exhausting fluids.—(Communication from Louis C. Burean, Paris.)
1175. Wedderspoon Keiller, Perth, Perthshire—Improvements in cartridges for guns or small fire-arms.
1176. William O. Bourne, New York, U. S.—Improvements in the means of and apparatus for separating metals, ores, and other substances of different specific gravities.
1177. John Absterdam, New York, U. S.—Improvements in impregnating illuminating gas with hydron-carbon vapour.

Recorded May 11.

1178. Alexandre Manbre, 10 Rathbone Place, Oxford Street—An improved method of extracting and purifying sugar, called glucose and "sirop de fecule," from potatoes or fecula, or starch or dextrine for the purposes and uses of brewers, distillers, vinegar makers, colouring makers, or otherwise.
1179. Alexandre Manbre, 10 Rathbone Place, Oxford Street—The manufacturing of a colouring matter for colouring spirits, beers, vinegar, and other liquids, from sugar produced from rice, maize, carrots, maple, ananas, pompions, chesnuts, mangel-wurtzell, sorgho, turnips, and Jerusalem artichoke.
1180. Thomas P. Bennett, Gilnow Mills, near Bolton-le-Moors, Lancashire—Certain improvements in or applicable to carding engines.
1181. Joze Luiz, 1B Welbech Street, Cavendish Square—An improved burling and napping machine.—(Communication from J. B. Duval, 10 Rue Magador, Paris.)
1182. Henry Clarke, Wakefield, Yorkshire—Improvements in balancing mill-stones to the running as well as to the standing state.—(Communication from Thomas Narburgh, St. Louis, Missouri, North America.)
1183. Michael Henry, 84 Fleet Street—A mode of protecting the mariner's compass against local attraction.—(Communication from Samuel C. Bishop, New York, U. S.)
1184. Charles F. Vasserot, 45 Essex Street, Strand—An improved musrol or nose-band for horses' bridles.—(Communication from Louis Marque, Vienne, Isere, France.)
1185. William Spence, 50 Chancery Lane—Improvements in knapsacks and other military equipments.—(Communication from John Rider, New York, U. S.)
1186. Walter Salter, jun., Lea, Wiltshire—Improvements in hay-making machines.
1187. James Leadbetter, Leeds, and James Rhodes, Armley, near Leeds, Yorkshire—Improvements in pumps.
1188. James B. Lyall, Castle Frome, Herefordshire, and Frederick W. Campin, Strand—Improvements in the "saloon" omnibus and other omnibuses, the wheels and springs whereof, and mode of attaching them, being applicable to other carriages.

Recorded May 12.

1189. Daniel Foxwell, Manchester—Improvements in sewing machines, and apparatus connected therewith.
1190. John Saxby, Brighton, Sussex—Improvements in the mode of securing the rails on railways.
1191. Richard A. Brooman, 166 Fleet Street—Improvements in machinery for solidifying, pressing, and moulding.—(Communication from Felix Dehaynin, Paris.)
1192. Andre P. Rochette, Brighouse, Yorkshire—An improvement in the manufacture of soft soap.
1193. Thomas R. Oswold, Sunderland—Improvements in building ships and other vessels.
1194. William Warne, John A. Fanshawe, Jamca A. Jaques, and Thomas Galpin, Tottenham—An improved compound or preparation of materials for, and mode of, and apparatus for, covering and insulating wires or conductors used for telegraphic or electrical purposes.

Recorded May 13.

1195. John Woodley, Church Row, Limehouse—Improvements in sawing machines.
1196. Thomas Scott, Rouen, France—An improved surface condenser and refrigerator.
1197. William Clark, 53 Chancery Lane—Certain improvements in knitting machines.—(Communication from Mr. Jonas B. Aiken, Manchester, Hillsborough, New Hampshire, U. S.)
1198. Joseph F. Allender and Job Richards, the younger, Brierley Hill, Staffordshire—Improvements iu furnaces for puddling iron.
1199. William Whitehouse, New Ferry, near Birkenhead, Cheshire—Improvements in steam vessels.
1200. Robert Gourlay, Glasgow—Improvements in making moulds for casting.
1201. Thomas Vicars, sen., and Thomas Vicars, jun., and Thomas Ashmore, and James Smith, Liverpool—Improvements in the manufacture of bread, biscuits, and like articles, and in the machinery and apparatus connected therewith.
1202. Richard A. Brooman, 166 Fleet Street—Improvements in cooking, preserving, and drying animal and vegetable substances.—(Communication from Anthony Bourdin, Paris.)
1203. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in machinery or apparatus for treating India-rubber and other similar gums.—(Communication from Austin C. Day, Seymour, Connecticut, U. S.)
1204. William S. Thomson, St. Martin's-le-Grand—Improvements in the manufacture of hooped skirts.—(Communication from William Wilmot, New York, U. S.)
1205. Joshua T. Beale, Greenwich, Kent, and Thomas N. Kirkham, Upper Halliford—Improvements in the preparation of colours for dyeing and printing.
1206. George R. Clover, Liverpool—Improvements in ships' night signals.

Recorded May 14.

1207. John M. Munro, Bristol—Improvementa in the manufacture and arrangemnet of chain harrows.
1208. Matthew Leahy, 53 Hereford Road, Westbourne Park—Improvements in apparatus for facilitating the draught of carriages.
1209. William E. Gedge, 4 Wellington Street South, Strand—Improvements in dyeing.—(Communication from J. B. Thenault, Triancourt, France.)

1210. David Smith, Glasgow—Improvements in projectiles for fire-arms.
1211. Thomas Cooper and Thomas J. Evans, West Bromwich, Staffordshire—A new or improved oven or stove for baking, for drying japanned and lacquered goods, and for such other purposes as the same is or may be applicable to.
1212. Edwin Maw, Doncaster Iron Works, Yorkshire—Improvements in the construction of buildings made of iron or other metals.
1213. John Chatterton, 7 Devonshire Street, Islington—Improvements in covering wires and other metal conductors for telegraphic purposes.

Recorded May 16.

1214. Schofield C. Sheard, Smethwick, Staffordshire—Certain improvements in fire-bars, which bars are applicable to all furnaces where great heat and economy of fuel are required.
1215. Edward Adams, Stanton Iron Works, Derbyshire—The employment of machinery for drawing or extracting the gas flame or smoke from furnaces, and forcing the same into them, or into the cupola, to be used as blast or fuel for melting iron or mines of any description.
1216. William Midworth, Newark-upon-Trent, Nottinghamshire—An improved iron for the use of laundries, tailors, or other purposes.
1217. John Jones, Dorstone, Herefordshire—Improvements in musical instruments.
1218. John Clark, Glasgow—Improvements in envelopes, and in machinery or apparatus for gumming, embossing, folding, counting, and otherwise treating the same, in part applicable in the treatment of note and other writing paper.
1219. George Allcraft, Upper Thames Street—Improvements in pressure gauges.—(Communication from John Allcraft, Bedford Street, New York.)
1220. William E. Gedge, 4 Wellington Street South, Strand—Improvements in mixing, combining, and otherwise treating certain matters and substances for the production of manure.—(Communication from Louis Parent, St. Marcel-les-Chalon, Paris.)
1221. William E. Newton, 66 Chancery Lane—Improvements in manufacturing instruments for sharpening knives.—(Communication from Mr. Charles S. Pomeroy, New York.

Recorded May 17.

1222. Lemuel D. Owen, 192 Tottenham Court Road—An improved menstrual receiver or truss.—(Communication from Hermann W. Ladd, Boston, Massachusetts, U. S.)
1223. John Brown, the younger, Rotherham Iron Works, Rotherham, Yorkshire—Improvements in buffers, draw springs, and bearing springs.
1224. Alexandre R. Landre, Polydore Gras, and Antoine L. A. Boncherie, Marseilles, France—Distilling schist or boghead coal and other minerals for lighting.
1225. Henry Dolley, Paris—An improvement in the manufacture of hooped petticoats, and in the metal ribs employed in the manufacture of hooped petticoats.
1226. Amedee E. C. J. R. de Trets, Marseilles, France—An improved composition for splitting rock.
1227. James Nasmyth, Surrey Street, Strand, Westminster—Improved apparatus for obtaining and applying motive power.
1228. Charles Law, Wolverhampton, Staffordshire—Improvements in the construction of locks.

Recorded May 18.

1229. Robert Romaine, Chapel Street, Bedford Row—Improvements in the means of applying steam power to the cultivation of the soil.
1230. Alexander R. Terry, 24 Great George Street, Westminster—Improvements in apparatus for sawing and cutting up loaf sugar.
1231. Edward Charlesworth, 1 De Gray Street, York, and 3 King William Street, Strand—Counteracting the recoil of small fire-arms, and lessening the risk of injury arising from the bursting of the same.
1232. Samuel N. Evans, Chapel Yard, North Street, Wolverhampton, Staffordshire—Improved mechanism for preventing accidents at mines from overwinding.
1233. John Haslam, Preston, Lancashire—An improved construction of healds or harness used in warp dressing and sizeing machines, and in looms for weaving.
1234. John Brennand, Manchester—Certain improvements in the construction of carriages for the conveyance of passengers, goods, and minerals, and also in the apparatus for propelling the same.
1235. John Dean, James Parkinson, Edmund Riley, and William Burton, Syke Mill, Haslingden, Lancashire—Improvements in certain self-acting mules for spinning fibrous materials.
1236. William Nicholls, Tregolls Road, Truro, Cornwall—Improvements in portable corn mills.
1237. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in lubricating certain portions of machinery.—(Communication from Michael Boniere, the younger, Paris.)
1238. Archibald A. Brooman, 166 Fleet Street—Improvements in heating.—(Communication from Stanislas Lebobe, Paris.)
1239. James Childs, Windsor House, Putney, Surrey—Improvements in hardening and vulcanizing compounds of sulphur with India-rubber and gutta percha.

Recorded May 20.

1240. Johan Valda—Improvements in stud fastenings, and a system of ornamenting and adapting belts, cravats, ribbons, draperies, and other articles to stud fastenings.
1241. George Walker, Old Nickol's Street, Church Street, Shoreditch—Certain improvements in swing looking-glasses.
1242. Robert Wilson, Patricroft, near Manchester—Improvements in hydraulic machinery.
1243. Henry Newman, Liverpool—Improvements in the construction of artificial teeth, and in the mode or manner of affixing the same to the frame.
1244. George J. Parfitt, Bath, Somersetshire—Improvements in gas burners.
1245. Robert V. Leach, Taibach, Glamorganshire, and Devizes, Wiltshire—Improvements in the manufacture of iron, and in the machinery connected therewith.
1246. David Kirkaldy, Glasgow—Improvements in the manufacture or treatment of steel.
1247. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in the roasting or calcining of ores, applicable also to the oxidizing of other substances.—(Communication from Professor Jean F. Persoz, Paris.)
1248. William Teasdel, Pier, Great Yarmouth, Norfolkshire—Improvements in coffer dams.
1249. George R. Sampson, Massachusetts, U. S.—A new and useful improvement in propelling navigable vessels through water.—(Communication from John Taggart, Roxbury, Massachusetts, U. S.)
1250. James P. Budd, Ystalyfera, near Swansea—Improvements in the manufacture of tin and terne plates.
1251. William C. Cambridge, Bristol—Improvements in thrashing and winnowing machines.

Recorded May 21.

1252. Alexander L. Taylor, 16 Ludgate Hill—An improved form of harmonican pianoforte.
1253. John R. Scartliff, Wolverhampton, Staffordshire—Improvements in the construction of lubricating and other cans, in order to regulate the discharge or flow of the liquids they contain.
1254. John Thompson, Witton, and John Thompson, the younger, Castle, Northwich, Cheshire—The manufacture of salt by an improved and more economical mode.
1255. Alfred V. Newton, 66 Chancery Lane—An improved construction of cartridge.—Communication from T. F. Henderson, Baltimore, Maryland, U. S.)
1256. William P. Savage, Roxham, Downham Market, Norfolkshire—Improvements in traction steam engines and machinery for moving agricultural implements and machines.
1257. William H. Perkin, King David Fort, St. George-in-the-East, and Matthew Gray, Dalmonach Print Works, Bonhill, Dumbartonshire—Improvements in mordanting and dyeing fabrics of cotton and other vegetable fibres.
1258. Thomas S. Cressey, Burton-upon-Trent—Improvements in machinery for cutting staves for casks.

Recorded May 23.

1259. Eugene Pasquier, Reims, Hincmar Prolongee Street, Marne, France—Apparatus for drying wool, and all filaceous matters.
1260. John H. Brierley, Stannary Works, Halifax, and George Old, Temple Street, Birmingham—A brace buckle.
1261. John Knowles, Lower Broughton, near Manchester—Certain improvements in power looms for weaving.
1262. Robert Valentine Leach, Briton Ferry, Glamorganshire, and Devizes, Wiltshire, and Thomas William Willett, Pont-Neath-Vaughan, Breconshire—Improvements in the manufacture of tin plates, and terne or leaded plates, and in the apparatus connected therewith.
1263. Walter Crum, Thornliebank, Renfrewshire—Improvements in printing and dyeing textile fibres and fabrics.
1264. George Burnell, East Hoathly, Sussex—An improved preparation or medicine for the cure of ague.
1265. John H. Mason and George L. Baxter, Nottingham—Ornamenting lace or other twisted fabrics.
1266. Harry Arthur Cooke, Chancery Lane—Improvements in omnibuses.
1267. John L. Jullion, Stoneywood Works, Aberdeen—Improvements in dressing and finishing textile fabrics.
1268. Charles Peters Moody, Corton Denham, Somersetshire—Improvements in machinery for the manufacture of matting or fabric from straw and other vegetable fibres, and rods or bars of wood and metal.
1269. Richard A. Brooman, 166 Fleet Street—Improvements in axles and fitting wheels thereto.—(Communication from M. Masson, Paris.)
1270. Frederick Joseph Bramwell, Great George Street, Westminster—Improvements in apparatus for raising ships and vessels out of the water.—(Communication from Messieurs Miers Brothers and Naylor, Rio de Janeiro.)
1271. William Clark, Greenock, Renfrewshire—Improvements in machinery or apparatus for propelling and manœuvering ships, vessels, and boats.
1272. Nathaniel Shatswell Dodge, 44 St. Paul's Churchyard—Improvements in treating waste vulcanised India rubber.—(Communication from Hiram Lyman Hall, Beverley, Massachusetts, U.S.)
1273. Andrew Barclay, Kilmarnock, Ayrshire—Improvements in steam hammers.
1274. Nathaniel Shatswell Dodge, 44 St. Paul's Churchyard—Improvements in finishing, colouring, and varnishing India rubber goods, and similar manufactures.—(Communication from Hiram Lyman Hall, Beverley, Massachusetts, U.S.)
1275. Alfred V. Newton, 66 Chancery Lane—An improved construction of washing machine.—(Communication from David Parker, Shaker Village, New Hampshire, U. S.)

Recorded May 24.

1276. James Stansfield, Batley, Yorkshire—Improvements in the permanent way of railways.
1277. George Davies, 1 Serle Street, Lincoln's Inn, and 28 St. Enoch Square, Glasgow—Atmospheric apparatus for the submarine transport of blocks of stone, and for raising sunken vessels.—(Communication from T. Bandier, Paris.)
1278. James Craig Fisher, 51 Cathedral Street, Glasgow—Improvements in preparing paints and varnishes.
1279. Gilbert D. Jones, Clerkenwell—Improvements in mills or machinery for grinding, reducing, and pulverising.
1280. Joseph Gibbs, Brentford—A method of treating coal, shale, lignites, and peat, in order to manufacture manure.
1281. William T. Denham, Wilmington Square—Improvements in the manufacturing of goffering machines.
1282. George Hadfield, Carlisle, Cumberlandshire—An improved arrangement of heating and evaporating apparatus.
1283. Edward Page, Bedford—Improvements in horse drags or rakes.
1284. Antoine J. Sax, Paris—Improvements in wind musical instruments.
1285. Benjamin F. Greenough, Boston, Suffolk, Massachusetts, U. S.—An electrical conductor for submarine telegraphs, which he denominates a hydro-electric conductor.
1286. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved apparatus for the preparation of sand moulds for metal casting.—(Communication from Messieurs Maudoy and Couty, Paris.)

Recorded May 25.

1287. James Harmer, St. James Street, Lower Road, Islington—Improvements in parts of dry gas meters.—(Communication from William Sinderby, Boston, Massachusetts, U. S.)
1288. David Simpson Price, 7 Green Street, Grosvenor Square—Improvement in the production of colours for dyeing and printing.
1289. Richard A. Glass, 115 Leadenhall Street—Improvements in submarine electric telegraph cables.
1290. Edwin Maw, Yorkshire—Improvements in the construction of metallic bedsteads and other furniture.
1291. Alexander Prince, 4 Trafalgar Square, Charing Cross—Improvements in the construction of ships and vessels.—(Communication from Hermann Hirsch, Berlin, Prussia.)
1292. Alexander Prince, 4 Trafalgar Square, Charing Cross—Improvements in screw propellers.—(Communication from Hermann Hirsch, Berlin, Prussia.)
1293. Albert J. Davies, 29 George Street, Hanover Square—Improvements in apparatus for protecting persons when employed in cleaning windows, painting, or working at the exterior of houses and ships' sides, and such like operations, applicable also for purposes of military and other observation.
1294. John Mallet, Barnstaple, Devonshire—An improved regulator for watches, portable clocks, and time-pieces.

1295. Alfred V. Newton, 66 Chancery Lane—Improved machinery applicable to the manufacture of rivets, bullets, and other like articles.—(Communication from Charles B. Allen, Philadelphia, U. S.)
1296. James Howard, Bedford—An improved construction of horse-rake.
1297. Charles E. Amos, Grove, Southwark—Improved apparatus for raising vessels for repair, and for floating vessels in shallow water.

Recorded May 26.

1298. James Webster, Birmingham—An improvement or improvements in pressure and vacuum gauges.
1299. Joseph Reynolds, 11 Carthusian Street, Charterhouse Square—Improvements in propelling vessels.
1300. Hugh W. Patrick, 4 Mill Hill Terrace, Acton—A new substance or material to be used in lieu of ivory and other like substances.
1301. Charles Dorn, Birmingham—Improvements in kilns for baking or burning China earthenware and bricks, and for other like purposes.
1302. John Young, Wolverhampton, Staffordshire—Improvements in locks, and in the manufacture of knobs for locks and latches, and also in apparatus for preventing draughts and keeping out wet from doors and windows.
1303. Peter Effertz, Manchester—Certain improvements in machinery or apparatus for cutting paper, pasteboard, cardboard, and also for cutting or slicing wood into thin scaleboard or veneers, or for similarly cutting other articles.
1304. George F. Chantrell, Liverpool—Improvements in the construction of charcoal kilns, and in the manufacture of coolers for charcoal kilns.
1305. William H. Nevill, Llanelly, Carmarthenshire—Improvements in the manufacture of steel and wrought iron.
1306. John Draper, 5 Little Tower Street—Improvements in applying indices to account and other books.
1307. Michael Michaelis, Manchester, and Robert Kershaw, Heywood—Improvements in the manufacture of velvets and other piled fabrics.
1308. James C. Bent, Birmingham—Improvements in gas-meters.
1309. William Wright, Deptford, Kent—Improvements in fastening shirts, collars, and other articles of wearing apparel.

Recorded May 27.

1311. William Weild, Manchester—Improvements in looms for weaving pile fabrics.
1312. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved mode of advertising.—(Communication from Albano Gatte, Paris.)
1313. Patrick Aitchison and Thomas Binks, Sheffield, Yorkshire—Improvements in self-acting and other water closets, and in flushing apparatus connected therewith.
1314. Leon Farrenc and Bernard Subra, Paris—Improvements in gas lighting by means of direct carburators.
1315. Hilary N. Nissen, Mark Lane—An improvement in book indices.
1316. George Hadfield, Carlisle, Cumberlandshire—Improvements in the mode of and apparatus for forming casks or barrels.

Recorded May 28.

1317. Bernhard Samuelson, Banbury, Oxfordshire—Improvements in machines for cutting roots and other vegetables.
1318. Thomas Wilson, Birmingham—Improvements in breech-loading fire-arms and ordnance.
1319. Walter Crum, Thornliebank, Renfrewshire—Improvements in printing and dyeing textile fibres and fabrics.
1320. William H. Graveley, Upper East Smithfield—Improvements in apparatuses for purifying and ærating sea water, parts of which may be employed for cooking and baking purposes.
1321. Richard A. Brooman, 166 Fleet Street—Improvements in machinery for cleaning, grinding, and bolting corn and other grain.—(Communication from Jean B. Falguire, Marseilles.)
1322. Joseph Oldbury, Summer Row, Handsworth, Staffordshire—Improvements in breech-loading fire-arms, applicable to pistols, muskets, carbines, and birding or other guns.
1323. John Bapty, Leeds, Yorkshire—An improved mode of, and apparatus for, manufacturing felted cloth.

Recorded May 30.

1324. Marcus Davis, 5 Lyon's Inn, Strand, Westminster—Improvements in the construction of wheels, axles, and boxes for carriages.
1325. Archibald Smith, 69 Princes Street, Leicester Square—Improvements in machinery for making lines, ropes, and cables, for telegraphic and other purposes.
1326. Weston Grimshaw, Bowdon, Cheshire—Certain improvements in machinery for compressing bricks, tiles, artificial fuel, and other similar articles.
1327. Edgar Breffit, 61 King William Street—Improvements in machinery or apparatus for the manufacture of hollow corks.
1328. John Bruce, Tiddington, near Stratford-on-Avon, Warwickshire—An improvement in agricultural drills.
1329. William Gossage, Widnes, Lancashire—Improvements in the manufacture of iron and steel.
1330. James Fry, Wrotham, Sevenoaks, Kent—An improvement in mills for grinding.
1331. Oliver Maggs, Bourton, Dorsetshire—Improvements in harrows.
1332. William Green, Victoria Works, Dod Street, Limehouse—Improvements in washing or purifying and treating sugar.
1333. Isaac Blackburn and Robert Blackburn, Long Eaton, Derbyshire—Improvements in locomotive or traction engines, and in implements connected therewith for cultivating the soil.
1334. James L. Norton, Belle Sauvage Yard, Ludgate Hill—Improvements in machines for stretching and drying fabrics, and in drying wool and other fibres.
1335. Arthur Mickelthwate, Joseph Peace, and Samuel J. Hobson, Sheffield, Yorkshire—Improvements in the coating and covering of metallic springs, steel, iron, and other metal bands for the use of any kind of machinery, driving bands, or straps, ribs suitable for umbrellas and parasols, staybusks, and ribs for stays, hats, bonnets, reeds, and crinoline, and articles of dress, and other useful purposes.
1336. Enoch Leeson, 13 Traffic Street, Derbyshire—Improvements in machinery for the manufacture of ornamental chenile fringes and braids and other fabrics.
1337. William Clark, 53 Chancery Lane—Certain improved means of reefing and shortening sail in ships and other vessels.—(Communication from Enoch E. Mulliner, New York, U. S.)
1338. William Clark, 53 Chancery Lane—A new manufacture of leaven—(Communication from Frederic Ludewig, Paris.)

Recorded May 31.

1340. James S. Cockings, Ann Street, Birmingham—Certain improvements in the construction of self-adjusting cases for holding and carrying cartridges of various sizes or gauges, parts of which improvements are also applicable to cartridge-carriers now in use.
1341. Samuel Carr and George Butterworth, Leeds, Yorkshire—Improvements in the manufacture of felted cloth, and in the machinery or apparatus employed in such manufacture.
1342. Edwin A. Wood, Victoria Terrace, Notting Hill, and Martin D. Rogers, Bromley—Improved apparatus for raising and lowering boats.
1343. James Wansbrough, Bridge Street, Southwark—Improvements in the construction of stereoscopes.—(Communication from Egbert Moxham, Bruges, Belgium.)
1344. George H. Smith, Manchester—Improvements in sewing machines.
1345. Philippe Gamberdella, 133 Chancery Lane—Improvements in obtaining motive power, and in machinery or apparatus connected therewith.
1346. John J. Lundy, Manchester—Improvements in cartridges and gun-wads, for facilitating the loading and lubricating of fire-arms.
1347. Alfred Suter, 65 Fenchurch Street—A furniture castor, to be used upon the feet of tables, seats, and all descriptions of furniture or other things.
1348. Frederick Roberts, Maiden Newton, and Alexander Roberts, Frome, Vanchurch, Dorsetshire—Improvements in apparatus for ploughing, tilling, or cultivating land, when steam power is employed.

Recorded June 1.

1349. Jean F. Miquel, Paris—Improvements in trusses.

Recorded June 2.

1351. Francis W. Saltonstall, Northumberland Street, Strand, and Alfred Bush, Hanover Cottage, Park Road, St. John's Wood—An improved machine or apparatus for dredging and excavating.
1352. Myron H. Chapin, 4 Gresham Street—Improvements in galloons, tapes, or ribbons, for supporting steel and other hoops used for distending ladies' dresses.
1353. Robert K. Whitehead, Elton, near Bury, Lancashire—Improvements in apparatus to be used in bleaching, dyeing, and extracting the colouring matter from dye material.
1354. Samuel Wood and John Wood, Manchester, and Phillip Billington, Rusholme, near Manchester—Certain improvements in and applicable to machines for embroidering.
1355. Alexander Smith and William Smith, Glasgow—Improvements in machinery for curing sugar, and for separating solid and liquid substances by centrifugal force.
1356. Samuel Bury, Manchester—Certain improvements in machinery or apparatus for embossing and finishing textile fabrics or other like surfaces.
1357. Samuel Bury, Manchester—Certain improvements in machinery or apparatus for embossing and finishing textile fabrics or other like surfaces.
1358. William H. Parkes and William Bagnall, Birmingham—A new or improved ventilator for hats and other head coverings, and also for carriages.
1359. Timothy Whitby, Millbank Street, and William Dempsey, Great George Street, Westminster—Improvements in, and applicable to, ordnance and fire-arms, and in projectiles to be used therewith.
1360. Jean B. Pascal, Paris—Improvements in hot-air engines.

Recorded June 3.

1361. John Wilson, St. Helens, Lancashire—Improvements in the manufacture of carbonate of soda.
1362. John Edwards, 77 Aldermanbury—Improvements in the manufacture of anchors.
1363. Robert W. Sievier, Hull, Yorkshire—Improvements in smelting and purifying of iron and other ores.
1364. Joseph Onions, Darlaston, Staffordshire—A new or improved steam boiler.
1365. Robert Mushet, Coleford, Gloucestershire—An improvement or improvements in the manufacture of iron and steel.
1366. Herbert N. Penrice, Witton House, near Norwich—Improvements in machinery for propelling vessels.
1367. John Kyle, Liverpool—Improvements in points for railways and chairs for the same.
1368. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in reducing solid substances to powder, and in the machinery or apparatus employed therein.—(Communication from William J. Cantelo, Burlington, New Jersey.)
1369. Jean J. Baranowski, Paris—Improvements in railway signal apparatuses.
1370. Alexander R. Arrott, St. Helen's, Lancashire—Improvements in the manufacture of soda.
1371. James Burrow, Ashford Parsonage, Bakewell, Derbyshire, and William N. Wilson, 144 High Holborn—An improved floor scrubber and sweeper for carpets, floors, lawns, and other such like useful purposes.
1372. Alfred V. Newton, 66 Chancery Lane—An improvement n balancing millstones.—(Communication from John Fairclough, Louisville, Jefferson, Kentucky, U. S.)

☞ *Information as to any of these applications, and their progress, may be had on application to the Editor of this Journal.*

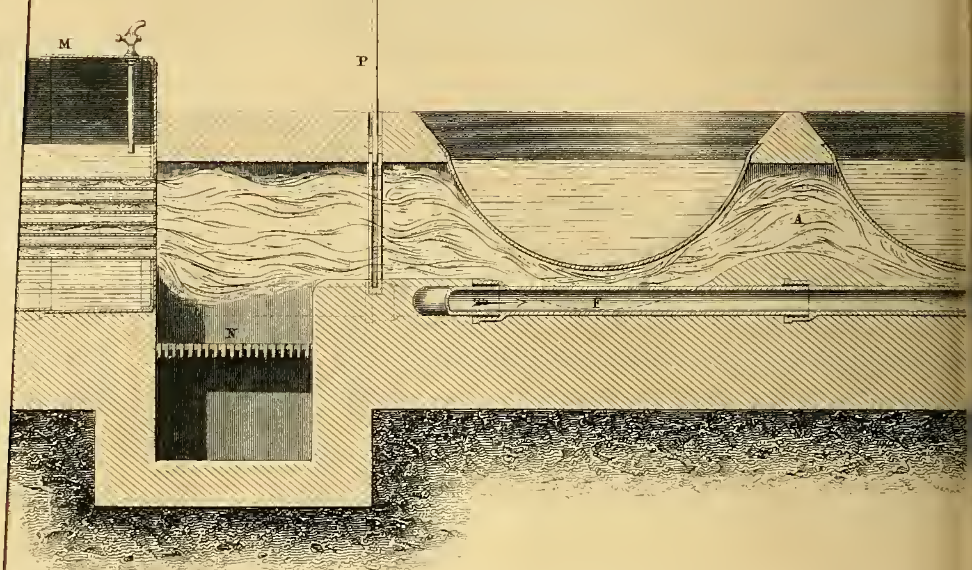
DESIGNS FOR ARTICLES OF UTILITY.

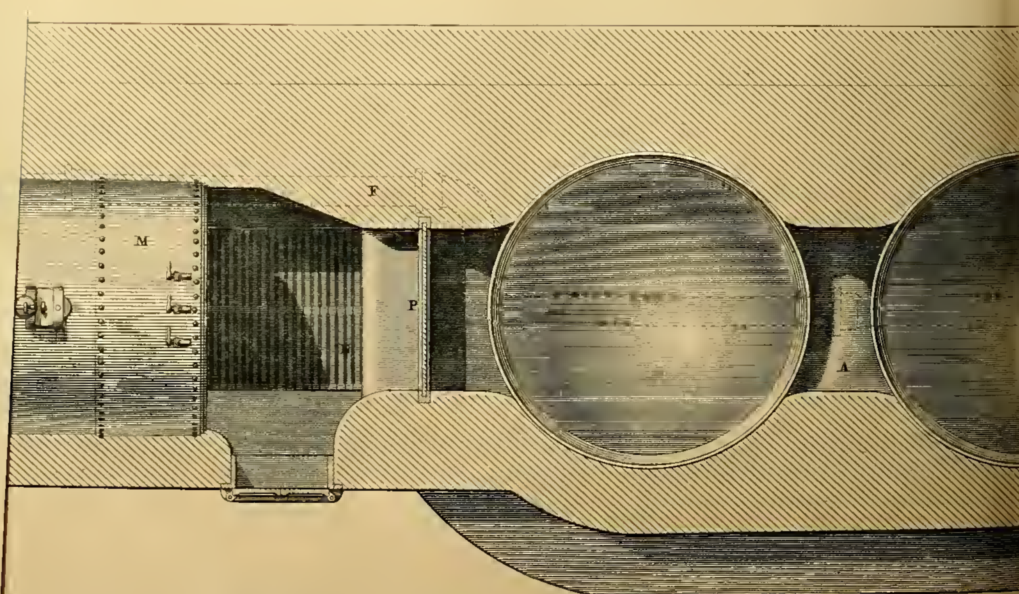
Registered from 13th May to 7th of June, 1859.

May 13th, 4172 Elliott, Brothers, 30 Strand, London, W.C.—"Improved levelling staff."
— 4173 Charles Lambert and Son, Fillwood Works, near Bristol.—"Improved attachment for box fastener."
14th, 4174 Edgar Parks, 140 Fleet Street, E.C.—"The Etna kettle."
17th, 4175 John Walters and Co., Globe Works, Sheffield.—"An adjustable vice"
21st, 4176 The Permanent Advertising and General Agency Co. (Limited), 78 Gracechurch Street, London, E.C.—"The universal post advertiser."
27th, 4177 Garton and Jarvis, Exeter.—"Boilers for heating hothouses and other uses."
30th, 4178 Charles Dutton and Joseph Jenncns, West Bromwich.—"Improved measuring tap, for drawing off stated quantities with each motion of the handle."
June 7th, 4179 William Taylor, Horsley Wylam, Newcastle-on-Tyne.—"Apparatus adapted to be used at windows and such like places, to facilitate cleaning, painting, and such like purposes.

SUGAR

W.R.A

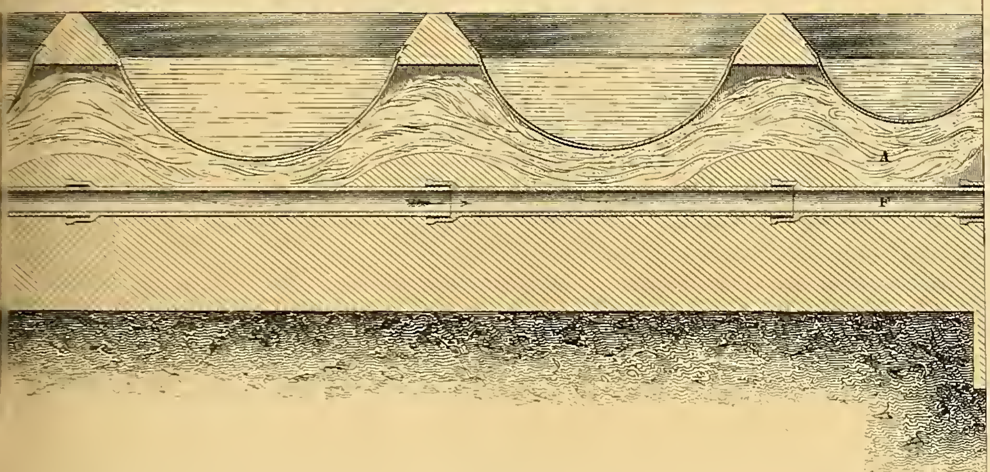




G FURNACES,

Q: PATENTEE,

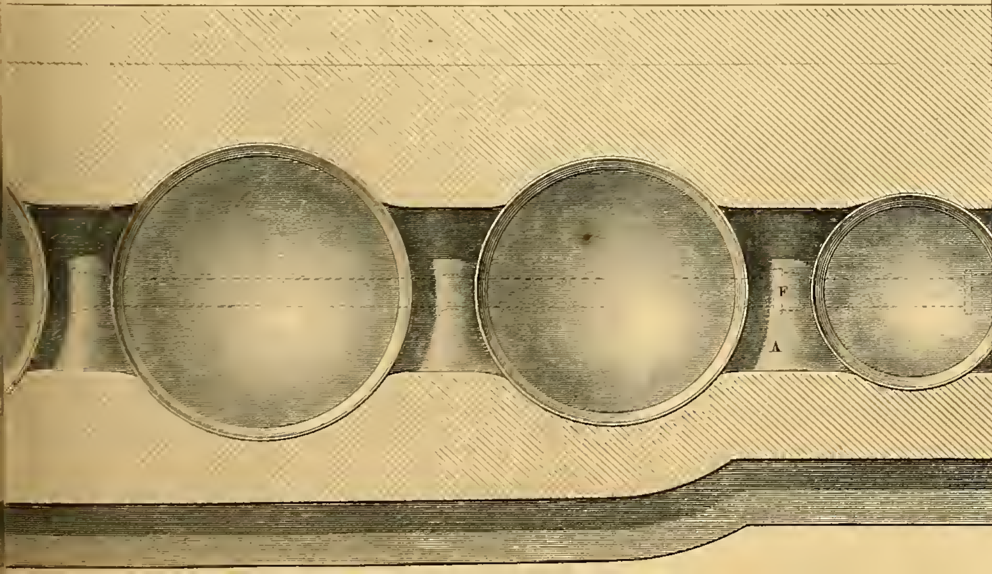
r.



— SCALE. —

15 20 25 30 35 FEET.

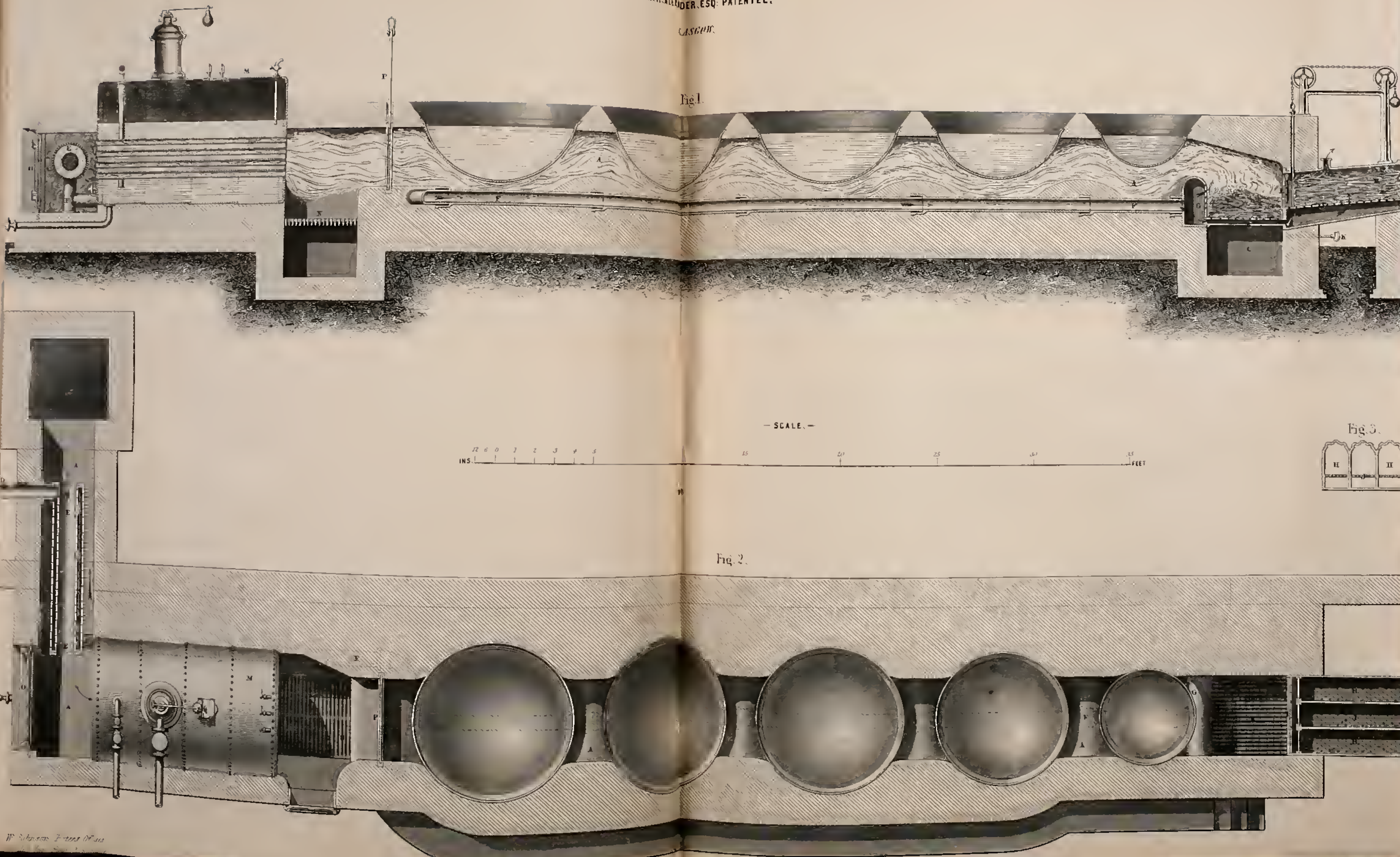
Fig. 2.



SUGAR BOILING FURNACES,

W. R. ALEXANDER, ESQ: PATENTEE,

GLASGOW.



SUGAR BOILING FURNACE.

By W. R. Alexander, *Esq., Glasgow.*

(Illustrated by Plate 244.)

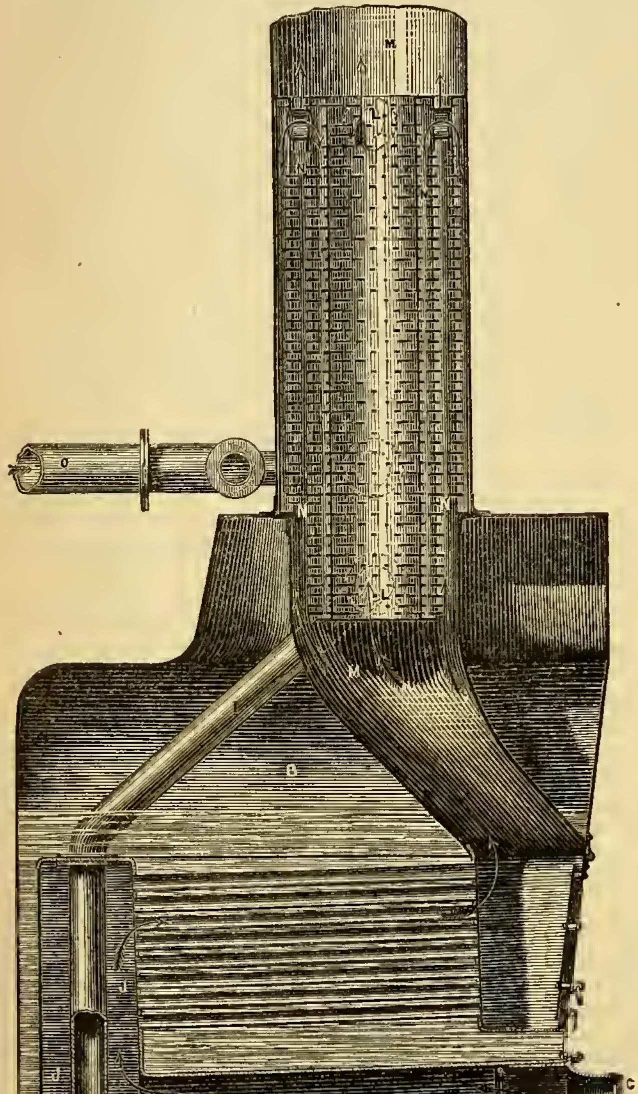
The large plate which we present this month, may be taken as a complete illustration of the most improved practice in the arrangement and construction of the boiling apparatus used for the manufacture of sugar from cane juice, by the common open pan process. The sugar cane, after the juice has been expressed therefrom, is termed "megass," and is commonly used as fuel for evaporating the cane juice. Mr. Alexander's invention is intended to facilitate the use of "megass" in a green or damp state, thereby obviating the necessity of expensive "megass" houses, for storing, drying, and rendering this fuel fit for combustion. Mr. Alexander has been long a resident in our West India islands, and is, therefore, a good judge of what was necessary for the improvement of the old state of things, as adapted for the purposes of the sugar manufacturer. This plan consists of a long "firemouth," or drying chambers fitted up immediately in front of the furnace, such firemouth or drying chamber being formed with a double bottom, perforated on the upper side for the discharge into the chamber of heated air. The "megass" or waste sugar cane is deposited in this chamber, and pushed into the furnace from time to time for use through a perforated door, which forms the communication between the drying chamber and the furnace. The furnace bars are tubular, opening at one end into a hollow fire bridge at the back end of the furnace, and at the other into the false bottom space of the front drying chamber. The grate bars are also minutely perforated on their upper side, for the discharge of air amongst the burning fuel upon the bars. Air is forced into the furnace by a blowing fan, or other mechanical forcer, at the extreme back end of the structure of the furnace. The pipe from the fan conducts the air into and through a set of heating cylinders or chambers, studded with lateral spikes or projecting pieces of metal, inside and out, to enable the air to take up a superior amount of heat. After leaving this heater, the air is forced along a conducting pipe laid along the bottom of the main flue, and beneath the steam boiler, usually fitted up at the after end of these structures, and beneath the "teaches" or evaporating pans at the front. The air thus takes up heat as it passes along, until it is finally discharged into the hollow furnace bridge, whence it passes partly into the furnace, directly amongst the burning fuel, and partly through the bars, into the space of the false bottom of the drying chamber. The latter portion dries the deposited megass, and then finds its way from the chamber through the perforated division door into the furnace also. In this way, the full and efficient supply of highly heated air, subdivided into numerous minute jets, effects the perfect combustion of the fuel, and prevents all, or nearly all, discharge of smoke. The same arrangement, or modifications of it, will answer for burning coal and other fuel.

Fig. 1, on plate 244, represents a longitudinal sectional elevation of one modification or arrangement of these improvements in furnaces and apparatus for the manufacture of sugar and the consumption or prevention of smoke. Fig. 2 is a plan of the arrangement corresponding to fig. 1; and fig. 3 is a transverse section of the drying chambers, in which the matters used as fuel are primarily placed. According to this arrangement the apparatus is built in a structure of brickwork, in which is constructed a flue, A, that extends from end to end of the apparatus. Above the flue a series of evaporating pans or "teaches" are placed. At the front end of the apparatus the flue, A, opens into a furnace, the fire bars, B, of which are made hollow throughout, the upper surface being finely perforated. The ash-pit, C, below the bars, B, is closely shut in by means of a door to prevent the admission of air thereto. The chimney is of the usual construction. The supply of air for the combustion of the fuel in the furnace is forced by means of a blowing fan or air-pump, or other mechanical means, through the pipe, D, into a compartment of the cylindrical heating chamber, E, placed in the flue leading to the chimney.

In this modification the heating chamber is shown as consisting of two cylinders arranged concentrically, the inner one being open from end to end, and the space between the inner and outer cylinders, which serves as an air heating chamber, being enclosed at each end with metal plates. The surfaces of the cylinders are studded with spikes, or flanges, or bosses of metal, which project in a radial direction from both sides of the cylinders—these spikes being thus arranged for the purpose of rapidly absorbing heat from the gaseous products of combustion as they pass to the chimney, and of imparting the heat to the air as it is forced through the air-heating chamber. The air after passing through the heating chamber descends by the pipe, F, which branches off laterally, is carried along the whole length of the apparatus, and is discharged at the front extremity of the pipe into the hollow fire bridge, G, which forms the back part of the furnace. The fire bridge forms a chamber which extends across the furnace, the front part being perforated to allow of the emission, directly into the furnace, of a portion of the stream of heated air that is forced through the pipe, F. The pipe, F, and the fire bridge, G, are by preference made of cast-iron, covered or protected from the action of the fire by a coating of fire-clay. The other portion of the heated air passes into the hollow fire bars, B, the backward ends of which enter the lower part of the hollow fire bridge, G. The perforations made through the upper part of the fire bars, B, permit a portion of the heated air to pass through amongst the fuel lying on the fire bars, the quantity thus conveyed to the fuel being sufficient to keep it in a state of active combustion.

In the manufacture of sugar, the waste cane, after the juice has been expressed therefrom, and which is termed "megass," is used as fuel; and in the engravings a chamber for drying the megass is shown, as arranged for use in conjunction with the improvements. This portion of the apparatus consists of a drying chamber, H, made of cast-iron or other material; the chamber is of a rectangular figure, and is divided into three oblong chambers by the vertical partitions, which are shown in the plan (fig. 2), and the transverse section of the chamber (fig. 3). The front ends of these several chambers are closed by means of the doors, I, which afford access to the interior of each chamber for the purpose of filling it with megass or discharging the same into the furnace. The bottom of the drying chamber, H, inclines downwards to the level of the fire bars, B, the front ends of which enter the lower part of the chamber, so that that portion of the heated air which does not pass into the furnace is carried into the chamber, H, and serves to dry the megass. The fuel to be dried rests upon the perforated diaphragm or false bottom, J, which is arranged on a level a little above the furnace bars, B. In this manner the space below the false bottom, J, serves as a chamber for the heated air, which rises and passes through the megass that is placed in the compartments above it. The quantity of air thus admitted to the drying chamber, H, is regulated by a valvular door, which is moved by the hand lever, K. The roof of the chamber, H, is furnished with a short tubular aperture, which admits of the steam that is driven off from the damp megass escaping into the air, or it may be carried into the chimney; this steam or vapour is prevented from entering the furnace by means of a damper fitted in each compartment of the drying chamber, H. The dampers are severally connected by means of a shackle and chain to a counter-weight; the chains pass over pulleys arranged above. At the backward end of each of the compartments of the drying chamber, H, is fitted a hanging door, L, swinging loosely; these doors are perforated, to allow of any combustible gaseous matters escaping into the furnace, when they become ignited. The dampers of the drying chamber are only kept down during the preliminary drying of the damp megass; and, as the furnace requires replenishing, the charges of dried and highly heated fuel are successively pushed out of each compartment into the furnace. Thus, as the fuel in the compartments becomes heated, the inflammable gases escape in minute jets through the perforations in the hanging doors, and, mixed with air, these matters are deflected downwards amongst the highly incandescent fuel in the furnace, when they meet a further supply of heated air discharged in jets from the front of the fire bridge, G, fit for immediate and rapid combustion. Every particle of inflammable matter is thus instantly flashed into flame, so that no visible smoke escapes from the chimney, whilst the fuel is economised in the highest degree.

The flame arising from the burning fuel in the furnace, passes along the flue, A, and is carried to the backward extremity of the apparatus, where the flue diverges laterally and enters the shaft or chimney. On its passage through the flue, the flame heats the several sugar pans, and also the multitubular boiler, M, the steam of which serves to drive the engine. To raise steam in the boiler at the commencement of operations, fire is lighted in the furnace, N, but when the apparatus is in full operation, the heat that flows through the flue, A, is sufficient to generate steam in the boiler, M. A door, O, is fitted in the brickwork to afford access to the boiler for cleaning the tubes or other purposes, and the



damper, P, serves to control the velocity of the current of flame through the flue. These several parts being, however, in all respects similar to those in ordinary use, it is unnecessary to enter into a more particular description. This arrangement may with very trifling deviations therefrom, be readily adapted to the boilers of stationary engines.

In the accompanying engraving is shown one mode of adapting the improvements to the boilers of marine engines. The figure is a longitudinal vertical section of the boilers of a marine engine. In this modification the boiler, B, is constructed in the usual manner. The furnace doors, C, open into the coking chambers, D, the bottom of each chamber is perforated for the admission of heated air from the chamber, E. The gaseous matters as they are evolved from the heated fuel escape through the perforations in the hanging door, F, into the furnace, G, where they are ignited as they pass over the incandescent fuel. The stream of heated air passes into the chamber, E, along the hollow bars, H, a portion of the air escapes through the perforations in the bars, which portion serves to maintain the combustion of the fuel in the furnace. The full supply of air for the furnaces is conducted by means of the pipes, I, through the boiler and flue, J, into the hollow fire bridge, K, from whence a portion of the air passes through the perforations in front, directly into the furnace, and the remaining portion goes through the hollow bars, H. The upward extremity of the pipe, I, enters the heating chamber, L, which in this modification consists of duplex concentric cylinders, arranged so that the upward current of the products of combustion flows in two columns, passing through the open ends of the inner cylinder, and between the inner and outer cylinders at N. The ingoing current of pure air is forced by the fan blast or air pump through the supply pipe, O, the inner part of which branches out laterally into two pipes, which enter the outer cylindrical heating chamber at opposite sides of the funnel, M. The air as it is forced into the heating chamber, passes upwards between the walls of the outer cylinders, and flows through the lateral openings at the upper part into the inner cylinder, it then passes downwards to pipe, I, and is conducted to the furnaces. The ingoing current of air in its passage through the heating chambers thus takes up, as already described, that amount of caloric which is ordinarily allowed to escape into the atmosphere through the funnel, for the purpose of producing a draught. The admission of air through the ash-pit, Q, is prevented by means of the close door, P, and if necessary, the quantity of air admitted to the coking chamber, D, may be regulated by the valve, R, moved by the handle, S.

Mr. Alexander proposes, when the nature of the fuel shall render it expedient, to convey a jet of steam into the air pipe, and so cause the mingled air and steam to enter the furnace. By this arrangement, the pipes are preserved to a great extent from being burnt, and as the steam escapes through the various orifices into the furnace, and amongst the incandescent fuel on the bars at a very high temperature, it will become decomposed into its gaseous elements, and thus assist in maintaining the vivid combustion of the fuel.

HISTORY OF THE SEWING MACHINE.

ARTICLE XVII.

On the 3d of January, 1854, Julian Bernard, Esq., obtained a patent, covering amongst other things, the employment of sewing machines for sewing the uppers or fronts to the soles or bottoms of boots and shoes.

Elmer Townsend obtained a patent on the 10th of January, 1854, for certain improvements relating to machinery for producing the chain or tambour stitch. For this purpose a notched needle and thread carrier were proposed to be used, the needle being supplied with thread, forces a loop down through the material and leaves it; a hook, fixed on the end of a revolving shaft, then seizes the loop and brings it into a position for the needle to pass through it on its next descending, and thus interloops the thread. Means somewhat after the fashion of a clamp are employed for holding the material in such a manner as to admit of it being removed laterally, as well as longitudinally, beneath the needle.

We pass over Mr. Greenshields' patent of the 18th of January, 1854, as the only reference in the specification to a sewing machine is its use for the purpose of working up ornamental parti-coloured chenile.

Nehemiah Hunt obtained a patent on the 19th of January, 1854, for improvements relating to the needle and shuttle machine, and which improvements consist in imparting a slight backward movement and a pause or dwell to the shuttle driver after each forward movement, the object being to open the space between the heel of the shuttle and the end of the driver, so as to facilitate the passage of the needle loop off the heel of the shuttle. Mr. Hunt also refers to an improved mode of operating the break or clamp by which the feeding wheel is actuated.

Provisional protection was allowed to William Darling, on the 23d January, 1854, for an invention communicated to him from abroad, relating to the general combination and arrangement of sewing machines, wherein a circular shuttle, formed to receive a correspondingly shaped metallic bobbin or spool, and provided with an opening through which the thread passes from the bobbin, is employed in conjunction with a curved needle, carried by a vibrating bar.

Edward Howard and David Porter Davis obtained a patent, dated the 3d of February, 1854, for improvements in machinery calculated to produce "back stitch" sewing or the ordinary "running" stitch, by means of two straight needles which pass through the fabric in opposite directions alternately, and are supplied with short pieces of thread. In carrying out these improvements the inventor and communicator, Mr. Roper, uses a groove, tube, or thread passage, in combination with a hooked needle made to draw the thread into such passage, the object being to keep the thread from springing back and becoming entangled. Another part of the invention consists in *making the shank of the needle tubular*, and causing the closing slide to work therein. Each machine is provided with two such hooked needles, and each needle is combined with the two thread carriers for binding the thread in two directions, and across the needle and into the opening hook of the same. A set of lips or nippers are combined with the thread binders or carriers, for the purpose of seizing the thread during the formation of each stitch, and drawing the same closely into the material. Another feature of the invention is the combining of a stationary knife with the cloth presser and feeding apparatus, to separate the length of thread employed in sewing from the roll of thread on the spool or bobbin.

Mr. R. A. Brooman obtained provisional protection, dated March 20th, 1854, for improvements in sewing machines, wherein the friction break is so constructed and applied upon the thread, that when operating on harsh materials at a high speed, the breaking of the thread at the period of greatest strain is obviated. Another feature in this invention consists in enlarging that portion of the needle, which having entered the material is to retire from it before the pull upon the last loop is commenced; by this means, in sewing leather and similar materials, the hole is so made that the process of finishing the stitch is greatly facilitated. Another point in this invention consists of a peculiar formation of the bed or plate upon which the work rests, whereby, when turning the work in order to sew a curved seam, each stitch may be as perfectly formed as when sewing in a right line

Elmer Townsend applied for a patent on the 30th of March, 1854, for certain improvements communicated to him by Alfred Swingle. These improvements have reference to a machine for performing the operation of sewing with two threads. One thread is passed through an eye near the point of an upright needle, which carries it upwards through the cloth, so as to form a loop in the same manner as in machines in which a needle and shuttle are used, but on the *upper* surface of the cloth The second or binding thread is used in short lengths, and is combined with the first thread by the use of a vibrating hook, and a vertical forked thread carrier, to which an intermittent rotatory motion is communicated. When the loop has been formed by the ascent of the needle, the hook passes through, and seizing the binding thread (which extends upwards from the cloth, and is held between the rearmost leg of the thread carrier and a spring attached thereto), draws it through the loop, and through the space between the foremost leg of the carrier and its spring. When the thread is drawn through the carrier, it is left supported by the said leg and its spring, and whilst thus supported, and during part of the descent of the needle, a semi-rotative movement of the thread carrier takes place, so as again to present the thread in a perfect position to be seized by the hook when it advances through the loop formed by the next ascent of the needle. By the intermittent rotatory motion of the forked thread carrier, the uppper thread *is wound round the lower thread during the operation of sewing*, and in this respect the sewing differs from that produced by other machines.

SOCIETY OF ARTS EXHIBITION.

III.

In the department of the exhibition devoted to the most recent improvements in apparatus for lighting and heating we observed Mr. J. B. Smith's patent chandeliers. The object of the improvement is to do away with the ordinary method of raising and lowering chandeliers by means of the hydraulic tube and balance weights, instead of which is used a quick-travelling internal screw; by this means the chandelier can be raised or lowered as required. The advantages of the invention are, that it prevents accidents arising from the breaking of the chains to which the weights are attached, and it dispenses with the necessity for using water to prevent the escape of gas, as, when once fixed, it requires no further attention, being perfectly air-tight. It can also be advantageously adapted to glass chandeliers, which have hitherto not been capable of being raised or lowered. The arrangement is good, and has long been a desideratum.

Mr. Syson Nibbs, of Harford Street Works, Birmingham, exhibits one of his most useful patent light and heat generators. The object of this invention is to economise the amount of gas usually employed in heating a gas stove, by rendering it available for light; or to employ the gas usually consumed in lighting as an agent both for light and heat. The chief feature of the improvements consist in the peculiar arrangements for admitting the atmospheric air, and discharging it after combustion—not a volume of dry, vitiated air, as is the case when gas is burned in ordinary stoves without flues—but a pure, warm, humid atmosphere. Instead of a number of small jets, one or more burners of the fishtail or argand kind are used, so as to give full combustion to the flame. The subjoined engraving shows this apparatus arranged as a light and heat generator, which may be fixed to any ordinary bracket or pillar, and in this form it is highly useful in churches and other public buildings; or it may be used as an ordinary gas stove on an office table, in halls, or for miniature hotbeds, as the cost is very trifling. A lamp may be used where gas is not available. The gas is admitted to the burners through an ordinary gas tap or union joint. There may be one, two, or more burners, according to the size of the apparatus. The atmospheric air is admitted through the apertures, A, which are formed by cutting an horizontal and cross slot, and bending the metal inwards, forming a series of partly closed valves; these apertures are sometimes formed by a set of ornamental perforations, but in either case no superabundance of cold air is admitted, but sufficient only to facilitate the combustion of the gas. The gas flames are enclosed by a thick globe of glass, B, which refracts a large amount of light. The air, after passing in at A, enters the dome or head, D, where, becoming intensely heated, expands and fills the dome, which, becoming overcharged, allows a *portion* only to escape through the openings, E, thus acting as a kind of reservoir of heated air. In its passage upwards the hot air strikes against the metal plate, F, and is deflected to its edges, and passes through narrow apertures between the pipe and plate. This plate serves also for the reception of a metal or earthenware pan, containing a quantity of water (about a pint for each bat's-wing burner.) A large piece of pumice-stone is placed in the water, to absorb the products of combustion. It will be found that the water will have evaporated in about eight hours, and the pumice-stone charged with foreign matter. About once a week the pumice-stone should be made red hot to cleanse it. The top, E, may be removed, and another top substituted for the purpose of cooking, lackering, or japanning. By the above arrangement a warm, moist, healthy atmosphere is maintained, even in a very small room, where it would be dangerous to use an ordinary dry gas stove. The glass globe is sometimes dispensed with, and the apparatus made as an ornamental standard. No heat whatever is lost, and the action is so certain and uniform that no variation in the thermometer is perceptible. Instead of the glass globe, plain or ornamental glass lantern panes may be introduced, which have a beautiful effect in halls or staircases. One important use of this apparatus is that it promotes active ventilation.

Mr. Kukla, of Pentonville Road, London, has also shown a compact gas cooking stove, which consists of a neat pillar, with an arrangement for heating vessels at the top. The design is artistic, and particularly pleasing.

Mr. J. White, of Finchley, has a series of ingenious arrangements for warming and lighting apartments, and for purifying the air of rooms and public buildings. This gentleman has also shown an excellent apparatus for facilitating respiration in the midst of smoke and noxious gases.

Mr. John Roberts, of the Terra Cotta Works, Upnor, near Rochester, exhibits one of his patent earthenware stoves, which are designed with taste. This stove may be made either of fire-clay, iron, or earthenware lined with iron. The fuel burnt in it is stated to be smokeless, and will give a continuous heat for twenty hours or more without any attention. The atmosphere heated is perfectly healthy, sweet, and safe to sleep in. The thermometer seldom varies more than two or three degrees during twenty-four hours. They are well adapted for nurseries, conservatories, &c. One peculiarity of the fuel is, that it retains its shape after combustion, and, with the addition of another chemical, forms guano. The cost of the fuel is 1s. 6d. per bushel, and the residue of the combustion is valued at 6d. per bushel. If this statement be correct the improvement is certainly a step in the right direction.

The London Warming and Ventilating Company also exhibit their patent stove and hot-water pipe. The stove consists of a plain interior cylinder with a series of perpendicular radiating wings, which secure a rapid transmission of heat to the edges. These stoves were used with great success in warming St. Paul's Cathedral during the highly popular services given during the past winter. The hot water pipe is constructed upon a similar principle, with transverse wings or flanges.

Among the articles of stoneware we noticed Mr. George Jennings' ingenious drain pipes, with chairs and saddles, by means of which junctions may be inserted, and any broken part of the drain removed without affecting or disturbing the general line of the drain.

Mr. B. Looker, of Kingston-upon-Thames, has also specimens of his stoneware sockets for telegraph posts, showing another and admirable application of this very useful material. It is also applied by the same gentleman for footings, to supersede the use of brick, stone, or concrete foundations to timber uprights.

Mr. W. Chadwick, of the Albert Works, Bury, shows a good ventilator and smoke conductor. Within the chimney pot are placed two blades of a screw, similar to those of a marine screw-propeller. These are made to rotate by the action of the wind on a peculiarly formed cowl, composed of strips of spirally curved metal with diagonal strips of straight metal between them.

Messrs. Rees & Co., of Seckford Works, Clerkenwell, have various specimens of their self shadowed glass for windows. This ornamental glass is formed by softening sheet glass in a kiln, and pressing it between dies so as to impress the required design. Flashed glass is employed where colour is introduced, and if the pattern only is desired to be in coloured relief, the flat portion of the coloured face of the sheet is ground off after it has been annealed.

Mr. John Tower, of 30 Walbrook, exhibits one of his beautiful and elaborately constructed bank locks, in which every care has been taken to defeat the operations of the most ingenious lock-pickers.

Mr. F. Blacket, of 31 West Smithfield, has a model of a banker's iron safe, fitted with his patent inaccessible lock. The feature in this safe is, that the lock is placed at the back of the safe instead of on its doors. The lock is reached by a long handle, into a slot in which is inserted, when needed, the true key. The idea is a good one and the arrangement ingenious.

Mr. John Willway, of St. August'n's Parade, Bristol, has shown his patent atmospheric bell. In this apparatus there is a length of ordinary gas pipe or other cheap tubing, used as the medium of communication between a pair of strong and simple pneumatic valves or bellows, each enclosed in a small cast-iron box. To one of these is attached the pull, and to the other the bell, and an impulse is instaneously communicated from the one to the other.

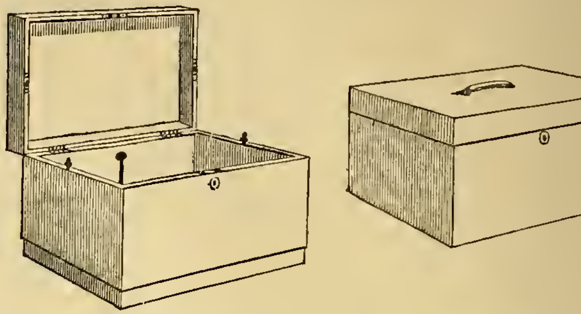
Messrs. W. Warne & Co., of Gresham Street West, exhibit specimens of their patent mineralised India-rubber mats, which are now so generally coming into use and favour. In the domestic department are also shown several washing machines which are gradually superseding the old laborious system.

An ingenious patent endorsing press is exhibited by Mr. G. Jarrett, of 37 Poultry, London. This press is intended for printing in colours without the use of fluid inks, carbonic or other chemically prepared paper, silk, or other suitable material being substituted This chemically prepared material is formed into endless bands, which are stated to be capable of giving more than a thousand impressions before requiring to be changed. The stamping action of the machine brings continually a fresh supply of colouring matter to the die or type, so that there is no interval of time wasted between the successive impressions, and the press is always ready for use. The die or type-holder is attached to the slide of the press by means of a taper-dovetailed key, so that it can be instantly removed for changing the dates, or for being replaced by another die. Embossing dies with copper counterparts may also be used in this press.

Mr. John Davis, of Coventry Street, has also an excellent endorsing press, which is so arranged that one movement of the lever causes the descent or motion of the printing surface, by which it is inked, whilst the movement of the lever in a contrary direction, causes the descent of the stamp or printing surface, by means of which the embossing or printing is effected.

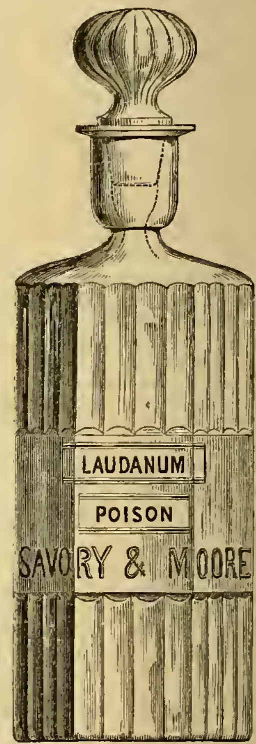
A somewhat out-of-the-way subject for letters patent is the imitation of human hair, formed from the fibres of the *abaca manilla*—a species of foreign hemp. The specimens are exhibited by the patentee, Mr. E. Speight, of Woodbridge Street, Clerkenwell. These specimens are dyed and worked up so as to form various ornamental patterns or designs, which are used for head ornaments, in place of the natural hair, which they closely resemble.

A good idea has been practically carried out in the patent telescopic despatch box of Messrs. W. Child & Son, of King's Road, Brighton. The



figures we have engraved will at once convey all the information required.

We trust that Messrs. Savory & Moore's patent bottles, for the prevention of accidental poisoning, will be at once adopted by all who have poisons or poisonous compounds in their possession; seeing how many fatal accidents have occurred through keeping poisons in vessels not distinguished by any peculiar characteristic. The patent bottles are hexagonal in shape, and deeply fluted longitudinally, so as to present to the sight and touch the most striking points of difference from any other kind of bottle. Vessels of this description, made in blue glass, are intended to be used for external applications only. For poisonous and powerful medicines, the dose of which is a tea-spoonful and under, bottles similarly shaped and fluted, in white glass, are proposed to be employed. The bottles are provided with a new contrivance, the effect of which is to make it impossible to pour out the contents otherwise than very slowly and gradually, almost drop by drop. This is accomplished by contracting the neck of the bottle at the lower part of the shoulder, and the mouth being of the usual size, the process of filling is but slightly affected by the contraction.



Price's Patent Candle Company exhibit some samples of their various products which they have so industriously and perseveringly wrought out, consisting of fine qualities of lamp and lubricating oils, that very useful fluid glycerine, and soap made therefrom; also Sherwoodole, a volatile product for removing grease and stains from fabrics, as well as the Gishurst compound, for destroying horticultural aud floricultural insect pests.

Mr. J. B. Thomber, of Great Russell Street, Bloomsbury, has an improved perambulator, which is so arranged as to greatly extend the utility of these now extensively used means for conveying to and fro the juvenile members of the human family. This perambulator is so constructed that it can be made a double or a single, and a closed or an open carriage, with windows, or a bed. The body of the carriage forms a little more than half a circle, with slots or grooves inside, in which a semicircular hood or cover, made of light material, slides. The sides contain glass windows, moving on an axle, and capable of being turned up or down, so as to be a partial or an entire cover from both rain and sun.

Mr. Essery, of Berners Street, London, has, in anticipation of the adoption of voting by ballot, turned his attention to the arrangement of a balloting booth—a model of which he exhibits. It represents an ordinary apartment—with a front wall down—divided across by a screen; a space in front of this screen is railed off for desks for the persons appointed to verify the voters, and for seats for the returning officer and candidates. Behind the screen are two divisions, each containing the requisite number of tell-tale gates or doors, which register the votes: the voter having had his right to vote verified, passes behind the screen, and through whichever of the tell-tale doors he pleases, and returning by the opposite side of the screen, passes out.

Among the drawings exhibited, we noted a number of inventions, full descriptions of which have already appeared in our columns. We may instance Messrs. Maudslay's annular cylinder engines; Mr. Meacham's engines of the *Metropolis;* Mr. Marshall's inverted double cylinder expansive marine engines; Messrs. Richardson and Jaffrey's cylinder trunk marine engine; Mr. J. Condie's steam hammer; Messrs. J. & E. Harthan's rotatory engines; Messrs. Robertson & Orchar's yarn winding machine; Mr. R. Aytoun's miner's safety cage; Mr. W. White's mechanical railway chair moulder; Mr. A. Kinder's wood cutting machinery; and Mr. Tindall's mechanical street sweeper.

Mr. Peter Jensen, of Mount Garden, Westminster Road, exhibits a drawing of his marine engine spring governor. It consists of a cylinder placed inside the ship, under the water level, either on one or on both sides of it, and near to the propeller. This cylinder is fitted with a piston, on one side acted upon by the water, whilst the other side is counterbalanced by a spring; the piston is connected with the throttle valve of the engine. The more deeply the propeller of the vessel becomes immersed, the more the pressure on the piston increases. The connection with the throttle valve is so arranged that as the pressure on the piston increases, this latter is thrust against the spring opening the throttle valve, and *vice versa.*

Messrs. Dunn & Co., of Manchester, show their steam excavating machine, which was designed for excavating the canal through the Isthmus of Suez. It is worked with engines of 12 horse power, and it is calculated to excavate 45 cubic yards of sand, clay, gravel, or other earth, per hour.

Mr. T. A. Weston, of Birmingham, has a drawing of an anti-friction press. It consists of four solid equal cylinders with a reciprocating plate interposed, which traverse on a plane surface as foundation, and under two equal inclined planes, formed in a part which rises and falls the height of the said planes as the plate moves to and fro, and which is in contact with the frame enclosing the whole, only with the intervention of loose rollers at its edges. The reciprocating rectilinear motion of the plate through a given space is converted into rectilinear motion at right angles through a space a 100th or 150th of the first, according as the height of the inclined planes may be made. The plate moves through twice the distance traversed by the cylinders. This answers to the long end of the lever—the short one being represented by the part having the inclined planes, and moving a distance equal to their height.

There is also a patent brick machine, by Mr. J. P. Oates, of Erdington, near Birmingham. In which the moulds are filled by the operation of a compound Archimedeon screw, having a less area of pressure than the area of the moulds, whilst all risk of damage to the machinery by undue strain, as well as wasteful consumption of motive power, are prevented by the escape of a column of clay, equal in sectional area to that of the screw, so soon as the brick has received its proper amount of pressure, which is regulated by the length of the tube or passage through which it escapes.

Mr. Johnston Hands has drawings of his patent kilns, furnaces, and drying rooms. According to Mr. Hands mode of construction, the surplus heat instead of being allowed to pass away into the atmosphere, is conducted from the top of the kiln downwards, and along horizontal flues passing through the drying chamber. The return flues pass through the furnace, so as to become highly heated; openings regulated by dampers are left in the return flues, by means of which the moist air may be withdrawn from the drying chamber. There are also openings at the part of the flues within the furnace, in order that the flame of the burning fuel may ignite the unconsumed gaseous products of combustion ere they pass away to the chimney. The arrangement has been highly approved of.

Mr. C. B. Blyth, of Dundee, exhibits a drawing of a machine for preparing jute, hemp, and other similar fibrous materials. Fibrous materials, such as jute, hemp, flax, &c., require preliminary treatment known as "softening," and this machine is designed for the purpose, and consists in arranging three or four rows, tiers, or series of rollers mounted in the same framing, and driven by means of gearing. The material to be treated is fed into and between two rows of rollers, say the bottom and middle set of rollers, where three rows or sets of rollers are employed, and it is returned back again between the middle and top row or set of rollers, by means of a return feeder, which carries the material from between the first set or rows up to or between the next set or rows. Heating pipes are carried under and through the machine framing for aiding the process of softening.

Dr. Cregeen, and Mr. J. H. Dickson, of Plough Road, Rotherithe, have shown drawings of three patent machines for treating fibrous materials. One for washing, drying, and wringing flax, hemp, &c.; a second, a breaking machine; and thirdly, a scutching, scraping, and brushing machine. There is also a clever, although simply arranged machine, by Mr. W. Jones, of Pendleton, for chiming church and other bells. The simple turning of a handle rings the peal of six or eight bells, an arrangement being provided for changing the peal as desired. An ingenious adaptation of the spring balance is shown by Mr. G. Bursill, jun., applied in combination with the ordinary cask supporter: it serves not only to facilitate the withdrawal of the contents without disturbing the sediment, but at the same time to indicate the quantity withdrawn in pints or pounds.

Altogether 448 articles were exhibited; and the collection, upon the whole, fully sustained the high reputation which these annual displays have acquired, as a means of affording the engineer the best information as to the progress of the mechanical arts.

PLATFORM HOUSES FOR LOCOMOTIVE ENGINE-DRIVERS.

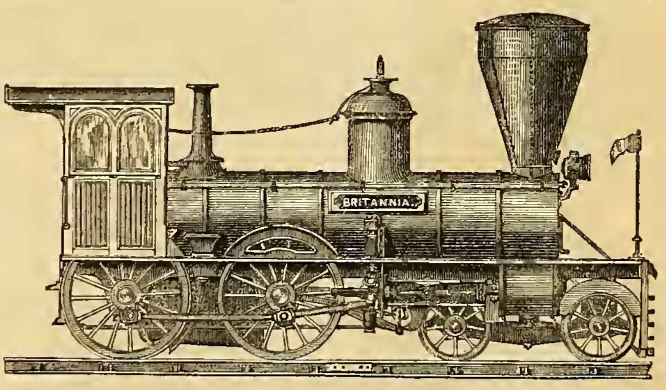
Any one who has ever travelled on the foot plate of a locomotive engine —even on a fine day—must have felt some surprise at the open, unprotected condition of the drivers. These men, on whom the safety of railway trains entirely depends, have a mere uncovered foot plate to stand upon, whilst they are in the performance of a dangerous duty, requiring every attention from the most experienced heads and hands. What the duty must be in wet, rough, and wintry weather, thinking people may perhaps try to conceive. The railway system has been worked out in an admirable manner in most points, but in this it has been left behind even by what we consider to be the rude system of the United States. The locomotive engine-drivers of this country are exposed to the direct heat of an intense fire below, whilst above they have to stand against all the inclemencies of our rigorous climate—wind, rain, and snow. It is not to be wondered at then when we find the following remonstrance in that greatest of all public prints—the *Times:—*

"May I venture to hope you will use the influence of your powerful journal in behalf of us, the railway engine-drivers, for some protection from the rays of almost a tropical sun or a blinding snowstorm? The guards are well protected from all weathers in their comfortable vans, and yet all the responsibility lies in our hands. Imagine, sir, running an express train in a hailstorm, or the blinding rain and thunder storms we have had lately, completely saturated and almost blinded, yet must keep time, and endeavour to see the signals in cases of danger, which if we happen to miss not the slightest mercy is shown us. If the directors would take pity on us and erect a mere covering over our heads, it would be an inestimable boon to us both in running and standing at stations.

"I sincerely hope the public will use their influence in behalf of a body of men who are constantly exposed to all the changes of our variable climate, and a vast amount of responsibility always on our hands.

"In fogs or storms we must always go, never hesitating nor relaxing our endeavours to keep time, and give satisfaction to the public and our employers also. If this slight concession is made to us, it would be the means of saving many a man's health and doctors' bills, also conducive to the public safety. By inserting this you may be the means of obtaining a boon which would be truly valuable to us, and at a slight cost to the railway companies. A Railway Engineman."

Every American engine carries a complete and well windowed house, such as we have already illustrated in our large plate of the "Champlain" on the Hudson River line,* and in our article "What an American locomotive engine is like;" † and there is not the slightest reason—except that arising from a bad habit and a baseless prejudice—why we should not adopt the same thing. Here, for example, is a United States



locomotive, built according to the present approved model. Its engine-driver's house is most complete, and the man can thus travel almost as snugly as he can stay at home. Let us hope that railway directors will

* Vol. III. First Series, *Practical Mechanic's Journal,* page 241.

† Vol. I., Second Series, page 231.

now give a practical answer to the present appeal from the ranks of those important servants, the locomotive engine drivers.

The engine which enables us to give a practical illustration of our views in the matter, was made by Messrs. Walter Neilson & Co., of Hyde Park Foundry, Glasgow, for goods traffic in British America. In it Mr. Neilson has very judiciously copied many of the good things which United States engineers have originated. It is on eight wheels, the four after ones being coupled, whilst the four front ones are attached to a bogie or swivelling frame. There is the never-forgotten bell of the American engines, the expanded chimney and spark-catcher for burning wood, and the cow-catcher. The "cab" or foot plate house is a large and comfortable structure, entered by doors at the front, where the roof is extended forward to give additional cover. It has plenty of glass all round, so as not to obstruct the driver's view of his engine and the line, and has a cushioned seat on each side. It is a very good example of an American design treated by British hands; and it certainly shows that experienced engineers in this country do really approve of the driver's house, and can be brought to bring it forward in practice for the protection of the hard-worked driver.

THE ROYAL AGRICULTURAL SOCIETY, WARWICK, 1859.

The steady progress of this great association has never been better shown than this year at Warwick; and we are glad to say, most especially in the implement section. In this division there were no fewer than thirty-two rows of sheds, covering 246 stands, each individual exhibitor having one. This collection shows an increase of one-fourth over the show of 1858 Since the Society drew prominent attention to the special application of steam-power to the cultivation of the soil, and awarded £500 as a prize last year, greater competition has taken place in this department. The cattle yard contained twenty-nine stands, eight of which were devoted to the exhibition of sheep and pigs, and twenty-one to cattle, horses, and stallions, being an increase in the number of stands of one-fourth over that of 1858. Three new features of the show were the exhibition of wool, drain pipes, and field gates, while "special prizes" were given for cheese and a peculiar breed of long-horns.

This is the first year of the new arrangements as to special prizes and medals for improvements, the subjects being—ploughs, harrows, cultivators, clod-crushers, rollers, and brick and tile machines; and farm machinists who have devoted attention to such mechanical helps, have, of course, been on the alert. Fifteen ploughs were entered for trial on light land, and thirteen for heavy work. And for the special prize there were forty-five clod-crushers, thirty-four cultivators, forty-six draining machines, 107 harrows, seventy-one rollers, sixteen steam-cultivators, ten steam-ploughs, and twenty-four tile and brick-machines. The greatest amount of attention was devoted to the "steam-cultivators" and steam-ploughs. There were also exhibited 115 chaff-cutting machines in every variety, and 219 ploughs. There were thirty exhibitors of thrashing-machines, thirty-four of horse-hoes, about sixty of drills and the same number of corn-dressing machines. The result of the trials with ploughs was, that Messrs. Hornsby's plough stood first in the "light land" class, Messrs. Ransome's second, and Messrs. Howard's third. In the "general purpose" division, Messrs. Howard's plough was first, Hornsby's second, and Ransome's third; and in the "heavy land" class, Hornsby was again first, Howard second, and Ransome third.

Mr. Romaine's rotatory cultivator, the original modification of which we have engraved in our plate 172, vol. viii., was put to work, but an unfortunate accident stopped it. In external appearance this cultivator bears considerable resemblance to the ordinary railway locomotive, behind which is placed the digging apparatus, consisting of a revolving cylinder, armed with spades. It moves slowly over the ground, cutting a space of eight feet to any required depth, the cutters passing through the soil in a direction opposite to the progressive movement of the engine. The weight of this apparatus is computed to be 12 tons, which is borne by wheels 21 feet in diameter, and 6 feet 6 inches in width. For so huge a machine it is singularly well under control, turning in about its own length. The water tank is above the engines in front, admitting through it at either end the passage of steerage rods, which, by a simple contrivance, direct the guide wheels, there being two of these beneath the boiler, 4 feet in diameter by 1 foot in width. The cylinder to which the diggers are attached is 2 feet 8 inches in diameter, from which the diggers project 10 inches. This cylinder is connected to the axle of the travelling wheels by great iron arms, working in slots, and is lifted out of work by means of two steam cylinders, one on either side, giving the required motion to a rack and pulley. The points in favour of this machine are, that it requires no assistance from horses, and needs only two men to work it, besides the man and horse to fetch water.

In cultivators, Mr. Coleman is still the first.

Mr. Royd, of Rochdale, showed a modification of Mr. Smith's or the Woolston steam-cultivator system. The windlass he exhibited is much larger than Mr. Smith's, and consists of two vertical drums, 3 ft. 6 in. in diameter, a friction catch-box to save strain in case of accident, and a change-motion, by which means the engine keeps running; besides this he has a self-adjusting anchorage. The cultivator used broke down very soon, and the whole apparatus was consequently withdrawn.

Messrs. Crowley and Son's modification of Mr. Smith's apparatus was exhibited last year, but was disqualified for competition from the want of motive power. Their windlass consists of three pulleys between the vertical drums, the centre of which carries the strap when idle, from which it is shifted by a elever contrivance to the pulley on either side, communicating motion to the drums at pleasure. The anchors cause much delay by not holding at one end, and not penetrating at another.

Messrs. Chandler and Oliver's apparatus attracted great attention. In it the drums coiling the rope are placed between the fire-box and the travelling wheels, and are driven by gearing from the flywheel shaft. Proceeding from these drums, the wire ropes run through a double snatch-block at right angles to the back of the engine, and then diverge to the snatch-blocks, which are in the line of the implements' passage, forming a triangle, the base of which is the line of work, and the sides of which are constantly diminishing. A balance-plough is used, carrying three furrows each way.

Mr. Fowler's admirable apparatus now consists of a driving drum attached to the centre of one of Clayton and Shuttleworth's ordinary engines, having pulleys at either end for the wire rope to pass round, affording two three-quarter turns round the drum to avoid slipping. The engine works itself along the headland by a simple contrivance, and by the further addition of a pitch chain and wheel the engine is assisted into place, requiring one horse in the shafts to guide it. A cylindrical water cart, carrying a coil of extra rope, follows on wheels. The principle of the anchor is the same as formerly, with this great improvement, that the metal work is of wrought iron, and the wheels are placed horizontally instead of vertically. There were two sets of this apparatus at work, one ploughing, the other with the breasts removed from the plough bodies and another substituted, which acted as a continuation of the share, and broke up the sod without inverting it. This operation was very successful, the work was left rough, and those portions of the plot that were afterwards stripped showed that the cut was very regular. The ploughing, though deep, was not well laid, or regular, but as the land was exceedingly hard, it would have been well to show what horses could accomplish along side it. The pace was about three miles per hour, and the width carried in one instance 28½ inches, and in the other 30 inches.

The land smashed up by Mr. Smith's process did not strip so well after its one operation as might have been expected. Two processes are essentially necessary for producing what Mr. Fowler effects in one, although it is quite clear that the two processes must produce a better final result than any single one. At any rate, the judges have decided upon awarding the £50 prize to Mr. Fowler, for his "set of steam cultivating apparatus and balance four-furrow plough." As far as power is concerned, Mr. Fowler, taking four furrows, 9 inches by 6 inches, used a power of ten horses; and, taking 40 inches with his cultivator, he required eight horses' power. In Smith's case, taking a width of 30 inches, and breaking up from 8 to 9 inches deep, 11½ horses' power were necessary.

The apparatus shown by Mr. Barnish, of Rochdale, resembles Mr. Smith's. The windlass is much larger than that used by Mr. Smith; the diameter, including the flanges of the drums, being about five feet. The moving anchor is smaller than Fowler's; it has a zig-zag cutter on the periphery of the wheels, to keep it from swerving, and a bevil wheel and pinion drive the two worms on the worm-wheel, which is connected with the travelling-wheel. It is rather complicated.

In mowing machines, Messrs. Burgess and Key carried off the medal, but Wood's and Harwood's were very satisfactory. In each case the acre was cut within the hour.

As regards the awards, it will, perhaps, be necessary to guard our readers against the placing of undue weight upon them, for where there is so much average approximate perfection, if a prize *is* to be given, a very slight thing may—indeed must—turn the scale. The best machines or implements may fail in the hour of trial; a very trivial matter may put them wrong; and there is really no award like that of the bestirring class of farmers who keep their eyes open to contingencies, and to the possible chances for, and against, the implements put before them, as well as to the actual trial performances. Perhaps one of the greatest sights—certainly one of the greatest facts of the show—was the simultaneous working of thirty-nine engines in the yard devoted to machinery in motion.

In brick machinery, Mr. Humphrey Chamberlain, of Kempsey, near Worcester, showed a dry clay machine, by Messrs. Bradley and Craven, of Wakefield. The manner in which this machine turned out fine bricks from rough clay taken directly from the hillside to the moulding apparatus, astonished all who witnessed its work. Yet this was done in a minute and a half. The mill is formed of a pan, in which revolve two heavy rollers, running on an ordinary cross shaft, carried by two side cheeks with slotted guides, allowing the rollers to ride over the material when the charge is excessive. Beyond the solid metal of this pan on which the rollers run is a grating, throu h which the ground clay drops to a pan below, whence it is raised by elevators to the hopper above the revolving mould table, when it is subject to enormous pressure from beneath and above to expel the air. The table is turned by a tappet wheel, and moves the length of one mould each time. This action delivers two empty moulds under the hoppers to receive clay, delivers two bricks to the attendant, and gives a powerful upward pressure to the clay received in the moulds that have just left the hoppers. The table is then stationary, while the two eccentrics give the final strain upon two bricks from above. The moulding part of this machine weighs 25 tons. With six moulds, and driven by a six-horse engine, at four strokes to deliver twenty-four bricks per minute, it is capable of giving 330 tons' pressure on the six bricks. There were dense bricks exhibited made from pure dry silica, which would, of course, require great pressure: ordinary clays require a pressure varying from 20 to 30 tons on each brick. We shall shortly engrave this very important machine, so as to exhibit it in the fullest detail.

Mr. Samuelson, of Bombay, occupied one of the largest spaces in the implement section. His most important machine was Messrs. Seymour and Morgan's self-racking reaper, an American invention, which cuts the corn to a width of 5 or 6 feet, with a pair of horses drawing by a pole on the near side.

Messrs. Burgess and Key were, of course, great in American churns. They also showed a revolving horse-hoe, the invention of Mr. W. A. Munn, of Throwley House, Faversham, Kent. It thins the young growing crops, and cleanses them from caterpillars and other insects.

As an example of the great interest excited by the Show, it may be mentioned that, on the day the show-yard was opened, 1,689 persons paid 2s. 6d. each for admission.

The amount awarded in prizes for live stock, is £1,502; and for implements, including medals, £211. The prizes given by the Local Committee amount to £695—making a total of £2,408.

The following gentlemen acted in awarding the prizes for implements:—

Judges: Messrs. W. Owen, C E., Jno. Brasnett, J. Clarke, J. Druce, J. Hicken, G. M. Hipwell, J. J. Rowley, J. Thompson, W. Tindal; C. E. Amos, C.E., consulting engineer. Stewards: Messrs. Barnett, Caldwell, and Pope; and their decisions were the following:—

Prizes: £4, Hornsby and Sons, light land plough; £3, Ransomes and Sims, ditto; £2, J. and F. Howard, ditto; £1, Hensman and Son, ditto; £2, John Eddy, turnwrest plough; £6, J. and F. Howard, general purpose plough; £5, Hornsby and Sons, ditto; £4, Ransomes and Sims, ditto; £2, Busby Agricultural Implement Company, ditto; £1, Hensman and Son, ditto; £3, Hornsby and Sons, heavy land-plough; £2, J. and F. Howard, ditto; £2, Ransomes and Sims, ditto; £1 10s., W. Ball, ditto; £1, 10s., Busby Agricultural Implement Company, ditto; £4, Messrs. J. and F. Howard, harrows for light land; £3, ditto, ditto; £2, Messrs. Page and Co., ditto; £2, Messrs. Mapplebeck and Lowe, chain harrows; £4, Messrs. J. and F. Howard, harrows for heavy land; £3, Messrs. Page and Co., ditto; £2, Messrs. Ransomes and Sims, ditto; £5, Mr. Bentall, cultivator for light land; £3, Messrs. Coleman and Son, ditto; £2, Mr. Gray, ditto; £5, Messrs. Coleman and Son, cultivators for heavy land; £3, Mr. Bentall, ditto; £2, Messrs. Ransomes and Sims, ditto; £3, Thomas Scragg, hand-power tile machine; £2, J. Whitehead, hand tile machine; £15 A. and W. Eddington, draining plough and windlass; £3, F. Parkes and Co., hundle draining tools; £2, Mapplebeck and Lowe, bundle draining tools; £10, J. Whitehead, brick and tile machine; £5, H. Chamberlain, brick and tile machine; £50, John Fowler, jun., set of steam cultivating apparatus, and balance of four-furrow plough; £5, Trustees of Wm. Crosskill, field roller; £3, Messrs. Hill and Smith, field roller; £2, ditto, ditto; £5, Messrs. A. and E. Crosskill, clod crusher; £3, W. Cambridge, ditto; £2, Trustees of Wm. Crosskill, ditto.

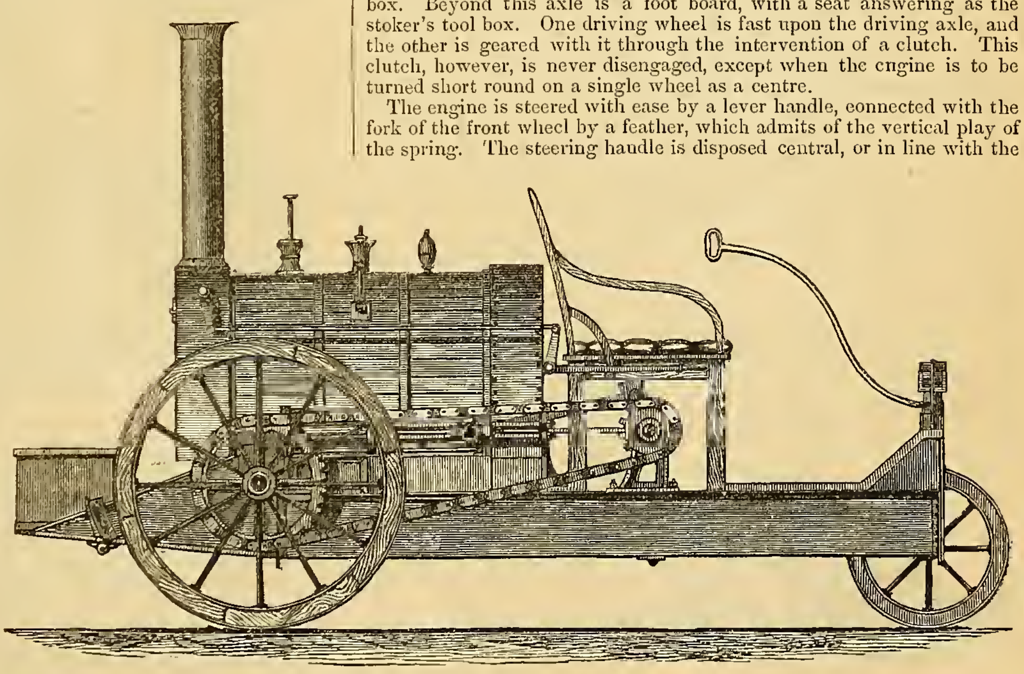
Silver Medals.—Sidney Flavel and Co., kitchen range; Thomas Gibbs and Co., collection of agricultural plants, seeds, and grain, in great variety; Peter Lawson and Son, collection of plants, seeds, and grain; W. H. and George Dawes, patent atmospheric hammer; Humphrey Chamberlain, dry clay brick-making machine; Humphrey Chamberlain, plastic clay brick-making machine; Burgess and Key, grass-mowing machine.

When the reader is told that there were 4,000 implements shown, he will begin to comprehend the vastness of the collection, and the great good which such exhibitions must do in the way of enabling the engineer and the farmer to improve their rapidly growing acquaintance.

LOCOMOTIVE STEAM CARRIAGE FOR COMMON ROADS.

The common road steam carriage which we here engrave was designed for the Marquis of Stafford and Mr. J. E. M'Connell, of the London and North-Western Railway, and was built by Mr. Thomas Rickett, at the Castle Foundry, Buckingham. It was intended to carry three passengers at ten miles an hour, and we believe that it has amply fulfilled these conditions. It is carried upon three ground wheels—two drivers behind, and a single running steering wheel in front. The main framing of the engine is formed out of a pair of longitudinal parallel sheet-iron tanks. Between these at the back is a coal store, whilst at the front is the leading wheel, room being left between the tanks for this wheel to turn to a right angle. The boiler is fixed at the back, above the coal store; and the actuating steam cylinders are set horizontally, one on each side of it, an ample seat for three being provided in front between the forward end of the boiler and the steering wheel. The first motion crank shaft is beneath the seat, the piston rods being coupled on in the usual manner. This shaft carries a pin or pitch wheel, over which is passed an endless pitch chain, which also passes over a larger chain wheel upon the driving axle. The respective diameters of the driving and driven chain pulleys is as 1 to $2\frac{1}{2}$. The driving axle carrying the large ground wheels is at the back end of the tanks, which carry guides for the axle boxes, a single steel spring being extended across to rest on each axle box. Beyond this axle is a foot board, with a seat answering as the stoker's tool box. One driving wheel is fast upon the driving axle, and the other is geared with it through the intervention of a clutch. This clutch, however, is never disengaged, except when the engine is to be turned short round on a single wheel as a centre.

The engine is steered with ease by a lever handle, connected with the fork of the front wheel by a feather, which admits of the vertical play of the spring. The steering handle is disposed central, or in line with the right hand seat, at the side of which is the steam regulator handle. In this way the person occupying this seat acts as driver, as he has complete control over the engine. The steam cylinders are three inches in diameter and nine inches stroke; the working steam pressure is 110 pounds; the driving wheels are three feet in diameter. The boiler has an internal flue and return tubes, and is not materially affected by variations of level. It is of cast steel, and is nineteen inches in diameter, and affords an area of thirty-one square feet of heating surface. The water tanks, which are of very ingenious structure, as both carrying water and acting as framing beams, carry forty-two gallons of water, sufficient for an eight or ten miles run. The coal store has capacity for from twenty to thirty miles consumption. The weight of the engine itself is nineteen hundredweight and a half; with its load of passengers and stoker, and water and coal, it weighs thirty hundredweight. Its



fuel consumption is from six to seven pounds of coal per mile, and the boiler evaporates about a gallon of water per minute.

On good level roads it runs easily at twelve and fourteen miles an hour; and it can ascend hills of 1 in 12—pretty steep work. Its performance in this respect is best measured by remembering that nearly five horses' power are necessary to take thirty hundredweight up an incline of 1 in 12 at four miles an hour. Its motion is extremely easy in running, as it is well mounted on springs; the only noise of importance made hy it being that of the blast pipe. It seldom produces smoke, but, as the passengers are in front of the chimney, neither steam nor smoke can ereate any discomfort for them. The promoters of this new attempt at making steam assume more directly the functions of horses, are very sanguine of success, and expect the plan, or something like it, to come into very general use. This, of course, remains, as the builder himself says, to be seen. The working conditions are very different to those attending railway engines. Great power and light weight are leading essentials. They must be obtained in combination, or even partial success can never be reached.

It was for the sake of going as far as possible in the direction of lightness that Mr. Rickett adopted so small a boiler, as he deemed it better to burn an extra half pound of coal per mile than to carry a hundredweight more metal and water. The available tractive power of the engine, which has had a lengthened trial upon the roads in Buckinghamshire and the neighbourhood, is equal to 380 pounds, or one-sixth of its weight, or one-ninth of its gross load. But as the opposing gravity when on an incline of 1 in 12 is equal to 280 pounds, it is clear that the roads must he in good order to insure that the friction will not exceed the other hundred pounds in $1\frac{1}{2}$ tons.

The chief practical difficulty met with in running on the ordinary roads is the passing horses, and this will always be a difficulty, for it is hardly to be expected that the horse will ever learn to pass automatic machinery without fear and trembling. At present, at any rate, frequent stoppages are necessary to allow the animals to pass. It seems that there is a feeling abroad that common road steam traction will shortly be an established fact, for a bill under the superintendence of Mr. Garnett, Mr. Wilson Patten, and Mr. Ridley, and which has passed to a second reading, enacts the following scale of tolls to be levied by corporations, commissioners, trustees, and other persons, viz.: For every locomotive attached to any loaded waggon or carriage, 1s.; for every waggon, wain, or carriage, drawn hy such locomotive, and having the felloes of the wheels not less than six inches nor more than eight inches in breadth, the sum of 3d. for each pair of wheels; for every waggon, wain, or carriage, drawn by such locomotive, and having the felloes of the wheels not less than eight inches in breadth, the sum of 4d. for each pair of wheels. Every locomotive must consume its own smoke. The reason for the bill is recited in the preamble, to wit, that the use of locomotives is likely to become common on turnpike roads for drawing waggons and carriages; and the existing Turnpike Acts do not provide for the contingency.

M. SCHOENBERG'S INDIA-RUBBER RAILWAY SPRINGS.

The arrangement of springs devised by Mons. Schoenberg has for its object the supporting of the load in railway waggons upon rings or tubes of vulcanised caoutchouc, or other elastic material. The springs being brought into action by the aid of pointer levers, arranged so as to produce the desired effect. These peculiar arrangements are illustrated by figs. 1 and 2, of the annexed cuts. The piece, A, is bolted to the underside of the waggon framing. To this piece are jointed the two links, B B, so as to form hanging feet, their lower extremities being jointed to the lower forked pieces, C C, which are fitted with rods, and enclosed by means of the plates, D, and nuts, E; the caoutchouc rings, F, are mounted on an axis of their own. The nuts, E, enable the caoutchouc rings to be more or less tightened up, and regulate the tension of the spring to suit the load and balance of the waggon. The two forked pieces, C C, which serve to compress the caoutchouc portion of the springs, are provided with antifriction rollers, G, the axes of which slide in slots at H, in the sole plate, I, connecting the two sets of links and slides. The recess, J, receives the axle line. The vertical pressure of the load is obviously transformed to a horizontal pressure upon the caoutchouc springs by the peculiar arrangement of the links and slides.

Fig. 1.

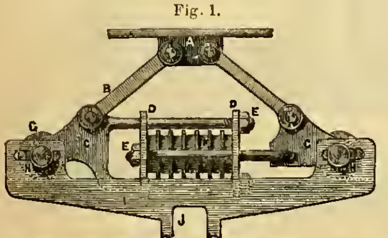


Fig. 2.

RECENT PATENTS.

DRYING FABRICS.

James Leck, *Glasgow.—Patent dated Dec. 28, 1858.*

This invention relates to the drying of various classes of goods, but in particular, Turkey red fabrics, in such a manner as to impart a superior finish and effect to the goods, and reduce the time ordinarily employed in the operation. One modification under which the invention may be practised, consists in passing the printed "goods" in fabrics through an ordinary drying machine, in connection with which the improvements for rapidly cooling and drying the fabrics are arranged. The "goods" are continuous lengths of textile fabric, formed by joining several pieces together, are in the first instance passed between the smoothing or stretching rollers of the drying machine, and from these rollers pass under the first steam cylinder or "can" of the machine. There are two series or rows of these "cans," arranged one above the other, the lower row intervening or being arranged between the two upper and contiguous "cans." The several cylinders comprised in the two series being arranged in this manner, they are driven at one end by means of gearing, and the steam is admitted to the interior of the cylinders, through hollow or tubular journals, which are arranged in connection with a steam pipe extending from end to end of the machine. In passing off from the periphery of the first "can," the cloth comes in contact with an open barred polygonal roller, arranged across the machine above the upper series of "cans," and running loosely in end standards projecting above the side frames of the machine. From the first "can" the cloth is carried upwards, to a height of ten or fifteen feet above the "can," where the cloth is passed over a polygonal roller, or agitator, arranged to run loosely in bearers, pendent from the roof of the building, or supported in any other convenient manner. These rollers consist merely of open frames of wood, which are made of a triangular or polygonal figure, or in the form of an open blade revolving on a central longitudinal axis or spindle. As the cloth passes round the first "can" in its wet state, as it comes from the washing operation, the heat of the "can" would dry it with great rapidity and injure the fibre, but for the velocity of its passage through the machine. Under any circumstances the heat is prejudicial to the beauty and delicacy of the finer colours, which are used in printing textile fabrics, and the special object of this invention is to avoid the injurious effect of heat by cooling the fabric the instant it leaves the "can." To this end, the moment the cloth leaves the periphery of the first "can," it comes in contact with the first polygonal roller, the rotation of which by the frictional contact of the cloth, causes it to be moved to and from the surface of the heated "can," so that it no sooner receives the influence of the heat, which causes the steam to rise from the surface of the cloth, than both steam and heat are dissipated by the cloth being agitated in the air. From the first "can" the fabric is carried over the elevated polygoual roller above, the ten or fifteen feet length of cloth being rapidly agitated in the air hy the rotation of the roller, the air being meanwhile allowed to flow in an uninterrupted current through the building in which the drying machinery is placed. From the upper polygonal roller, the cloth passes downwards between the first pair of "cans" of the upper series, rouud the first of the lower series, from which it passses to the second of the upper row. From the heated surface of the second upper "can," the cloth is carried over a second polygonal roller, arranged parallel to the first, and in manner similar. This roller alternately shakes or agitates the ascending and descending length of cloth, which then passes under the second "can" of the lower series, and partially round the third "can" of the upper series. In this manner the length of cloth is carried successfully round the "cans" or heated cylinders, and over the polygonal rollers or open frames, until it reaches the last of the series of "cans," whence it is drawn off in the usual manner by a pair of reciprocating frictional rollers. In the passage of the cloth through the machiue, each portion of the cloth is in contact with the heated cylinder only for a very short space of time, and it no sooner leaves the upper cylinder than it is immediately cooled, and the steam is dissipated by the shaking motion imparted to the cloth. The result of this treatment is, that the goods are dried with great rapidity and ease, and being quickly cooled as the fabric passes off from the heated cylinders, the delicate bloom of the most brilliant colours is brought out, with a freshness and brilliancy far superior to the effect produced by the ordinary mode of drying. Another mode of effecting this rapid cooling process, consists in arranging a series of wire cloth cylinders, alternately with the upper row of steam "cans." These wire cloth cylinders are similar to those ordinarily used in the manufacture of paper, and instead of employing wire cloth for the purpose, the cylinders may be composed of segmental plates, each plate having a great number of slots, or narrow elongated openings made therein. The wire cloth or open cylinders, are mounted and driven in the same manner as the contiguous steam "cans." Inside each of the open cylinders is arranged a fanner air-wheel, the spindle of which is connected with external gearing, so as to drive the fanuer at a high velocity. The fanners are kept iu motion during the passage of the goods through the machine; the rotation of the vanes or blades of the fanners puts the air into rapid motion, and causes it to impinge upon, and agitate the contiguous lengths of cloth, so as to produce a rapid and effective drying action, and at the same time preserve the brilliancy of the colours unimpaired.

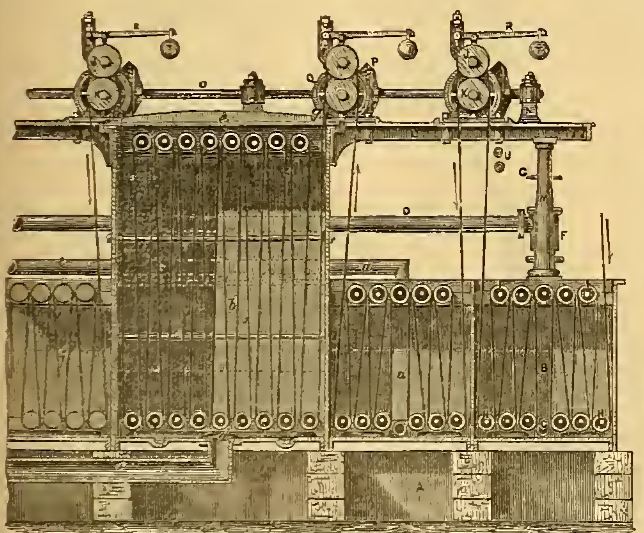
BLEACHING FABRICS.

Robert Alexander, *Dillichip, Dumbarton, N.B.—Patent dated November* 27, 1858.

According to the patentee's improvements, instead of boiling the goods as is usually the practice, the fabrics are passed in an open sheet form, slowly through steam chests, or through or in contact with steam, in any other convenient way. This steam treatment is employed instead of the usual boiling process, at all or any of the stages of preparation and bleaching where boiling is resorted to, and with or without the presence of the chemical ingredients employed in the process. The time occupied by the processes is in this way very much reduced, and the colour, effect, and appearance of the treated goods are greatly improved.

Fig. 1, of the accompanying engravings, is a sectional elevation of a portion of one arrangement of the improved apparatus for treating and

Fig. 1.



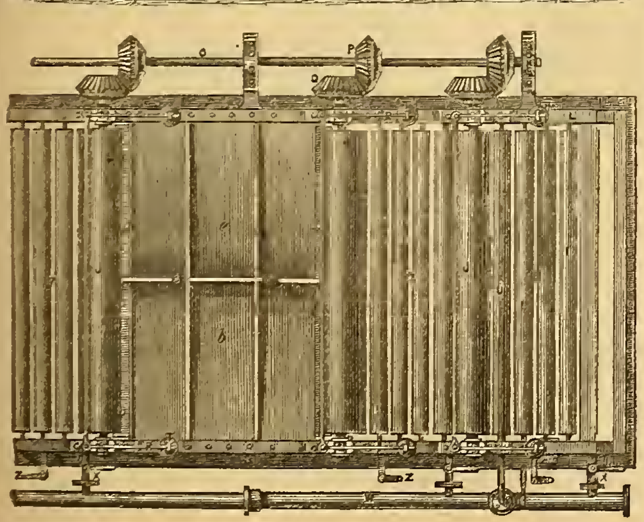


Fig. 2.

bleaching fabrics by steam. Fig. 2 is a plan corresponding to fig. 1. The apparatus consists of a range or series of cisterns and steam chests, which are disposed in a continuous line. The cisterns and steam chests are arranged upon a stone or brick foundation, A, and the series consists of seven iron and two wooden cisterns, and three steam chests; the whole of these vessels are of a rectangular figure, the metal ones are formed of cast-iron plates, the wooden cisterns heing bound together hy malleable-iron tie rods and nuts. The first cistern, B, of the series is filled with hot water, which is kept up to the boiling temperature by the steam which flows through the perforated pipe, C, this pipe branches off from the steam pipe, D, that is carried along the side of the apparatus above the cistern, B. The steam pipe, D, communicates with the main pipe, E, which steam pipe is connected with the hoiler; the steam way of this pipe is controlled by a valve in the valve chest, F, which is actuated by the hand wheel, G. The goods or fabrics to be bleached are conveyed into the cistern, B, and dowuwards beneath the first of a series of hollow sheet iron rollers, H, which are arranged parallel to each other at the lower part of the cistern. There are six of these rollers at the bottom of the cistern, and at the upper part there is a corresponding set of five rollers, I. The fabrics are passed successively over and under these rollers, and after passing under the last of the rollers, H, they are carried upwards and passed between a pair of nipping rollers, J K, which are carried in end standards that are bolted to the longitudiual framing, L. This framing extends the whole leugth of the apparatus, and is supported at intervals by the columns, M. The framiug, L, overhangs the cisterns ou one side, and to this overhanging part the pedestal bearings, N, which carry the main shaft, O, are fitted. This shaft, which is driven from a steam engine or other prime mover, actuates a pair of nipping rollers, which are fitted over each cistern and steam chest. The shaft, O, has keyed to it a bevel wheel, P, which gears with a corresponding wheel, Q, fast to the spindle of the lower roller, K, iu this manuer the whole series of the rollers, K, are driven at a uniform velocity. The bearings of the upper roller, J, are carried in slots made in the end standards, so that by means of the weighted lever, R, the upper roller may he caused to press with more or less force upon the lower roller. The lever, R, is centred upon a stud that is carried in a vertical arm which springs from the eud standard, and is jointed to the short presser bar which hears upon the spindle of the roller, J. The balance weight, T, is adjusted upon the lever according to the amount of pressure required upon the fabrics undergoing the process. As the goods pass up from the cistern, B, prior to their reaching the first pair of nipping rollers, they are subjected to the washing action of streams or jets of water, which issue from the horizontal perforated pipes, U. There are two of these pipes which are arranged parallel to one another, and brauch off from the vertical pipe, V, which communicates with the main water pipe, W, the water way of the pipe, V, being controlled by a suitable tap or valve. A branch pipe and cock, X, also connects the main water pipe, W, with each cistern throughout the series, hy meaus of which they are supplied with water as required. Each cistern is also furnished with an outlet valve, Y, which is actuated by the handle, Z, to allow of the contents heing drawn off from time to time. The fabrics, after passing over the first roller, K, are carried downwards into the second cistern, *a*, in which they are subjected to the action of a boiling chemical solution, heated by the branch steam pipe, a^1; the chemical solution consisting of half a pound of soda ash, and half a pound of Irish lime to each gallon of water contained in the cistern. From the cistern, *a*, the goods are carried hetween the second pair of nipping rollers, J K, and into the steam chest, *b*, the steam passes into this chest from the pipe, *c*, in a spray or sheet beneath and all round the edge of the plate, *d*. The steam pipe, *c*, is carried along beneath the range of cisterns and into the three steam chests, receiving its supply from a laterally branching steam pipe in connection with the main steam pipe, E. As the steam within the chest, *b*, is kept ahove the atmospheric pressure, it is provided with au arrangement at the slits, where the goods enter and come out, for the purpose of preventing, as far as possible, the escape of the steam. This consists of a pair of brass jaws fitting closely to each other, and between the faces of which the goods pass. Two flat stripes of iron are holted to the top of the steam chest, one of these has cast to it the fixed jaw, *f*, whilst the other has fitted to it the slidiug jaw, *g*. These jaws are by preference made of brass, their contiguous faces being ground smooth so as to clip the cloth closely, hut without impending its traverse through the steam chest. The sliding jaw, *g*, is moved to and fro by stationary screws which are fitted in the staudards, *i*, and work through the upwardly projecting part of the jaw, *g*. The two pairs of clipping jaws are arranged on each side of the top of the steam chest, immediately beneath and in a line with the periphery of the nipping rollers, K. A corresponding arrangement is fitted on the top of each steam chest in the series. The fabrics are subjected to the full action of the steam heat, by passing them successively under and over the rollers, H and I; after beiug carried through the third pair of nipping rollers, they are subjected to the action of cold water in the cistern, *j*. Before passing under the fourth pair of nipping rollers, the goods are subjected a second time to the streams or jets of cold water which issue from the duplex perforated pipes, U, which are in all respects similar to those hefore described. From the fourth pair of nippiug rollers the goods pass dowu into a wooden cistern, K, which is filled with a solution of muriatic acid and water, by preference of a strength marking two degrees Twaddell; this acidulous solution is kept at a temperature of ninety degrees Fahrenheit, by duly regulating the admission of the steam through a steam pipe. The goods are next washed in an adjoining cistern, which is filled with cold water, and are then passed into the next cistern, which contains a chemical solution composed with proportions of half a ℔ of resin, one gill of caustic soda, and one gallon of water; this solution is kept at the boiling temperature. From the last cistern the goods are conveyed into another steam chest, and are next washed in a hot water cistern which is heated by a steam pipe, the passage of the steam being controlled by a valve. Before passing into the next compartment, the goods are washed by the jets of water issuing from a fourth pair of perforated pipes; in this cistern the goods are immersed in a solution of chloride of lime and water, marking one and a-half degrees Twaddell. From the chemical cistern the goods are next conveyed into a steam chest, and thence into a cistern which is constructed of wood, and contains an acidulous solution composed of sulphuric acid and water, of a strength marking two degrees Twaddell. Finally the goods are passed through a washing machine which completes the preparing or "bleaching" process. In the arrangement and working of the foregoing apparatus, preference is given to the cloth passing through the machine in two breadths, at the rate of thirty-four yards per minute. The hereinbefore described apparatus and process is equally applicable to the preparation of Turkey reds, as for what are technically known as "madders" and "steams." These improvements in treating, preparing, and bleaching textile fabrics, accomplish the work in a very superior manner, and effect an important saving of time and labour.

TELEGRAPH CABLES.

J. H. Johnson, *London and Glasgow* (H. J. Rogers, *Baltimore, U. S.*)—*Patent dated November* 19, 1858.

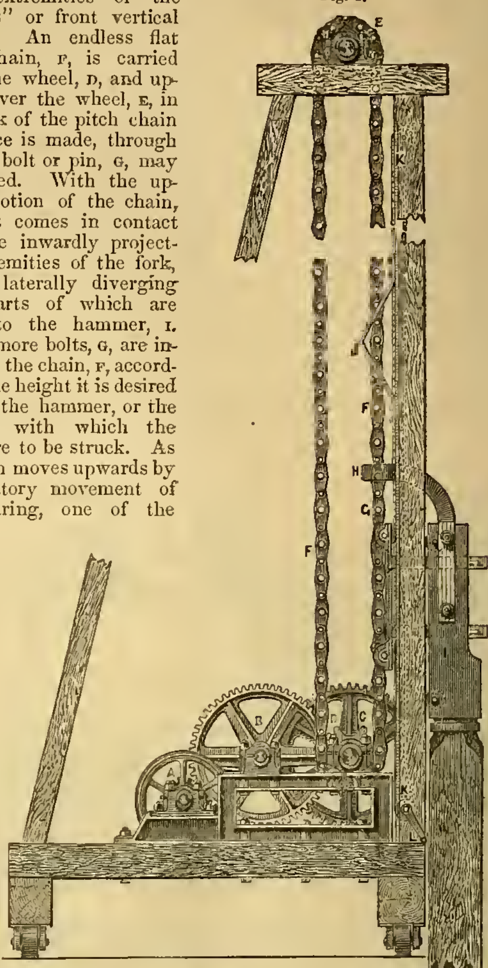
This improved mode of constructing telegraph cables or conductors consists in covering and protecting such conductors, composed of copper or other metal, by means of plaited, braided, or interwoven strands of hemp, flax, or other fibrous material, instead of the modes hitherto practised of overlaying such conductors with strands of reeled, twisted, or spirally laid wires or other material. Experience has demonstrated that the "iron-bound" conductors or cables heretofore employed are objectionable, from the fact that the covering is laid spirally, or like the strands of a rope, and is therefore liable to unwind and "foul" or "kink" the cable during the process of laying. In addition to this defect of such conductors they are liable to serious and fatal injury from the exposure of the insulating covering of the conductor, by the breaking of one or more of the strands of the spiral covering, as these strands will continue to unwind for some distance and expose the gutta-percha or other insulating material to abrading agents, and to injury from other causes. It has also been proved that the wire-covered cables are too heavy for deep sea telegraph lines, and therefore it is proposed to dispense with the wire covering heretofore employed, and to substitute for the same a covering composed of hemp thread, twine, cord, or other suitable fibrous material, which is plaited, braided, or interwoven by well-known machinery over the gutta-percha or other insulating medium, so that the strands are woven together similar to those of a whip lash. One or more of these plaited coverings may be employed (braided or plaited) one over the other, and the whole may then be covered with any marine paint or varnish adapted to the purpose. This mode of covering conductors or cables greatly reduces the weight and cost of submarine telegraph lines, at the same time the insulating material and conductor is protected from abrasion, and the process of laying the cable is facilitated whether at sea or underground. For shoal water or anchorage ground the foregoing described cord should be incased in wires, which may also be plaited or otherwise laid over the hemp or other fibrous plaited material. The plaiting process may also be applied to the manufacture of the electric conductor itself when several wires are to be used in its formation.

PILE DRIVING MACHINE.

Toshach, *Gloucester.—Patent dated September*, 10, 1858.

In the subjoined engravings we have shown an elevation and plan of Mr. Toshach's improved pile driving machine. The framing of the machine is of a rectangular figure, the end balks of which are carried upon low wheels, so that the machine may be readily run to and fro, as the piles are successively driven. The moving parts are actuated from the pulley on the shaft, A, which is driven by an endless band that is carried round the pulley of a portable engine, arranged behind the pile driving machine, or it may be carried upon its framing. The shaft, A, carries a pinion, which gears with a wheel on the shaft, B, which has also keyed to it a pinion in gear with the spur wheel on the shaft, C. On this shaft is a chain wheel, D, and a corresponding wheel, E, is fitted on a transverse shaft, which is carried in pedestal bearings that are bolted to the cross framing on the upper extremities of the "leaders" or front vertical timbers. An endless flat pitch chain, F, is carried round the wheel, D, and upwards over the wheel, E, in each link of the pitch chain an orifice is made, through which a bolt or pin, G, may be passed. With the upward motion of the chain, the bolt comes in contact with the inwardly projecting extremities of the fork, H, the laterally diverging front parts of which are bolted to the hammer, I. Two or more bolts, G, are inserted in the chain, F, according to the height it is desired to raise the hammer, or the rapidity with which the blows are to be struck. As the chain moves upwards by the rotatory movement of the gearing, one of the bolts, G, comes in contact with the fork, H, and thus lifts the hammer, I, as the chain traverses up towards the wheel, E. The hammer is released by the bolt, G, coming in contact with, and moving over, the outwardly inclined face of the wedge pieces, J, as the bolt moves outwards towards the apices of the wedge pieces, it slides out beyond the extremities of the fork, H, and the hammer falls on to the head of the pile beneath. The hammer is fitted in the usual manner with anti-friction rollers, which work against the faces of the "leaders," and serve to facilitate its ascent and descent. The bolts, G, are so arranged in the pitch chain, that as soon as the hammer has made the blow, another bolt comes under the fork, H, and the hammer is again raised, so that the work goes on with great rapidity and economy of labour. To regulate the height of the fall, the wedge pieces, J, are attached to an endless

Fig. 1.



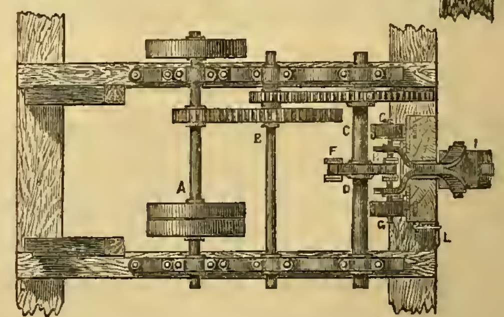


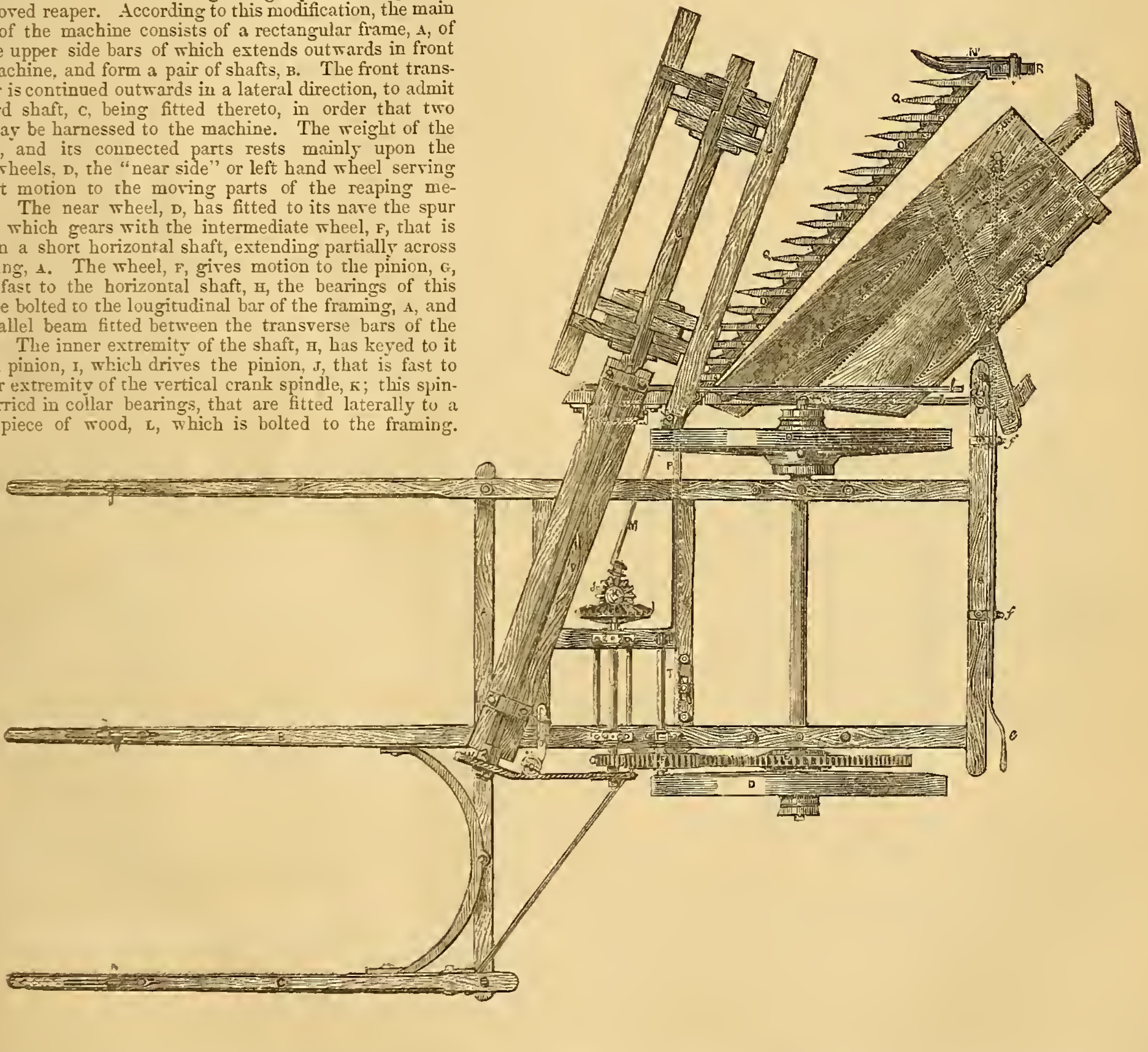
Fig. 2.

band. which is passed round and over chain wheels, fitted at the upper and lower parts of the "leaders." The spindle of the lower chain wheel is fitted with a winch handle, by turning which the elevation of the wedge pieces may be adjusted as required; the lower chain wheel is held in position by a ratchet wheel and pawl, or other similar contrivance. With these arrangements, the height of the fall and the rapidity of the blows are under complete and effective control.

REAPING MACHINES.

James Drummond, *Edinburgh.—Patent dated October* 29, 1858.

The patentee arranges his improved reaping machine in such manner, that the cutter extends outwards from the machine in a lateral direction, and is arranged in an angular position, so that the fore end only is first brought in contact with the crop. As the machine is drawn along, the position of the cutters causes them to effect the cutting operation, in manner similar to the action of a scythe, or with a kind of shearing motion, which it is stated is far superior to the ordinary mode of arranging these machines, and requires less expenditure of horse power. Our illustrative engraving represents a plan of the improved reaper. According to this modification, the main framing of the machine consists of a rectangular frame, A, of wood, the upper side bars of which extends outwards in front of the machine, and form a pair of shafts, B. The front transverse bar is continued outwards in a lateral direction, to admit of a third shaft, C, being fitted thereto, in order that two horses may be harnessed to the machine. The weight of the frame, A, and its connected parts rests mainly upon the driving wheels, D, the "near side" or left hand wheel serving to impart motion to the moving parts of the reaping mechanism. The near wheel, D, has fitted to its nave the spur wheel, E, which gears with the intermediate wheel, F, that is carried on a short horizontal shaft, extending partially across the framing, A. The wheel, F, gives motion to the pinion, G, which is fast to the horizontal shaft, H, the bearings of this pinion are bolted to the longitudinal bar of the framing, A, and to a parallel beam fitted between the transverse bars of the framing. The inner extremity of the shaft, H, has keyed to it the bevel pinion, I, which drives the pinion, J, that is fast to the upper extremity of the vertical crank spindle, K; this spindle is carried in collar bearings, that are fitted laterally to a pendent piece of wood, L, which is bolted to the framing.



The lower part of the plank, L, is supported and strengthened by an iron stay, the upper end of which is attached to the side beam of the framing, A. The lower end of the crank shaft is connected by the rod, M, to the cutter, N, which is so arranged, that it extends laterally from the machine at an angle of about 45°. The cutter, N, consists of a series of finely serrated cutting blades, O, of a triangular figure at the outer or cutting part, these blades or cutters are riveted to the iron bar, N. This bar is arranged in immediate contiguity to another but thicker bar, P, to which are riveted the outwardly projecting spikes or fingers, Q, these fingers have a slot formed in each, the direction of which is parallel with the upper and under surfaces of the fingers. The slots in the fingers, Q, admit of the rod, N, with its attached cutters, Q, moving freely to and fro therein; the action of the cutters, O, against the fixed surfaces, Q, serving to sever or divide the stems of the wheat, or other plants to be reaped. The transverse bar, P, has riveted to it a series of pendent brackets; these brackets extend outwards, and serve to support the cutter bar, N, which slides to and fro on the surfaces of the brackets. Thus when the crank shaft, K, is put in motion, the cutter, N, moves rapidly to and fro between the fingers, Q, acting in manner similar to the cutting action of a pair of scissors. The outwardly extending part of the reaping mechanism traverses upon two wheels, R, the inner one of which is carried in a case or box, that is bolted to the front part of the inner bar of the reaping mechanism; the outer wheel, R, being fitted in a corresponding case or box at the extremity of the bar, P. The inner portion of the bar, P, is bent inwards, and extends beneath the central transverse bar of the framing, the face of the part near the extremity being twisted from the horizontal to the vertical position, and perforated. This upwardly extending part of the bar, P, is secured by a bolt and pin to the vertical bar, S, the upper end of which has a screw thread cut on it. The bar, S, passes upwards through a guide that is secured to the underside of the central transverse bar, and then through the bar itself, a screw, T, being fitted to the upper end, so that the length of the bar may be adjusted as required. This arrangement of the bar, P, admits of the cutter bar and its connected parts passing readily over any inequalities of the ground; and also the adjustment of the distance of the cutters from the ground, by means of the screw, T. The crop to be cut is pressed over the cutting apparatus, and in close contact with the knives, by means of the reel, U, which consists of a central shaft fitted with radial arms, having flat boards or vanes attached thereto. The shaft of the reel is carried in bearings that are bolted to a wooden bed, V, that extends in an angular direction across the machine. The reel shaft, U, has fitted to one extremity a pulley, W, which is driven by an endless band, X, that is carried round a pulley on the end of the shaft, H, from which it derives its motion. The band, X, being diverted from a right line to reach the pulley, W, is guided by the adjustable pulleys, Y. The crop as it is cut falls back upon the inclined platform, Z, the inner part of this platform next the driving wheel is attached to the jointed adjusting rod, *a*, by means of a link, *b*, which is bolted to the bar that carries the inner wheel, R. The adjusting rod, *a*, is free to move vertically in the guide, *c*, which is attached to the end bar of the framing, A, through which bar the upper end of the rod, *a*, passes, and has fitted to it an adjusting nut, *d*. To the outer part of the platform, Z, the lower end of a second bar, *e*, is bolted, this bar is bent upwards, and extends across the back part of the machine, and it forms a hand lever for the adjustment of the angular direction of the platform. The bar, *e*, passes between the faces of two guides, *f*, these guides are perforated and fitted with retaining pins, by means of which the bar, *e*, may be adjusted as required. Another arrangement is also provided for giving more or less inclination to the platform, Z; this is effected by means of the board, *g*, which is secured to the back of the platformin an angular direction. The adjusting board or bar, *g*, projects above the top of the platform, Z, and rests upon a bracket, *h*, which is bolted to the end bar of the framing, and is bent to form an inclined surface corresponding to the inclination of the adjusting bar, *g*. A series of holes is made in the bar, *g*, a pin is passed through one of these holes, and it rests upon the upper edge of the bracket, *h*. By shifting the position of this pin from one hole to another, the bar, *g*, is practically lengthened or shortened, and the inclination of the face or receiving surface is varied accordingly. To prevent any part of the cut crop from falling towards the off side driving wheel, a vertical board or guard, *i*, is secured to the frame of the cutting apparatus, this guard extends backwards in an angular direction, as shown in the engraving; it serves effectually to prevent any of the cut crop from falling beneath the wheels of the machine. At the outer extremity of the receiving platform, Z, there are fitted two outwardly sliding arms, *h*, the extremities of these arms are bent upwards so as to retain a considerable quantity of the cut crop. The angular direction in which the cutting apparatus is arranged, tends to carry the cut material towards the arms, *h*, from whence it is easily removed as it accumulates, either to be made up in sheaves or otherwise disposed of. In a reaping machine arranged in accordance with these improvements, the angular position or direction of the cutters and platform, may be varied to any degree of inclination with the utmost ease and facility, so as to obtain a greatly superior cutting action, combined with the minimum expenditure of power. Whilst at the same time, the parts being so adjusted upon the moveable pivots, that the action of the machine is not interrupted in passing over broken ground. And further, to provide for this adjustable rocking motion of the cutting apparatus, the bar, P, is made with two backwardly extending lateral arms or links, which are jointed to rods pendent from the main framing, or are otherwise connected to suitable centres. So that whilst the arms firmly hold the bar, P, and the cutting apparatus when opposed to the resistance of the crop, the arrangement admits of the whole rising and falling with an easy and regular motion, as the machine passes over the inequalities of the ground.

ENDORSING PRESS.

S. T. Clarke, *Westbourne Park, London.—Patent dated Oct.* 20, 1858.

The press consists of a rectangular base plate of cast-iron, from the backward end of which springs an upwardly directed overhanging arm, similar to the ordinary embossing presses. The free overhanging extremities of the arm are made of a forked or duplex figure, the two projecting parts being arranged one above the other; in the lower one an aperture is made in which is fitted a vertical slide of a triangular section working in a guiding groove of a corresponding shape, formed in the front of the press body. This slide is retained in the groove by a front plate, capable of being more or less tightened up by screws. A chamber or recess is formed in the front plate for the reception of a helical spring, which bears against a projection formed on the face of the slide, and thus serves to raise the slide after it has been depressed. To the lower end of this slide is fitted the perforating tool or punch, which consists of a block of metal with a shank formed upon its upper surface, which shank is introduced into a corresponding aperture in the bottom of the slide and retained therein by a tightening screw. To the under surface of this block is screwed a plate, which is fitted with a number of solid punches, arranged in suitable order, for producing in perforations the requisite letters and lines for crossing a cheque. The inner ends of the punches have bevilled heads formed upon them, to prevent them from escaping through the plate when secured to the block, but when removed, each punch is free to be withdrawn and replaced by a new one, if required. Parallel with the block there is a stripper plate for removing the cheque from off the punches after they have operated, and it serves also to hold the paper firmly down upon the surface of the fixed perforated plate or matrix below during the descent of the punches, thereby preventing the paper becoming puckered whilst the punches are being forced through it. There is a series of helical springs placed inside the block for the purpose of forcing the stripper plate outwards towards the ends of the punches, and so stripping the paper therefrom on the ascent of the punching tool. Another important advantage derived from the use of this plate is, that the ends of the several punches, when the machine is at rest, are concealed within the plate, and are consequently guarded or protected from accidental injury. In crossing a cheque by this machine, the cheque is laid across the perforated plate or matrix, which is secured firmly to the bed of the machine, and the knob or handle on the top of the actuating spindle, which is connected with the triangular slide, is struck smartly by the hand, when the descent of the punching tool will perforate the cheque in the manner required for crossing. The waste fragments of paper which are cut out by the punches are allowed to escape freely from the matrix plate by means of lateral inclined slots in a base plate, upon which the matrix is secured, or they may be allowed to pass directly through the matrix and through the bed of the machine, when an opening is made for that purpose therein. An ordinary lever handle, similar to an embossing press, may be employed for working the punching tool in lieu of the striking knob.

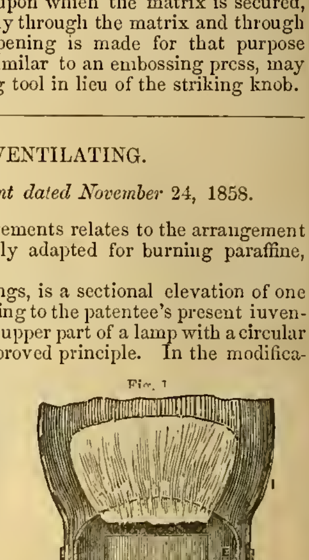
LIGHTING AND VENTILATING.

J. S. Nibbs, *Birmingham.—Patent dated November* 24, 1858.

The first part of the patentee's improvements relates to the arrangement of lamps, which are more particularly adapted for burning paraffine, petroleum, or naptha.

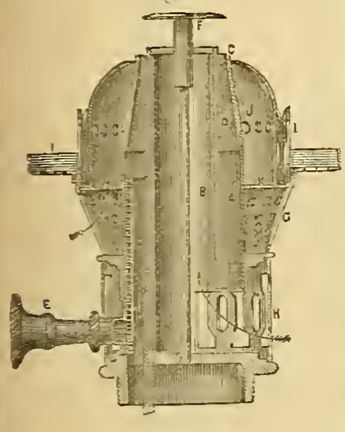
Fig. 1, of our illustrative engravings, is a sectional elevation of one modification of a lamp arranged according to the patentee's present invention. Fig. 2 is a vertical section of the upper part of a lamp with a circular or argand wick arranged upon the improved principle. In the modification, as arranged in fig. 1, the ornamental pillar, of the lamp has screwed to its upper part, the reservoir or holder, A, in which the oil or spirit is contained. To this glass or porcelain reservoir, a brass ring, B, is cemented, this ring is made with an internal screw in it, to which is fitted the screen or windguard, C. This portion of the lamp consists of a perforated diaphragm of thin metal, which is made in the form of an inverted frustum of a cone, the narrower portion having a ring thereon, which is made to fit the internal screw of the ring, B. The windguard, C, has fitted within its upper rim the glass holder or chimney gallery, D. In this modification of the improvements, this part of the lamp consists also of the outer gallery, for carrying the lamp shade of the cone or deflector, E, and of the finely perforated diaphragm, F. That is to say, the parts that serve these several offices, are in this arrangement formed in one piece. The ring of metal which fits the windguard, C, extends upwards, forming the light perforated gallery, D, in which the chimney, I, is fitted. To the lower edge of this gallery, D, is soldered, or otherwise secured, a perforated ring, the upwardly turned edge of which serves to partially support the lamp shade which rests upon the horizontal ring. To the lower face or base of the cone, E, is fastened a disc, F, of finely perforated metal, this diaphragm serves to check and divide into a multiplicity of fine jets or streams, the currents of air that flow in through the apertures in the conical windguard, C. These minute streams of air flow upwards all round the wick-holder, G, which extends through the slot or opening in the disc, F, nearly up to the cone or deflector, E; and thus, as the streams of air impinge against the inner surface of the cone, the air is deflected and thrown back upon the flame of the wick. The wick-holder, G, is in this modification, arranged for a

Fig. 1



flat or ribband wick, and is formed of a piece of thin metal bent to form a flattened channel internally, this holder is fitted into a slot at the lower part of the windguard, C, and is soldered thereto. The wick, is raised by means of a pinion, the spindle, H, of which is carried in bearings that are soldered to the face of the wick-holder, G, the spindle extends out beyond the gallery, D, and has fitted to its extremity a milled head, by means of which the wick is raised or depressed. The cone or deflector, E, with the perforated plate is fitted within the top of the windguard, C, it is formed of thin sheet metal, and has a transverse slot cut in it, through which the flame of the wick passes. A row of holes are made through the cone; these holes extend in a horizontal line round the circumference of the cone, and serve to facilitate the combustion. This external draft or supply of air is a portion of that which flows through the apertures in the windguard, C. By this arrangement of the upper portion of lamps, the patentee is enabled to obtain a broad flame of superior illuminating power, of a form similar to the ordinary "fish-tail" gas flame; the improvements also avoid the necessity of cutting the wick of an arched form, a clean horizontal cut prodneing the desired form of flame. Petroleum, paraffine, and other similar oils or spirits may be burnt in these lamps without requiring the intervention of wood, cork, or other non-conducting substance at the junction of the metal and the oil or spirit reservoir. This freedom from heating is obtained in a great measure by the peculiar arrangement of the windguard, C, and by the small quantity of metal that is brought within the influence of the flame, and in contact with the reservoir; the whole being cooled by the continuous upward flow of air as it passes rapidly through the apertures of the windguard, and is then diffused around the wick-holder, G, by means of the perforated plate, F. This arrangement also prevents the escape at the juncture of the burner with the reservoir. In modifying the construction of these lamps, for the use of circular or argand wicks in place of the flat or ribband wick, shown in fig. 1, preference is given to the arrangement delineated in fig. 2. The upper or mechanical portion of the lamp is secured to the oil or spirit reservoir by the screwed ring, A; this part serves as a disc, which encloses the opening to the body or reservoir, except at the segmentally shaped apperture left to receive the lower end of the duplex tubes, B and C. The outer tube, B, does not extend upwards so high as the inner tube, C: a short moveable piece, D, is fitted within the tube, B, which brings it up to the same height as the inner tube. When the piece, D, is removed, it facilitates the access to the wick-holder, E, which works up and down between the tubes, B and C. The wick-holder consists of a double segmentally shaped tube, F, which is curved to slide within the segmental portion of the tubes, B and C, the upper portion of the inner part at G, forms a tubular part that encircles the tube, C. The wick-holder is raised in the ordinary way by means of a rack, H, which is soldered to the back of the segmental outer tube, and traverses between a vertical guide that is attached to the tube, B, and the actuating pinion, I. The pinion is carried on the inner end of the laterally projecting spindles, J, which terminates in a milled head —the spindle, J, working through a stuffing-box or collar, K, that is screwed into the projecting boss at the upper part of the tube, B. In the centre of the disc which forms the upper part of the ring, A, is fixed a vertical spindle, L, which carries on its upper extremity the button, M, this button serves to deflect the flame of the wick, and causes it to take a cup shaped form, which increases its brilliancy. The air for the support of the combustion is admitted to the exterior and interior of the wick through the windguards, N and O, which are soldered in one piece with the chimney gallery, P, the lamp shade or globe gallery, Q, and the cone, R. The upper part of the tubular windguard, O, has a ring soldered inside which is made to fit the tube, B, and a slot is cut out of the lower part to allow of its passing over the latterally projecting boss through which the spindle, J, works. The upper windguard, N, is arranged in the conical form, similar to that before described. This windguard admits the air that is supplied to the exterior of the circular wick, S. The air thus admitted passes through the perforated diaphragm, T, a portion of it reaching the flame directly through the cone; whilst another part passes ontwards through the ring of holes made therein. The current of air for the supply of the inner portion of the flame, passes in through the windguard, O, and upwards beneath the overhanging segmental part of the duplex tubes, B and C. The flame is thus abundantly supplied with air, so as to produce the full intensity of light without

Fig. 2.

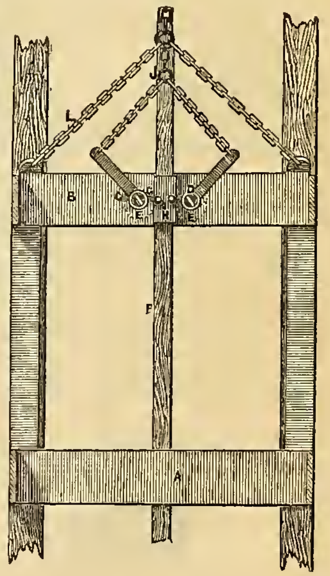


unsteadiness arising from draught. The surplus portion of the wick, S, below the overhanging part of the tubes, B, is cut partially through to admit of its passing downwards through the segmental part of the wick-holder, to the oil or spirit contained in the reservoir. The patentee's improvements in the arrangement and construction of ventilators, are applicable to either lamps, gas stoves, or ordinary purposes of ventilation. One modification consists of a thin metal cylinder made to taper gradually towards the upper part where the edge is turned outwards. A metal diaphragm is fitted within the cylinder towards its upper part; this partition has a series of radial openings or slots made in it, these openings extend round the outer portion of the diaphragm. The current of heated air passing off from the stove or lamp, strikes against the diaphragm and escapes through the radial slots, and passes upwards into the dome or cap. This portion of the apparatus is fastened to the angularly disposed perforated plate or windguard, which is made to fit the taper cylinder. The heated air passes downwards and away out by triangular openings made in the windguard. The apertures in the windguard are made so that the metal which is cut through on two sides of the triangle, forms an inwardly projecting vane. The metal at each aperture thus bent upwards serves as a protection to prevent external currents of air from blowing in through these openings, at the same time ample space is left for the free egress of the heated air evolved from the lamp flame or burning fuel. The patentee's improved reflector consists of an oblong shaped piece of metal, bent or otherwise formed into a segmental figure, made up of a series of planes or reflecting surfaces. The reflector is fitted in the usual way to the back of the interior of the lamp, and from its peculiar construction—the reflecting planes partially surrounding the flame or flames—the light is visible through a greater arc than is the case with the ordinary arrangement. These reflectors may also be advantageously applied for reflecting or throwing forward the heat arising from gas and other stoves or fire grates.

MINING CAGES.

Robert Ridley, *York.—Patent dated October* 13, 1858.

This apparatus consists of a peculiar combination of coiled or barrel springs and gripping eccentrics. The cage is fitted at its upper end with a pair of transverse parallel shafts, which shafts carry at each extremity an eccentric, there being thus two eccentrics on either side of the cage. These eccentrics are disposed on each side of the conducting rods, and when brought into action or partially rotated by means of coiled springs, they grip or lay hold of the conducting rods, and so prevent the descent of the cage should the rope accidentally break. The coiled springs surround and are secured to the transverse shafts, one end of each spring being secured to the shaft, and the other to the framing of the cage, so that they will have the effect of turning the shafts in their bearings. In the middle of each of these shafts is a lever arm, to which are attached the ends of a double safety chain, so arranged with regard to the winding rope, that when the weight of the cage is on the main rope, the safety chains will be tightened, and by acting on the lever arms and shafts, will keep the eccentrics out of contact with the conducting rods, but should a breakage of the winding rope occur, the lever arms will be relieved from the tension of the safety chain, and the coiled springs will consequently be free to act and cause the eccentrics to turn towards each other, and grip the conducting rods between them, thus maintaining the cage stationary at whatever part of the shaft it may be.



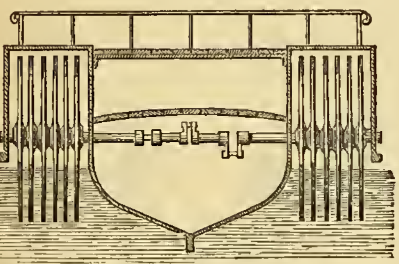
The subjoined engraving represents a vertical section of the improved safety cage. A, is the floor of the cage, and B, a rectangular framing, connected by four vertical supports to the floor, A. This frame carries the safety apparatus, which consists of the coiled or barrel springs, C, surrounding the transverse parallel shaft, D, combined with the two pairs of gripping eccentrics, E, severally secured to the extremities of the shafts, D, and so disposed as to nip or grip firmly the conducting rods, F, when the springs, C, are allowed to turn or operate upon the shafts, D; G, are stops which are secured to the shafts, D, for the purpose of preventing the eccentrics from being turned further than is necessary to fill up the greatest space possible between them during the time of an accident. For this purpose the stops are made to bear against the sides of a projection, H, on the inside of the framing. The safety chains, I, are connected at J, to the hauling rope or chain, and are severally secured to the ends of the arms, K, fast on the shafts, D. L, are the chains which connect the four corners of the cage to the winding chain or rope, and these chains are made rather longer than the safety chains, so that on commencing to wind, the safety chain will be first acted upon, and through the arms, K, will turn the shafts, D, slightly, so as to take the gripping eccentrics out of contact with the conducting rods, and have the cage perfectly free to be either raised or lowered. Should however, a breakage of the winding chain or rope occur, the strain on the arms, K, will instantly cease by the descent of the chain, and the springs, C, coming into action, will turn slightly the shafts, D, and cause the eccentrics to grip the sides of the conducting rods, and hold the cage suspended in the shaft till assistance arrives. The weight of the cage itself will still further increase the hold of the eccentrics, and cause them to grip firmly the conducting rods.

PROPELLING.

J. J. Aston, *London.—Patent dated December* 17, 1858.

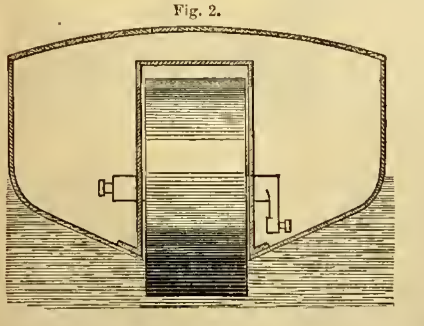
Mr. Aston's improved propellers consist of solid circular discs or rollers mounted on a central axis, and made of wood, metal, or wood and metal combined, or of other convenient substances. They are flat at the sides, and have no floats, paddles, or projections of any kind on their plane peripheries. These propellers may be made of various diameters, and of various thicknesses or widths, and may be made as thin as practicable, having due regard to their size and the material used, so that they may be sufficiently strong to be turned rapidly in the water without breaking or buckling. Various means may obviously be employed for strengthening the discs when requisite. Another form of propeller is composed or built up of wood in the form of a drum or roller, and strengthened by having pieces of metal let into the wood. When such propellers are applied so as to have any considerable portion of them above the water, variations therein may be made in those parts of the propellers not working in the water by cutting away portions thereof, and fitting or forming arms therein at the centre. The number of propellers used may be increased, and two or more may be combined, placed on the same shaft at a small and convenient distance apart. Fig. 1 represents an arrangement of six of the propellers on each side of a boat, and in this case they may be made of sheet metal or of wood, each disc being kept a slight distance from its neighbour by the interposition of distance blocks, or bosses, or stretchers, the whole being firmly secured together on the shaft. When found desirable these propellers may be partly incased in the vessel, and so placed as to work in or under the keel at the head or stern or other part of the vessel. Fig. 2 represents an end view of a single wide propeller or drum placed across a vessel, and partially projecting below the keel.

Fig. 1.



The patentee in the drawings appended to his specification shows several modes of arranging the propellers both at the centre and at the head of the vessel, and both partially and wholly submerged. The propellers should have a rapid rotatory motion imparted to them by means of any suitable force applied by machinery in connection with the propeller shafts, or with shafts fastened into the centres of such propellers, thereby causing the ship, boat, or other vessel carrying the same to be propelled on and through the water. These improved propellers may further be applied to boats, barges, or other similar craft, and in these applications cranks worked by hand or by the feet might be employed for actuating the same. This propeller offers great advantages in its application to canal navigation, by reason of the diminished agitation of the water caused by these propellers as compared with paddle-wheels or screws.

Fig. 2.

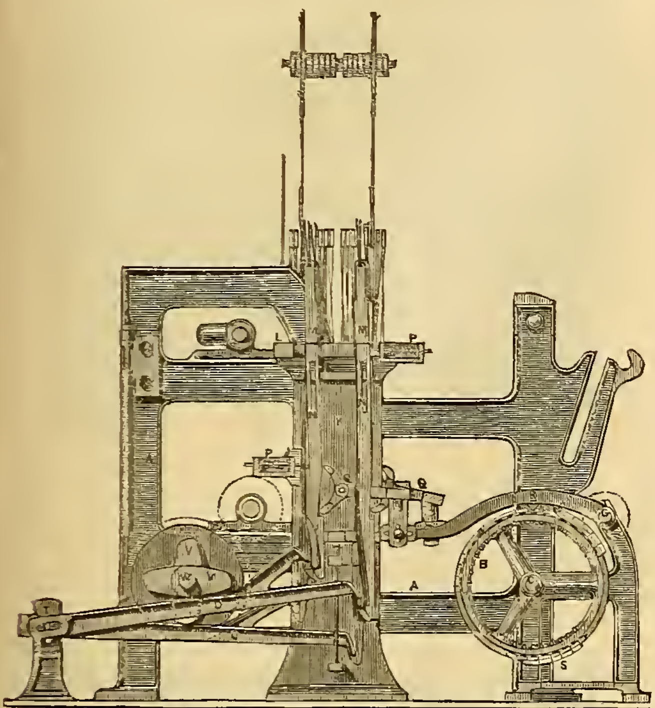


LOOMS FOR WEAVING.

Gavin Walker *and* James Clachan, *Glasgow.—Patent dated September* 29, 1857.

The improvements specified under this patent, relate in some respects to an invention for which Letters Patent were granted to Messrs. Muir and M'Ilwham, in June, 1856, and it consists of certain mechanical combinations and arrangements, whereby Messrs. Muir and M'Ilwham's loom, as well as other looms of a generally similar class, are rendered more effective as regards their range of variety in weaving. In addition to the ordinary figure movements involved in the loom referred to, the present invention provides for the addition to such mechanism of a separate twilling heddle action. This twilling action is operated upon by an additional traversing lever, working over a portion of the barrel in a manner similar to the figuring lever, actuating the drop boxes of the shuttles. The free end of this secondary or additional lever bears against the under side of a broad or platform lever, set on a fixed stud centre in the loom framing, being broad enough to present an acting surface sufficient to bear against the end of the secondary lever throughout its traverse back and forward over the barrel. On this platform lever there is an upper and a lower bent lever stop or pressing piece, with a broad end face piece of such a size as to bear against a range of four or more vertical link rods set in a suitable guide frame, and kept pressed forward towards the lever face pieces by springs. The bottom ends of these vertical link rods have catches upon them, capable of coming within the range of a corresponding set of horizontal cam levers, severally actuated by a continuously revolving cam or tappet. The upper ends of the vertical link rods are connected by suitable cord and lever movements with the heddle leaves, eight or more in number, as may be required. The result of this arrangement is, that whenever a twilling change is required to take place, the proper projection or stud piece on the figuring barrel comes round to operate upon the additional or secondary lever, the other end of which then lifts the platform lever, and pushes back one set of the vertical link rods, so as to bring their lower ends within the range of their operating cam levers, and at the same time releasing the others of the vertical link rods which have already been within the range of and operated by the cam levers. The latter then lift the required number of the heddle leaves, whilst the rest descend by their spring or weight actions. When in the course of the barrel's revolution, the absence of the twilling action projection allows the secondary lever to fall, the reverse action occurs, and the twilling is obviously again reversed. The result of this arrangement is, that in addition to the figuring powers already possessed by the loom referred to, a great variety of additional effects can be given to the goods woven in such looms for the reason that the twilling can be alternated and changed at pleasure to any extent. In other words, any of the warp threads can be alternated from surface to surface of the piece at pleasure. Fig. 1 of the illustrative engravings is a partially sectional elevation of a loom, showing one modification of the improvements applied thereto; fig. 2 is a plan corresponding thereto. In the foregoing figures, the parts of the loom not essential to the illustration of the invention are omitted. The mechanical arrangement shown in figs. 1 and 2, is adapted for working a series of sixteen leaves of heddles. The principal working parts are arranged parallel to the end standard, A, at the side of the loom on which the pattern barrel, B, is fitted. This pattern barrel forms a part of Muir and M'Ilwham's invention, the pattern barrel with its connected mechanism is described as being used for the purpose of actuating the series of shuttle-boxes, in the order or sequence of succession necessary to produce the predetermined pattern of the woven fabric. Now, the essential feature of the present invention consists, in extending the utility of these improvements, by combining therewith certain arrangements of mechanism for actuating the heddles as well as the shuttle-drop box; the reciprocatory movement of the different leaves of heddles being derived from that of the pattern barrel, B. The pattern barrel, B, is carrried loosely upon a horizontal spindle, C, fixed in the end standards; the barrel has a ratchet wheel, D, upon one end of it, and upon the other end a spur wheel, E; the spur wheel, E, is in gear with a pinion, F, which is keyed to the end of a parallel screw spindle, G, carried in brackets formed on the standards. The pattern barrel, B, has a number of holes made in its periphery; these holes are arranged in a spiral direction, the pitch of the spiral line of holes being made to correspond, to suit the gearing arrangement, to the pitch of the screw, G. The sizes of the wheels, E and F, are also so proportioned, that a nut lever, H, carried by the screw spindle, G, as it were, follows the helical line of holes upon the barrel, being moved longitudinally a distance equal to the pitch of the helical line at each revolution of the barrel. The pitch of the teeth of the ratchet wheel are made to correspond to that of the holes on the barrel as taken circularly, and at each revolution of the tappet shaft, the barrel is moved round to the extent of a hole, by the action of a lever, which is acted upon by a cam on the tappet shaft. The lever carries two catches or pawls which alternately take into the teeth of the ratchet wheel on the barrel, B, and the smaller ratchet wheel, I, which is fast to the screw spindle, G; by this means the barrel, B, is driven in one direction by one of the pawls acting upon the teeth of the large ratchet wheel, and then in the opposite direction

Fig. 1.



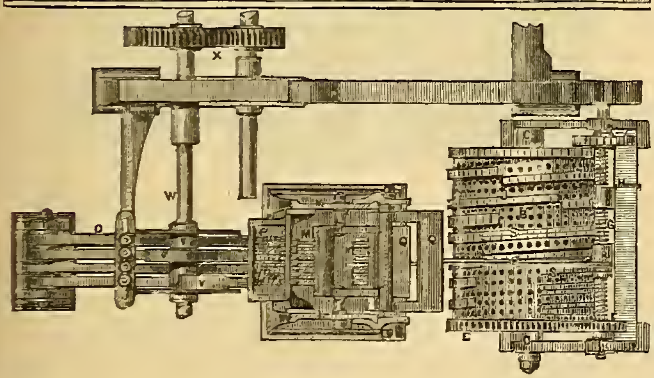


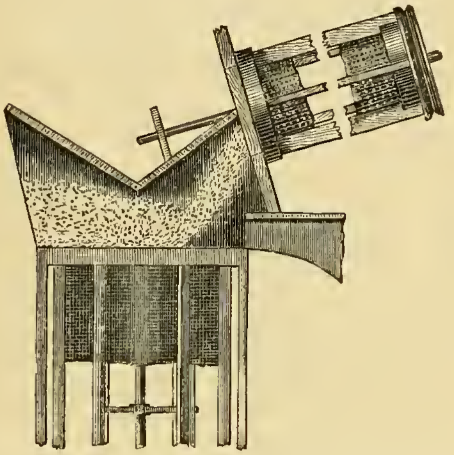
Fig. 2.

by the second pawl acting on the teeth of the ratchet wheel, I. The boss of the nut lever, H, is tapped to work upon the screw spindle, G; this nut lever has a projection upon its under side which comes in contact with the pins, J, which are inserted in the holes of the barrel. The different cells of the shuttle-drop box are brought on a level with the race by the varying heights of the pins, which are arranged in the barrel according to the sequential order in which the shuttles are required to be thrown to form the predetermined pattern. Thus far, the pattern barrel, B, has been described as confined to the raising and depressing of the shuttle-drop box; we will now show the application of the improvements whereby the leaves of the heddles are actuated in their proper order as well as the shuttle cells. The main part of the additional mechanism is carried within a vertical frame, K, the upper part of which is connected to the end standard, A, of the loom by a horizontal stay. The frame, K, carries at its upper part a horizontal guide, L; passing through the parallel slots formed in the guide, are the vertical links, M, the number of the slots, correspond to the number of leaves of heddles to be worked. The upper ends of the link rods, M, have an eye formed in each through which the cords by which they are attached to the heddle leaves, are passed. These link rods, M, are guided in their lateral and reciprocatory traverse by the slots in the guide, L, but they are also guided in their vertical traverse by the transverse rods, N, which are passed through the longitudinal slots in the link rods, M, and secured to the frame, K. The lower ends of the link rods are formed into hooks, which are caused, at the proper intervals, to take into recesses formed in the under sides of the horizontal cam levers, O. When not otherwise acted upon, each of the link rods, M, is kept forwards by the pressure of a helical spring, which serves to keep its individual link rod beyond the range of the cam levers, O, until its pressure is overcome by a superior force. The back part of the horizontal frame which forms the guide, L, is prolonged outwards, and forms a recess in which the series of helical springs, P, are fitted. The springs are secured to short horizontal rods, which slide to and fro in holes made through the front and back of the recessed part of the guide; the back ends of the springs press against the inside of the recess; the front extremities of the horizontal rods, each press against one of the eight link rods, M. The link rods, M, are moved backwards and brought within the range of the cam levers, O, by the action of the broad or platform levers, Q, which are carried loosely upon a horizontal spindle, fixed to the front part of the frame, K. The front part of each platform lever, Q, consists of a rectangular metal plate, against the under side of which the free end of the lever, R, bears. The back part of the lever, Q, branches out into two bent arms; the extremities of these arms are carried out laterally, and each forms a broad stop or pressing piece, which bears against the front edges of the link rods, M. A portion of each link rod is cut away, forming a notch; one half of them have these notches made opposite the upper bent arm, whilst the others have the notches made opposite the lower bent arm of the platform lever, Q. The platform levers are brought into action by the stud levers, R, the studs of which are tapped with an internal screw to traverse upon the screw spindle, G. The central part of the stud levers, R, have a projecting piece, which traverses over the periphery of the barrel, B, or the surface of the pins inserted therein. The free end of each lever, R, is made with a slot, in which is fixed an adjustable piece of metal carrying an antifriction roller; this roller bears against the under side of the platform lever, Q, the width of which is sufficient to admit of the lateral traverse of the lever. In the position in which the levers, Q, are shown, the lower arms are pressing back the four link rods, M, which have the notched part, opposite the lower arm; and as the pressure of the arm, overcomes the resistance of their springs, P, the link rods are brought within the range of the cam levers, O. The other alternate link rods, M, which have their notched parts opposite the upper arms of the levers, remain unaffected by the arms of the lever, as the narrower part of the link rods is beyond the reach of the lower arms. This is the relative position of the parts during the time the projections of the levers, R, are traversing over the periphery of the pattern barrel, B. When the other four link rods are to be brought into operation, one or more pins, S, are inserted in the holes in the barrel, B, and as the levers, R, traverse over these pins, the upper arms are pressed against the four link rods, M, next to those before acted upon, and they are brought within the range of the cam levers, O. The link rods, M, being connected by cords, to the outer ends of the heddle levers, the depression of the link rods raises the heddle leaves. This depression is effected by the action of the horizontal cam levers, O; these levers have each a slot at its backward end, through which is passed the horizontal spindle, T, on which the cam levers turn; the lever spindle is fixed in a pair of standards, the base of which is secured to the flooring on which the loom is placed. The lower end of a strong helical spring, U, is attached to an eye cast on the upper side of each of the cam levers, O; the upper end of each spring, U, is fastened by an adjusting nut to a bracket, bolted to the end standard, A. The springs, U, raise the cam levers, O, above the catches or hooks of the link rods, M, so as to always be in a position ready for depressing the link rods. The depressing action is effected by means of the cams, V, on the shaft, W; there are four of these cams, corresponding to the number of the cam levers, O, and they are bolted to a pair of circular cheek plates which are fitted on the end of the shaft. The shaft, W, has keyed to it a spur wheel, which is driven by a pinion fast on the tappet shaft; the wheel and pinion are proportioned, so that the shaft makes one revolution to two of the tappet shaft. As the link rods, M, are pressed back by the action of the platform lever, Q, the catches, on their lower ends, come within the range of the cam levers, O, and as the cams, V, are successively brought round by the rotatory motion of the shaft, W, the cam levers are depressed, and carry down the link rods with which they are engaged. The downward motion of the link rods raises the twilling heddles to which they are attached, each alternate link rod remaining unaffected by the lever, Q. When the pressure of the cams, V, is taken off the levers, O, the spring, U, raises the levers, whilst the weight of the connected heddle leaf raises its corresponding link rod. The slot in the end of each of the cam levers, O, admits of a self-adjusting action of the levers, so that they clear the catches, of the link rods in their ascent; but when they reach their highest point they are sufficiently forward to catch the hooks of the link rods when pressed back by the action of the arms of the levers, O. In this manner the different twilling heddles may be alternately actuated, according to the arrangement of the pins and the intervening spaces on the barrel, B. In this arrangement the lifting pins, S, which are inserted in the holes in the pattern barrel, B, are made of two different heights. The periphery of the barrel and the differential heights of the pins, give three elevations to which the stud levers may be raised. The platform lever of the back series of link rods, is arranged so that each alternate link rod of this series is in gear with the cam levers, whilst the other half is free. But with respect to the front series of link rods, the whole of them may be thrown out of gear with the cam levers; to this end the platform lever is so arranged, that when its platform is horizontal, neither of its bent arms are in contact with the link rods. The height between the barrel, B, and the highest part of the pins, s, admits of the lever being placed in this position whenever the front series of link rods, M, are required to be thrown out of contact with the cam levers. By means of this duplex arrangement of the link rods, sixteen leaves of heddles may be wrought in the sequential order required to produce the predetermined pattern. It is obvious that these arrangements for working the heddles combine great simplicity of mechanism, with the power of working any number of leaves of heddles required in practice.

LAW REPORTS OF PATENT CASES.

WINNOWING MACHINES: NALDER *v.* CLAYTON AND SHUTTLEWORTH.—The second objection is that of Slater. This apparatus includes an inclined revolving cylindrical screen made of *punched zinc*, and was used by Slater prior to the year 1853, for dressing corn. Fig. 3 represents this objection. The third objection was that of Dixon, and included an inclined

Fig. 3.



revolving cylindrical screen made of wire *cloth*. This screen has also within it a *revolving beater*. It was used prior to 1853, for dressing corn. Fig. 4 represents this objection. The fourth objection is Garrett's, and includes a *horizontal* revolving screen made of wire *cloth* of two degrees of fineness, there being an *internal screw* as a means to conduct the corn from end to end of the screen. It was in use prior to 1853, for dressing corn. Fig. 5 represents this objection. The fifth objection is that of Ferrabee, and includes a *horizontal* screen of *wire* wound *spirally round*, varying in degrees of fineness or proximity of the wires, but having an internal *helical screw*, as a means to conduct

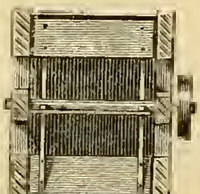
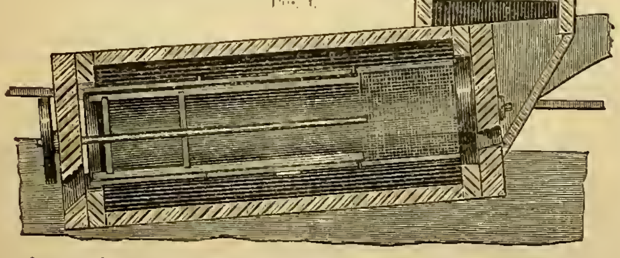
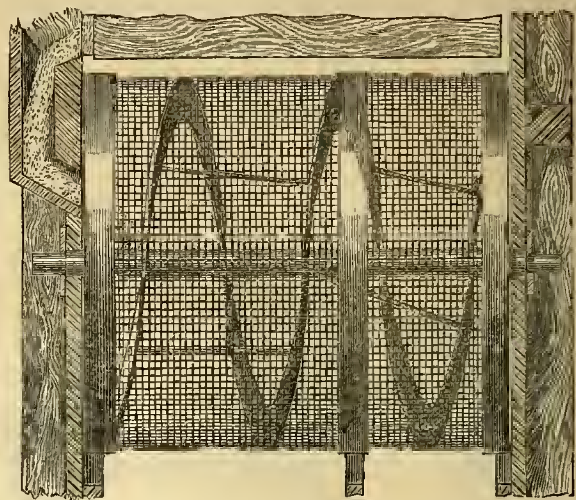


Fig. 4.



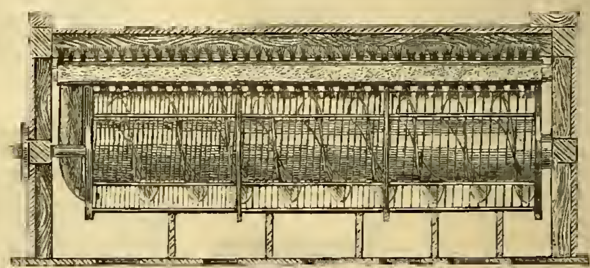
corn from end to end of the screen. This was in use prior to 1853, for the dressing of corn. Fig. 6 represents this objection. A sixth objection, was an arrangement of apparatus set up at the City Mills, and also at the Powder Mills, at Waltham Abbey, and at the Deptford Victualling Yard, and includes an inclined revolving cylindrical screen of wire *cloth*, and hav-

Fig. 5.



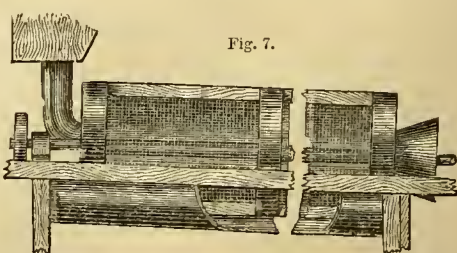
ing two *longitudinal ribs* fixed to the *interior* of the screen and the lower end having a *discharge mouth* of smaller area than the screw. Fig. 7 represents these objections. The last objection is a screen included in an arrangement of apparatus constructed at the New Crane Mills, Shadwell. This screen is a *horizontal* wire screen with an *internal screw* to conduct the grain from end to end. It did not appear from the evidence

Fig. 6.



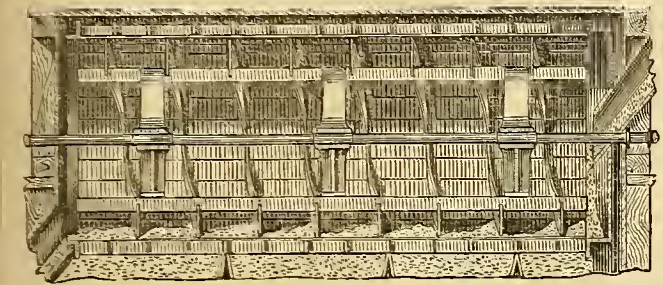
whether this screen revolved or not. Fig. 8 represents this objection. Mr. Bovill appeared to show cause against the rule, and contended that the specification and claims must be construed together, and that the drawings were to be brought in aid, so as to determine the intent of the inventor, and submitted, that notwithstanding the claims of the specification were *general in terms*, and if construed alone, would include *all* revolving screens, yet if taken with the statement of the specification,

Fig. 7.



aided by the drawings, which they must be, the invention would be found to be limited to the *specific* screen *represented* by the drawings. Lord Campbell in delivering judgment, expressed extreme regret that the Court were obliged to decide against the plaintiff and Knapp's patent of 1853, because it appeared that the screen certainly was meritorious, and that their lordships had the testimony of the defendants that it was very valuable. That the defendants adopted it, paid a royalty for it, and put the plaintiff and Knapp's plate upon the winnowing machine constructed by them, thus doing homage to Nalder and Knapp. But it seemed to his lordship that the patent could not be supported, inasmuch as he thought, that looking at the entire specification and drawings, the plaintiff claimed *generally*, the application and use of a *revolving cylindrical screen*, for the purpose of winnowing and dressing corn, and that therefore, the claim was greatly too wide, as including the subjects of prior publications before referred to. Mr. Justice Wightman observed

Fig. 8.



that there seemed to be no question that the machine of the plaintiff was a very useful machine, and probably better than any which had ever been used for similar purposes, but concurred with the Lord Chief Justice, and for the same reasons, that the patent could not be maintained. Justices Erle and Crompton concurred. The judgment of the Court therefore would be, that the verdict on the issues raising the question of novelty should be entered for the defendants, and the verdict on the issue raised by the plea of not gulity to stand for the plaintiff. The effect of this judgment is, that the defendants have infringed the plaintiff and Knapp's patent of 1853, but by reason of the claim in the specification being too large, the patent is invalid. Since their lordships' judgment, the plaintiff, by leave of Her Majesty's Attorney-General, has filed a disclaimer and memorandum of alteration, the effect of which is, to enable the plaintiff to maintain an action for infringement against all persons who shall use a screen such as that already employed by the defendants, and which the four judges of the Court of Queen's Bench have adjudged to be an infringement. Mr. Bovill, Q.C., Mr. Hindmarch, and Mr. Mellish, instructed by Mr. J. Henry Johnson, of Lincoln's Inn Fields and Glasgow, were the counsel for the plaintiff, and Mr. Knowles, Q.C., Mr. Grove, Q.C., and Mr. Webster, were the counsel for the defendant.

Smoke Prevention Furnaces: O'Regan *v.* Tod and Higginbotham.—This was an action in the Scottish Court of Session, and one certainly of a very extraordinary character. Mr. O'Regan of Liverpool, the plaintiff, is the patentee of an invention of a smoke consuming furnace, and Messrs. Tod and Higginbotham, the defendants, are extensive calico printers in Glasgow.

It seems that the defendants accepted the plaintiff's proposal to supply them with a number of his smoke prevention furnaces, and the apparatus was duly supplied and fitted up. In course of time, the defendants, as they now aver, discovered that the plaintiff's patent was invalid, and they then refused to pay for the furnaces. To enforce payment, the plaintiff brought an action in the Sheriff's Court at Glasgow, to recover the sum of £450 as agreed upon. The defendants on the other hand, brought an action in the Court of Session, for the purpose of having the patent declared invalid and annulling their contract. The action in the Sheriff's Court being argued *ab contingentiam*. They proposed certain issues, whilst on the other side it was maintained that there was no issuable matter on the record.

In giving judgment, the Lord President stated that the case was peculiar. He had never before heard of a patent being assailed by the purchaser of the patented article, and it would be a strange thing to hold a patentee liable to be assailed by every one who purchases his article and chooses to pick holes in his patent. There was no allegation of fraud in this case, no allegation even that O'Regan knew that his patent was invalid. All that is said is, that he knew that it had been "publicly challenged." It might have been challenged. It might have been challenged on the weakest and silliest grounds possible. The case looked like one of inexcusable negligence on the part of the contractors. They ought to have satisfied themselves as to the character of the articles they were contracting for. Even now they do not seek to reject the articles. They did not do so as soon as they knew that this patent was invalid, as they allege, from prior use, defective specification, &c.; but they retain them, and desire the Court to fix a reasonable price for the furnaces on the footing that the patent is invalid—to reduce the price from £450 to about £70. As to the account, the case being reported on issues, it must go back to the Lord Ordinary; but he was of opinion that there was no issuable matter in the record. The others concurred, Lord Deas remarking that he did not think that by every patented article a man sold he made himself a new enemy, and that he considered this contract a contract of sale and not of work. The Court refused to allow the issues, with expenses. We have known many very curious grounds for actions on patents, but we certainly never heard of any so extraordinary as in this case. Here is a patentee, who makes a bargain to erect certain furnaces at a cost of £450. That was his price, and patent or no patent, he had plainly a right to recover the amount, if he really fulfilled his contract, and it is not denied that he did so. The defendants assuming that there was virtually no patent, sought in the face of their bargain to get the contract sum reduced, as we suppose, to what they considered the furnaces could be erected for. In this procedure, the defendants must evidently have been most erroneously advised, for a bargain had been entered into for the execution of certain work, such bargain being really quite independent of any patent. It is therefore no answer to turn round and tell the patentee, that the payment formally contracted for could not be made, for the reason that the patent was alleged to be invalid. We give no opinion upon the merits of the invention, or upon the novelty, or otherwise, of the patent, for neither of these points is in question. It is however, satisfactory to find, that the Lord President decided as he did, for were it otherwise, and were such a decision to become law, no patentee would be safe.

Egg Beaters: Griffiths *v.* Turner.—In this case, Mr. Edward Griffiths, of High Street, Camberwell, confectioner, brought an action against Mr. George Turner, of Dover Road, Borough, dealer in patented articles, for an infringement of plaintiff's patent apparatus for beating the whites of eggs and other fluids. The infringement was admitted, and the question was whether the patent was not void for want of novelty. The defendant relied on a patent of Messrs. Pollitt and Eastwood for churns, and a publication of an invention by Mr. Harkes, also a patentee for churns, being substantially identical with the patent of the plaintiff and prior to it in point of time.

The jury found that as to Pollitt and Eastwood's patent it was the same as the plaintiff's, with this difference, that the plaintiff's had concentric axes, which, in the opinion of the jury, was an important improvement with reference to the object to which the apparatus was applied; and that as to Harke's invention, it was the same in form and construction as the plaintiff's, with the difference of having flat expanded wooden beaters, whereas the plaintiff's had slight wire bars, which more readily effected the object of the apparatus.

The Lord Chief Justice said the plaintiff would have the right to raise the question whether, notwithstanding the similarity of the instruments, the novelty of the combination was not sufficient to constitute a good patent, and the defendant would have the right to raise the question, whether, looking at the particular language of the specification, the points of identity found by the jury were not sufficient to invalidate the plaintiff's patent. It did not seem to him of much consequence how the verdict was entered. Verdict for the plaintiff, with liberty to defendant to move.

MECHANIC'S LIBRARY.

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Encyclopædia Britannica, eighth edition, vol. xviii., 24s. cloth.
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Hydrostatics and Hydrodynamics, Treatise on, 8vo, 9s. cloth. Besant.
Marine Painting in Water Colours, 12mo, 1s. sewed. Carmichael.
Mathematical Examples, crown 8vo, 8s. 6d. cloth. Newth.
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Practical Tunnelling, second edition, revised by Haskoll, 21s. cloth. Simons.

REVIEWS OF NEW BOOKS.

Three Lectures on the Rise and Progress of Civil and Mechanical Engineering, and on Popular Education. By W. Fairbairn, C.E. 8vo. Pp. 52. Lithographs. Derby: 1859.

We are always glad to meet Mr. Fairbairn in print. He has always something to say on a good subject, well fitted to the time, and when we remember that he ought to be considered the father, at any rate, of the mechanical engineering of our time, we give perhaps the most powerful of all reasons why the rising generation of millwrights and engineers of our time should listen to what he says, and gather from the vast stores of his experience, what it is impossible to learn in another fashion. The two first of these lectures were delivered before the Mechanics' Institute, the Railway Literary Institute, and the Working Men's Association at Derby. The third one conveys to us the essence of an inaugural address to the members of the Mechanics' Institute at Blackburn. By the republication of these little more than oral discourses, the author has, of couse, greatly added to the practical value of his dissertations, inasmuch, as by this treatment of them, they are rendered accessible to everybody, and the decided opinions of the well practised engineer and mechanic are thus put on permanent and most effective record. The first lecture is devoted to a consideration of "The rise of Civil and Mechanical Engineering, and its progress to the present century" The second takes up the subject of "The state of Mechanical and Civil Engineering between the years 1750 and 1800;" and the third deals with "Popular Education." Mr. Fairbairn certainly possesses the enviable faculty of saying much that is good and useful within a very limited space, and this is by no means the least of the reasons we have for recommending the pages before us to the careful study of the young engineer. He traces in pithy language the gradual formation of a mechanical system, out of the rude elements of guess work in existence in former ages, and brings us down from the rude grinding mills of the Romans, past all the leading intermediate grades of improvement, to the beautifully accurate steam corn mills of 1858. Similarly he recapitulates the great transition from the days of the Marquis of Worcester and Savery, to the 400-horse mill engines of Mr. Salt at Saltaire, and the talents, energy, industry, and perseverance of the men who took leading parts in the different phases of the several progressive improvements. Mr. Fairbairn gives us the following, with reference to two other men who have left their mark upon the details of the active world.

"To Watt and Arkwright we owe a debt of gratitude which we shall never sufficiently repay. We may write their histories, or raise monuments to their memories; but these are of little moment when compared with the splendid results which have flowed from their discoveries, and influenced the relative positions of the whole human race. If we compare the steam-engine as it left the hands of Watt, with its puny condition and restricted applicability when he first became acquainted with it, we are lost in amazement at the extent of its power, the beauty of its construction, the docility with which it adapts itself to all circumstances; and all these qualities are due to him, and to him alone.

"At the present time there exists in the British Empire a total steam power equivalent to that of more than 8,000,000 horses, working ten hours a day; or if we add to this the engines afloat, we have a total of 11,000,000 of horse-power, a force vastly exceeding that of all the living horses in the kingdom. Compare the state of our manufactures, the extent of our commerce, the facilities of transport which we now enjoy, with the same in the early days of Watt, and tell me whether this amazing increase, this immense development of our resources is not owing to his genius.

"It is impossible to form a just conception of the benefits that have arisen from the introduction of the steam-engine. It is applicable to every condition in life, and has multiplied the material comforts of mankind to an extent without a parallel in the history of nations. It has given a subsistence to millions who but for it would never have existed, and it has given employment to thousands of an intellectual character which no other means could have furnished to the same extent. Now, in every country where coal, wood, and water are found, industry may flourish, and the steam-engine be in constant demand."

This is very well and properly put. It is a pity that many others of our pioneers of improvement are not spoken of to similar purpose. These are the details of the author's calculations on this head.

"I have estimated the total in round numbers at 11,000,000 horses working ten hours per day. That is—

Employed in	Nominal horses power.
Mining and the manufacture of metal	450,000
Manufactures	1,350,000
Steam Navigation	850,000
Locomotion,	1,000,000
Total	3,650,000

"And as these engines are worked at an average of three times their nominal power, the above numbers represent a force equivalent to *eleven millions of horses;* and taking one person to every nominal horse power, we shall then have nearly four millions of people to whom the steam engine is giving employment in Great Britain and on board our ships. It is no wonder, therefore, that we revere the memory of Watt, when we look upon the benefits he has conferred upon the world and upon his country.

"The Cotton Trade.—To Richard Arkwright, an ingenious barber, belongs almost exclusively, the merit of those inventions which gave an important impetus to the development of an entirely new branch of industry. The carding, drawing, and spinning of cotton, which eighty or ninety years ago was performed by hand, being spun upon a single spindle, is now increased a million fold; and the value of the cotton manufacture has increased from £2,000,000 to upwards of £60,000,000 per annum, being in the ratio of 30 to 1. Upwards of 1,500,000 bales of cotton were imported into Liverpool in 1857; and the improvements which have followed Arkwright's original inventions have raised the country, with the aid of the steam engine, to her present high state of prosperity.

Other sections of the lectures deal with Marine Engineering, the Iron Trade, and Railways, and the compact details laid before us are interesting in the highest degree. The pamphlet is illustrated by fourteen lithographs, showing us how ancient, has grown into modern practice. It is a very welcome contribution to the history of mechanical engineering, and it is valuable, not more for its practical information, than for its all-pervading appeal to the good sense of mechanical students, on the subject of practically developing industry, energetic perseverance, and a high ambition in the pursuit of their art.

High Speed Steam Navigation and Steamship Perfection. By Robert Armstrong. 8vo. Pp. 89. London: E. & F. N. Spon. 1859.

Mr. Armstrong's title page goes a good deal further than this. It proceeds to ask the question, "Can perfection be defined in the form of a steamship, a propeller, or any other mechanical appliance? A proposition for the solution of the scientific world, and for the consideration of the British Admiralty." We therefore go into his 89 pages for the discovery of the answer, which authors who ask questions in their books usually give. On our way to this, we must take cognizance of the terms in which he ushers his views into the presence of the world of scientific readers. He says,

"The immediate object of this pamphlet is to call the attention of scientific men to a reconsideration of the principles of mechanics; to define perfection in machines; and to reduce naval architecture to an exact science. For it may truly be said, we are still experimenting in many departments of mechanics that ought to be susceptible of mathematical accuracy, if those principles were clearly defined.

"No better proof of the total want of a correct application of the principles of applied mechanics to the sciences in connexion with steam navigaton by our naval architects and marine engineers can be exhibited, than by stating, that one man alone has cost this country nearly four millions of pounds in experimenting upon the forms of ships, without establishing a single useful result. And the continually repeated proposition of the following subject, by the Institution of Civil Engineers, viz:—"On the circumstances which appear to limit the maintenance of higher speeds than are now attained by our steamships in deep sea navigation; and an inquiry into the circumstances which have hitherto prevented the asserted high speeds of steam navigation on the American rivers from being arrived at in England," is a further proof of our deficiency of any established rules essential to the perfection of naval science, and the want of correct data amongst practical men, by an institution claiming to be the highest mechanical tribunal in the world."

After a little dalliance with the Institution of Civil Engineers, that body refused to have anything further to do with our author, and hence, as he tells us, the present work. The first of the papers reproduced here, is that laid before the Institution. The second and third are reports on the trial trips of the vessels of the Peninsular and Oriental Co. The fourth relates to memoranda upon the author's second Peninsular and Oriental Report. The fifth, sixth, and seventh, are reprints from a contemporary, "On the conservation of the mechanical effect of force." Some "suggested experiments for the consideration of the Committee of the British Association on steam-ship performance," and a series of tables complete the work. It will thus be seen, that the bulk, at any rate, of Mr. Armstrong's production, has already been before the public, Perhaps, therefore, it will be as well if we confine ourselves to a notification of the fact, that his peculiar views may now be obtained in print in a collected form.

On the Action of Hard Waters upon Lead. By W. Lauder Lindsay, M.D. 8vo. Pp. 33. Edinburgh: 1859.

This essay, which is a reprint from the *Edinburgh New Philosophical Journal*, is the production of a philosophical enquirer, whose researches upon this and kindred subjects entitle his opinions to the greatest consideration and respect. What he proposes to elucidate in the very important matter of the action of hard waters upon lead, is thus described by himself:—

"It is, and has long been, currently believed—1. That where there is free access of atmospheric air, pure or soft waters—that is, waters absolutely or comparatively free from saline ingredients, readily corrode lead and become impregnated—sometimes to a poisonous degree, with some of the salts thereof. 2. That the rapidity and extent of this solvent or corrosive action are proportionate to the purity of the water—that is, its freedom from neutral salts. 3. That impure or hard waters, that is, waters containing a considerable amount of neutral salts, do not so affect, or become impregnated with lead. 4. That such waters are prevented from acting on lead by, or in virtue of, their saline constituents, which exert a sort of protective or preservative power in regard to the lead. 5. That, if a given water does not, within a short period. cause a white coating on freshly burnished lead plates or rods, it may be regarded as destiute of any corrosive action, and may therefore be safely allowed to be kept in leaden cisterns, and transmitted through leaden pipes.

"Observation, experiment, and inquiry have led me to the following somewhat opposite conclusions:—1. That certain pure or soft waters *do not* act upon lead 2. That certain impure or hard waters, in some cases containing abundance of the very salts which are generally regarded as most protective or preservative, *do act* upon lead. 3. That the rationale of the action in these anomalous or exceptional cases is very imperfectly understood. 4. That experimentation on the small scale, and for short periods, is most fallacious, and frequently dangerous, in regard to the conclusions thence to be drawn. 5. That water may, under certain circumstances and to certain extents contain lead, without necessarily being possessed of appreciable poisonous action on the human system. 6.

That water contaminated with lead may deleteriously affect certain members or individuals only of a community, family, or household. 7. That the use of water so contaminated is the obscure cause of many anomalous colicky and paralytic affections."

We cannot follow, within the limits of our review, the logical arguments which the author brings to bear upon the points thus started. It is indeed enough for us to show what grounds he takes on the subject; and that one of his principal objects in discussing the matter is, that attention may be drawn to the fact that the knowledge of the action of water upon lead is as yet very imperfectly understood. As Dr. Lauder Lindsay's views are now most conveniently open to the world, and as he has undoubtedly been at great pains in considering what is so important in these water works times for us all to know, his deductions ought to be read with corresponding care.

Remarks on Coinage; with an Explanation of a Decimal Coinage proposed to be introduced into this Country. By "Jacia." Square. Pp. 24. London: Simpkin, Marshall, & Co. 1859.

"Jacia," otherwise Mr. John Crane, of Birmingham, here returns in a fuller style, to the subject which he has several times before discussed in our earlier volumes. He looks upon a decimal system of coinage, simply as an improvement upon the existing system of money account keeping, holding the opinion with which we cordially agree, that the existing coinage answers every purpose of a circulating medium. This is so true, that whatever advantages we should gain in our day books and ledgers from the introduction of a decimal system, it is very certain, that we should at first make acquaintance with many objectionable features in our actual money transfers, by converting our present coins into others having different exchangeable values. We have had a slight foretaste of this in that mistake which was made in giving us a two shilling florin. We agree with Mr. Crane that in any change, we ought to take the existing farthing as the standard coin, and gradually creet the decimal superstructure upon it. For the details of the proposed system, we must leave our readers to make personal acquaintance with Mr. Crane's book. They will find it very full and clear in its descriptive portions, and well illustrated by an elaborate table, showing the mode of conversion of pounds, shillings, and pence into the new system.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

STATISTICAL SOCIETY.

June 21, 1859.

"On the duration of life as affected by the pursuit of literature, science, and art; with a summary view of the duration of life among different ranks and classes in society," by Dr. Guy.

The author commenced by observing that this was the concluding portion of a series of communications upon the duration of human life, which had been laid before the Society at different times since the year 1845. Former essays had, however, (with the exception of one, "On the duration of life of the several professions,") always treated of distinct and well-defined classes of society—such as sovereigns, the aristocracy, the gentry, and the three learned professions. It was now proposed to treat of the less defined class known as "literary and scientific men" and artists. In doing so, however, it would be necessary to divide the paper into five divisions, viz:—1. The duration of life of literary men; 2. The duration of life of scientific men; 3. The duration of life of the professors of the fine arts; 4. A comparison of these three classes; and 5. A summary view of the duration of life in the different ranks of society, and among persons engaged in different pursuits. In regard to the first of these divisions, the duration of life among literary men, the author had been able to collect, from "Chalmers's Biographical Dictionary" and the "Annual Register," 942 ages at death of men more or less devoted to literary pursuits. These were subdivided into antiquaries, historians, poets, miscellaneous writers, and writers professionally engaged as schoolmasters. Of these ages at death the lowest were those of two poets, who died at the age of 21, the highest that of T. O'Sullivan, a celebrated Irish bard and author, who died at the recorded age of 115. According to the tables exhibited by Dr. Guy, poets appear, on an average, to live the shortest lives, and next to them come schoolmasters. This may be explained, as regards poets, by the circumstance of their commencing their distinctive pursuit earlier than any other class of literary men; and, as regards schoolmasters, by the immense amount of confinement in unhealthy rooms which they are compelled to undergo. That poets had ever been a short-lived race, appeared evident from some statistics of the ages at death of Roman poets, produced by Dr. Guy. Thus Tibullus died at 24, Persius at 30, Lucilius and Catullus at 46, Virgil at 51, Horace at 57, Ovid at 59, and Martial at 75,—the eight names giving the low average of 48½ years. Against these may be placed Kirke White, who died at 21, Collins at 36, Parnell and Robert Burns at 37, Goldsmith at 46, Thomson at 48, Cowley at 49, Shakespere at 52, and Pope at 56; yielding an average of 43 years. As regards the comparative duration of life among the married and single members of the literary profession, the advantage is in favour of the married men. Under the second head of his paper, the author had collected the ages at death of 188 men of science, and had divided them into the classes of mathematicians and astronomers, chemists and natural philosophers, and naturalists. The lowest age at death was 22, which occurred under the first class; the highest, 92, was that of a naturalist. There was no great difference in the duration of life of the different classes into which the scientific men were divided; but, in consequence of the small number of facts, it appeared that in this division the single men had a slight advantage over the married. Under the head of artists, the author had included the following professions: engineers, architects and surveyors, sculptors, painters, engravers, musicians, actors, and vocalists. Of these the class of engravers yielded the lowest average (67—91.) There was no means of comparing the married with the single. The author then proceeded to compare the duration of life of the above three classes together, and produced a table, which showed that scientific men have an advantage over the other two professions at every age of life; that artists come next in order, if the younger members of the profession are included in the averages; and that the pursuit of literature is favourable to longevity, but destructive to life at the earlier periods. In summarising the results of the whole of the communications which had been read to the Society at different periods, the author had been able to base his conclusions on the large number of 8,449 facts. From these he had drawn the following inferences:—1. That the value of human life was lower in the seventeenth century than in the sixteenth; but that it experienced a marked recovery in the eighteenth; and that this remarkable feature was incidental to each class of the community, with the exception of sovereigns, medical men, artists (who show a progressive improvement), and lawyers (who show a progressive deterioration.) 2. That the duration of life of married men is greater than that of unmarried men—the difference being 5¾ years in favour of the former. 3. That, as regards the comparative duration of life of the two sexes, females have the advantage over males, and a better expectation of life at every age from 25 to 75.

SOCIETY OF ENGINEERS.

June 6, 1859.

"On the softening and purification of water, by Dr. Clarke's process," by J. Glynn, Jun. The lecturer commenced by stating how necessary a good, pure, and plentiful supply of water was to all persons, for not only did it act physically, but morally. He then treated on the contaminations of water arising from various sources, among which were those arising from taking up mineral matter and holding it in solution. This he showed was produced by water holding certain gases within it combining with the mineral salts, thus forming a solution which became prejudicial to health.

Another great source of impurity was from organic matter. This was traced to many causes, not the least of which was from the amount of sewage matter draining into rivers from manured lands, houses, &c.; the production and support of animal and vegetable life from this source being detrimental to health. He adduced medical testimony to prove the injury done by the use of impure waters. The present mode of purification of water, as supplied to the metropolis, &c., was then treated upon, but showed that although some of the contaminations were partially removed, the hardness of the water remained nearly the same, and, consequently, it required a still further purification before becoming a fit and wholesome supply.

He then explained how easily this could be done by Dr. Clarke's softening and purifying process, which has the great advantage of removing the objectionable quality without adding any other matter to the water—it being merely the removal of chalk by chalk—its application on a large scale being as easy as on a small one. The process also removes a portion of the organic matter from the water left in by the present mode of filtration; it also reduces the action of many waters on lead from a dangerous amount to scarcely a trace. The cost of working the process was shown to be small comparatively to the large saving in soap, soda, &c., and all articles of infusion—besides the saving in fuel in steam-engine boilers, as from one-half to two-thirds of the fuel now goes to pass the heat through the lime-incrustations in the boilers.

The application of the process to the existing works of the companies was shown to be very easy—as it only produced a larger amount of deposit without injuring the filter beds. The Plumstead, Woolwich, and Charlton Works, designed by Mr. S. C. Homersham, was instanced as a successful application. Another instance, on a smaller scale, at the seat of the Earl of Carlisle, Castle Howard, Yorkshire, answered every expectation. The lecturer then gave a summary of the advantages in the use of the process. Some of the deposit as taken out of the depositing reservoirs at Plumstead was exhibited as a fine sample of whiting.

ASTRONOMICAL SOCIETY.

June 10, 1859.

"On the occultation of Saturn by the Moon on the 8th of May, as observed at the Cambridge Observatory," by Prof. Challis.

"On the present state of the controversy respecting the amount of the acceleration of the the Moon's mean motion," by the Rev. R. Main, president.

"Results of observations of small planets, made with the transit circle at the Royal Observatory, Greenwich, during the month of May, 1859," by the Astronomer Royal.

"Occultation of Saturn, as observed at Hartwell on the 8th of May, 1859," by Norman Pogson, Esq.

"Occultation of Saturn by the Moon, on the 8th of May, 1859," observed by F. Morton, Esq., at Wrottesley Observatory.

"On the successive illuminations of the lunar crater geminus," by W. R. Birt, Esq.

"Description of various processes made use of for finding out the configuration of optical surfaces," by M. Léon Foucault.

"On a new method of clearing lunars," by Lieut.-Col. R. Shortread.

"Note on the recent occultation of Saturn by the Moon, and on experiments for ascertaining the polarization of the Moon's light," by Prof. Secchi.

"On the deduction of the latitude from transits over the prime vertical," and "On a method of determining the latitude by transits," by Capt. J. F. Tennant, C.E.

"Note on ν scorpii," by Capt. Noble.

ROYAL AGRICULTURAL SOCIETY OF ENGLAND.

July 6, 1859.

Mr. Thompson, Chairman of the Journal Committee, reported:—

1. That in class III., Essay on steam cultivation, the prize of £25 is awarded to the essay bearing the motto, "Faint but pursuing," and on the seal being broken Mr. J. Algernon Clarke, of Long Sutton, was declared the author.

2. That in class VII. none of the essays are considered worthy of the prize.

3. The following list of the subjects for prize essays for 1860 is recommended to the Council:—

	£	s.	d.
I. Agriculture of Berkshire, ...	50	0	0
II. On the best period of the rotation, and the best time for applying the manure of the farm, ...	20	0	0
III. Alterations advisable in farm management, in land of different qualities, by low price of grain and high price of meat, ...	10	0	0
IV. Late improvements in dairy practice, ...	10	0	0
V. Proper office of straw in a farm, ...	10	0	0
VI. Amount of capital required for the profitable occupation of a farm, ...	10	0	0
VII. On the condition of seed-bed best suited to the various agricultural crops, ...	10	0	0
VIII. On the adulteration of agricultural seeds,...	10	0	0
IX. Any other agricultural subject, ...	10	0	0

INSTITUTION OF CIVIL ENGINEERS.

The Council of the Institution of Civil Engineers have awarded the following premiums for papers read during the session recently concluded:—

1. A Telford Medal, to Michael Scott, M. Inst. C.E., for his paper "Description of a breakwater at the Port of Blyth, and of improvements in breakwaters, applicable to harbours of refuge."

2. A Telford Medal, to Robert Mallet, M. Inst. C.E., for his paper "On the co-efficients of elasticity and of rupture in wrought iron, in relation to the volume of the metallic mass, its metallurgic treatment, and the axial direction of its constituent crystals."

3. A Telford Medal, to Henry Bessemer, for his paper "On the manufacture of malleable iron and steel."

4. A Telford Medal and the Manby Premium, in Books, to William Joseph Kingsbury, Assoc. Inst. C.E., for his paper "Description of the entrance, entrance lock, and jetty walls of the Victoria (London) docks; with remarks on the form adopted in the construction of the wrought iron gates and caisson."

5. A Watt Medal, to James Wardrop Jameson, Assoc. Inst. C.E., for his paper "On the performances of the screw steam-ship *Sahel*, fitted with Du Trembley's combined vapour engine, and of the sister ship *Oasis*, with steam engines worked expansively, and provided with partial surface condensation."

6. A Council Premium of Books, to Thomas Sebastian Isaac for his paper "On the successful working, by locomotive power, over gradients of 1 in 17, and curves of 300 feet radius, on inclines in America."

7. A Council Premium of Books, to Matthew Bullock Jackson, M. Inst. C.E., for his paper "Description of the gravitation water works at Melbourne, South Australia."

CHEMICAL SOCIETY.

June 2, 1859.

"On the action of boracic acid upon the carbonates of the alkalies and alkaline earths," by Professor Bloxam. He found that the amount of carbonic acid expelled by boracic acid varied with the proportion of boracic acid used, with the temperature at which the experiment was made, and with the nature of the base with which the carbonic acid was combined. At a bright red heat, boracic acid expelled about one equivalent of carbonic acid from carbonate of potash, about two equivalents from carbonate of soda, about two and a half equivalents from the carbonates of lithia and baryta, and about three equivalents from carbonate of strontia. The author showed that boracic acid, after complete saturation with potash, could yet expel carbonic acid from carbonate of soda, and, after saturation with soda, could yet expel carbonic acid from carbonate of lithia.

June 16, 1859.

"On gas analysis," by Dr. Williamson. He explained his original instrument, by the use of which all calculations for changes of temperature and pressure were rendered unnecessary. He had now so far elaborated his apparatus as to allow of the absorption of the gas by liquid re-agents, and of its measurement at two considerably removed pressures.

"On the combination of potassium with carbonic oxide," by Professor Brodie. At one stage of the process, the absorptive action was sufficiently intense to sustain a column of twenty inches of mercury. The resulting compound had a composition represented by the formula K C O.

Mr. J. J. Griffin described a new gas-burner, by means of which he was able to melt several ounces of copper or cast iron in ten minutes.

ROYAL INSTITUTION.

April 15, 1859.

"On the consolidation of lava on steep slopes, and on the origin of the conical form of volcanoes," by Sir C. Lyell.

May 6, 1859.

"On houses in relation to health," by R. Druit, Esq.

May 20, 1859.

"On the colours of shooting stars and meteors," by J. H. Gladstone, Ph. D.

May 27, 1859.

"On the ossiferous caverns and fissures of Devonshire," by Mr. W. Pengelly.

June 17, 1859.

"On phosphorescence and fluorescence," by Professor Faraday.

INSTITUTION OF MECHANICAL ENGINEERS.

January 26, 1859.

This was the twelfth annual general meeting, when the annual report of the council was read, showing the financial matters to be in excellent order, there being a balance in hand of £425, after payment of all due accounts. The total number of members is 341.

"On the progressive application of machinery to mining purposes," by Mr. T. J. Taylor, of Earsdon, Newcastle.

"On a dry clay brick making machine," by Mr. B. Fothergill, of Manchester.

ASSOCIATION OF FOREMEN ENGINEERS.

July 2, 1859.

"On economical formation of steam," by Mr. Stabler. An animated discussion followed; and it was announced that Mr. Galloway would, on the first Saturday in August, read a paper on "superheated steam."

ROYAL SOCIETY.

June 9, 1859.

This was the annual election of Fellows, when the fifteen gentlemen we named in June were duly elected.

MONTHLY NOTES.

MARINE MEMORANDA.

The number of vessels engaged in the collier trade, and quantities of coal and coke shipped to London and other home ports, from various ports in the United Kingdom during the month of June, was as follows:—vessels, 4,592, tons of coal, 701,978, and tons of coke, 8,787. Of this quantity Newcastle furnished 938 vessels, 146,939 tons of coal, 2,865 tons of coke. Hartlepool and West Hartlepool shipped 102,193 tons of coal, but no coke, and Sunderland, 108,196 tons of coal, and 30 tons of coke. It is from these three ports that nearly all the north country coal is shipped, and, compared with what they monthly export, the quantity of Welsh coal shipped is very trifling. From Cardiff, the centre of the Welsh coal trade, 505 vessels sailed in June for London and other ports in the United Kingdom, carrying 61,251 tons of coal, and 1,103 tons of coke; from Newport there were shipped 46,921 tons of coal, and 380 of coke; and from Maryport, 35,512 tons of coal. The principal other ports engaged in the coal trade are Seaham, Whitehaven, Llanelly, Swansea, Middlesborough, and Troon.

On the 4th instant, the *Soukssou*, Russian screw despatch vessel, one of the two steamers lately constructed at Northfleet Dockyard, for the Russian government, and fitted with "Harman's patent direct-acting screw-engines," was tried under steam in the Thames, and with the most satisfactory results—both as regards the speed of the vessel and the working of her engines. The latter especially deserve remark, from the fact of their possessing peculiar features as regards arrangements, affording among other advantages great length of connecting rod, great stability, entire freedom from vibration, jar, or noise, to which most direct-acting engines are liable, the weight so disposed as to balance on each side of the vessel's keel, always keeping the ship in trim, and easy access to the details of pumps, valves, and all minutiæ, when going at full speed—a great desideratum in all sea-going vessels. The following are some of the principal dimensions of vessel and engines:—Length on load water line, 121 ft. 10 in. Breadth on load water line, 20 ft. 3 in. Draft on trial (mean), 9 ft. 4 in. Area of midship section, 123·5. Displacement on trial, 288·5. Coal on board, 38 tons. Co-efficient of duty performed, 491·6. Nominal horse-power, 60·. Indicated horse-power, 251·2. Diameter of cylinders, 28 in. Length of stroke, 15 in. Diameter of propeller, 7 ft. 9 in. Pitch of propeller, 11 ft. 6 in. Steam pressure, 20 lbs. Speed of vessel (through the water), 10 knots. Speed of propeller, 11·93.—It is believed that the speed would have been much augmented but for causes over which the patentee of the engines has had no control; this, however, does not affect the extremely satisfactory result obtained in every other respect. These are the second pair of engines so constructed and attended with similar success, and we cannot avoid expressing our opinion that it is to be regretted that our own Government does not afford to the patentee, and others like him, the opportunity for giving the public service of this country the benefits of their proved practical acquirements, rather than by confining their patronage to a select few, and jealously adhering to a list of names, however respectable and eminent, who are thus permitted to hold the door closed, as it were, against inquiry, and opposed to every idea but such as emanate from themselves. Thus it is, that in numerous instances, foreign governments realise the benefits that should accrue to ourselves and to those whose vocation has been mainly instrumental in maintaining our country in its present position in the world of practical science. A notice of these engines (in full) was given in No. 78 of this *Journal* for September, 1854, as designed for 400 horse-power.

On the 31st December last there were 6,974 sailing vessels of 50 tons burden, and 12,447 above 50 tons, registered in England, besides 626 steamers of 50 tons, and 821 above 50 tons. In Scotland the number of sailing ships was, respectively, 1,175 and 2,054, and the steamers 70 and 244. In Ireland the number of sailing vessels was 1,005 and 1,087, and the number of steamers 30 and 125. At the ports of England, 86,545 English, and 301 foreign sailing vessels entered inwards coastwise, besides 13,628 and 14 in Scotland (English and foreign), and 17,019 and 5 (English and foreign) in Ireland. The number of steamers entered coastwise was, in England, 16,008 British and 2 foreign; in Scotland, 6,224 British and 1 foreign; and in Ireland, 6,564 British and no foreign at all. 4,100 British sailing vessels of 1,487,990 tons, and 483 foreigners of 268,051 tons, entered inwards at the ports of England from the colonies (including the repeated voyages), besides 405 and 13 vessels (British and foreign) in Scotland, and 733 (British) in Ireland. The total number of steamers was 733, of 161,443 tons, all British, while 807 British steamers and 1 foreign steamer cleared outwards. The English sailing vessels engaged in the foreign trade amount to about 13,000, the Scotch to 1,800, and the Irish to 714, taking the *maximum* numbers. The British steamers so engaged numbered some 5,000. 863 timber vessels and 137 of iron were built and registered last year in the United Kingdom; the tonnage of the former was 144,058, and that of the latter 64,022. 1,551 vessels were sold and transferred, 566 wrecked, and 59 broken up. 57 foreign-built vessels, of 20,408 tons, were registered in the United Kingdom last year.

The number of steam vessels registered in the United Kingdom on the 1st of January, 1859, was 1,854, and their aggregate gross tonnage 680,433 tons, or, exclusive of engine-room, 441,878 tons. The first 510 on the list belong to London, 37 to Bristol, and 67 to Hull. Liverpool is the port of registry of 210, of which 152 are built of iron and the rest of wood, 82 of the former and 2 of the latter being propelled by the screw. The oldest on the list is the *Manchester*, built in 1825, of which Mr. D. Bellhouse is the registered owner. She is a wooden paddle vessel, and, with three exceptions, the smallest steamer registered at this port, measuring but 72½ ft. by 16½ ft., and being 43 tons only, with engines of 24 horse-power. The longest steam vessel is the *City of Washington*, 319 ft. by 40 ft., 460 horse-power, and 2,381 tons, or, exclusive of engine-room, 1,619 tons. The *Great Britain* and *Royal Charter* are both, however, of greater capacity, their tonnage, exclusive of engine-room, being respectively 1,734 and 2,165 tons, and the engines of the former of 500 horse-power. Their dimensions are respectively 274 ft. by 48 ft., and 306 ft. by 40 ft., but both surpass the *City of Washington* in depth of hold, as, indeed, many other Liverpool steamers do.

Marine engineers, in taking advantage of what has been taught by the late experiments with the *Doris*, may turn with advantage to Sir Howard Douglas' work, *Naval Warfare with Steam*, which we reviewed in January last. In that book the author suggested the identical modifications which have now led to such practicable, good results. Sir Howard Douglas also, in August, 1858, obtained provisional protection for a new form of screw involving the now decided points of improvement. He proposed to gain increased speed, better steering, and reduced vibration. All these points have now been secured in practice, and it is right and proper that we should place on record the name of the real originator of the plan.

Mechanical appliances for raising sunk and stranded ships have never yet received the attention due to them from mechanical engineers. Every one can remember how, but a very few years ago, the *Great Britain* had a very narrow escape from being totally lost, and how she was only recovered in a shattered condition, simply from the reason that the science of ship-raising had really received no practical attention. Now we have a project on foot for working out a plan which promises to be of real importance. This is the joint invention of Capt. W. Coppin, of Londonderry, and Mr. John Weild, the marine agent of the Glasgow Association of Underwriters. The main structure is a twin vessel, formed by two hulls, connected by four girders of great strength, and rigidly bound together on deck, and six feet below it, with diagonal iron bars, so as to appear on deck as one ship. The breadth of one hull is 40 feet, and the other 30 feet, having a clear space of 20 feet between the two, and the extreme length is 260 feet. The machine is to be propelled by two engines of 200 horse-power each, which drives a large paddle-wheel in the centre space between the two hulls. In this space there is also fitted two rudders of a novel description for steering. The lifting machinery consists of four sets of large shears ranged along the side of the larger vessel, and one set placed across the sterns of both. Connected with each set of shears is a large hydrostatic ram or press, of peculiar construction, to which is attached a pitch chain, with suitable blocks and shears. The side shears are capable of lifting 600 tons each, or 2,400 tons in all, and, if necessary, can be used simultaneously. The set of shears at the stern is calculated to lift 800 tons, and is intended to be used when the wreck is in such a position that the side shears cannot be brought to bear on it. The inside of each vessel is divided into a number of water-tight compartments. When the side shears are applied, there is a sufficient quantity of water allowed to enter into the smaller vessel, for the purpose of counterbalancing the weight and strain on the larger one during the operation of hoisting the wreck; provision is also made for the reception of the requisite quantity of water in the bow end, to counteract the weight at the stern when the single set of shears is in operation. The hydrostatic rams will be worked by a steam-engine of sufficient power; and it is calculated that after the sling chains are passed round the wreck, the hoisting will not occupy more than from one to two hours; and as the strain on all the chains can be equalised in the working of the hydrostatic rams, the chance of the chains breaking is almost entirely obviated, especially as the pitch chains are so much stronger than link chains, from there being no welds in them. It is believed that the ship will attain a speed of from nine to ten miles an hour under her own steam, as her draft of water will only be about 3 feet 9 inches when coaled for a voyage, and with no cargo on board.

The number of steam-vessels registered at Liverpool last year was twenty-four, but only nine of the number were built in 1858. The largest of these is the Pacific Steam Company's iron steamer *Callao*, 1,062 tons, and 320 horse-power, being 236 ft. long, by 29 broad, and 14½ deep. Next in dimensions to this of the vessels built last year, is Mr. W. F. Macgregor's iron screw-steamer *Said*, 609 tons, and 250 horse-power, which measures 234½ ft. by 28 ft. and has a depth of 16½ ft. in the hold.

Since the trip of the *Dean Richmond* through the North American lakes and across the Atlantic to Liverpool, in 1856, the trade has been continually increasing. In 1857 the through voyage was made by two vessels (the J. C. Kershaw and the Madeira Pet); in 1858 by thirteen vessels, of which one was a brig, four were barques, and eight were schooners. In 1859, already twenty-one vessels have sailed from lake ports for Europe, taking 1,100,000 feet of lumber, and 2,000,000 staves.

The Peninsular and Oriental Company have just added to their steam fleet, the paddle ship, *Delta*, built at the works of the Thames Shipbuilding Company. She is 314 feet long over all, with a 293 feet keel, 35 feet broad, and 24 feet 6 inches deep. Her burden is 2,000 tons, and her engines by Penn are 400 horse power. She will run between Southampton and Alexandria.

In addition to the extensive order recently given by the Cunard Company to ship-building firms on the Clyde, for the construction of several large first-class steamers, to replace those recently sold to the Spanish Government, the Pacific Steam Navigation Company have contracted with Messrs. J. Reid and Co., of Port Glasgow, to build a screwship of 800 tons for their line.

The French *Messageries* Imperiales, had at the end of 1858, 58 vessels measuring 77,015 tons, and fitted with engines of 14,530 horse power. Since that time there have been added to the fleet five more vessels, of an aggregate tonnage of 5,674 tons, and 1,460 horse power.

The number of new gunboats for which the Government have just made a contract is 18. They are understood to have been taken by six builders at the following prices:—Green, two at £24 15s. per ton; Wigram, four at £21 10s.; Mare, three at £21 10s.; Russell, four at £20 10s.; Miller (Liverpool), two, price not stated; Langley, one at £24; Pitcher, one at £25; and White (Cowes) one at £25.

Messrs. Robert Napier & Sons, and Messrs. G. & J. Thomson, of Glasgow, are now busy with several large first class steamers for the Cunard Company, to replace those recently disposed of to the Spanish Government.

There are at present more ships building in the New York yards than there have been at any period since the panic of 1857.

Wreck Chart of the British Isles for 1858.—The objects of the Royal National Life Boat Institution are now being worked out with an amount of energy which certainly deserves reward. Its latest and most powerful appeal to the public, is to be found in the handsome wreck chart, issued for the purpose of showing at a glance the vast number of shipwrecks which annually occur upon our shores. It is a tinted outline map of the whole of our islands, with the names of all the coast towns, and with distinguishing marks showing where wrecks have taken place. Eight several symbols are used, to indicate the different casualties of total loss otherwise than by collision; partial loss otherwise than by collision; sailing vessels in collision with total loss, and the same with partial loss; collision of sailing vessels with steamers with total loss, and the same with partial loss; steam vessels in collision with total loss, and the same with partial loss. Symbols in red are also used for severally indicating the different life boat, mortar, and rocket stations. Thickly dotted as it is, the chart presents a most melancholy picture. Hardly a spot is free from a wreck mark, but they cluster most numerously off Liverpool, and the Norfolk and Suffolk coast. We hope that the public will bestow some thinking attention upon this telling view of our saddest fatalities, and having thought, will afford the institution a helping hand.

Sutton's Straight Timbered Boat.—The boat, which we lately referred to as having been constructed entirely of straight timber, by Mr. Sutton of St. Brelade's Bay, Jersey, has now been tried at sea. This peculiar craft, which has been facetiously named the *Skimmer*—from her capability of skimming the water instead of ploughing deep through it—is 40 feet long; breadth 7 feet; depth 3 feet. The sides are upright like a wall, and form the two arcs of a circle of about 240 feet radius, so that the boat is symmetrical as regards bow and stern. The bottom is perfectly flat transversely, but has a curvature of one foot in the length; so that the boat draws one foot of water in the middle, and nothing at the ends. Beneath the flat bottom is a keel one foot in depth. The gunwale has no sheer. She is rigged as a schooner, and has three sails, mainsail, foresail, and jib. Inside there is a cuddy at each end, and 20 feet of the middle of the boat open. She was built by a man and a boy in two months, and the entire cost was £50.

The first trip with this boat was from St. Brelade's Bay, Jersey, to St. Malo, a town on the French coast, 42 miles off, in a direct line across the sea. The

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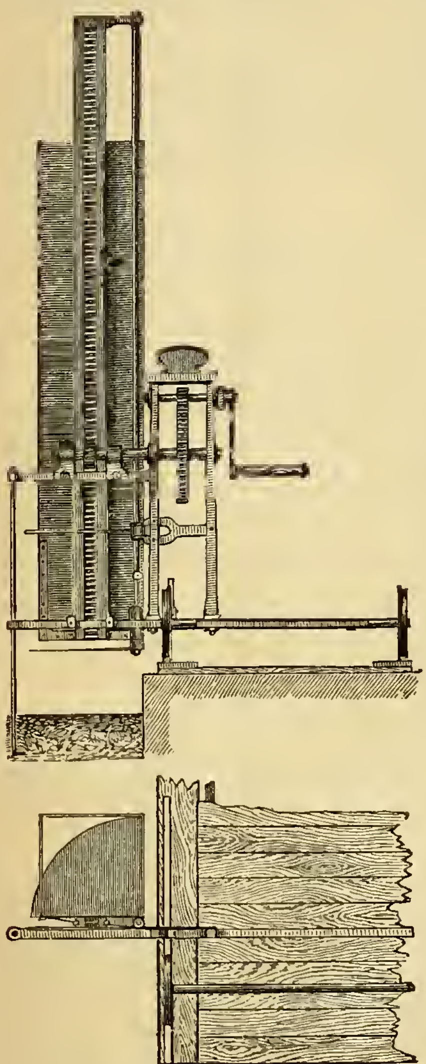
crew consisted of the man and boy who built her—Jean Poingdestre and Jean Duval, Mr. Sutton and his son, and a son of Poingdestre's. They started with the wind aft, and ran before it, at about 4 knots, with the mainsail and foresail boomed out on opposite sides of the boat—"goose-wing," as it is termed. The trip over was quite successful, and as the boat carried no papers, the French officials investigated her very narrowly, and roughly measured her to be 4·77 tons. On the return voyage there was more sea, and 28 miles were run in four hours. On the whole, this curious experimental craft was a real success.

Treating and Preparing Peat.—M. Mercier has introduced a new mode of treating and converting peat into fuel, the following is a resumé of the process:—The object of the invention is to render peat more serviceable for industrial purposes, and has the following advantages:—An unlimited quantity may be manufactured in one place, the method of extraction is easy, and accomplished by mechanical means. The smallest possible amount of manipulation of the material is required. Rapid drying of the peat, and as the article can be quickly disposed of a quick return of capital is brought about. These advantages are mainly accomplished by the use of centrifugal force, for the purpose of expelling from the peat the moisture contained therein. For this purpose the inventor gives the preference to those machines hitherto employed for cleaning sugar and the drying of fabrics. M. Mercier states that the result of numerous experiments seem to point out that the following are among the most advantageous process to pursue, in order to arrive at the best results:—1st, The rapid drying of the peat, by means of centrifugal force, after it has been excavated either with the ordinary spade or by mechanical means. 2d, The subdivision of the material by means of a machine, the details of which are given further on. 3d, The thorough working up the materials, after being dried by means of vertical mills, in order to render the peat more homogenous. 4th, The process of moulding the peat by means of a screw press, or any other machine assisted by a conducting tube. 5th, The propulsion by means of an endless screen, or other appliances of the screen, on which are placed the moulded bricks after issuing from the moulding machine. 6th, The process of drying, whether by stove or any other well-known means. The peat is excavated by the machine, of which the accompanying illustration is an elevation and plan, by means of a rack and pinion, actuated by a winch handle, a vertical descending and ascending motion is imparted to the cutting tool at pleasure, which causes it to enter the peat and divide or cut it into pieces of a cubical figure. When the dividing tool has descended to the required depth, another cutter, moving in a horizontal plane, passes across the base of the tool and detaches the cut portion from the bulk of the peat. The dividing apparatus is then elevated, bringing with it the enclosed and detached cube of peat. This machine is fixed on a framing which is mounted on wheels that travel on rails laid down for the purpose. The peat to be dried is then placed in bags, baskets, or any other receptacle formed of a porous material, such as wire or net work. The receptacles require to be made of this kind of material, so as to retain all the solid particles of the peat, but allowing of the escape of the liquid portions through the meshes of the net work by virtue of the centrifugal force. After that the bulk of the water has been expelled from the peat, by the centrifugal apparatus, it is placed in a receiver which is of a cup-like form, and works on a pivot, a horizontal rotatory motion being imparted to it; at the same time, a series of curved blades, which are arranged within the receiver, are caused to revolve around their axis. Any convenient prime mover may be used to give motion to these curved rotatory blades, which thoroughly stir up and mix all the particles of peat. At the expiration of a certain time, the peat as excavated becomes thoroughly pulverised, and reduced to fine and perfectly homogenous paste, being freed from pieces of wood, grain, and other extraneous matter, and is then ready to be moulded into any desired form. In some cases, in order to obtain a more perfect admixture, the peat is allowed to fall on to an inclined plane, whence it is carried to mill stones arranged in a manner similar to those of an oil mill, and by crushing the peat causes it to be more thoroughly pulverised. After the peat has been thus far sufficiently prepared, it is allowed to fall through a lateral opening into receptacles, which may either be presses of similar formation to those used in the manufacture of drain pipes, or else into a cylindrical apparatus provided with an endless screw. The inventor proposes placing in its interior, at the centre, a die of equal diameter to the interior of the longitudinal orifice, that he wishes to produce in the moulded peat. In this manner the peat is moulded to a tubular figure, which dries with a great rapidity, and constitutes a new article of industrial produce of superior hardness and quality, and well adapted for fuel. After leaving the pressing apparatus, the articles of peat are carried forward on an endless band to which suitable motion is imparted, to the drying stove, which is heated by the waste gases from the ovens used to carbonise the peat.



Parker's Warp Tensional Movement for Looms.—Messrs. Charles Parker and Sons, of the Lady Bank Works, Chapelshade, Dundee, have lately proposed a very ingenious plan of working looms, so that the warp threads may be slackened just prior to, and during the formation of the shed, and again tightened for the beat up. This tightening and slacking operation is wholly performed at the front of the loom, the necessary motions being derived from the slay or lathe. The slay or lathe has jointed to it a pair of short connecting or link rods, the front ends of which again are jointed by adjustable slot and stud connections, to short pendant levers set on a long cranked bar, roller, or shaft, carried in end bearings in the loom framing. This bar or roller stretches entirely across the line of the newly woven fabric, and either above or below it, and it is so arranged that when the beat up is about to take place, it is pressed by the action of the lathe or slay forcibly against the woven cloth laterally. In this way the woven cloth and the warp threads are at once tightened so that the beat up of the weft may take place in the most effectual manner. Then, when the lathe or slay recedes, the lateral pressure of the bar is removed from the cloth, and the warp threads are thus at once slackened to allow of the formation of the warp shed.

Legal Measurement of Gas.—If an old apple woman sells a pound of fruit by weights or scales which can be shown to be fallacious—whether intentionally so or not—an inspector at once pounces upon her, and she is subjected to condign punishment; but on public gas companies who deal with consumers to the extent of £5,000,000 a-year, are in no way restricted in their mode of dealing with their very expensive commodity. Gas consumers are now, however, universal, and they have at last developed their views in a petition just presented to both Houses of Parliament, in the following terms:—

"A public bill, entituled 'An act for regulating measures used in sales of gas,' has been introduced, and is now pending in parliament.

"That all things sold by measure, except gas, are referred to a fixed legal standard, or to some practical mode of ascertaining the capacity of the instrument used, and inspectors are employed throughout the kingdom to prevent inaccuracy or fraud.

"That the value of the gas sold by measure in this kingdom is estimated to amount to five millions of pounds per annum, and yet its measurement is governed by no legal provision.

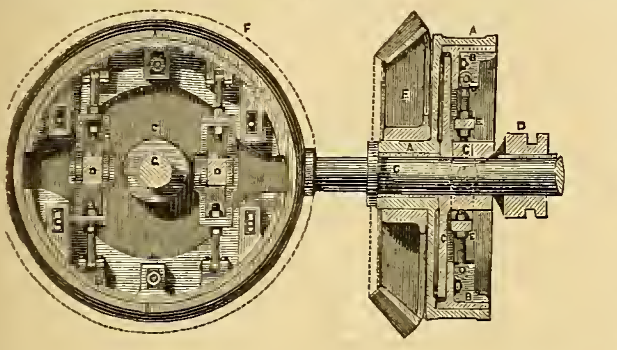
"That gas meters are capable of being managed so as to register as much as 50 per cent. from the true quantity, and numerous instances have been discovered where meters have been registering to an extent ranging from 5 to 30 per cent. in excess of the gas which has actually been consumed.

"That the said bill provides the like mode of ascertaining the contents of a measure of gas, as is adopted for ascertaining the contents for other measures of capacity, and provides for the appointment of inspectors to prevent fraud as in the case of weights and measures generally, and all meters may be tested and certified before being used, and there will be a proper officer to decide complaints of the inaccurate working of meters, whereby your petitioners will be relieved from great annoyances, losses, and injustice."

It is certainly high time that some such remedial measure be put in force, for at present no one knows the basis on which his gas transactions are conducted.

Steam-Digging Apparatus.—Another contribution to the practical science of steam-digging has recently been made by Mr. Von Kanig, a German inventor. In this gentleman's arrangements, the machinery consists of three parts—the actuating steam-engine, with its appurtenances; the actual digging or working apparatus; and the traversing movement for the forward conveyance of the machine. The engine and boiler is of the ordinary locomotive or agricultural class, set upon a long frame carried by four ground wheels, which may, or may not, be arranged with jointed or linked rail pieces, to form a continuous railway for the machine to pass over the ground by. The crank, or first motion shaft, actuates a train of gearing, working a transverse horizontal shaft, carrying cams or eccentric pieces, which operate upon open frame pieces, one at each side of the main framing. These frame pieces carry detents or catches, gearing with ratchet teeth, upon, or in connection with, the after pair of ground wheels. In this way the cams being formed to suit, the machine is impelled forward when at work with a step-by-step motion over the land, a pause being made at each turn of the cams to allow of the digging action going on properly. The same train of gearing also actuates another shaft at the back end of the framing, which shaft also carries cams working in open frames for the actuation of the diggers. These diggers are in the form of spades, set side by side across the machine to the intended width, each spade being attached to a lower cross shaft, working in bearings carried by a pair of the open frame pieces actuated by cams, so as to have an up and down vertical motion in suitable guides, for putting the spades into, and taking them out of the earth. The shaft on which the spades turn also carries curved arms, against which other cams are made to work, so as to turn the spades upwards upon their shaft as a centre. In this way one set of cams raises and lowers the spades in a vertical line, and the other working in combination with them turns the spades upwards to throw the earth over. These combined motions effectually dig up the earth, and the loosened surface is then raked over and levelled by a mechanical leveller at the extreme after-end of the machine. This raker consists of a set of teeth carried by pendant lever arms, from a shaft or moveable support above, adjustable as to height. The same shaft which actuates the digging cams also carries cranks with connecting rods for causing these raking teeth to vibrate; and in this way they are passed back and forward over the loosened earth, so that the machine leaves it well levelled. The machine is steered at the front end by a hand wheel and chain barrel, the chain from which is connected at each end to a forward central lever piece, connected with the surveilling frame and vertical spindle of the front pair of wheels. This machine, or modification of it, may also be used for excavations.

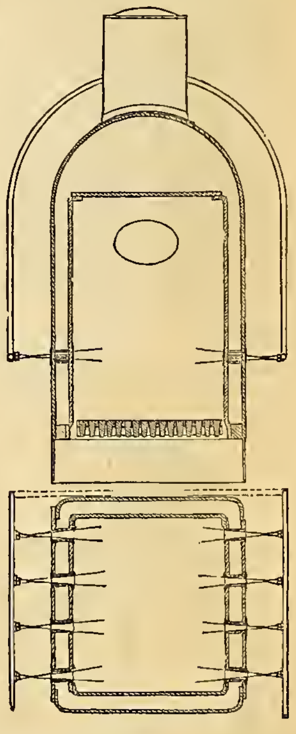
Improved Frictional Coupling Apparatus.—In the subjoined engravings is figured in front view, and partially sectional elevation, one modification of the patent friction coupling invented by Mr. Francis Wrigley, of York Chambers, Manchester, engineer. The coupling consists of an external friction ring and plate, A, the boss of which is bushed with brass, and runs loosely on the shaft, G. Within the ring, A, are arranged the internal friction



segments, B, which press against the internal surface of the outer ring; these segments are connected by bolts and nuts to the centre plate, C; the bolts pass through slots made in the segments, and which admit of their moving in a vertical direction. By means of this arrangement the friction segments may be moved apart, so as to be in close contact with the internal surface of the ring, A, or be released therefrom by causing them to approach each other. The centre plate, C, is a disc of metal, the boss of which is keyed fast to the shaft, G, on which is fitted the sliding box, D, which moves to and fro on a feather fitted in the shaft. The box, D, is connected to the double levers, E, which are jointed at the centre of the coupling, and at their extremities, to the snugs that are cast on the segments, B, these double levers are fitted with adjusting screws and nuts, so as to regulate with nicety the position of the segments. The bevel or spur wheel, F, which communicates its motion to the machinery to be driven, is keyed to the boss of the external friction ring, A. When the sliding box, D, is moved away from the disc, C, it draws with it the central parts of the compound levers, E, this motion causes the segments, B, to approach each other, and thus release the friction ring, A, which runs loosely on the shaft, G, so that no motion is imparted to the wheel, F. The contrary movement of the box, D, brings the segments, B, in close contact with the ring, A, which is thus carried round with the motion of the shaft, G. These couplings may be made to transmit any amount of power required, and without slipping, starting, or stopping any machine or combination of machinery gradually, and without noise or shock, whilst the driving power is at full speed. It affords us much pleasure to add that Mr. Wrigley has received numerous testimonials from eminent engineers, stating the satisfaction these couplings have given in practice.

Manchester Association for the Prevention of Steam Boiler Explosions.—At the last monthly meeting of the committee of management, the chief inspector, Mr. H. W. Harman, C.E., presented his report, from which we find that the association has now under inspection 564 mills and other works, and 1,585 boilers, being an increase since the 25th ult. of six mills and 22 boilers. The engineer has made 208 visits, and examined 633 boilers and 442 engines: of these seventeen visits have been special, and 29 boilers have been specially, 60 thoroughly, and 20 internally examined. 84 diagrams have been taken from 42 cylinders: of these six cylinders and 15 diagrams have been special and one additional. The number of boilers found defective are as under:—From corrosion, 35 (six dangerous), fracture, 11 (one dangerous), safety valves extra and overweighted, and otherwise out of order, 73; pressure guages, 16, water guages, 52, feed apparatus, 2, blow-off cocks, 23, fusible plugs o t of order, 5, deficiency of water, 1, total 218; 7 dangerous. Twenty boilers were without back pressure valves, 7 without pressure guages, 8 without glass water guages. Many safety valve spindles have been found to be passed through stuffing boxes, and although not packed, they are highly objectionable, as affording the opportunity of their being tampered with. Among the things to be deprecated is the too prevalent custom of overloading old boilers by extra weighting the safety valves as a means of meeting the increased requirements of the manufacturer. Another fault is, the allowing those who are called watchmen to superintend the firing and feeding of boilers during the night for steaming purposes connected with the mills. Many cases of collapsed flues have occurred through the neglect of those thus permitted to practise the duties of well instructed firemen. It is also to be regretted that notwithstanding the investigations which have taken place as regards the laws of collapse under steam pressure, and the best means of counterbalancing the very serious effects that too often ensue, yet there are makers who still continue to construct boilers on the old plan, that is, with flues of excessive length and of large diameter, and without any support from end to end, and without any of those provisions for strengthening them, which have been deduced from late experiments as absolutely indispensable to safety, such as hooping them round with T iron, or by positive connection with the shell at one or more places by well-known mechanical contrivances, and not only so, but who are also at this moment discarding the hitherto recognised necessity of firmly staying the end plates to the shell.

Combustion of Coal in Locomotives.—We here illustrate Mr. D. K. Clark's plan for burning coal in locomotive engines. A sufficient number of tubular or other shaped openings are made through the sides or other part of the fire-box, for the admission of air above the fuel; and jets of steam are projected through these openings, as indicated by the expanding outlines, to induct and forcibly distribute the air within the fire-box, and enforce its immediate mixture and combustion with the gases: the action of the jets of steam in creating powerful currents of air into the fire box being similar to that of the blast-pipe in the chimney. This plan has been tried on the Eastern Counties Railway, and is quite successful in preventing smoke, making a bright fire, keeping up steam, and working economically. By inclining downwards the jets of steam, the air may be thrown at any desired inclination upon the fuel, and amongst the smoke.



Factory Accidents.—The total number of accidents arising from machin ry reported during the six months ended the 30th April, 1859, was 1856, of which 37 resulted in death, and 271 in amputation, chiefly of part of the hand, the remaining injuries consisting of fractures, contusions, &c. There were also 156 accidents reported not arising from machinery, of which 3 were fatal. The official report states that these accidents are "formidable, certainly, in point of number; but if those were deducted which are in themselves trifling, as well as those which no practicable regulations could prevent, the remaining amount, when contrasted with the very great number of factories in the United Kingdom, would appear extraordinarily small to any one who has seen the complicated machinery, moving with vast speed, often in a very contracted space, among which the people are employed. But even that number of serious accidents might be reduced, if the excellent example set by many mill-owners in fencing dangerous machinery, whenever practicable, were more generally followed." The report shows that during the half-year there were in the four districts 877 informations for offences against the Factories' Act, 558 of which resulted in convictions, while 313 were withdrawn on payment of costs, and 6 were dismissed. The total amount of fines inflicted was £877 3s.; and the total amount of costs was £466 17s. 5d. Only three of the prosecutions occurred in the district of Scotland. It is certainly matter for high congratulation that in the midst of our vast factory system bodily accidents are not more frequent nor more severe. Fencing, to which the report adverts as being too much neglected, may, in our opinion, be carried too far; and we are confident that, whilst some few accidents do arise from the neglect of this proper precaution, many others of a more frightful nature would occur were boxing in carried out to the extent frequently suggested. The only real safeguard is care on the part of the workpeople—without it, all the precautions which ingenuity can devise must necessarily be useless; with it, fencing can only be needed in peculiarly exposed instances. Workpeople habituated to the whirl and thunder of vast and complicated machinery are well impressed with an instinctive feeling of care for themselves. Only they who have been accustomed as we have to a constant acquaintance with forests of machinery and their attendants, can fully appreciate this; but we repeat, in other terms, that a few walks through our wondrous factories and machine shops would bring about a conviction in the minds of observers, that the accidents—large in number as they may appear—are small indeed as compared with the extent of the working machinery in this great industrial country.

Patents for India.—The act for granting exclusive privileges to inventors for India received the assent of the Right Honourable the Governor-General on the 17th May, 1859. We have already given the substantial provisions at page 66 of our present volume, and the print of the act has reached us at too late a period to allow us to do more than give a simple announcement of it at present. We shall, however, in our next Part, again refer to the subject.

Lawrence's Patent Sluice.—In this invention, the pressure of water against the sluice is made to assist in raising it. Fig. 1 shows the principle applied to sluices in canal locks; A is the paddle or sluice, the upper part fitting the chamber, B; C is a small valve or sluice, and D a small flap-valve connected with the valve, C, by the link, E, so that when C is raised D is closed; F is a rod to the machinery, G. On turning the winch handle, H, the rod, F, is raised, opening the valve, C, and closing D, allowing the water from the chamber, B, to run off to the lower level through the opening, C. The upper level water then presses in an upward direction against the sluice, A (the water in the chamber having been run off as described), and forces it upwards, the rising being regulated by the machinery, G. In locks, the water is generally at the same level on either side, when the sluice is required to be lowered, in which case it descends by its own weight; but should it be required to lower the sluice against a pressure, that is, when the water is running from one level to the other, the rod, F, in descending, closes the valve, C, and opens D, allowing the water in the upper level to fill the chamber, B, producing an equilibrium of pressures, and the sluice is then lowered by the machinery. Sluices of this construction have now been at work for some time at the Old Ford Lock, on the River Lea, and the large sluices of the new locks at the Commercial Docks are constructed on a similar plan. In all cases, a very great saving in time has been effected. Sluices, to act with a pressure on either side, are made on a modified plan.

Fig. 1.

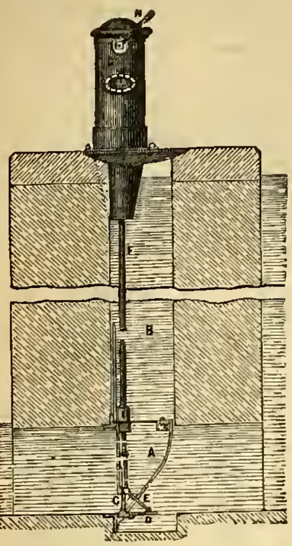


Fig. 2.

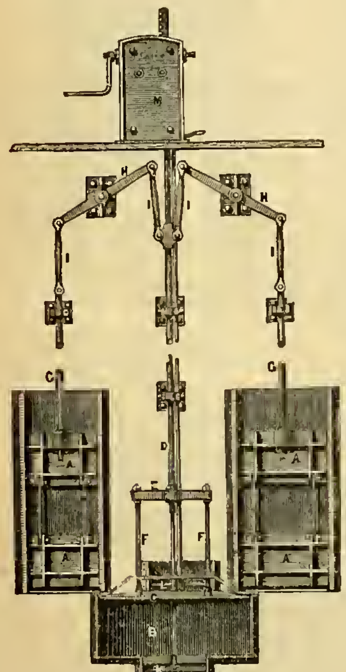


Fig. 2 shows the principle applied to raising sluices in lock gates. The old sluices, A, in the gate, originally worked by screws at the top; B is the power chamber, the front plate of which is removed in the engraving, to show the interior in which the piston, C, works. The rod, D, is attached to the piston, C, by the cross head, E, and rods, F. The rods, G, from the old sluices, are connected with the rod, D, by means of the levers, H, and slings, I, so that as the piston, C, is raised or lowered, the sluices, A, are closed or opened; K and L are small sluices above and below the piston, C; on opening the sluice, K, the water below the piston, C, runs off to the low level, and the high level water on the top presses down the piston, C, and thus, by means of the slings and levers, raises the four sluices, A. To lower the sluices, the small sluice, L, is opened, and K closed. The high level water then presses on the underside of the piston, C, forcing it upwards, and thus closing the sluices, A. The machinery, M, is so constructed, that the small sluices are opened or closed as may be required, and the rising of the piston, C, regulated by simply turning the winch handle. The sluices on the gates of the old entrance to the Commercial Docks, London, are now worked in this manner, the time occupied in raising the four sluices, with one man, being about a quarter of a minute.

Front Ignition Breech Guns.—A new form of breech for fire-arms has lately been introduced with good effect, by Mr. J. D. Dougall, the well-known gunsmith of Glasgow. In this breech the end is bored out in such a manner as to leave a central longitudinal projecting piece of metal in the form of a cone. The front or forward end of the chamber and cross chamber, or thoroughfare, forming the communication between the igniting nipple and the breech, passes along or is formed in this central conical piece of metal, terminating at the apex of the cone in a small aperture, forming the actual point of ignition of the charge. With this arrangement the igniting fire of the percussion cap is conveyed to the front end of the charge, which envelopes the cone, and by thus igniting the gunpowder at the front or forward end, not only is the whole of it consumed in the explosive discharge, but its expansive force is employed in the most effective manner in propelling the shot or missile. Instead of making the breech in this manner with a solid conical igniting conductor, a separate piece may be screwed in or attached to answer a similar purpose. With guns constructed in this way, Mr. Dougall has obtained first-rate results as regards hard and exact shooting, with very small charges of gunpowder.

Mackenzie's Sewing Machine.—Very considerable improvements in the sewing machine have recently been made by Mr. Alexander Mackenzie, an ingenious machinist in Glasgow, for the special purpose of rendering the machines more durable in their wearing details, combined with superior simplicity of parts, than has hitherto been the case. According to one portion of the invention, the improvements refer to what is known as the "circular needle" machine, the sewing or stitching action being effected by the combined action of a straight needle of vertical action, and a curved needle of horizontal action. The framing of the machine is generally similar to that already in use, consisting of a rectangular table frame, open beneath, and formed with a platform top for the working operations. The machine is actuated by a treadle or other convenient movement, which works the first motion spur-wheel, running loose on a stud in the framing. This wheel gears beneath, with a spur pinion on the end of a horizontal shaft beneath the platform, and which shaft carries a grooved disc cam, working a stud pin on a short horizontal segmental rack lever arm, working loosely on an end stud on the lower face of the platform. The free end of this rack-lever is formed with a segmental toothed rack-gearing, with a horizontal pinion, the vertical stud of which carries the curved or circular needle, situated immediately beneath the level of the platform, in which there is a suitable aperture for access to the needle. Thus the continuous rotation of the first motion shaft gives a horizontal vibratory motion to the rack-lever, and a corresponding reciprocatory partial rotatory motion to the needle. The first shaft also drives the feed-motion for the periodical traverse of the fabric being sewn, and it carries a second and duplex cam for this purpose. This cam rotates beneath a horizontal feed-motion bar, capable of both a longitudinal and lateral movement, a spring being fitted at one end for the former, and another above it for the latter movement. From the central portion of this feed-bar there projects up through an aperture in the platform a vertical arm, with a roughened or serrated top-piece, over which the fabric is passed during working. The under side of the feed-bar is formed with a deep shoulder for the cam to work against; and the result is, that at each revolution of the cam the roughened feed surface or plate, is alternately lifted up and down, and pushed back and forward, the springs affording the return movement. One end of the bar bears against the periphery of a small adjustable eccentric or cam piece, set on a stud in the frame, and capable of being set round at pleasure by a hand lever, with a setting screw stud projecting through the frame, and capable of traverse along a segmental slot. In this way the operator can set the eccentric round to any required position, and so regulate the traverse of the feed bar. The actual roughened feed-piece may either be solid or in vertical divisions. If formed in divisions, their lower ends work in suitable guides on the feed-bar against bottom springs, so that when folds, edges, or irregular thicknesses of fabric are being operated upon, each roughened piece comes to a fair bearing, and secures the fabric properly for an even, straightforward traverse. The first motion spur-wheel also gears with an upper pinion on an upper horizontal shaft, working through the upper frame-bracket arm. The front end of this shaft carries a differentially-face-grooved cam, operating upon the stud of the vertical needle-bar, the differential curvature being such as to give the required up-and-down movements and rests of the vertical needle in its action, in conjunction with the curved needle beneath. The track of the curvature of action of the cam is formed with very easy changing bends, so that the action between the stud and the bends is smooth, working without shocks or jars, and avoiding unreasonable wear of the parts. The cam is also contrived that it operates upon, or with, its easiest leverage, at the instant when the greatest resistance is opposed to the passage of the needle through the material being sewn. The upper spring-presser or resisting surface for the roughened feed-piece is carried, and operates in the usual way, and its face may, or may not, be in divisions or sections to correspond with those of the roughened feeder. The needles are attached to their carrying bars in such a manner as to be easily adjustable, and securely held in accurate position for work. Each needle is formed with a broad, flat, socket-piece, formed to fit accurately in a recess in the face of the needle-bar, and so as to be flush with the latter. Over this recess there is hinged a binding, clasping bar, the free end of which is capable of being set hard down by a pinching screw. In this way the needles may be changed with the utmost facility, whilst they must necessarily be set with perfect accuracy.

For curvilinear or differential line sewing, provision is made for traversing the fabric being sewn, so as to follow any pre-determined line. For this purpose a disc wheel, cut or formed on its periphery, in accordance with the intended line of sewing to be produced in the manner of the surfaces employed in the turner's "rose engine," is fitted up in the gearing of the machinery, so as to bear, during its revolution, upon the movements in connection with the feeder. This may be accomplished in various ways, but it is preferred to cause the operating disc to bear against a level arm working on an end centre carrying a bent pinion, which pinion is in gear with a segmental toothed rack on a short horizontal arm, which works round the needle-bar as a centre. The needle-bar has, at its upper end, a horizontal ring-piece, within the interior of which projects the lower end of an adjustable incline-piece, carried by the top of a vertical lever, set on a horizontal stud centre, capable of traversing in a vertical slot. The bottom end of this lever carries the roughened traversing feed-piece, which, in this instance, operates from above. The same arm which works upon the needle-bar as a centre is also connected by means of a slot with the upper part of the vertical feed lever, so that whatever motion is imparted by the guide disc wheel, to the gearing of the short arm before referred to, is communicated as regards lateral, or transverse action, to the feed-lever, which is at the same time being operated upon for the forward traverse of the feed surface by the ring on the needle-bar, acting against the incline-piece on the top of the feed-bar. In this way the traversing feed has a compound motion transmitted to it, a forward traverse from the needle-bar movement, and a lateral or differential traverse from the disc wheel movement; and thus the stitching may be carried on to suit almost any desired figure—for ornamental or other work. All or most of these improvements may be employed in various classes of sewing machines.

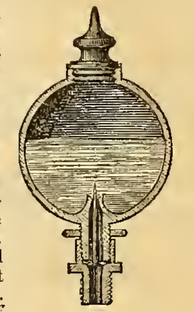
In what are known as "shuttle" machines, the sewing thread is wound for use in the "cop" form, instead of being wound up as a bobbin. With this arrangement the thread comes directly and evenly off in sewing, without the tendency to "snarl" or coil up and get loose, always felt in the use of bobbins.

Shand and Mason's Steam Fire Engine.—We have long been aware of the immense accession of power which the ordinary fire engine would receive from a judicious application of steam power. The floating engines on the Thames have, in fact, proved this long ago, but we have sadly neglected the adaptation for stationary purposes. Messrs. Shand and Mason, the well known leading London fire engine builders have, however, now come forward to prove the great practical advantages to be gained by setting steam to perform the heavy work of the firemen, and we recently had the pleasure of witnessing the results accomplished by a second steam fire engine made by this firm for the metropolitan service.

This engine is mounted upon wheels of large diameter, so as to be capable of being drawn by horses in the usual way, whilst steam does all the pumping work. The box contains the hose and implements, with a driving seat and space for firemen. Its extreme dimensions are 12½ feet long by 6 feet 5 inches wide, and 8 feet high without chimney. The total weight, including firemen and all implements, is nearly three tons, or almost double the weight of the ordinary brigade engine. This increase of weight is apparently the only disadvantage which it possesses when compared with the common brigade engine; in all the other and important qualities the superiority of the steam fire engine is so great as to leave no room for comparison with any other. Like the common fire engine, this one by steam can be worked either with a suction pipe, or water may be drawn from the cistern, which forms part of the engine itself. The steam cylinder and pumps are made entirely of gun-metal; the valves of India-rubber, as in the floating steam fire engine; and the whole machinery is of the simplest and strongest construction, and not liable to be damaged by any amount of jolting over rough roads. The boiler is of the upright tubular construction, affording ample means for superheating the steam; there are 199 brass tubes, 1¾ inch outside diameter, and 15 inches long. The fire-box is of copper, 3 feet 4 inches diameter; the cylinder is 8½ inches diameter, with 6-inch stroke; one water cylinder is 6 inches diameter, with 6 inches stroke, the other 7⅜ inches diameter, with a 4-inch stroke, the two being equal in cubic contents. In designing this engine, other important circumstances besides obtaining the best theoretical steam pump have had to be taken into consideration, such as weight, bulk, means of transit, and accommodation for hose and implements. The London brigade engines have pumps consisting of two single-acting cylinders, 7 inches diameter and 8-inch stroke. The average rate of working at fires is not more than 40 strokes per minute, and, as the cylinders contain 616 cubic inches, it follows that a London brigade engine delivers, at its average rate of working, 88 gallons per minute, being worked by 28 men. The water cylinders of the steam fire engines contain 340 cubic inches, and, as it can be readily worked at no less than 218 strokes per minute, it will thus be equal to three brigade engines at their ordinary rate of working. The rapidity with which steam can be generated is, of course, an important point in the construction of a machine required for duty on the most sudden emergencies, and this point has been well and satisfactorily ascertained. Nevertheless, in the course of the experiments which we witnessed, it was demonstrated that a pressure of 10lb. steam could be generated in six minutes from the moment of lighting the fires; a high pressure was obtained in 10½ minutes, and the engine was immediately in full work. Of course, in the case of an engine of this class being generally adopted, the fires would always be kept laid, and lighted while the horses were being harnessed; so that the whole machine would be in full motion on its way to a fire. Before the trial the boiler was overcharged with water, part of which was run out before the fire was lighted, and found to be cold by the spectators. The jets used were ⅝, ¾, ⅞, and inch, in succession, the changes being accomplished by means of a stop-valve on each of the two lines of hose, without stopping the engine. This feature will be of great use at a fire. The height attained by the ⅞ jet was considered to be 145 feet, and the horizontal measured distance 161 feet; the inch jet went 120 feet perpendicular, and 150 feet horizontal. At a second trial, the engine was started under a pressure of 25 lb. in 9 minutes from lighting the fires. The only indicator of height was a tree 70 feet high. The ⅞ jet was considered to be 150 feet in height, and the inch 130; the measured horizontal distance was 168 feet with the inch jet. It was considered by those who were present at both trials that the engine worked better at the second trial than at the first. As the steam can always be got up whilst the engine is being taken to a fire, no time will be lost in this necessary operation; and the moment the fire is reached, the tremendous power which steam can exert can be at once applied, without waiting for men, and, of course, without that dependence upon combined manual exertion which harasses the ordinary engines. Steam fire engines must now come into general use, and the country owes much to Messrs. Shand and Mason for the practical development of this great mechanical advance.

Prize Design for the Public Clock Tower at Burnley.—As we have before remarked, Messrs. Bellamy & Hardy, of Lincoln, were the fortunate architectural designers in answer to the wishes of the commissioners acting under the Burnley Improvement Act, for a public clock tower. It is in the Italian style, being composed of a rustic pedestal, surmounted by a campanile, with Corinthian pilasters at the angles. The four windows between these pilasters are filled in with stained glass, and in its entablature are the four clock dials. The projecting cornices, formed as pediments, serve as a protection to the clock from the weather. From the intersections of the pediment a characteristic roof rises, and finishes with a well-proportioned bell turret. The dials are 40 feet from the ground, and they are illuminated on a new principle, having panels of variously coloured glass. The hands are also of a peculiar construction, enabling the time to be seen at a very considerable distance off. The interior of the body of the tower is formed into storeys, the first having a staircase leading to the clock chamber, on a level with the balconies. The available space being but small, these balconies afford access to all the clock-works. Over this storey is a room for the requisite dial machinery.

The Alpha Lubricator.—That the lubricating properties of oil may be properly expended, the bearings kept cool, free from friction and destructive action, without waste and unnecessary supply, the oil should be supplied in smaller quantities and more frequently than is ordinarily done by the attendant in charge. The principle of the Alpha Lubricator is that of raising a projection within the cup, which projection contains a small aperture; through this aperture a taper cone or needle passes. The supply of oil is increased or diminished by simply turning round the cup, thereby making the aperture larger or smaller as required, thus making it applicable for either large or small bearings. When regulated, the lock-nut is screwed down, and thus holds it firmly in its position. The projection and orifice are raised above the bottom of the cup, so that deposits which may accumulate will not impede its proper action. These lubricators are made with cups of brass, tin, and glass. The "Alpha" appears to be a simple, effectual, and common-sense contrivance; and we cannot doubt but that its merits will cause it to be adopted generally. The patentees are Messrs. Ramsbottom and Bailey, of the Albion Works, Salford, Lancashire.



Aid to Science-Instruction.—The following minute has been recently passed by the Committee of Council on Education. My Lords proceed to revise the minutes which have been passed in the science and art department, for the encouragement of scientific instruction among the industrial classes of this country who have already received primary education.

I. All former minutes relating to science or trade schools, and scientific class-instruction, except those referring to navigation, public lectures, and the training of teachers (as hereafter appended), are hereby cancelled, and the following regulations are substituted in their place.

II. The science and art department will hereafter assist the industrial classes of this country in supplying themselves with instruction in the rudiments of—

1. Practical and Descriptive Geometry, with Mechanical and Machine Drawing, and Building Construction,
2. Physics,
3. Chemistry,
4. Geology and Mineralogy (*applied to Mining*),
5. Natural History,

by augmentation grants in aid of salary to competent teachers, and by payments and prizes on successful results, and grants for apparatus, &c.

III. Any school or science class, either existing or about to be established, and duly approved by the science and art department, may apply, through its managers, *for a Certificated Teacher*, or for the certification of any teacher, in any one or more of the above named branches of science.

IV. Examinations for certificates of three grades of competency to teach any of the above named sciences will be held annually by the department, in the last week of November, in the metropolis, as follows:—

Nos. 1, 2, and 5, at South Kensington.
No. 3, at the Royal College of Chemistry, Oxford Street.
No. 4, at the School of Mines, Jermyn Street.

V. Annual grants, in augmentation of salaries of teachers so certified to teach in any of the above mentioned sciences, will be given as follows:—

For the 1st grade of competency £20.
" 2d " £15.
" 3d " £10.

Any teacher holding a certificate of competency to give primary instruction will receive, from the science and art department, a sum equal to the augmentation grant which has been attached to such certificate, in addition to the grants above mentioned.

VI. Such grants will only be made while the teacher is giving instruction in a school or science class for the industrial classes, approved by the department.

VII. The department will require that suitable premises shall be found and maintained at the cost of the locality where the school or class is held; that the names of ten students shall be entered, whose fees for half a year shall have been paid in advance; and that the local Managers shall guarantee, for the support of the schools and teachers, from fees or local funds, a sum at least equal to the grants so long as they shall be paid. If at any time neither fees of pupils nor local funds cover the requisite amount, it must be inferred that there is no demand for instruction in the above-named sciences, in that locality, which the Government is justified in aiding; and the assistance of the department will be withdrawn.

VIII. Every school or class having a certified teacher will be inspected and examined once a year by the department, and Queen's prizes of an honorary kind will be awarded to successful students.

IX. Payments will be made to the teacher on each first-class Queen's prize obtained by the student, £3; on each second class, £2; and on each third class, £1.

X. A grant towards the purchase of apparatus, fittings, diagrams, etc., of 50 per cent. on the cost of them, will continue to be afforded to schools and classes in mechanics and similar institutions.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When city or town is not mentioned, London is to be understood.

Recorded March 18.

686. Ferdinand Potts, Birmingham—A combined metallic support and label for training supporting, removing, and transplanting flowers or trees, in gardens, or green or hot-houses, or for other horticultural purposes.

Recorded April 28.

1064. Joshua Kidd, Birkenhead, Cheshire—Improvements in sewing machines.

Recorded May 27.

1310. Luke D. Jackson, 32 Finsbury Market, Finsbury—An improved machine for cutting wood.

Recorded May 31.

1339. William Smith, 18 and 19 Salisbury Street, Adelphi—Apparatus for raising and docking ships and other similar purposes.—(Communication from John W. Nystrom, Russia.

Recorded June 1.

1350. George H. Cottam and Henry R. Cottam, Old St. Pancras Road—Improvements in stable fittings.

Recorded June 4.

1373. Henry Crossley, Failsworth, near Manchester—Improvements in Jacquard machines
1374. Richard Chrimes, Rotherham, Yorkshire—Improvements in apparatus for supplying water to, and discharging the contents from urinals, wash-hand basins, and other similar articles.
1375. Edward Gill, St. Ann's Road, Wandsworth Common, Surrey—Improvements in producing spirit from rice, maize, and other descriptions of grain.
1376. James Nuttall, Old Accrington, George Riding, Clayton-le-Moors, and William Coultburst, Old Accrington, Lancashire—An improved size powder, to be used in sizeing cotton, linen, or other warps for weaving.
1377. George Davies, 1 Serle Street, Lincoln's Inn, and 28 St. Enoch Square, Glasgow—An improvement in wearing apparel.—(Communication from Gabriel J. J. Laury, Paris.)
1378. James Wood and William Wood, Nottingham—A peculiar mode or method of dyeing lace or other fabrics, and making the same into bonnet and cap fronts, or other articles.
1379. Christopher James, Aberdare, Glamorganshire—An improvement in the manufacture of railway chairs.

Recorded June 6.

1381. Thomas Hyland, Manchester—Improvements in the manufacture of gum or dextrine, and their compounds, from starch.
1382. George Davies, 1 Serle Street, Lincoln's Inn, and 28 St. Enoch Square, Glasgow—Improvements in paddle wheels and screw propellers for steam vessels.—(Communication from Auguste Jouan, San Francisco, California.)
1383. James Ferrabee, Phœnix Iron Works, Stroud, Gloucestershire—Improved machinery for forming hats of fleece or sheet silver, and also for folding cloth and other fabrics.
1384. Willoughby Green, 2 Victoria Street, and Leeds, Yorkshire—Improvements in mowing machines.

Recorded June 7.

1385. Charles Porley, Manchester—Improvements in machinery for preparing to spin, and for spinning cotton and other fibrous materials.
1386. Kenneth H. Cornish, 5 Essex Court, Middle Temple—Improvements in bedsteads, sofas, couches, and chairs, applicable to other seats or reclining surfaces.
1387. Peter Salmon, Glasgow—Improvements in valves for pumps and other uses.
1388. William B. Nation, Union Row, Union Bridge, Rotherhithe—Improvements in the manufacture of superphosphate of lime.
1389. William H. Dorman, Winchester House, Old Broad Street, and Charles Cowper, 20 Southampton Buildings, Chancery Lane—Improvements in traction and locomotive engines.
1390. Robert Barclay, Bucklersbury—Improvements in the manufacture of paper from which writing or other inks cannot be expunged or extracted without detection.
1391. John Greenfield, 8 Speedwell Street, Oxford—Improvements in fastenings for dresses and other like apparel.
1392. Robert R. Fairgrieve, Boston, U. S., and Simon Bathgate, Selkirk—Improvements in machinery or apparatus for winding yarns or thread.
1393. Francis Muir, Paisley, Renfrewshire—Improvements in ornamental or colour printing.

Recorded June 8.

1394. John Henderson, William Henderson, Thomas Bagley, and Samuel Houldsworth, Durham—Improvements in looms for weaving, some of which improvements are applicable to other purposes.
1395. Charles de Bergue, 9 Dowgate Hill—Improvements in machinery for punching and shearing metal.—(Communication from Michael de Bergue, Barcelona, Spain.)
1396. Joseph B. Howell, Sheffield, Yorkshire, John Ilick, and William Hargrieves, Great Bolton, Lancashire—Improvements in apparatus for applying heat to steam or other boilers or vessels, and for facilitating the combustion of gases and smoke.
1397. Joseph N. Royer, Paris—Improvements in the manufacture of wadded or quilted fabrics, and in their imitation.
1398. Jean B. Molozay, 68 Rue d'Angouleme du Temple—New means of manufacturing velvet.
1399. Charles W. Eddy, Kegworth, Leicester—An improvement in reaping machines.
1400. Alfred V. Newton, 66 Chancery Lane—Improvements in gas meters.—(Communication from William Richards, Spain.)
1401. John E. Ashby, Enfield—Improvement in sights for fire-arms.

Recorded June 9.

1402. William Burness, 2 Prospect Terrace, Brixton, Surrey—Improvements in steam culture machinery, part of which is applicable to steam cartage and other purposes.
1403. George Bartholomew, Linlithgow—Improvements in shoes for horses and other animals.
1404. Joseph Henry Tuck, 34 Great George Street, Westminster—Improvements in breakwaters, sea-walls, and like structures.
1405. Enos Welsford, Bona, Algeria—Improvements in tanning.

Recorded June 10.

1406. Thomas Greenshields, 11 Little Titchfield Street—Improvements in purifying gas and obtaining ammoniacal and other salts.
1407. Michael J. Haines, Dursley, Gloucestershire—Improvements in the manufacture of driving straps or bands.
1408. George J. Farmer, Hampton Street, Birmingham, and George B. Hardy, Alexander Place, Brompton—Improvements in stair rods and eyes or sockets, which are also applicable for other purposes.
1409. Albert F. Haas, Camomile Street—Improvements in lamp and gas shades or glasses.
1410. Francis Puls, Roxburgh Terrace, Haverstock Hill—Improvements in the treatment of hydrocarbons.
1411. Samuel W. Tyler, Greenwich, New York, U. S.—Improvements in harvesters.
1412. William Sellers, Philadelphia, Pennsylvania, U. S.—Improvements in ovens for baking bread or other substances, which purposes are also applicable for drying, annealing, and other analogous purposes.
1413. Moses H. Pieciotto, Finsbury Circus—Improvements in apparatus for producing or obtaining motive power.

Recorded June 11.

1414. William Donhavand, and David Crichton, Manchester—Improvements in looms for weaving.
1415. Jabez James, Broadwell, Lambeth, Surrey—Improvements in obtaining and applying motive power.
1416. Francis Palling, Esher Street, Lambeth, Surrey—Improvements in the construction of lamps for burning tallow, grease or oils, either singly or in combination
1417. Thomas F. Henley, Denbigh Street, Pimlico—Improvements in obtaining alcohol or spirit from rice and other grain, and in apparatus for that purpose.
1418. Henry J. Nicoll, 114 to 120 Regent Street—Improvements in trousers.
1419. Alfred V. Newton, 66 Chancery Lane—Improvements in fire arms.—(Communication from Charles T. Pierson, New York, U. S.)
1420. Felix A. Testud de Beauregard, Paris—Certain improvements in generating steam, and in apparatus for obtaining power and in generating steam for other purposes.
1421. George C. Ash, West View, Hampstead—Improvements in the manufacture of artificial teeth.

Recorded June 13.

1422. Benjamin Baugh, Bradford Street, Birmingham—Certain improvements in apparatus or machinery for raising metals.
1423. Henry L. Corlett, Inchicore, Dublin—Improvements in rails and the permanent way of railways, parts of such improvements being applicable to common roads.
1424. Oliver Maggs, Bourton, Dorsetshire—Improvements in washing machines.
1425. Arthur Smith, 4 Stafford Terrace, Brixton, Surrey—Improvements in bleaching and purifying bees' wax.
1426. Constantine, N. Kottula, Liverpool—A means of cleansing and purifying the "Thames."
1427. Jacques T. Smets, Plaçamen, France—Improvements in the manufacture of vinegar from grain and other vegetable products containing saccharine matter, and from a refuse product obtained in the manufacture of starch, also, in apparatus employed therein.
1428. Alfred V. Newton, 66 Chancery Lane—Improvements in the fitting of life and other boats.—(Communication from Matthias Ludlum, Fairhaven, Vermont, U.S.)
1429. William E. Newton, 66 Chancery Lane—Improvements in the manufacture of piled fabrics, and in the machinery employed in such manufacture.—(Communication from Charles Miller, New York, U. S.)

Recorded June 14.

1430. George Smith, Manor Road, St. Mary's, Newington—Improvements in hat-bands.
1431. William Brown, the younger, and Simeon Bathgate, Selkirk—Improvements in machinery or apparatus for carding and treating or preparing fibrous materials.
1432. John Dixon, Bishopwearmouth, Durham—Improvements in puddling steel.
1433. John Cowan, Barnes, Surrey—An improved soap.
1434. James Wansbrough, Bridge Street, Southwark Bridge, Surrey, and Alexander Bain, Clerkenwell Green—Improvements in effecting communications between parts of railway trains.
1435. Alexander MacDonald, Manchester — Certain improvements in machinery or apparatus for punching patterns or devices upon metallic printing rollers or cylinders.

Recorded June 15.

1436. Edme J. Maumene, and Victor Rogelet, Reims, France—Using the "suint," or the portion soluble in water of the greasy substance found on the skin and hair of sheep, for the purpose of manufacturing potash and other products.
1437. Alfred V. Newton, 66 Chancery Lane—Improvements in the manufacture of polishing wheels, sticks, and tools.—(Communication from Thomas J. Mayall, Roxbury, Norfolk, Massachusetts, U. S.)
1438. Edward Humphries, Deptford, Kent—Improvements in marine steam engines.

Recorded June 16.

1439. James Taylor, Aberdeen—Improvements in planes or cutting tools for working in wood
1440. Simon Levy, Manchester—Improvements in hats, caps, or coverings for the head.
1441. Edward T. Hughes, 123 Chancery Lane—An improved night lamp clock.—(Communication from Louis Montanari, Lyons, France.)
1442. Jozé Luis, 1B Welbeck Street, Cavendish Square—A new siphon meter for liquids.—(Communication from A. Grenet, 10 Rue Magador, Paris.)
1443. Jozé Luis, 1B Welbeck Street, Cavendish Square.—An apparatus for regulating individually the pressure, expenditure, and light in gas burners.—(Communication from Edward Fergusson, 10 Rue Magador, Paris.)
1444. Leon Barroux, 10 Rue Magador, Paris—A new system of railroad, supported on iron soles, with or without wood being used.
1445. William Birkmyre, Port-Glasgow, Renfrewshire—Improvements in drying, treating, and preparing yarns or thread.
1446. Nicholas C. Szerelmey, 6 Park Terrace, Brixton Road, Surrey—Improvements in preparing combinations of materials for preventing rust in iron and other metals, and decaying timber.
1447. Charles H. Waring, Neath Abbey, Glamorganshire—Improvements in safety lamps.
1448. Charles Wilkinson, Slaithwaite, Yorkshire—Improvements in doubling or twisting silk, cotton, worsted, linen, or woollen yarns, or yarns from any other fibrous substance.

1449. Thomas E. Tallent, Southwark Bridge Road, Southwark, Surrey—Improvements in the manufacture of leather, and in machinery for that purpose.
1450. Thomas W. Jones, 35 George Street, Hanover Square—Stereoscopic glasses for single pictures.
1451. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved kiln for brick and plaster burning.—(Communication from Mr. A. Mombrun, Paris.)
1452. Henry F. Smith, 4 Dale Street, Manchester—Improvements in the manufacture of driving straps or bands.
1453. Edward A. Cutler, Connecticut, U. S.—A new and useful machine for making horse shoes.—(Communication from Charles H. Perkins, Putney, Connecticut.)
1454. Alfred V. Newton, 66 Chancery Lane—Improvements in casting cylinders and tubes.—(Communication from Freeborn Adams, Somerville, Massachusetts, U. S.)
1455. John Harmer, Wellington Villas, and William Parsons, Scotland Street, Brighton, Sussex—Improvements in fire-arms.
1456. Thomas Cattell, 30 Euston Square—Improvements in the manufacture of varnish and lacker.

Recorded June 17.

1457. Thomas Orrell, jun., Mill Hill, Bolton-le-Moors, Lancashire—Certain improvements in mules for spinning.
1458. Henri Evette, Lisieux, Calvados, France—A new system of bedding.
1459. Edward T. Hughes, 123 Chancery Lane—Improvements in treating and decomposing fatty substances.—(Communication from Charles Leroy and Joseph J. M. Durand, 25 Route de Fontainbleau, near Paris.)
1460. William H. Hammersley, Leek, Staffordshire—Improvements in stringeing, glossing, or finishing of silk, and apparatus employed therein.—(Communication from James Leigh, Seymour, Connecticut, U. S.)
1461. David Deas, Carneil, Fifeshire—Improvements in reaping machines.
1462. Richard A. Brooman, 166 Fleet Street—Improvements in generating anhydrous steam, and in apparatuses employed therein and connected therewith.—(Communication from Claudius M. C. Duplay, Firminy Loire, France.)
1463. Charles F. Vasserot, 45 Essex Street, Strand—Improvement in the construction of stereoscopes.—(Communication from Henry A. Corbin, Paris.)
1464. Jules J. L. Guiblet, 11 Wilmington Square, Clerkenwell—Improvements in watches.
1465. Alfred V. Newton, 66 Chancery Lane—Improved means for assorting substances of different specific gravities.—(Communication from Désiré Marchal, Brussels.)
1466. John Combe, and Robert Smallpage, Leeds, Yorkshire—Improvements in winding and spinning machinery, and in arranging and securing a uniform delivery from cops, to be used as weft or warp, or for other purposes.

Recorded June 18.

1467. Jozé Luis, 1B Welbeck Street, Cavendish Square—A new system of windmill.—(Communication from Bernard Z. Liethers, 10 Rue Magadore, Paris.)
1468. James Cox, Wenlock Road, City Road—Improvements in machinery for cutting rags for paper makers.
1469. Alfred Jeffrey, Commercial Road, Limehouse—An improved mode of giving rotatory motion to projectiles fired from rifled fire-arms.
1470. Richard Bradshaw, Camden Town—Improvements in rotatory steam engines and pumps.
1471. Richard Harper, and Robert Stokes, and Thomas Walker, Derby—An improvement in the manufacture of chenille bonnet wreaths and bonnet feathers.
1472. Josiah Firth, Heckmondwike, near Leeds, and James Crabtree, Mill Bridge, Leeds, Yorkshire—Improvements in the manufacture of carpets.
1473. George J. Parker, Church Street, Stoke Newington—A self-acting apparatus for giving alarm of fire, which is also useful in checking the same.
1474. William Clark, 53 Chancery Lane—An improved method of supplying furnaces with hot air.—(Communication from Messrs. Addison C. Fletcher, Cincinnati, Ohio, and George A. Redman, New York, U. S.)
1475. Paul F. Aerts, London—Improved apparatus for lubricating railway rolling stock, and the moving parts of machinery.
1476. James Ransley, 19 Princes Terrace, Islington—An improved brake for retarding railway and other carriages.
1477. James Ransley, 19 Princes Terrace, Islington—An improved omnibus.

Recorded June 20.

1479. John Cox, Birmingham, and Samuel Frankham and Moses Frankham, Walsall, Staffordshire—Certain improvements in spurs for military and general use.
1480. Richard Laming, Hampstead—Improvements in purifying gas, and in obtaining and reproducing materials useful for that purpose.
1481. Charles L. J. Dierickx, Paris.—Improvements in coining.
1482. John Edwards, 77 Aldermanbury—Improvements in the manufacture of iron rails.
1483. Alfred V. Newton, 66 Chancery Lane—Improved apparatus for blowing off water from steam boilers.—(Communication from Jas. H. Washington, Baltimore, U. S.)
1484. Alfred J. Hawkes, Jewin Crescent—An improved triturating apparatus.
1485. William Rowan, Belfast—Improvements in the generation of steam.
1486. Thomas C. Clarkson, 56 Stamford Street, Blackfriars, Surrey—Improvements in the manufacture of boots, shoes, and other articles.

Recorded June 21.

1487. Andrew P. How, 81 Mark Lane—Improvements in self-supplying distilling apparatus, and in apparatus for cooking combined therewith.
1488. George Tomkins, Pontymister, near Newport, Monmouthshire—Improvements in coating metals and in the apparatus connected therewith.
1489. Edward Gwyn, Islington—Improvements in breech-loading fire-arms.—(Communication from Henry Gross, Ohio, U. S.)
1490. Stephen Gibbs, Eddington, Herne, near Canterbury—Improvements in apparatus for slinging horses, mules, and other animals.
1491. William E. Newton, 66 Chancery Lane—An improvement in tailors' and other shears.—(Communication from James H. Roome, New York, U. S.)
1492. James Meikle, 79 Rumford Street, Glasgow—Improvements in coating iron ships with asphalte, which improvements are also applicable to coating other surfaces.
1493. Alexander Parkes, Birmingham—Improvements in the manufacture of cylinders and tubes of copper, and alloys of copper.
1494. Lemuel D. Owen, 192 Tottenham Court Road—Improvements in machinery for manufacturing bolts and nails.—(Communication from Messieurs Buck and Co., Lebanon, New Hampshire, U. S.)
1496. Ebenezer Oliver, King William Street—Improved medicinal mixtures for the cure of rheumatism, tic-doloreux, lumbago, cramp, sciatica, and such like complaints.

Recorded June 22.

1497. Robert Smith, Longridge, near Preston, Lancashire—Improvements in apparatus applicable to looms for weaving fancy fabrics.
1498. William Buckwell, East Greenwich, Kentshire—Manufacturing materials for building and other structural purposes, and of the machinery applied thereto, which last invention is applicable to other purposes.
1499. Andrew Barclay, Kilmarnock, Ayrshire—Improvements in steam hammers and pile driving machines.
1500. George T. Bousefield, Loughborough Park, Surrey—Improvements in apparatus for winding thread of cotton or linen, or other fibrous materials, or sewing silk or similar articles upon bobbins or spools.—(Communication from Lawson C. Ives, Hartford, Connecticut, U. S.)
1501. Charles Clarini, New York, U. S.—Making wrought metal nails by machinery.
1502. William Goulding, Leicester—Improvements in the construction of ploughs.
1503. Francis X. Kukla, 121 Pentonville Road—Improvements in projectiles.
1504. William Russell, Leicester—Improvements in wheels for ploughs, cultivators, and other implements or carriages.
1505. Thomas Moore, Lupus Street, Pimlico—Improvements in knapsacks and mess tins.
1506. James Apperley and William Clissold, Dudbridge, Gloucestershire—Improvements in the manufacture of wheels for carriages and engines.

Recorded June 23.

1508. Jozé Luis, 1 Welbeck Street, Cavendish Square—A machine for corking bottles.—(Communication from Jacques Peury, 10 Rue Magador, Paris.)
1509. Cromwell F. Varley, 4 Fortess Terrace, Kentish Town, and Cornelius J. Varley, 7 York Place, Kentish Town, St. Pancras—Improvements in proving electric conductors, and in the apparatus connected therewith.
1510. Alexis J. Dessales, 13 Rue des Enfants Rouges, Paris—An improvement in the working and securing of sliding tubes, applicable to gas chandaliers, lamps, and other purposes.
1511. Edward T. Hughes, 123 Chancery Lane—Improvements in the manufacture of artificial sandstone, bricks, tiles, and similar articles.—(Communication from Léon and Edouard P. de Lafarge, Viviers, France.)
1513. Alexander Prince, 4 Trafalgar Square, Charing Cross—Improvements in alarum locks and latches.
1514. Henry Doulton, Lambeth—Improvements in earthenware jars and bottles.
1515. Alfred V. Newton, 66 Chancery Lane—Improvements in springs for resisting sudden and continuous pressure.—(Communication from Charles Perratone, and Messrs. J. F. Cail and Co., Paris.)

Recorded June 24.

1516. William Lister, jun., and Thomas G. Garrick, Sunderland, Durham—Improvements in ships' windlasses, and other like apparatuses, applicable also to the steering of ships.
1517. James Mills, Heaton Norris, Lancashire—Improvements in the manufactures of keys and gibs, and in the machinery employed therein.
1518. Auguste Chesneau, 29 Boulevart St. Martin, Paris—Improvements in paddlewheels.
1519. William Clark, 53 Chancery Lane—Improvements in sewing machines.—(Communication from James S. Goodridge, 29 Boulevart St. Martin, Paris.
1520. George Redrup, Loughborough, Leicester—Machinery for the cutting of shives, bungs, corks, spiles, and vent or other pegs.
1521. Richard Hornsby, jun., Grantham, Lincoln—Improvements in ploughs and in giving motion to ploughs and other agricultural implements by steam power.
1522. Prosper Faure and Jules Pernod, Avignon, France—An improved process for utilising the residues of madder in the manufacture of garancine and other preparations of madder.
1523. John Drury, Exley, near Halifax, Yorkshire—Improvements in steam engines and boilers.

Recorded June 25.

1524. Thomas Howard, Rotherhithe, Surrey—Improvements in condensing steam in engines where superheated steam is used.
1525. William J. Sluce, Bethnal Green Road, Owen Murrell, Edward Street, Bethnal Green Road, and William Hudson, Hackney Road—An improved method of generating steam.
1526. Charles W. Williams, Liverpool—Improvements in steam boilers.
1527. William E. Newton, 66 Chancery Lane—Apparatus for exhibiting stereoscopic pictures.—(Communication from J. S. Perry, Newport, New York, U. S.)
1528. John Roberts, Upnor, Kentshire—Improvements in filters.
1529. John Boden, Portswood Road, and Willian Clark, Northern Road, Southampton—Improvements in apparatus for superheating steam.
1530. Samuel Russell, Sheffield, Yorkshire—Improvements in breech-loading fire-arms, and projectiles to be used therewith.
1531. William Coppin, Londonderry—Improvements in apparatus for raising sunken and stranded vessels and their cargoes, and for raising and lowering other bodies into and out of the water, part of which improvements are applicable to raising weights generally.

Recorded June 27.

1532. Robert Dick, Toronto, York, Canada—Keeping accounts current in printed form, for addressing cards, circulars, papers, and periodicals of all kinds, with great rapidity, by the aid of a very simple machine, which is a constituent part of this invention.
1533. George Wrigley, Dukinfield, Cheshire, and Thomas H. Wrigley, Mossley, Yorkshire—Improvements in self-acting mules for spinning and doubling.
1534. Daniel J. Fleetwood, Birmingham—An improvement or improvements in shaping metals.
1535. Bethel Burton, Brooklyn, New York, U. S.—Improvements in breech-loading fire-arms.
1536. Gilbert Smith, Buttermilk Falls, Orange County, New York, U. S.—An improved construction of primer for fire-arms.
1537. Thomas Leigh and Job Line, St. Mary Cray, Kentshire—An improvement in paper making machinery.

Recorded June 28.

1539. William E. Newton, 66 Chancery Lane—An improvement in variable cut off gear for producing expansion in steam and other motive engines.—(Communication from Ambrose Foster, Noah Sutton, and James Stephens, New York.)
1540. Alfred V. Newton, 66 Chancery Lane—Improved machinery for cutting corks.—(Communication from Edward Conroy, Boston, U. S.)
1541. John M. J. Baillie, 15 St. Mary Axe—A new process for tanning hides and skins.—(Communication from Monsieur A. Paulmier, Paris.)

Recorded June 29.

1542. James Nash, Mill Wall—An improved disengaging block.
1543. George Hall, jr., Montrose, Forfarshire.—Improvements in reaping machines.
1544. Alexander McDougall, Manchester—Improvements in the preparation of disinfecting and antiseptic substances.
1547. William Wilkinson, Bayswater, and David White, High Holborn—Improvements in apparatuses for holding, regulating, compressing, and burning gas and other gaseous fluids, parts of which apply to the holding of liquids.

1548. Isaac Tirebuck, Windsor Court—Improved machinery for printing from engraved plates.
1549. William J. T. Williamson, 37 Gerrard Street, Soho—Improvements in gas burners.
1550. George Chapman, Rutland Street, Leicester—Improvements in knitting machines.
1551. John J. Griffin, 119 and 120 Bunhill Row—Improvements in gas furnaces suitable for fusing refractory metals.
1552. George Baker, Birmingham—Improvements in the manufacture of metallic lattice or trellis work.—(Communication from Owen Carraway, late of New York.)

Recorded June 30.

1553. Edward Francis, Wrexham, Denbigh—Apparatus for facilitating the making up or packing of sugar and other articles of grocery, and other substances.
1554. Alphouse Gueyton, Paris—Improvements in enamelling articles of jewellery, applicable also to other similar purposes.
1555. Richard Kay, John Manock, John Whittaker, and Thomas Booth, Heywood, Lancashire—Improvements in machinery for slubbing, roving, spinning, and doubling cotton, and other fibrous materials.
1556. William Bestwick, Salford, near Manchester—Improvements in crinoline steel for ladies' dresses, skirts, and other similar purposes.
1557. Richard A. Brooman, 166 Fleet Street—Improvements in lithographic and chromo-lithographic presses.—(Communication from Jean T. Dupuy, Paris.)
1558. Louis Boigeol, Giromagny, near Belfors, France—Improved machinery for winding and twisting fibrous materials.
1559. Thomas Bell, Plaistow, Essex—Improvements in the manufacture of manure.
1561. Levi L. Tower, Massachusetts, U. S.—A new and useful machine for dampening and wetting paper, &c.—(Communication from John A. Lynch, Boston, Massachusetts, U. S.)
1562. Jeptha A. Wilkinson, Brooklyn, U. S.—Improvements in printing presses and apparatus connected therewith.
1563. William Summerscales, the elder, and John Summerscales, Keighly, Yorkshire—Improved wringing and mangling machine.
1564. Julian Bernard, Albany, Piccadilly—Improvements in uniting certain parts of boots and shoes, and in the means employed therein.

Recorded July 1.

1565. James R. Beard, Manchester—Improvements in the manufacture of artificial whalebone, applicable to umbrellas, parasols, stays, hats, bonnets, reeds, crinolines and other similar purposes.
1566. Abel Jones, Blackburn, Lancashire—Improvements in machinery or apparatus for drawing, twisting, or looming textile materials.
1567. Bridge Standen, Salford, Manchester—Improvements in the deodorising and separation of fecal and putrescent organic matters, in a preparation or manufacture therefrom of a portable artificial manure or fertilising compound, and in apparatus to be employed in such preparation or manufacture.
1568. Anton Carron, 25 Little Moorfields—An improved loom for the manufacture of silk and other velvet.—(Communication from Henri Carron, 2 Rue St. Jean, Lyons, France.)
1569. Nesserwanjee Ardaseer, Bombay, E. I.—An improved method of making steam boilers.
1570. Joseph B. Howell, Sheffield, Yorkshire—Improvements in the treatment of iron.
1571. Edward W. Carter, Rochdale, Lancashire—Improvements in machinery or apparatus for sewing.
1572. Edwin A. Wood, Victoria Terrace, Notting Hill, and Martin D. Rogers, Bromley—Improved apparatus for raising and lowering boats.
1573. Samuel Fisher, Birmingham—Improvements in ordnance and projectiles.
1574. Robert Royds and Anthony Harcourt, Woolston, Hants—An improved composition for protecting the bottoms of ships and other structures of iron.
1575. William Riddle, Westbourne Terrace, Barnsbury Park, Islington—Improvements in advertisement show cards or boards.
1576. William E. Kenworthy, Water Lane, Leeds, Yorkshire—Improvements in purifying gas, and saving of lime in said purifying.
1577. Mark Bogg, Duggleby, near Malton, Yorkshire—Improvements in washing machines.

Recorded July 2.

1578. Charles H. P. Cook, Glasgow—Improvements in ventilators and ventilating flue or chimney tops.
1579. Robert W. Morville, Pendleton, Salford, Lancashire—Improvements in mechanism, or arrangements for suspending and securing window sashes.—(Communication from Porter A. Gladwin, Pawtucket, Rhode Island, U. S.)
1580. Thomas J. Hart, Birmingham—Improvements in breech-loading fire-arms.
1581. Charles G. Guy, James Brough, and Robert Cotton, Liverpool—An improved upright steam boiler.
1582. Edouard Fourmaux, jun., Provin, France—A new weaving loom.
1583. Charles H. G. Williams, 39 Regent Square, Gray's Inn Road—Improvements in dyeing fabrics and yarns.
1584. Hermann Hirsch, Berlin, Prussia—Improvements in screw propellers.
1585. Henry Harris, Newport, Isle of Wight—An improved method of connecting together the parts of which bedsteads and other furniture are composed.

Recorded July 4.

1586. Joseph Simon, 5 Passage des Petites Ecuries, Paris—A composition named zeiodelite, a kind of paste which becomes as hard as stone, is unchangeable by the air, and being proof against the action of acids, may replace lead and other substances for various uses.
1587. James Hollingworth, Clyde Paper Mills, Eastfield, Lanarkshire—Improvements in machinery or apparatus for the manufacture of paper.
1588. Robert Lane, Cirencester, Gloucestershire—Improvements in mills for grinding grain and other materials.
1590. Richard A. Brooman, 166 Fleet Street—An improved hemmer or apparatus, to be used in connection with sewing machines, for turning over and presenting the edge of the material to be hemmed properly to the needle.—(Communication from Joseph P. Pirsson, New York.)
1591. Richard A. Brooman, 166 Fleet Street—A cementing powder or mixture, and process for cementing, converting, refining, strengthening, and steelifying iron.—(Communication from Job Johnson, East Brooklyn, Long Island, New York.)
1592. Alfred V. Newton, 66 Chancery Lane—An improvement in the process of, and improved apparatus for, separating metals from their ores.—(Communication from Louis Solomon, New York, U. S.)

Recorded July 5.

1593. James M'Intosh, Glasgow—Improvements in the manufacture of leather driving belts.
1594. William Knapton, Albion Foundry, Monkar, York, and Adam Aitchison, Knottingly, Yorkshire—Improvements in the manufacture of gas.
1597. William E. Newton, 66 Chancery Lane—Improved apparatus for moving iron or other metals, while the same is in process of manufacture at the rolls.—(Communication from Charles Hewitt, Trenton, New Jersey, U. S.)
1598. James H. Nalder, Alvescott, Oxford, and Thomas Nalder, Berks—Improvements in winnowing and dressing grain and seeds, and in the machinery or apparatus employed therein.
1599. John Watkins, and James Pugh, Aberdare, Glamorganshire—Improvements in lubricating wheels.

Recorded July 6.

1600. William H. Ward, Auburn, Cayuga, New York—Ocean marine signal telegraphing for day and night, whereby messages and communications on all occasions and subjects, may be given with clearness and despatch, within seeing distance, day or night.
1601. Jozé Luis, 1B Welbeck Street, Cavendish Square—An apparatus for washing wool, manufactured or not, and all other matters.—(Communication from Eugène Pasquier, 10 Rue Magador, Paris.)
1603. Joshua Horton, Dudley, Worcestershire—A new or improved gas meter.
1605. Samuel B. Haskaid, Wollaton Street, Nottingham—Improvements in the manufacture of hook guides used in machines for the making of lace and other fabrics.
1607. Louis Schwartzkopff, Berlin, and Ferdinand Carl Philippson, Dusseldorff—Improvements in steam hammers, and in machines for cutting files, and for planing and grooving iron, stone, and other substances.
1608. Benjamin Seed, Keighley, and Thomas Steel, Bradford, Yorkshire—Improvements in apparatus employed in the treatment of soap suds or other saponaceous or oily matters.
1609. John T. Edmonds, Prestwood, Great Missenden, Bucks—Improvements in winnowing or corn-cleaning machines, parts of which are applicable for other screening or sifting purposes.

Recorded July 7.

1610. David T. Jones, Headless Cross, Ipsley, Warwickshire—Improvements in ploughs.
1611. Charles F. Vasserot, 45 Essex Street, Strand—An improved form of regulator, chiefly applicable to water-wheels.—(Communication from Ferdinand Gabet, Bermarin Nord, France.)
1612. Francois A. Le Mat, New Orleans, Louisiana, U. S.—Improvements applicable to ordnance.
1613. John Knowelden, Southwark, Surrey, and Downes Edward, Upper Belgrave Place—Improvements in hydraulic engines and pumps, and the employment of apparatus for applying motive power.
1614. Richard C. Rapier, Newcastle-upon-Tyne, Northumberland—Improvements in working rolls for rolling plates of unequal thicknesses.
1615. Sir Francis C. Knowles, Lovell Hill, Berkshire—Improvements in making iron castings.
1617. William Robinson, Wembdon, Bridgewater, Somersetshire—Improvements in cask washing machines.
1618. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in knitting frames.—(Communication from Jules N. Poivret, Troyes, France.)

Recorded July 8.

1619. George Ellis, 4 Collier Street, Pentonville.—The improvement of muffs, to be called "the patent reticule travelling muff."
1620. William H. Dawes, West Bromwich, Staffordshire—An improvement or improvements in the manufacture of iron.
1621. William Waite, 48 Baker Street, Portman Square—Manufacturing bonnets, hats, and other articles, partly or entirely from the leaves of the palm tree, or other flat or thin material.
1622. Francois A. Le Mat, New Orleans, Louisiana, U. S.—Improvements in the construction of revolving or repeating fire-arms.
1624. George Cartwright, Birmingham—Improvements in corks for bottles and jars.
1625. George A. Boggis, Croxted Place, Dulwich, Surrey—Improvements in rendering boots and shoes waterproof.
1626. Elijah Livermore, New York, U. S.—Improvements in the manufacture of burning fluids for illuminating and heating purposes.—(Communication from Levi L. Hill, Greenport, Columbia, New York. U. S.)
1627. David Mathews, Oulton, near Leeds, Yorkshire—Improvements in apparatus for refrigerating and heating liquids.
1628. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in moulding or shaping metals by pressure, and in the machinery or apparatus employed therein.—(Communication from Levi Dodge, U. S.)

☞ *Information as to any of these applications, and their progress, may be had on application to the Editor of this Journal.*

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 27th May to 1st July, 1859.

May 27th, 4177 Garton and Jarvis, Exeter—"Boilers for heating hothouses and other uses."
30th, 4178 Charles Dutton and Joseph Jennens, West Bromwich—"Improved measuring tap, for drawing off stated quantities with each motion of the handle."
June 7th, 4179 William Taylor, Horsley Wylam, Newcastle-on-Tyne—"Apparatus adapted to be used at windows and such like places to facilitate cleaning, painting, and such like purposes."
14th, 4180 Henry Spence, 33 Great Charles Street, Birmingham—"Economic gas regulator."
15th, 4181 Cottam and Company, 2 Winsley Street, Oxford Street, W.—"Cottam's ventilating manger fitings."
16th, 4182 The Permanent Advertising and General Agency Company (Limited), 78 Gracechurch Street, E.C.—"Universal advertising medium."
17th, 4183 James Heavens, 28 South Molton Street, London, W.—"Safety hunter's shoe."
24th, 4184 James Cornes, 104 Pool Square, Sheffield—"Improved cheese-making apparatus."
27th, 4185 Henry Naylor, Barbridge Works, near Nantwich—"The engraver's assistant."
29th, 4186 John William Scott, Victoria Works, Worcester—"Stud button shank."
July 1st, 4187 Cuthbert Harrison Thew, Whitehaven—"Draw springs for ships' cables and towing lines."
4th, 4188 John William Mott, Lea Bridge Road, Clapton, N.E.—"An India-rubber tobacco pouch."

THEORY AND PRACTICE.

Theory and practice are usually spoken of as if they were radically and essentially opposed to each other. A man of theoretical ideas commonly signifies a man who lives in the clouds remote from our ordinary world, lapped in dreams that have a very distant connection with reality. The practical man is one who takes things as they are, is well acquainted with their capabilities, and bends them successfully to his purposes. In short, the practical man succeeds, because he only undertakes what is possible. The theoretical man is never successful, because his ideas are, in the nature of things, incapable of practical application.

But is there, in point of fact, such a natural and irreconcilable enmity between theory and practice? We think there is not; and our opinion is, that the supposed opposition between them rests entirely upon confused notions of what the words really indicate. The matter deserves investigation, for error ought to be exposed whatever shape it assumes, and this is one of no slight importance. Let us, therefore, beg the reader's attention for a few minutes whilst we endeavour to point out where the error lies, and attempt to substitute just ideas in place of false ones.

The practical man, then, is he who undertakes only what he has learned from experience is capable of being executed. He follows examples, and allies himself to facts. What has been done before, he argues very justly, can be done again; and if it be desirable to do it once more, he will endeavour to do it. But let us inquire what is the nature of the facts which he considers in the light of examples proper to be copied and repeated, for it is plain enough that it is not every event that occurs which he would think it desirable to reproduce. A man may unexpectedly slip into a deep stream, and may yet reach the bank without having suffered injury. But this is hardly an act that a practical man would attempt to imitate. No; the act to be repeated must be one that has beneficial consequences, and hence it is evident that the practical man will exercise his judgment with a view to ascertain what acts are followed by such consequences, and what are not. He will endeavour to make himself acquainted with those cases in which the results are constantly and not merely accidentally beneficial, and he will attend to the former whilst neglecting the latter. But observe, that cases which are constantly followed by certain results are cases which must have occurred many times, or how could he know that the results are constant? Good practice must know such cases well, and distinguish them accurately from cases merely accidental, before it can venture to follow them. Hence it is an indisputable proposition that whatever aids us in acquiring such knowledge and strengthening our judgment in coming to a true conclusion is of great importance in arriving at perfection of practice. Now, the reader will observe that all practice is founded on a theorem grounded on our experience, namely, that the future will resemble the past! If an event has once occurred, we believe that it will occur again, provided that the casual phenomena are the same, because we have always observed that the like antecedents are invariably followed by the like consequents. This, therefore, we look upon as a law of nature, and act accordingly. It is a theorem of the human mind, in other words it is a theory. And thus we see that a theory is the foundation of all practice, that is, which we intentionally adopt for the purpose of arriving at a desired result.

Let not this reasoning be deemed quibbling and futile. The more we enquire into the origin of practice the more we shall be convinced that practice is founded upon observations of the past, out of which are formed general rules for present or future action. Upon what else are theories themselves founded? Do they not also assume to be built upon facts as they have been observed by man? It is no answer to say that theories are frequently erroneous, for is not practice also frequently erroneous? and for precisely the same reason, namely, that the facts have been erroneously observed, or that our inferences respecting them have been improperly drawn. Turn the matter how we will, we cannot escape from the conclusion that erroneous practice is that which has been founded on an incorrect observation of the past, and theory becomes erroneous when it is also founded on incorrect observation. The practical man acts upon his recollection of constancy in many instances with a view to produce antecedents for the sake of consequents; and the recollection of that constancy, when expressed in words, becomes a theorem. Take an example from the farmers:—If the grain obtained from the ground were less in quantity than that placed in it, we should have no sowing and no reaping; but experience—that is, the observation of the past—in other words, the remembrance of a constant sequence tells them that, if grain is sown, the ground will return an increased quantity at a future time. Here we have practice founded on a theorem. And the sole difference between a theorem and a theory is, that the latter is the name of the thought, and the former the name of the language, by which that thought is expressed. Hence it is quite clear that all practice which is founded upon the recollection of constant sequences is in reality founded upon theory, and that there would be no practice, such as is now under consideration, without theory.

Does it not, then, seem an absurdity to set practice in opposition to theory in the way so generally done? And do those people who taunt others with being theorists, and plume themselves upon being practical persons, prove anything besides their ignorance of what correct practice and correct theory are? It has been forcibly said that all men in every rational action of their lives are followers of theory, and they may be divided into those who follow good and those who follow bad theory. This being so, it is, of course, a matter of great importance to find out the difference between good and bad theory—to ascertain the tests by which one may be distinguished from the other. However difficult this may be, it is an object to be aimed at with all our power. And at least we know that since the object is to ascertain cases of constant sequences, when such a case of constancy has been found and correctly set forth in words, we have arrived at a correct theory. But when the proposition professing to express a case of constant sequence, in point of fact gives us a case which is not constant, we have before us a wrong theory.

Of correct theories, however, some relate to things which have little relation to the concerns of man, whilst others are founded on facts that have a close connection with the happiness of our race. It is the latter class of theories that are of importance to us; and the degree of that importance must always be in proportion as the sequences which they formalise, have an influential operation on man's life. Moreover, whilst one theory, though correct as far as it goes, expresses but a short sequence of events, another will embrace a much larger sequence, and summarise a much greater number of facts. Every one will admit that the latter kind of theory is the most valuable. Gravitation, or the tendency of the particles of matter towards one another, will supply an apt instance. From the earliest time it must have been observed that bodies left free to move, fall to the earth, and, after a number of observations, the theorem was announced that the tendency of bodies to fall is as the square of the distances. After a while a philosopher was able to trace the operation of this law to the planets and their satellites, and thereby won unusual honour. In reality, when it is said that the more general and comprehensive a theory is, the more it is valuable, this is but saying that more knowledge is of greater worth than less; and it will scarcely be denied that the man whose mind is furnished with a greater number of correct theories is better off in regard to correct practice—other things being equal—than the man who possesses fewer correct theories.

Enough, we think, has now been said to show that sound theory is the necessary foundation of sound practice, and to expose the folly of those who would place theory and practice in irreconcilable hostility to each other. It only remains to remark, that it is the business of philosophy to trace the sequences of nature, and to draw up formulas expressing the result of these investigations. The greater the number of sequences expressed by a single formula the more important is it, for the very simple reason that we have here a greater number of particulars bound together, and furnishing men of practice with a more comprehensive rule for their guidance in dealing with those particulars. If theory were proscribed, if man were unable or unwilling to collect the result of his observations into general formulas, civilisation would cease to exist, and there could be no advance beyond the stage of mere animality. "The truth is," said Dr. South, "there could be no such thing as art or science could not the mind of man gather the general natures of things out of the numberless heaps of particulars, and then bind them up into such short aphorisms or propositions, that so they may be portable to the memory, and thereby become ready and at hand for the judgment to apply and make use of as there shall be occasion."

The objections to theory take many forms. How often do we hear a man boasting that he is practical, and sneering at theorists solely that he has been lucky enough to get on in the world with a small amount of knowledge—he himself affording, as he thinks, a striking instance of the uselessness of theory, and the all-importance of a practical turn of mind. If his success has been owing to the native vigour of a scantily cultivated intellect, much credit is no doubt due to him; but it is only a proof of his ignorance to express his contempt for that which might have made him ten times what he is. Such a man considers pure science to be pure nonsense, to study which is a waste of time. He thinks that the mathematics may amuse, but they do not instruct. His calculations are in plain figures, and steer clear altogether of unknown quantities like x and y. But let us hear what a sage not long departed from amongst us has said upon this point:—"Whilst it may readily be admitted," wrote Dr. Peacock, "that abstract science is useless if not combined with good sense and experience, yet the converse of this proposition is at least as correct, if not more so; it may, in fact, be affirmed that no great public works can be safely entrusted to practical men, however great their ability, if they are deficient in a sound knowledge of mechanical principles and their application." And a philosopher of ancient days, whose name is synonymous with that of wisdom, once said (if Plato has reported him aright), "That is not an art, but mere skill, which cannot give any account of the nature of the things it employs, nor explain the causes of the effects it produces. I do not give the name of art to that which cannot render a reason for what it enjoins."

THE HIGHLAND AND AGRICULTURAL SOCIETY, EDINBURGH, 1859.

Whatever may be the condition of other societies, and the results of their shows and exhibitions, it is clear that those connected with agricultural pursuits are flourishing like green bay trees. Last month we reported the great success of the Royal Agricultural Show of England; now we have a similar duty to perform with reference to the sister exhibition of the Highland and Agricultural Society of Scotland. This show took place in Bruntsfield Park, Edinburgh, where 20 acres of ground were inclosed for the purpose; covered accomodation being provided for the whole of the exhibited stock.

The reaping machine competition, as touching a branch of agricultural mechanism now much affected by Scotch farmers, attracted great attention.

The following implements were on the ground:—

Of the one-horse machines—Gardner and Lindsay, Stirling; James Drummond, Cameron Bank, Edinburgh.

Of the two-horse machines—George Bell, Inchmichael; Brigham and Bickerton, Berwick; Robert Burn, Edinburgh; Crosskill's Trustees, Beverley; James Drummond, Edinburgh; R. Forshaw and Co., Liverpool; Gardner and Lindsay, Stirling; Lord Kinnaird, Inchture; T. Perry and Son, Glasgow; J. Shaw, Ayton (Burgess and Key's agent); B. Samuelson, Banbury.

The crop on which the machines were tried was barley, and very light —not over 4 quarters to the acre; the straw was from $1\frac{1}{2}$ to 2 feet high, with a strong under-growth of weeds and grass. The crop was drilled— about nine or ten inches apart. The ground had apparently not been rolled, several stoppages having occurred with the machines from loose stones. The crop lay towards the lower part of the ground, and the wind was blowing in the same direction. These circumstances were very unfavourable to the working of the machines, in one direction at least. The ground was marked off by the judges. Only two of the machines—viz., Bell's and Crosskill's—being able to clear a way through the standing corn, these machines were appointed to prepare the roads for the others.

The performance of Burgess and Key's machines, exhibited by J. Shaw, Whiterigg, Ayton, was upon the whole the best, the cutting being very good, and the delivery being more regular than any of the other machines, laying the corn in swaiths. The stubble was even, but not so low as we have seen it; this no doubt owing to the state of the ground, and especially the lie of the grain when cutting with the wind. In most of the machines, the cutting was very decidedly better when cutting the other way. The screw delivery had a manifest advantage in such a crop. The straw being short has a tendency to lodge upon the guards, and the compound movement—back and lateral—cleared the guards more effectually than the lateral movement of the web or the belts. The consequence was a better delivery, and a more regular swaith in the prize machine, than in Bell's and Lord Kinnaird's.

The draught in Burgess & Key's appeared to be lighter, judging from the appearance of the horses, as the dynomometer was not applied; but this may have been in part owing to the horses in Bell's machine having had extra work in opening the ground for the others. In Bell's machine, which gained the second prize, the cutting, was, as usual, very good, but the delivery was thought not to be quite equal to Burgess & Key's.

Wood's machine, exhibited by T. Perry & Son, Glasgow, executed the work in a very satisfactory manner—the cut grain being delivered in sheaves by a man seated on the platform with a fork. There are some good points in this machine—the facility with which height is regulated, which can be done when the machine is travelling. This can also be done in the prize machine. By simply removing the platform, Wood's machine can be converted into a mower. We question, however, whether on a crop with longer straw or entangled, the delivery could be made with so much ease, and the sheaves so regular.

Dray's machine, exhibited by Forshaw & Co., Liverpool, worked very well, the sheaves being delivered with regularity and ease to the man There is a jointed dividing iron or separator which is very useful when corn is laid, or on a windy day, securing all corn coming within the range of the platform, and preventing choking in a tangled crop. There is, however, a tendency in short and laid corn, when the tilt is raised, for the corn to get between the tilt and the frame. Were a platform substituted when operating upon short or laid corn, this might be obviated.

Gardner & Lindsay's one horse reaping machine, to which the prize was awarded, wrought very well, although it may be doubted whether this machine is such as to induce farmers to adopt it in preference to the two horse machines.

Some of the other two horse machines competing worked tolerably well, but one or two failed completely. Through some misunderstanding B. Samuelson's machine was entered in the competing section, though not intended for competition. It was taken to the field, however, and tried, doing its work in a very satisfactory manner.

The machines not being tested on a variety of crops, the present cannot be regarded as a complete trial; but as the circumstances under which the trial took place were not favourable conditions for machine reaping, a more severe test was thus applied. The result was, on the whole, decidedly favourable to the cause of reaping by machinery.

An equally comprehensive trial of the thrashing machines was also carried out. A certain weight of coals was allowed each of them, and also a number of sheaves of wheat, by which to try the working of their machines before proceeding with the trials. After the owners or those in charge were satisfied of the capability of their machinery to the work they considered them fitted for, a determinate quantity was put through each, and the work done by Mr. Foster, and Robey & Co., was, we understand, of a very superior description. The straw contained very few grains of corn from both of them, and that from Robey & Co., was very well preserved. In the chaff an occasional wheat pickle might be seen, but more were found under the heck. The wheat, however, was a little split in both almost alike—enough to injure somewhat the value of the grain as a seed sample. In Foster's machine, every precaution had been taken to prevent this occurring, the covering of the drum being made of rods of iron rounded on one side, and although both had Goucher's drum, in Foster's there were eight beaters, and in Robey & Co.'s, six; while Robey had cloth introduced behind to prevent the grain being injured.

The speed of each would be between 900 and 960 per minute, and at this rate they were capable of passing 8 or 9 quarters of wheat per hour through them; but though the straw was wonderfully clean, the chaffing well done, and the wheat only slightly broken, the grain was not fit for market as it came into the bag. In fact, almost any old mill, with chaffing fanners, and another pair of cleaning ones attached, would dress better. A large amount of ingenuity has been expended on this part of all of these machines, and to all appearance, as yet, with less success than in any other part of their mechanism.

The following is the implement and machine prize list:—

Best two-horse plough for general purposes, J. and F. Howard, Bedford, £3; second, George Sellar and Son, Huntly, bronze medal.

Best trench or deep-furrow plough, George Sellar and Son, Huntly, £3; second, J. and F. Howard, Bedford, bronze medal.

Best subsoil plough for two horses, James Kirkwood, Tranent, £4; second, George Sellar and Son, Huntly, bronze medal.

Best subsoil plough for three or four horses, Robert Law, Shuttleston, Glasgow, £4; second, James Kirkwood, Tranent, bronze medal.

Best double mould-board plough, for forming drills or bulking, with attachment for lifting potatoes, George Ponton, Woolston, Linlithgow, £3; second, James Kirkwood, Tranent, bronze medal.

Best ribbing plough, James Kirkwood, Tranent, £2; second, Peter Macgregor and Sons, Keith, bronze medal.

Best two-horse grubber or cultivator, Coleman and Sons, Chelmsford, £4; second, James Kirkwood, Tranent, bronze medal.

Best Norwegian harrow or other pulverising land-roller, David Young, Hassendean, Kelso, £4; second, Alexander Jack and Son, Maybole, bronze medal.

Best consolidating land-roller, Robert Wright, Seton, Prestonpans, £5; second, trustees of William Crosskill, Beverley, bronze medal.

Best land-presser for preparing seed-bed for grain, Smith Brothers and Co., Kinning Street, Glasgow, £5; second, Young, Peddie, and Co., Edinburgh and Glasgow, bronze medal.

Best ribbing machine, Mrs. Thomas Sherriff, West Barns, Dunbar, £2; second, James Kirkwood, Tranent, bronze medal.

Best harrows for heavy land, J. and F. Howard, Bedford, £3; second, James Kirkwood, Tranent, bronze medal.

Best harrows for light land, Edward Page and Co., Bedford, £3; second, J. and F. Howard, Bedford, bronze medal.

Best harrows for covering grass seeds, J. and F. Howard, Bedford, £3; second, Edward Page and Co., Bedford, bronze medal.

Best common swing-trees or draught-bars for two horses, William Gray, Cambusnethan, Wishaw, £1; second, George Ponton, Woolston, Linlithgow, bronze medal.

Best equalising swing-trees or draught-bars for more than two horses, William Gray, Cambusnethan, £2; second, George Ponton, Woolston, Linlithgow, bronze medal.

Best broadcast sowing machine for grain, George Finlayson, Gighty Burn, Arbroath, £6; second, Alexander Dick, Smithy Green, Liberton, bronze medal.

Best drill sowing machine for grain, William and James Hunter, Samuelston, Haddington, £6; second, Mrs. Sherriff, West Barns, Dunbar, bronze medal.

Best sowing machine for grass seeds, George Finlayson, Gighty Burn, Arbroath, £6; second, Andrew Tyrie, Errol, bronze medal.

Best sowing machine for turnips, George Finlayson, Gighty Burn, Arbroath, £4; second, Alexander Jack and Son, Maybole, bronze medal.

Best sowing machine for turnips with manure, R. and J. Reeves, Bratton Iron Works, Westbury, £5; second, Nathaniel Smith, Thrapston, bronze medal.

Best sowing machine for mangold, J. and T. Young, Newton Green, Ayr, £4; second, Charles Hay, Freelands, Ratho, bronze medal.

Best sowing machine for carrots, Mrs. Sherriff, West Barns, Dunbar, £4.

Best three-row sowing machine for beans, Mrs. Sherriff, West Barns, Dunbar, £4; second, George Hunter, Kippielaw, Dalkeith, bronze medal.

Best one-row sowing machine for beans, Alexander Jack and Son, Arbroath, £1; second, Andrew Tyrie, Errol, bronze medal.

Best machine for pulverising guano, &c., James Thomson, Stow, £4; second, James Mitchell, Fisher's Tryst, bronze medal.

Best machine for distributing guano in drill or broadcast, R. and J. Reeves, Westbury, £6; second, Mrs. Sherriff, West Barns, Dunbar, bronze medal.

Best liquid manure distributing machine, trustees of W. Crosskill, Beverley, £4; second, Issac James, Cheltenham, bronze medal.

Best liquid manure pump, trustees of W. Crosskill, Beverley, £2; second, Smith Brothers and Co., Glasgow, bronze medal.

Best horse hoe for drilled grain crops, W. and J. Hunter, Haddington, £6; second, Smith and Ashley, Stamford, bronze medal.

Best horse hoe for green crops, William Gray, Cambusnethan, £2; second, James Kirkwood, Tranent, bronze medal.

Best machine for singling turnips, P. M'Gregor and Sons, Keith, £4; second, John Eaton, Kettering, bronze medal.

Best machine for raising potatoes, Smith Brothers and Co., Glasgow, £4; second, Robert Law, Shuttleston, bronze medal.

Best scythe for general purposes, James Smith, Lawhill, Auchterarder, £1; second, James Payne, Kirkcudbright, bronze medal.

Best reaping machine for one horse, Gardner and Lindsay, Stirling, £10 and bronze medal.

Best reaping machine for two horses, James Shaw, Whiteriggs, Ayton, £10; second, George Bell, South Inchmichael, Errol, bronze medal.

Best horse, stubble, or hay rake, James Kirkwood, Tranent, £2; second, Edward Page and Co., Bedford, bronze medal.

Best hand stubble or hay rake, William Kirkwood, Duddingston, Portobello, £2; second, Young, Peddie, and Co., Edinburgh and Glasgow, bronze medal.

Best thrashing machine adapted for two or more horses, William Brothers, Kendal, £10.

Best thrashing machine with steam power, £50, equally divided between William Foster, Lincoln, and R. Robey and Co., Lincoln.

Best fanners or other machine for winnowing grain, John Richardson, Brunton Place, Carlisle, £4; second, John Grant, Lenny Park, Corstorphine, bronze medal.

Best fanners or other machine for cleaning grass seeds, John Richardson, Brunton Place, Carlisle, £4; second, Robert Reid, Colliston Mill, Arbroath, bronze medal.

Best weighing machine for grain, Herriot and Co., Græme Street, Glasgow, £4; second, D. and J. Thomson, Edinburgh, bronze medal.

Best weighing machine indicating from 1 lb. to 2 tons, A. and W. Smith and Co., Glasgow, £4; second, D. and J. Thomson, Edinburgh, bronze medal.

Best strawcutter for hand-labour, Richmond and Chandler, Liverpool and Manchester, £2; second, Pickslcy, Sims and Co., Leigh, bronze medal.

Best straw-cutter for power, Richmond and Chandler, Manchester and Liverpool, £3; second, Picksley, Sims, and Co., Leigh, bronze medal.

Best turnip-cutter for cattle, Picksley, Sims, and Co., Leigh, £2; second, John Wingate, Alloa, bronze medal.

Best turnip-cutter for sheep, Picksley, Sims, and Co., Leigh, £2.

Best turnip-cutter for sheep, attachable to a cart, Mrs. Sheriff, West Barns, Dunbar, £3; second, James Kirkwood, Tranent, bronze medal.

Best root-washer, trustees of W. Crosskill, Beverley, £2; second, George Porteous, Haddington, bronze medal.

Best linseed-bruiser for hand labour, Richmond and Chandler, Manchester, £2.

Best oil cake bruiser for hand labour, Richmond and Chandler, Manchester, £2; second, Smith and Ashby, Stamford, bronze medal.

Best grain grinder or bruiser for power, Richmond and Chandler, Manchester, £6; second, Smith Brothers, and Co., Glasgow, bronze medal.

Best steaming apparatus for food, Smith Brothers and Co., Glasgow, £5; second, Richmond and Chandler, Manchester, bronze medal.

Best feeding-troughs for byres, Patrick B. Mure Macredie, of Perceton, Ayrshire, £1; second, John Robson, Glasgow, bronze medal.

Best feeding troughs for sheep, William Kirkwood, Duddingston, £1, second, John Robson, Glasgow, bronze medal.

Best sheep fodder rack, James Kirkwood, Tranent, £2; second, Young, Peddie, and Co., Edinburgh, bronze medal.

Best churn worked by hand, Robt. Tinkler, Penrith, £2; second, Philip Hunter, Edinburgh, bronze medal.

Best churn worked by power—William Lindsay, Edinburgh, £3.

Best cheese-press, J. and T. Young, Newton-Green, Ayr, £2; second, Smith Brothers and Co., Glasgow, bronze medal.

Best curd-cutter for dairy purposes, J and T. Young, Newton-Green, Ayr, £1.

Best general set of dairy utensils, Wm. Lindsay, Edinburgh, £1; second, Philip Hunter, Edinburgh, bronze medal.

Best one horse cart, with harvest frame, Robert Law, Shuttleston, Glasgow, £4; second, trustees of W. Crosskill, Beverley, bronze medal.

Best harvest cart, trustees of W. Crosskill, Beverley, £4; second, Robert Law, Shuttleston, Glasgow, bronze medal.

Best light spring cart, trustees of W. Crosskill, Beverley, £4; second, trustees of W. Crosskill, Beverley, bronze medal.

Best divisions, rack, and manger for farm stables, Adam Jack and Co., Glasgow, £1; second, Young, Peddie, and Co., Edinburgh, bronze medal.

Best farm harness, Hay Downie, Corstorphine, £1; second, Thomas M. Berry, Leith, bronze medal.

Best stone or iron stack pillars, with framework, Young, Peddie, and Co., Glasgow, £2; second, John Robson, Glasgow, bronze medal.

Best field gate, constructed entirely of iron, J. M. Watson and Co., Edinburgh, £1; second, J. M. Watson and Co., Edinburgh, bronze medal.

Best dunghill gate, to open at different elevations, James Denholm, Morningside, Edinburgh, £1.

Best iron hurdles for cattle fence, Young, Peddie, and Co., Edinburgh, £1; second, Thomas Perry and Son, Glasgow, bronze medal.

Best iron netting for sheep fence, Young, Peddie & Co., Glasgow, £1; second, Bain, M'Nichol, & Young, Edinburgh, bronze medal.

Best pipe or tile machine for hand or power, Edward Page & Co., Bedford, £6.

Best glazed pipes for conveying water under pressure, John Robson, Glasgow, £5; second, John Grieve, Prestonpans, bronze medal.

Best tiles and pipes for field drainage, John Robson, Glasgow, £2; second, William Brodie, Dunbar, bronze medal.

Best glazed socketed pipes for sewerage, Patrick B. Mure Macredie, of Perceton, Kilmarnock, £3; second, John Robson, Glasgow, bronze medal.

Best general set of hand implements for the farm, William Miller, Airntully, Stanley, Perthshire, £2.

Best apparatus for manufacturing and supplying gas to country houses and farm steadings, J. T. B. Porter & Co., Lincoln, £10.

Best wheelbarrow of malleable iron, William Kirkwood, Duddingston, Portobello, £1.

Best barrow for conveying cooked food, John Wingate Alloa, £1; second, Do., bronze medal.

Extra Implements.—The judges recommended summerhouse and rustic seats belonging to J. T. Alexander, Carnoustie; hand turnip drill and sack-holder and harrow, belonging to James Begbie, Haddington; patent washing machine, with wringing and mangling combined, belonging to Thomas Bradford, Manchester; patent portable double-cylinder steam engine, belonging to Alexander Chaplin & Co., Cranstonhill, Glasgow; patent separator for drawing off the whey from the curd in making cheese, belonging to Robert M'Adam, Silverdale, Newcastle-under-Lyne; machine for shaking the grain from the straw, belonging to Peter M'Lellan, Abernethy; machine for making cattle fencing, belonging to Alexander Macpherson, Carstairs, Lanark; revolving machine for dressing flour, belonging to Alexander Mather, Edinburgh; collection belonging to Francis Morton & Co., Liverpool, specially commended; American cast steel hay and straw forks, belonging to James Payne, Kirkcudbright; straw-rope twister, belonging to Robertson, Traprain, Prestonkirk; carrot seed bearding and clover and trefoil seed milling and dressing machine, belonging to Thomas Scott, London; mowing and rolling machines, &c., belonging to A. Shanks & Son, Arbroath; Dynamometer and Odometer, belonging to Alexander and George H. Slight, Edinburgh; M'Kinnell's patent ventilators, belonging to George R. Stewart, Glasgow; patent rotatory force and lift pumps, belonging to John H. Winder Sheffield.

According to custom, Dr. Anderson, of Glasgow, the chemist to the society, delivered a lecture to the members in the hall of the society's museum, George IV. Bridge—the subject being this year, the "Feeding of Stock as a Branch of Farm Management." In this discourse the lecturer gave some excellent practical hints upon the use of food, and what the stock feeder has to expect from its proper employment.

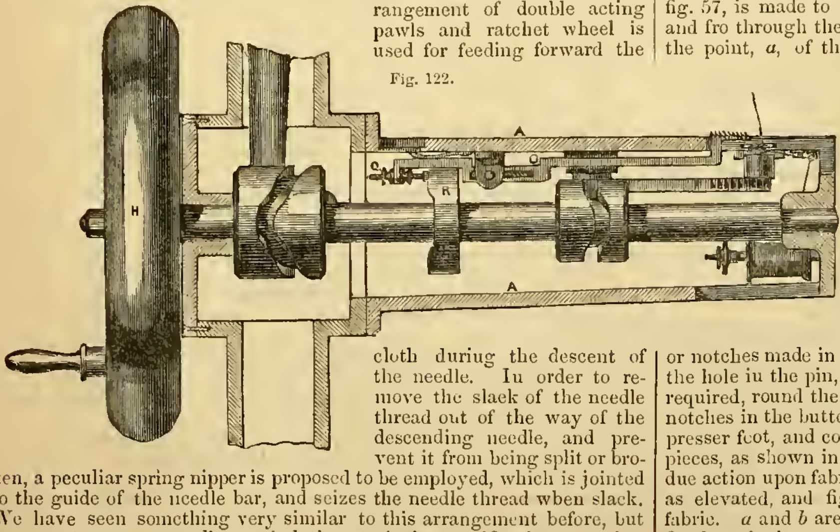
On the Thursday of the show week, there were about 30,000 visitors to the inclosure, and upwards of £1,900 was taken at the doors. The exhibition altogether has been the best the society has ever held.

HISTORY OF THE SEWING MACHINE.

ARTICLE XVIII.

A. V. Newton obtained a patent, dated the 1st of April, 1854, for certain improvements which had been communicated to him from abroad, the essential features of which appear to be the application of magnetism to a sewing machine, for the purpose of keeping the shuttle in contact with the face of the shuttle race, the magnetic attraction serving as a substitute for springs or other devices. The idea is certainly novel and curious, but we fear scarcely practicable. Another and more practical improvement consists in inserting a hollow cop in the shuttle without any spindle or spooler, whereby facility is afforded for drawing the thread off from the inside of the cop, in place of from the outside, which enables a uniform draught on the cop thread being maintained. In order to obtain a uniform tension on the shuttle thread during the drawing up or tightening of the stitch, a slot is formed in the face of the shuttle, through which a stud in the race projects, which draws the thread from the shuttle bobbin. An arrangement of double acting pawls and ratchet wheel is used for feeding forward the

Fig. 122.



cloth during the descent of the needle. In order to remove the slack of the needle thread out of the way of the descending needle, and prevent it from being split or broken, a peculiar spring nipper is proposed to be employed, which is jointed to the guide of the needle bar, and seizes the needle thread when slack. We have seen something very similar to this arrangement before, but cannot at present recall to mind the particular specification or rather specifications in which it is referred to.

Mr. Bellford took out a patent on the 6th of April, 1854, for modifications communicated to him by Messrs. Grover, Baker, & Co. This invention consists principally of improvements upon and modifications of the sewing machine, belonging to the same eminent firm, and patented in this country under the name of William Edward Newton, on the 19th of October, 1852, and previously noticed in our "history." The first object of the present improvements is to afford facility for making the longitudinal seams on cylindrical or conical bag, or hose-like articles, such as the legs of boots, trousers, &c. For this purpose, instead of the platform or table, described in the former patent, a hollow cylinder or cylindrical body is used, containing the feed and other motions previously described, placed beneath the table. In this latter arrangement, however, the direction of the feed is altered, as the material is required to travel longitudinally with respect to the cylinder; whereas, by the former arrangement it would have a tendency to travel transversly thereto—all that is requisite for this purpose is to alter the shape of the cam which directs the motion. Fig. 122 of the accompanying illustrations represents a longitudinal vertical section of the modified form of sewing machine, taking through the centre of the driving shaft; and fig. 123 is an end view of the cylinder. In order to facilitate comparison with the previous improvements above referred to, we have indicated the corresponding parts in each machine by corresponding letters of reference—making use of Hughes' machine, figs. 55, 56, and 57—since that machine is identical with Newton's, which we have not therefore illustrated. A, is the cylinder or half round body, upon which the cylindrical article is passed, for the purpose of sewing it up longitudinally. O, is the feed bar working on a fulcrum at P, which is situate near the centre of the bar, in place of at the end. The feed cam, R, is so constructed as to act by its lateral edge, in lieu of circumferentially upon the head of the adjustable screw spindle, Q. By these alterations the feeding motion of the serrated or roughened bar is performed at right angles to that of the previous machine, the motion in the present machine being directed from the end of the cylinder or table, A, towards the driving pulley, H. With this single exception, the construction and operation of the machine is similar to that before referred to. By changing the direction of the feed to a right angle, transverse seams may be sewed round cylindrical or tubular articles. Figs. 124 and 125 show respectively an end view and plan of an improved guide for binding fabrics and materials. A represents the fabric, and B the binding, which is guided and folded thereon by the fixed guide plates, C, secured to the bed of the machine. Fig. 126 represents a mode of working a shuttle or thread carrier, by means of the segmental lever arm, K, which, in place of being provided with rack teeth, as in fig. 57, is made to contain and carry a shuttle or thread carrier, M, to and fro through the loop of the needle thread. The loop passes under the point, *a*, of the thread carrier, and slips off again at the thick end, *b*. Whilst the thread carrier passes through the loop it unwinds a sufficient quantity of thread, and then resumes again its starting position. The essential feature of this part of the invention is the free suspension of the thread carrier resting upon an implement which carries it through the loop, without causing it to slide upon a solid body. The patentee also describes a simple and effectual mode of regulating the drag or tension of the thread proceeding from the upper bobbin. This is effected by passing the thread through a hole made transversly through a vertical pin mounted on the frame upon the needle, and provided with a button head having a number of nicks or notches made in its circumference. The thread, after passing through the hole in the pin, is wound one or more times, according to the tension required, round the shank of the pin, and is lastly hooked into one of the notches in the button head. Another improvement refers to the yielding presser foot, and consists in making the foot double, or of two or more pieces, as shown in figs. 127 and 128, whereby facility is afforded for its due action upon fabrics of varying thickness. Fig. 127 represents the foot as elevated, and fig. 128 shows it down and resting upon a piece of fabric. *a* and *b* are the two plates composing this foot, the plate, *a*, is fixed to the bottom of the bar, *c*, which acts under the influence of the helical spring, *d*, whilst the plate, *b*, is capable of sliding upon the bar, and is also acted upon by the spring. There is also described an arrangement of presser foot and guide plates, to be used for hemming or sewing

Fig. 123.

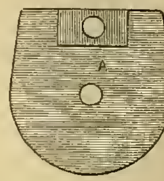


Fig. 124.

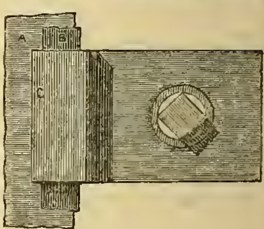


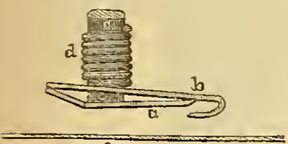
Fig. 125.

such fabries as have a tendency to curl up at the edges. For this purpose the fabric, before reaching the presser foot, passes between two elastic plates which pinch it aud keep it well stretched; and in order to facilitate the passage of the fabric beueath the presser foot, its forward edge is cut diagonally iu place of at right angles to its sides. Figs. 129 and 130 represent respectively a lougitudinal section and plan of a tuhular thread carrier or shuttle. This shuttle is composed of a cylindrical piece of steel, M, terminating in a point, *a*, and bored out for the reception of the cop or thread bobbin. The thread emerges from one of the openings made in the top of the shuttle, and is passed under and over oue or more teeth of a comb, *c*, secured to the shuttle. The friction thereby produced prevents the thread coming off the eop too easily.

Fig. 126.

Another feature which we may select from the eighteen different heads of which this eompendious specification is composed is a peculiar apparatus for cording and binding articles. The hem is laid or turued down by passing hetween two inclined points, the gradually diminishing distance between which effects the desired turning of the hem. This

Fig. 127.



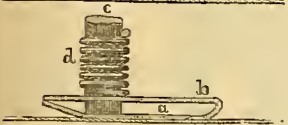
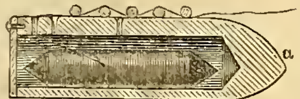


Fig. 128.

Fig. 129.



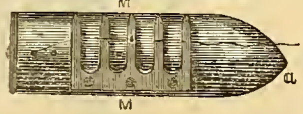
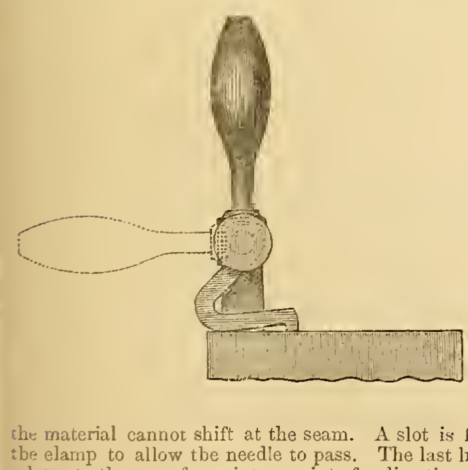


Fig. 130.

hem is then sewed up, with a cord inside, by passing beneath the needle of the machine. A binding apparatus is also shown for binding hats, elotbes, and otber articles. A feed apparatus is described, wherein the serrated or notehed faee bar moves to and fro horizoutally ouly, without the eompound vertical motion; and when this arrangement is used, two rods are employed for lifting the material from the bar whilst it makes its back stroke, thereby preventing it from earrying the material back witb it According to another modification in the feed motion the notched or rough faeed bar is applied to the upper side of the material to be sewed, instead of causing it to act upon the under side as previously done. It is further proposed to give a periodical lateral motion to the notched feeding bar, whieh admits of different kinds of stitching being performed, or the same result may be obtained by using a separate additional feeding bar, moved laterally at stated periods by a separate and distinct lateral feeding cam. The patentee proposes also to employ, in the case of heavy or unwieldy pieces of material, an endless chain worked by the uotched bar, for moving and directing the work. In the making of lap or flat seams a clamp is employed, consisting of two distinct pieces, between which the two thicknesses of material are seeured throughout the whole length or part of the seam in such a manner that the material cannot shift at the seam. A slot is formed in the jaws of tbe elamp to allow tbe needle to pass. The last head of this invention relates to the nse of a point or points for directing or guiding materials, such as leather, by retaining the point or points in a furrow or groove made along the material, in the direction required to be sewed. There are numerous other heads in the specifieation, which our limited space compels us to pass over without detailing—they relate to a single thread stitch, which, by the way, is identical with one of the stitches made by Mr. Jenning's machine, and illustrated by us at fig. 107. The use of lubricating matter is another feature, though not a novel one—a mode of mounting the bobhin for regulating the supply of the thread, and a peculiar knee lever for holding up the presser rod. As this lever is now extensively used, we have given an illustration of it at fig. 131, and leave it to explain itself, as it requires none from us.

Fig. 131.



Ou the 6th of April, 1854, Julian Bernard, Esq., obtained a patent for a novel kind of stitch, composed of one thread, which is so ingeniously tied or knotted in the material by suitable instruments, as to entirely prevent it from unravelling should the thread break at any part of the seam. A knot or tie may either be formed on each succeeding loop, or only on every alternate oue, or one loop may be passed throngh one or through several other loops. Mr. Bernard proposes also to apply breaks or other suitable contrivances to sewing machines, to prevent such machines from being turned iu any hut the right direction, as a reversal of the machine is sometimes attended with injurious effects on the mechanism. A spring arm is also proposed for taking np the slack of the thread in the button-hole machine previonsly described and illustrated by us in our sixteenth article. Another feature in Mr. Bernard's invention is the uniting and ornamenting of materials by a three-thread stitch, produced by interlooping the three threads together in such a way as to form an ornamental braiding on one side of the material. By a subsequent invention, patented the 18th of April, Mr. Bernard proposes to stitch the soles to the uppers of boots and shoes, and to stitch various other parts of boots and shoes, hy meaus of two needles working from the outside or on one side of the boot or shoe. Each of these needles carries a thread passed through an eye near its point; and, in sewing, each thread is secured alternately hy a loop of the other. The two ueedles are caused to work in such a manner that their points will pass each other, and enter between each needle and its respective thread alternately, so that wheu one ueedle is inserted in the material, before it is withdrawn the other needle is caused to descend and insert its point, with part of its thread also, in the form of a loop. The first needle is now withdrawn, leaving a loop of its thread round the second ueedle, and is again inserted, passing in its descent between the second needle and part of its thread, the loop of the first thread being still ronnd the secoud needle, which, at this part of the operation, is withdrawn; these movemeuts are repeated till the part is stitched. This is a similar stitch to the diagoual needle arrangement referred to by us, and illustrated at figs. 62, 63, and 64, under Hughes' patent of August 10th, 1852, bnt its application to the sewing of boots and shoes is ingeuious and novel.

THE PATENT LAWS.

The sum of £20,095 was voted hy the House of Commons, on the 4th August, to make up the sum required to defray the fees, salaries, and expenses payable under the provisions of the *Patent Law Amendment Act*. The following discussion which took place may he interesting to our readers, as showing the great want of knowledge evinced by members of the House upon this important question.

Mr. Brady called attention to the expenses a poor man of genius was put to for obtaining a patent. The couseqnence frequently was that he was obliged to sell his invention to some wealthy person, who thus obtained nearly all the reward which should belong to the inventor. There were a number of officers and clerks attached to the Patent Office, and their allowances occasioned the expense in obtaining patents. There was also a sum of £8,300 in the vote payable to the law officers of the Crown in England. He had no objection to the law officers being properly paid, but he objected to their being paid in this way; and he felt it his duty to propose that the vote should not be agreed to.

Mr. Laing said that the expenses of obtaining a patent were by the change in the law greatly reduced; bnt nothing was more important for a humble man, hefore going to the expense of taking out a patent, than to ascertain whether a similar patent had been registered beforehand. (Hear, hear.) It was mainly to establish a machinery for this purpose that the expense for the Patent Office was rendered uecessary. The fees now fixed were on the lowest rate, simply rendering the office self-supporting. The questiou concerning the law officers of the Crown was discussed very much last year, and it was then very clearly shown that the fees they received were not mere honorary fees, but every patent which passed through their hands involved points respecting the rights of the Crown, on which it was necessary that the Crown should take the opinion of the law officers, and if a charge were made, according to the usual rate of professional fees, that charge would be larger than the one that appeared in the present vote.

Mr. W. Williams thought the amount of £8,300 paid to the law officers of the Crown enormous, and he proposed that the fees payable to those officers should be reduced by one-half.

Colonel Sykes reeommended, in favour of the poor inven ors in the eountry, a reduction of the stamp duties, the proceeds of which appeared to have produced a surplus of £20,000.

After some further conversation,

Mr. Laing observed that the law officers had to give their opinion on the legality of patents before the seal was put to them; and it was of importance to the industry of the country, and to poor inventors as well, that the records of the Patent Office should not be filled up with a number of patents of doubtful validity, occasioning difficulties and litigation.

Mr. Brady observed that at present there was scarcely a day passed without litigation of the most serious character being carried on with regard to patents.

Mr. James believed that the law officers of the Crown had a good deal to do with respect to patents; and nothing would be more disastrous than that people should get patents for all sorts of things without any proper investigation.

The motion of Mr. W. Williams for reducing the payment to the law officers by one-half was then rejected without a division.

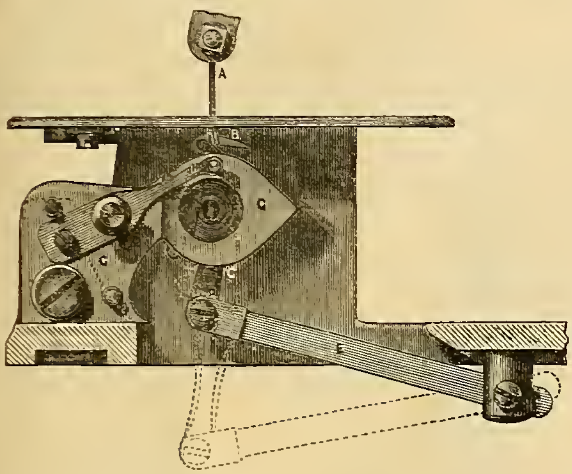
It will be seen from this that the enormous sum paid to the law officers is attempted to be justified in cousequence of their alleged duties with respect to patents. The fact is, that the law officers do not devote one hour per day to the discharge of these duties; and the requirements of their offices, in other respects, will not permit them to do more. We believe that the law officers universally have the greatest desire to perform these duties with fairness and attention, but it is perfectly impossible for them to find time to devote to this purpose. We also believe that the entire emoluments of the offices of Attorney and Solicitor-General are by no means too high for the duties of those offices, but we do think that inventors and patentees have a right to complain that their money is paid to the law officers as a compensation for services in no way connected with patentees or their interests. It is beneath the dignity of the Government of this country to pay their lawyers in such a way. The sum of £8,300 before mentioned does not by any means represent the entire sum paid to the law officers by patentees, as in the case of an opposed patent the inventor and the opposer have each to pay a fee of £3 10s., and every patentee entering a disclaimer has to pay a fee of £7 0s. 6d. These fees in the aggregate amount to a large sum, probably £2,000 per annum more than we have already mentioned.

The Commissioners of Patents ought to have the power to appoint an officer to perform the whole of the duties now in the hands of the Attorney and Solicitor-General; he would be liberally paid by a salary of from £2,000 to £3,000 per annum, and patentees and inventors would have their interests much more carefully attended to, whilst a saving of at least £7,000 per annum would be effected.

THE BRITISH SEWING MACHINE.

We do not know of any manual labour superseding machine to which we could direct attention, that has advanced more steadily yet rapidly in this country, than the sewing machine. True, we may not have adopted them in our manufactories with the feverish impatience for novelty which characterizes our transatlantic fellow-workers; simply because the machine required a long ordeal of improvement, and a patient adaptation to the end in view. The sewing machine is an instrument constructed to supersede a mechanical operation that demands manual dexterity, nicety of touch, quickness of vision, and mental aptness. Regarded in this light, may we not look upon the sewing machine as one of the marvels of science—a mere mass of metal—a few mechanical elements just blended together to work harmoniously, and these produce work equal to, nay surpassing, that which has called forth all the skill of the operative. And now that these machines are better understood by the public, that they gain daily upon the confidence of manufacturers, we may safely predict that the use of them will ere long be as general as in the United States of America. One modification which is much approved of and bids fair to obtain a large amount of public favour and patronage, is the "British sewing machine," which is represented in the accompanying engravings. The sewing machine is fixed upon a small work table, which is supported upon open Gothic pattern side standards. The needle, A, in its reciprocatory movement passes through a small aperture which is made in the working platform. The needle has its eye near the point and carries the thread or silk through the fabric to be sewn, which is moved along the working platform by means of the feed motion This feeder consists of a toothed sliding bar, which projects slightly above the working platform, this bar is arranged beneath the platform and slides in contact therewith, it has near its centre a downwardly projecting part which rest on the periphery, and against the side of a cam arrranged on the driving pulley. The face of this cam is made with a projecting part or swell, so as to impart a forward as well as upward movement to the toothed part of the feeder, which thus moves the cloth regularly along as the stitches are formed. The needle carries the thread through the fabric, and a loop is formed below the working platform by slightly raising the needle, this loop is caught by the hook, B, which traverses in an elliptical path. The hook, B, forms the upper extremity of a lever, which is centred upon a pin projecting laterally from a crank on the main or driving shaft, the outline of the crank is shown by the dotted lines at C. The lower end of the hook lever is jointed to the link, E, the backward extremity of which turns on a laterally projecting pin fitted in a stud on the under side of the table. The dotted lines show the hook lever and link in its lowest position, when the hook has drawn the loop downwards to its greatest extent. Each loop is locked by causing a second thread to be passed

through it, which thread is supplied from the circular bobbin or holder, F, this bobbin consists of two thin steel plates curved to a convex figure externally, and riveted together at the centre. The concavity between the convex discs is sufficient to hold enough of thread or silk to do a considerable amount of work. The bobbin is supported between two thin plates of metal, which form a part of the holder, G, which is screwed to the standard of the working platform; the horizontally projecting parts of the holder consist of two thin plates of metal, having a circular aperture in each, through which the bobbin, F, is seen. These thin plates of metal spring easily apart, so as to permit the insertion and removal of the bobbin, which is held loosely between them. To the face of the holder, G, is fastened a blade spring, H, which extends over the outer supporting plate, and serves to press the bobbin towards the back supporter. The beak of the hook, B, is notched out obliquely, and has its heel projecting over the bobbin, whilst its point is arranged obliquely or made to stand towards the needle in such manner as to cause it to enter the loop of the needle at the proper time. The arrangement of the heel of the hook, so as to overhang the bobbin, facilitates the passage of the loop on to and over the bobbin. By the rotatory motion of the driving shaft, the hook is carried around the bobbin, the holder of which is so arranged as not to obstruct the upward passage of the hook, B, which is controlled in its movements by the crank, C, and the link, E, and so caused to travel in an eliptical path around the bobbin without being turned over or reversed, as would be the case were the hook made to project directly from the crank, C, and not turn upon any pin, or the equivalent projecting therefrom. The machine is put in motion by means of the treadle, I, which is connected by the rod, J, to the crank shaft, K, to which is keyed the band and fly-wheels. The band, L, is carried over the driving pulley on the main horizontal shaft of the machine, which extends across the metal base in proximity to the letter M, in fig. 1; a cam on this shaft gives motion to the arm, N, the backward extremity of which is connected by means of a bolt and nut, O, to the overhanging arm, P. The bolt, O, serves also to connect the arm, N, to the needle lever, Q, and thus impart a reciprocatory motion thereto. The carrier to which the needle, A, is fitted, slides up and down in the vertical extremity, R, of the arm, P; in this part is also fitted the spring presser or foot, which serves to keep the work down upon the platform during the operation of the needle. The thread for the supply of the needle passes



from the bobbin or reel at the back of the machine, beneath the tensional spring presser, S, the pressure of which upon the thread is regulated with the utmost ease and facility, by simply turning the milled edge head at the upper extremity of the vertical spindle. The thread then passes through guide-eyes and away to the needle, which is upon Howe's plan, having the eye near the point, and a groove down the face. When the needle has passed through the fabric to be sewn, it is drawn back sufficiently to form a loop beneath the platform, the hook enters this loop, draws it downwards, and, by its peculiar construction, opens the loop out, so that it readily passes over the bobbin, F, from which the locking thread is slowly unwound by the drag thereon. As the hook rises it frees itself from the loop, remains at rest for a moment until another loop is formed by the descent and partial withdrawal of the needle, this loop is then caught by the hook and is drawn downwards, which action causes the first loop to be drawn with the proper degree of tightness into the cloth. At the front part of the table at T there is a neat arrangement for readily filling the reels and the disc bobbins. The machine is altogether simple in its construction, and therefore not liable to get out of order; it is very easily operated, and the work it produces all that can be desired for neatness and regularity.

INDIAN PATENT LAW.

The bill upon this subject, of which we gave an account in a previous number (*ante* p. 66), and which was then before the Legislative Council of India, has since been passed by that body, and on the 17th of May last, received the assent of the Governor-General, and its provisions now form a complete system of patent law for India. As some of these provisions are rather peculiar, and may possibly be at some future time of great value as indicating the direction which any reform of our own patent law might take, and as containing suggestions for such a reform, we think it advisable to call attention to them more particularly, and to discuss them more at length, than was possible in our former article.

The first point of difference between English and Indian law which we meet with, is the difference of qualification required by the two systems in the persons to whom exclusive privileges may be granted. Our own law allows no one but the actual inventor or the first importer of a new invention, to be a patentee, except in the case of the death of an applicant who has obtained provisional protection, and died during its continuance, when the letters patent may be granted to his personal representatives within three months after his death. In India, the rule laid down is quite different. On the one hand, importers of inventions, unless also actual inventors, will not be able to obtain protection at all; while, on the other hand, the representatives of an inventor, or the persons to whom he may have assigned his invention, may obtain the benefit of the act in all cases, without any restrictions as to time or otherwise. There are probably peculiar circumstances connected with the state of society in India which have influenced the adoption of the first of these rules, and there appears to be no occasion for any alteration of the English law in this respect; more especially since the late regulation of the commissioners, requiring the publication of the inventor's name, as well as of that of the importer, will check any improper use being made of the privilege of obtaining a patent for an importation. With regard, however, to the second of the rules above-mentioned, we think that one branch of it, viz., that permitting exclusive privileges to be granted to the personal representatives of inventors in all cases, might with advantage be adopted into our law. The principle is, it is true, acted upon to a limited extent in England, and it is, we believe, the practice to grant letters patent to the widow or children of an inventor, as for an invention communicated by the deceased; but it remains to be seen how far such letters patent are sustainable, and at any rate, the privilege does not appear to extend beyond the case of a wife or child. But there does not seem to be any reason why it should stop here; and it would appear more just, and certainly it would be more satisfactory to the inventor, to allow the persons entitled to his general estate in all cases, and whether they be relations or not, to enjoy the benefit of an invention in the maturing of which great part of that general estate has probably been wasted.

As respects the Indian rule allowing assignees of an inventor to obtain exclusive privileges, the facilities for fraud which such a rule would give, by enabling needy inventors to take out patents in the names of other persons upon secret trusts for themselves, and so to keep from their creditors the knowledge of their possessing valuable property, would most likely be thought a great obstacle to its introduction here; but if such an obstacle could be got over, we think there would be little doubt that the rule would lead to great saving of expense, and that the present necessity for a series of agreements binding the inventor to take out the patent in his own name, and to hold it, or assign upon complicated trusts for the benefits of the parties who are to be entitled to the whole or part of the beneficial interest, would be in a great measure done away with.

The provisions as to what public use of an invention before applying for protection will avoid the patent are (see *ante* p. 66), in general, much the same in Indian and English law, but they differ materially in one important point, viz., as to the prior public user by the inventor. It may often happen that an inventor cannot be certain as to the value of his invention, unless he has an opportunity of practically working it; and this opportunity may only occur under circumstances in which it is impossible to keep the public from a knowledge of the invention. In the case, for instance, of a contractor employed in the construction of public works (and this is a case which has actually occurred), it may happen that his invention is of such a nature that its capabilities cannot be properly tested within the four walls of a workshop; and it may be absolutely necessary, in order to judge of its value, that it should be used on his works, where, of course, it is open to the inspection of all the world. In such a case, the English rule is so strict that it is almost impossible for the inventor to prevent the use of his invention from being considered as a dedication of it to the public, which, of course, would render invalid any letters patent subsequently obtained. The new Indian rule will be much more just, and at the same time much more favourable to the inventor; for it provides that the use of an invention in public by an inventor, or his servants or agents, or by any other person by his license, for a period not exceeding one year before the date of his petition, shall not be deemed public use so as to invalidate the exclusive privilege. The inventor will thus be able fully to satisfy himself of the value of his invention before spending any money upon it.

One of the most remarkable, however, of the enactments of the new Indian act, is that relating to actions for infringements. We passed this over in our former article, as our object was merely to give an outline of the act, and we were not then concerned with the practice of the Indian courts. Viewing the act, however, from our present point of view, as suggestive of improvements in English patent law, these provisions are very important. They are contained in the 25th and following sections, and are in substance as follow:—Defects in the specification, or want of novelty or utility in the invention, or fraudulent mis-statements in the specification, are to be no defence to an action for infringement; nor is any such action to be defended on the ground that the plaintiff was not the inventor, or the representative or assignee of an inventor, unless the defendant shall show that he himself is the actual inventor, or that he represents him, or that he has obtained a right to use the invention wholly or in part. The action, moreover, may be defended on the ground of want of novelty in the invention, if the defendant, or some person through whom he claims, have publicly used the invention in India, or any part of the United Kingdom, before the date of the petition.

It is, however, provided that any person may apply to the courts of law for a rule to show cause why the exclusive privilege should not be declared not to have been acquired, on the grounds of want of novelty or utility in the invention, or because the petitioner was not the representative or assignee of the inventor, or on account of the specification not properly describing the invention, or containing fraudulent mistatements; and similar applications may be made as to any part of an invention, and in any such case the courts may declare the exclusive privilege good, and may amend the specification if necessary. It will be observed that these provisions differ materially from those of the English law, which admits of all the above circumstances (except fraudulent mis-statements in the specification, which form a ground of invalidity peculiar to the Indian law), being used by way of defence to an action for infringement; and if the patentee fail on any of these grounds, the action must go against him, even though the defect be one which can be at once cured by disclaimer, and which does not in the least affect the part of the invention infringed. Thus, according to the English rule, when a patentee complains of the infringement of part of his invention, he may obtain a verdict against the defendant on the plea of "not guilty," *i.e.*, it may be clear that the defendant has imitated that part of the plaintiff's machine; and yet, if the plaintiff has inadvertently included in his specification a claim for something to which he is not entitled, and of the infringement of which he does not complain, he must lose all the benefit of his action, and his patent will be useless to him, and whoever pleases may safely infringe it, until he has amended his specification by disclaiming the superfluous part. The pressure of the law is thus much heavier upon the patentee than upon the infringer of his patent, and the latter may often violate the rights of the former upon the mere chance of being able to discover a flaw in the specification, which will enable him successfully to resist an action for infringement, or at all events drive the plaintiff into a compromise.

Very different, and more consonant with justice, will be the new rule in India. There a patentee will be able to prevent all encroachments on his monopoly, unless proper steps have been taken by those who doubt his rights, to have his exclusive privilege declared void, or unless the circumstances are such that the person infringing has a prior claim to the invention. He may, however, be at any time called upon to establish his right in a court of law; but since the courts have power in such a case to adjudge the exclusive privilege to be good, and at the same time to amend the specification, and thus to place the patentee in a better position than before, it is not likely that steps will be taken to impeach his claim unless there are very good reasons for believing that his patent is radically bad. The initiative in legal proceedings will thus be thrown upon those who dispute the patentee's rights; and the result will probably be, that whilst the public are protected against an unjust monopoly, the inventor who is *bonâ fide* entitled to the exclusive privilege which he has obtained, will be able to reap the fruits of his skill and labour, without being first subjected, as he too often is in England, to the anxiety and expense of protracted and troublesome litigation.

There is a further provision in the act which is very peculiar, and which will, we expect, be found to work very satisfactorily. We allude to that whereby an actual inventor may obtain an assignment of an exclusive privilege, and an account of profits from a person who has fraudulently obtained it. The enactment also extends to the case of an exclusive privilege which has been acquired by a person, whose knowledge of the invention is derived from the disclosure of a confidential communication from the actual inventor. This rule appears to be a great improvement upon our law, which in such a case leaves the true inventor without remedy. It affords him, indeed, the small gratification of punishing the wrongdoer, by showing that the latter was not the true and first inventor, and so invalidating his patent, and preventing him from deriving any benefit from his fraud; but this is all the redress it gives to the person who has thus been robbed of the just reward of his industry. The proceedings which are necessary to be taken for the purpose of upsetting the wrongfully acquired patent, are in themselves such a publication of the invention as would be sufficient to vitiate any patent subsequently taken out; and the injured party is thus left to consider whether he will expose the fraud, and throw the invention at once open to the public, or whether it will not be more for his advantage to endeavour to make terms with the patentee, and by conniving at a breach of the law, obtain a share of those profits which should, according to the commonest justice, have been all his own.

Such are some of the points suggested for consideration by a careful perusal of the new Indian act. It has evidently been drawn with great care, and with a view to prevent the patent law of India from being disfigured by the defects which mar the effective working of our own system, and render it so difficult for inventors to obtain the full benefit of their inventions; and we think we may safely predict, that if at any time a reform is made in the patent law of this country, it will follow the lines which have been laid down in India, by the "Act for granting exclusive privileges to inventors," which we have been discussing.

MECHANICAL HAMMER, WITH FRICTIONAL NIPPING ACTION.

By MR. A. M'KECHNIE, *Engineer, Carron Iron Works, Falkirk.*

(*Illustrated by Plate* 245.)

ONE of the greatest artificial helps ever received by the mechanical workshop, was undoubtedly the steam hammer. By its means the mechanical engineer was enabled to handle and work up masses of wrought iron which were previously quite unmanageable; and machinery and metallic structures, easy to design, but impossible of execution, were, one after the other, brought within the extended scope thus given to our workshop tools. But the steam hammer is necessarily restricted, in a great measure, to extensive workshops, where heavy work is constantly in hand; and the larger class of minor engineers and mechanics have therefore been compelled to look out for some mechanical substitute which should afford them the required working assistance without entailing the costs and difficulties of the steam hammer.

We have lately had many such contrivances, and we now engrave one of the most feasible—a hammer of frictional action, by Mr. Archibald M'Kechnie, of the well-known Carron Iron Works. Fig. 1, on our plate 245 is a complete side elevation of Mr. M'Kechnie's hammer, and fig. 2, is a corresponding front view at right angles to fig. 1. Fig. 3, is a plan of the tool. By it, variable blows may be given with great rapidity, ease, and certainty, whilst the machinery is simple, and the hammer can be suspended at any point required, when cessation of work is necessary. The main framing of the hammer consists of a vertical pillar bolted down to a suitable foundation, and fitted or formed with upper overhanging brackets, like a slotting machine. The lower bracket of the framing is fitted with an adjustable collar guide bearing, to receive the vertical wrought iron hammer bar, which is further guided by an overhead guide bearing on a pillar bracket, carried by the main frame at the top. The hammer is actuated by a belt pulley on one end of a short horizontal shaft running in bearings on the top of the main frame; the other end of that shaft carrying a fly wheel to insure steadiness. This shaft has upon it a spur pulley in gear with a spur wheel fast near the centre of a lower horizontal shaft, which also carries a broad frictional pulley. The same top framing also carries another and similar shaft parallel to the one first described, and on the same level, and also fitted with a corresponding broad frictional pulley. It is between these pulleys that the hammer bar is nipped during the lift, the second or outer shaft being also fitted with a spur wheel in gear with the wheel on the other or inner pulley shaft. In this way the belt pulley movement actuates the two frictional pulley shafts in concert, but in reverse directions. The four end bearings of the two frictional pulley shafts are set in horizontally traversing blocks, fitted into guide apertures in the top framing, for the purpose of enabling the attendant to bring the two frictional pulleys into, or out of, nipping contact with the hammer bar. This movement is effected by means of a bottom weighted hand lever, set on a stud centre near the base of the frame. A long link rod passes up from this lever, to the outer end of an overhead lever fast on a short horizontal shaft, set in bearings in the top framing. This shaft carries at each extreme end, a short double lever, each end of the two levers being fitted with a joint stud for attaching to the back ends of upper and lower connecting rods, the other ends of which are respectively jointed to external studs on the sliding bearing blocks of the frictional pulley shafts. In this way, the simple depression of the hand lever brings the frictional pulley into nipping contact with the hammer bar; and when the lever is let go, its counterweight falling down, relieves this nipping contact. Thus, as the belt pulley shaft is a continuous revolver, the attendant can give very rapid strokes, because a very slight motion of the engaging lever nips the hammer bar for the lift; and the weight relieves it for the descent, as easily. The adjustable lower collar bearing of the hammer bar is worked by a horizontal screw spindle, passing through the centre of the lower bracket, and through the main pillar, to the outside of the pillar behind. The projecting end of the screw spindle is here fitted with a weighted lever, so that the adjustable bearing can at once be expanded or contracted by turning the lever. In this way the attendant can set the hammer at any required height, when it is at rest. The hammer bar may be nipped either by its two opposite parallel faces with plain faced frictional pulleys, or by its diagonal faces with grooved pulleys, the latter being preferred as affording a superior hold. By varying the frictional contact of the pulleys with the hammer bar, the blows may be made hard or soft, just as required. This tool has been sometime in operation at the Carron Works, and answers most satisfactorily in practice. It is managed with great facility, and the grasping and releasing of the hammer bar, and consequently, the rapidity of the blows are extraordinarily quick and certain.

PURIFICATION OF PARAFFINE OR SOLID PORTABLE ILLUMINATING GAS.

SINCE the discovery, by Reichenbach, of the existence of the curious hydro-carbon "paraffine" in tar, much chemical attention has been directed towards the effective utilisation of its peculiarly valuable properties. Up to the present time little has been done with it, and the crude material, as produced in the distillatory processes for the product of oils and fats, accumulates in many cases as a useless encumbrance in the works of manufacturing chemists. Originally detected in the tar of beech wood, it is now made in large quantities from peat, and more recently still, from that wonderful debateable mineral, "boghead coal,"

Second Series
Plate 245. Vol. IV.

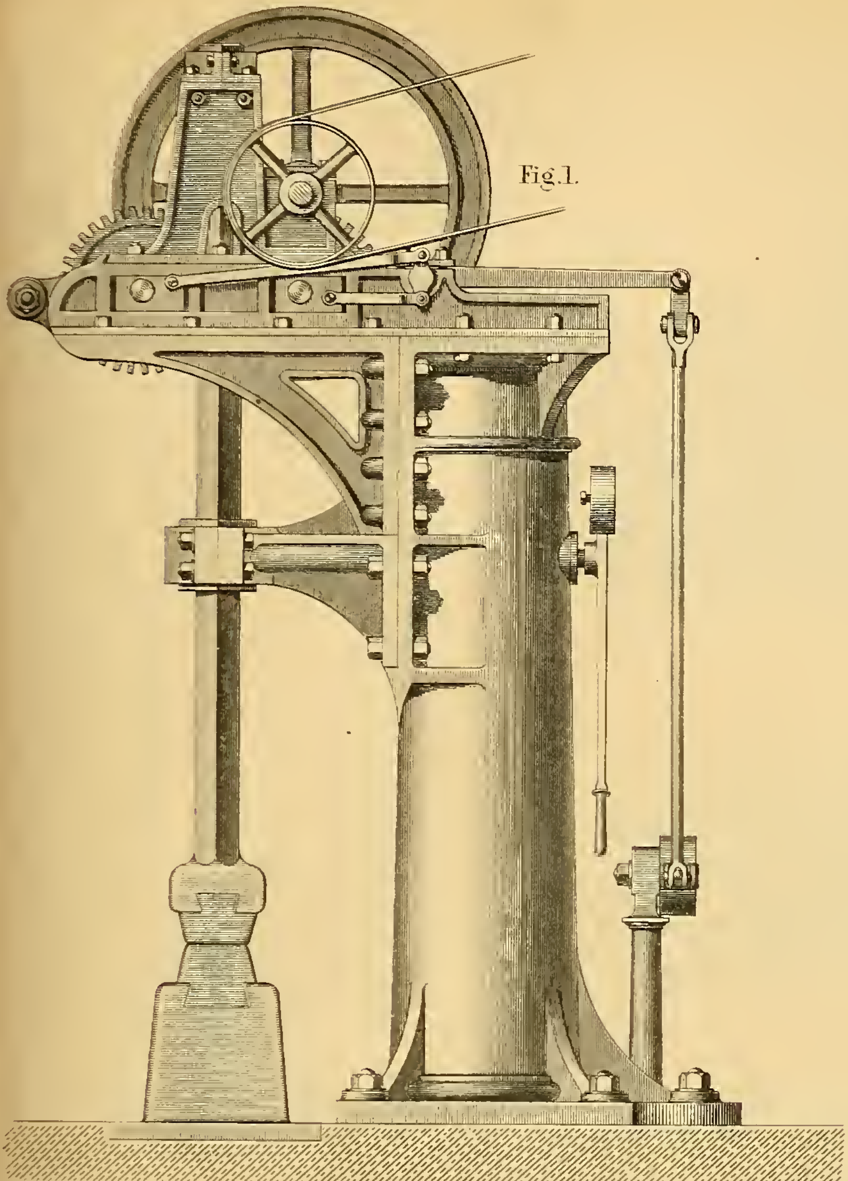


Fig. 1.

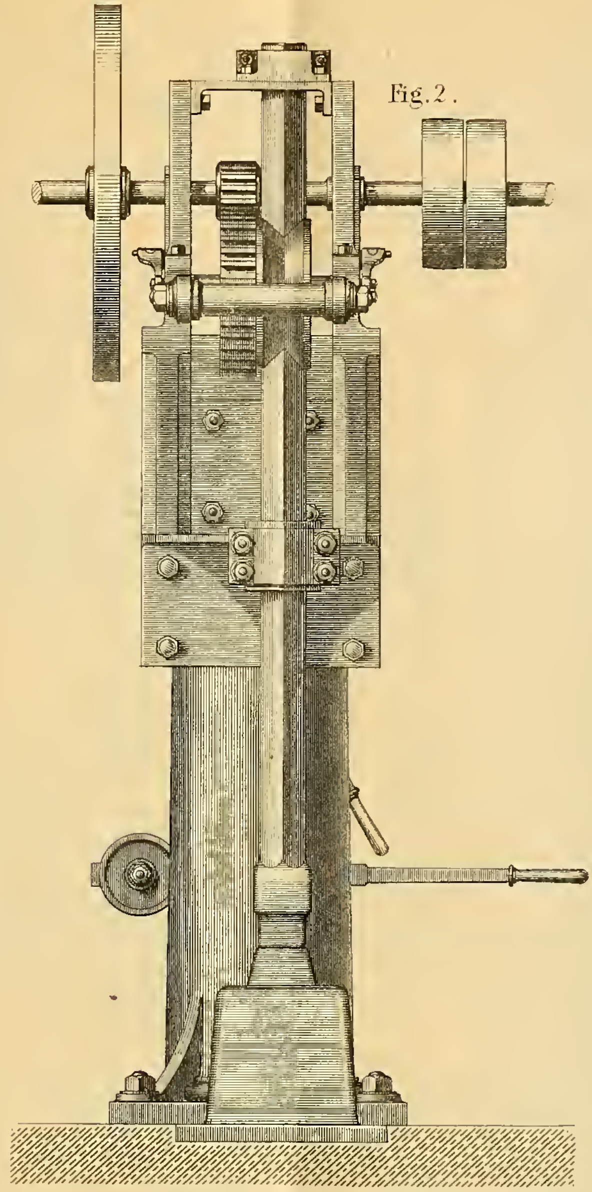


Fig. 2.

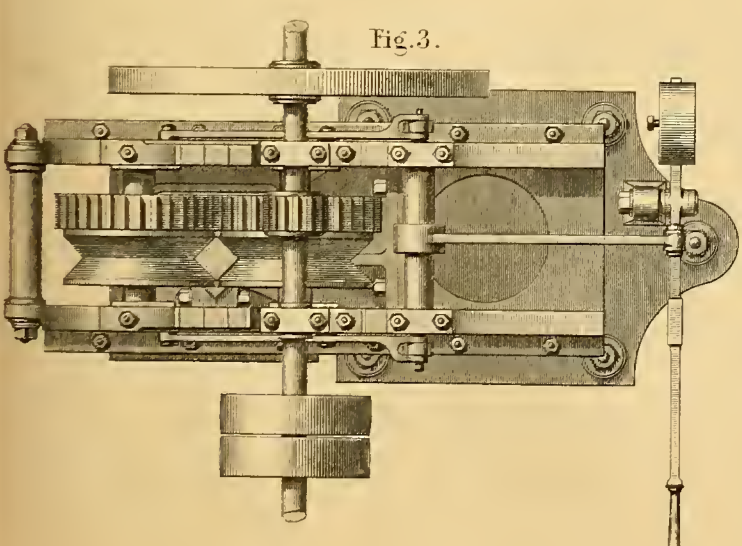


Fig. 3.

MECHANICAL HAMMER,

A. Mc KECHNIE,

CARRON IRONWORKS,

PATENTEE.

—SCALE.—

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[illegible]nson, Patent Office
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Printed by Mackay & Kirkwood, Lith.

peculiar to a certain district of Scotland. It is a white, crystalline, solid, volatile substance, bearing a strong resemblance to wax, but is quite tasteless, colourless, and inodorous, is fusible at about 110°, and resists the action of the powerful caustic acids, whilst alkalies and chlorine fail to exert the smallest action on it. Its peculiar name is derived from the words *parum* little, and *affinis* akin, to denote its remarkable chemical indifference or want of affinity.

The great difficulty in the way of bringing paraffine within the working commercial pale, has been that of purification, and decoloration. Now, however, we are coming to important practical results in this way, and we have before us some beautiful samples of hard, brilliant, white, and sweet paraffine. It resembles spermaceti in its silky feeling and physical structure, but at the same time presents a waxy appearance, gives a powerful clear flame without soot, melts into a colourless oil, and it may be properly considered as a solid portable illuminating gas. It holds a successful competition with wax and sperm, on account of the great uniformity of its combustion, high illuminating power, and beautiful apprarance, melting at a temperature of 29° above that previously made. This is the patented product of a process lately invented by Dr. C. M. Kernot, of Gloucester House, West Cowes, Isle of Wight. In his process Dr. Kernot boils the crude paraffine in water or steam, so as to free it as much as possible from its oil, and render it inodorous and hard. He discards acids altogether, and taking advantage of the fact, that the tar with which the crude paraffine is mixed, melts at a higher temperature than the paraffine itself, he heats the raw material to the temperature just sufficient to disengage the two constituents, and he then filters it, when the pure paraffine passes through the filtering medium, and the tar, with any other impurities, is left on the filter.

The melting is performed in a pan heated with steam tubes, and fitted with a moveable perforated bottom, on which is placed a layer of felt as a filter. As paraffine melts at about 110° or 112°, the heat is raised to 130°, taking care not to reach 180°, the melting heat of tar.

When it is necessary to decolorise any oil which may be left in the paraffine, and cannot be taken out by hydrostatic pressure, or by centrifugal apparatus, the inventor uses chloro-chromic acid or chloro-chromic acid gas, agitating the acid and paraffine together, in a "compound opposite rotator," at a temperature of from 110° to 200°. After this, the mass is washed with warm water to get rid of the colouring matter and acid, and it is then re-melted, adding from ten to twenty per cent. of any light, easily evaporating fluid, such as fusel oil, benzole, photogen, or alcohol. The paraffine is finally cast in moulds for treatment in the hydrostatic press.

The product is really very fine, and as the process is so simple, it is probable that it will come into general use. It has the same per centage and composition as olefiant gas, hence its great utility in the manufacture of candles; and it burns superior to spermaceti or wax, and mixed with either, or with the solid fat acids, it is destined to become an important branch of industry. The firm, in whose hands the manufacture of the new article now is, are making from three to six tons of it per week.

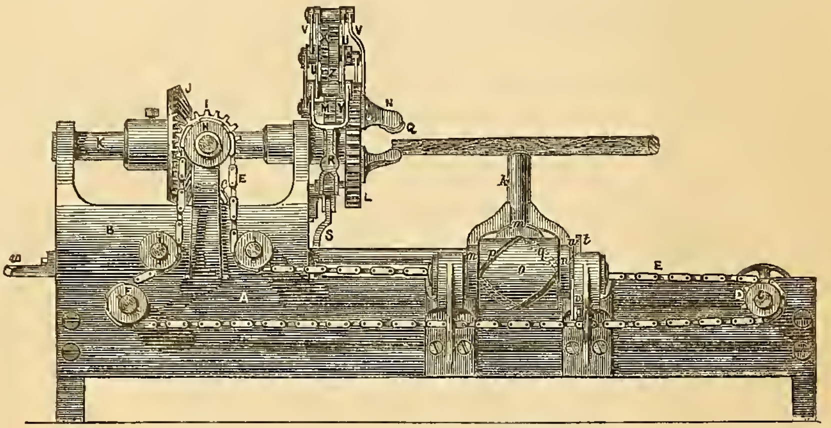
RECENT PATENTS.

TURNING.

J. H. Johnson, *London and Glasgow* (P. H. Niles, *Boston, U. S.*)—*Patent dated January*, 1859.

The improvements specified under these letters patent relate to the construction and arrangement of machinery for turning articles of a tapered or irregular form, which, by reason of their great length, would be apt to bend and vibrate if attempted to be turned in an ordinary lathe without suitable intermediate supports between the ends of the article for steadying the same. Although it is proposed to apply this machine more especially to the turning of masts and tapered spars, it is equally applicable to the turning of other articles of great length and bulk, such as architectural columns or pillars. According to this invention, the stick of timber is held stationary, being rigidly fixed in the machine, whilst the cutters are supported in a carriage, which traverses from end to end of the machine, the cutters revolving at the same time round the stick. The stick is steadied or supported between its two extremities by means of "dogs" or props, which are so arranged that they may be moved out of the way of the cutters as the latter approach,

Fig. 1.



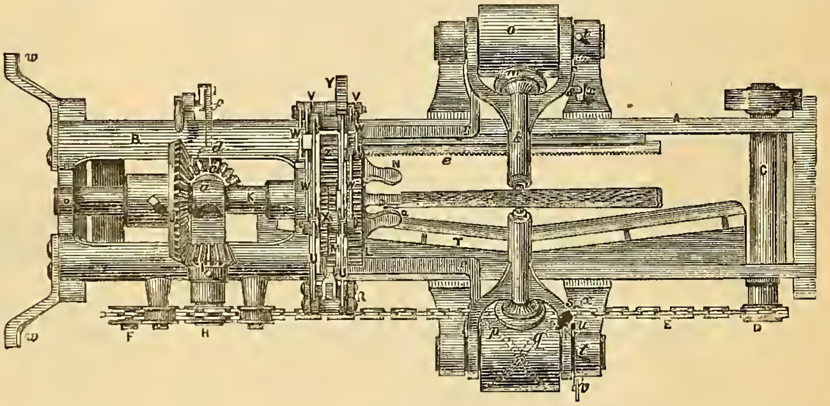


Fig. 2.

and return again to their duty after the cutters have passed, their motion being effected either automatically by the machine itself, by means of suitable grooved cams or cylinders and eccentrics worked by projections on the cutter carriage, or by the attendant in charge of the machine.

Fig 1 of our illustrative engravings is a longitudnal elevation of the machine, and fig. 2 a plan corresponding. In machinery or apparatus arranged according to this invention the "stick" or spar of timber is held stationary, while the cutters travel from end to end and revolve round it. The turning machine consists of a strong rectangular framing, A, which carries the operating parts of the apparatus; this framing may be made of wood or iron, and it forms a bed or platform on which the traversing headstock or cutter carriage, B, travels to and fro. Motion is communicated to the various moving parts of the machine from the horizontal shaft, C, which derives its motion from a steam engine or other convenient prime mover. Upon one extremity of the shaft, C, is keyed a chain pinion, D, which gives motion to the endless pitch chain, E; this chain is carried towards the opposite extremity of the machine, and is passed round a chain pulley, F. Above the pulley, F, are arranged two other guide pulleys, which serve to guide the chain, E, upwards to the chain pinion, H, round which it passes. The pinion, H, is fast to a short horizontal shaft, which carries a bevel pinion, I, that gears with a wheel, J, the boss of which is fast to a hollow or tubular shaft, K. This shaft is carried in bearings fitted in the extremities of the headstock or cutter carriage, B, and its inner extremity projects beyond the carriage to admit of the cutter wheel, L, being secured thereto. Parallel with the cutter wheel is arranged a corresponding wheel, M, which runs loosely upon the hollow shaft, K; this wheel serves to control and regulate the radial traverse of the cutters. Each wheel has three slots made through it; the slots in the wheel, L, are cut or arranged in a radial direction, whilst those in the wheel, M, are tangential: the object of the arrangement being, that as the wheel, M, is moved about its axis, it causes the cutter blocks, which are arranged in the slots of the wheel, L, to approach or recede from each other. The cutter blocks, N, project out from the face of the wheel, L; these blocks are each made with a stem or shank, that fits the radial slots in the wheel, L, so as to slide to and fro therein. The cutter blocks are secured in the slots of the wheel, L, by rings or collars, which are fitted tightly to the shanks. The prolongation of each shank, or that part beyond the collar, enters the slots in the wheel, M, by means of which the position of the cutters is regulated. The cutters, Q, are secured to the cutter blocks, N, so that as the wheel, L, is rapidly driven by the motion of the shaft, K, the "stick" of timber which passes through the hollow shaft is quickly reduced. The regulating movement imparted to the cutters by means of the wheel, M, consists of the forked arm, R, which is jointed to a bracket projecting from the headstock, B; the lower part of the arm has fitted to it a tail piece, S, the free extremity of which traverses to and fro in a groove or slot, T, which forms the pattern, and is arranged on brackets projecting from the inside of the framing, A. The upward extremities of the arm, R, has jointed to them the duplex arms, U, to the ends of which are jointed the pendant links, V; the lower ends of these arms are jointed to brackets or supports, which are carried by the headstock, B. The arms, U and V, are connected by the jointed links, W, the connecting spindles of which carry the pinions, X, Y, and Z. The pinion, X, which is arranged in the centre of the arms, U, gears with the wheel, M, and the pinion, Y, at the lower extremities of the links, V, gears with the wheel, L; the motion of the pinion, X, being communicated to the pinion, Y, by the intermediate pinion, Z, the spindle of which passes through the duplex links, W. Thus as the wheel, L, rotates with the shaft, K, its motion is communicated to the wheel, M, through the pinions, X, Y, Z, and as the headstock, B, traverses along, the tail piece, S, causes the arm, R, to rise or fall according to the configuration of the slot. The motion of the arms, R and U, alters the position of the pinions, X and Z, and causes the wheel, M, to move about its axis and set the cutter blocks, N, either closer to each other or farther asunder, according to the inclination or direction given to the slot, T. The headstock or cutter carriage, B, is caused to traverse along the bed, A, by means of an arrangement which derives its motion from the shaft, K. This shaft carries a sleeve or loose collar, *a*, to which is connected a pendant shaft, *b*, which is steadied by passing through a slot made for the purpose in the cross brace of the headstock. The shaft, *b*, has keyed to it a bevel wheel, *c*, which gears with the wheel, J, and at its lower extremity is a pinion, *d*, which may be put into or out of gear with the rack, *e*, at pleasure. A rod, *f*, is connected by a loose collar to the shaft, *b*; this rod extends out beyond the framing, A, and has fitted to its extremity a crank, which is connected to a short spindle that is carried in a standard, projecting from the headstock, B. A handle is fitted to the end of the spindle; a half revolution of this handle puts the pinion, *d*, either into or out of gear with the rack, *e*. As the wheel, J, revolves, it imparts its motion to the bevel wheel, *c*, and pinion, *d*, which, if in gear with the rack, *e*, causes the headstock and its connected mechanism to travel along the bed of the machine. The timber to be turned is supported at intervals by means of "dogs," to prevent it sagging or bending downwards between the ends; these "dogs" are caused to move out of the way as the headstock approaches, and to fall back after it has passed by. The shank of the "dog," slides in a cylinder, *k*, which forms a case for it; the shank has an internal screw tapped in it, to which is adapted a screw. This screw is turned by means of the nut or hand wheel, *m*, the turning of which causes the shank to protrude or recede; the shank is prevented from turning by a pin cast on it, which fits a groove in the cylinder, *k*. The lower part of the cylinder, *k*, has laterally diverging arms, which are formed into rings to fit the eccentrics, *n*, on the ends of the metallic cylinders, *o*, the spindles of which are supported in brackets that project from the faces of the framing, A. Each of the cylinders, *o*, is made with two curved grooves, *p*, *q*, cut in its periphery, and, as the headstock travels along, a bent arm, *r*, projecting from the front end, enters the groove, *p*, and causes the cylinder to turn partly round. This motion of the cylinder withdraws the "dog" from the timber, and then raises it and throws it outwards away from the spar. When thus raised, a pin, *s*, on one of the arms of the cylinder, *k*, comes in contact with a pin, *t*, fixed on the upper part of one of the supporting brackets, this prevents the "dog" from being thrown back too far. And to prevent its falling forward when the arm, *r*, has left the groove, *p*, a pin, *u*, in the end of the cylinder, is caught by a spring pawl, *v*, which retains the cylinder, *o*, and holds the "dog" up out of the way whilst the headstock is passing. The "dog" is brought back to its position by a bent arm, *w*, which is secured to the rear end of the headstock; the extremity of this arm, *w*, enters the groove, *q*, and causes the cylinder, *o*, to turn towards the framing, A, and so restore the "dog" to its former position. The inward motion of the "dog" is stopped by the pin, *s*, which comes in contact with the block, *x*, on the supporting bracket, and prevents its falling too far inwards; but this takes place before the arm, *w*, has left the groove, *q*, so that the cylinder, *o*, is turned round a little further, and the eccentrics thus project the "dog" towards the centre of the spar, and thus give it the required support. The "dogs" are arranged in pairs, at suitable distances asunder, along the sides of the framing, A, and in some cases they may be wholly, or in part, under the control of the attendant; that is to say, they may be actuated entirely by the hand, or partly by hand and partly by the machine itself. In this manner, masts, spars, architectural columns, and other bulky articles of a tapering or irregular form may be turned with accuracy and rapidity.

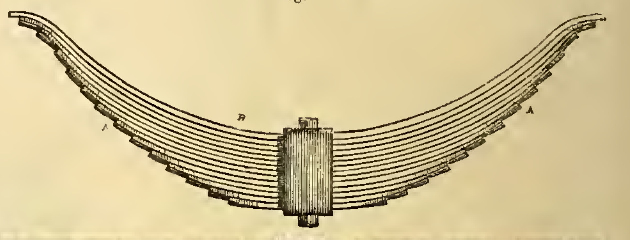
SPRINGS.

THOMAS SPENCER, *Newcastle.—Patent dated November* 22, 1858.

THIS invention relates in the first place to certain improvements upon the springs known as "Baillie's Volute Spring," and consist in forming the coils with ribs or projections upon them, for the purpose of strengthening the coils, and preventing them from pressing or rubbing their whole surface upon each other when the spring is being compressed. These ribs or projections may be formed upon the coils in any position or direction. The improvements further relate to springs of the ordinary or laminated springs, and consist in the dispensing with the slits and their accompanying studs or ribs, at present used in the construction of these springs. This object is accomplished by forming at the ends of the plates small hollow ribs or projections; the underside or cavity formed in making these ribs upon the upper plates, fitting upon the ribs on the under plates, or *vice versa*.

Figs. 1 and 2 of the subjoined engravings, represent respectively a side elevation, and a plan, of an ordinary or laminated spring, constructed

Fig. 1.



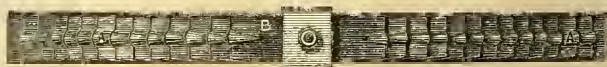


Fig. 2.

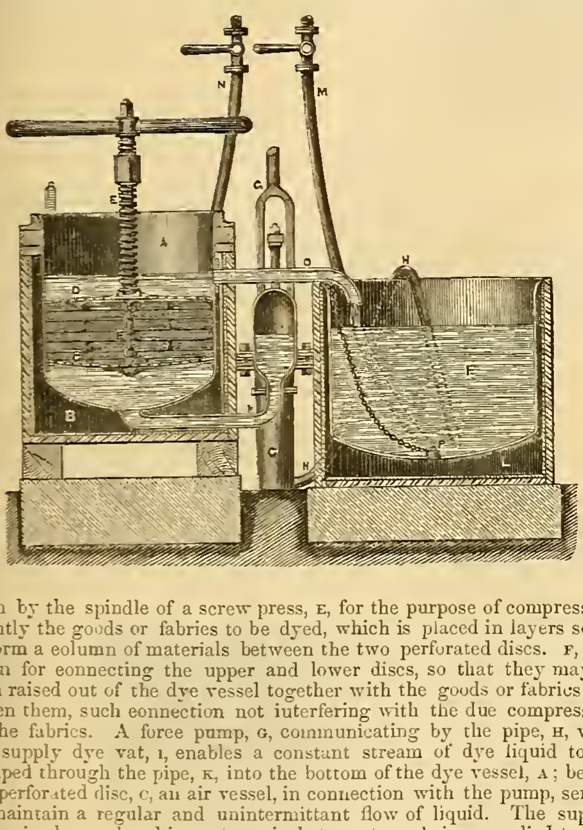
according to this invention. A, are the small hollow ribs or projections before referred to, which are formed by stamping the ends of the several plates, B, in such a manner that the convex or projecting portion of one rib will fit into the concave or recessed portion formed by the hollow of the rib on the next plate.

DYEING.

EMILE WEBER, *Mulhouse.—Patent dated December* 18, 1858.

THIS invention relates to certain modifications of, and improvements in the apparatus for dyeing, for which letters patent were granted to the present patentee, on or about the 13th of August, 1853. The principle embodied in the invention above referred to, is the forcing of the liquid by the aid of force pumps, through the fabrics or materials to be dyed, which operation is accomplished in a suitable vessel, having a false perforated bottom and moveable perforated disc, which is pressed upon the top of the materials to be dyed. In the present invention this principle remains unaltered, but the apparatus itself is slightly modified in construction and arrangement. The vessel in which the materials to be dyed are contained, is to be of a larger diameter as compared to its depth than that described in the specification before referred to, by which means the layer or column of material contained between the disc and false bottom, through which the dye liquid is to be forced, is greatly reduced, and consequently a more uniform tint is obtained, whilst a considerable reduction in the power required to work the force pumps is effected. The inventor prefers that the height of the layer or column of material should be from one foot to sixteen inches, but it should in no case exceed two feet in height, as the power requisite for forcing the dye liquid through such a dense body of matter will be too great to render the apparatus practicable and useful. Moreover, it has been found that when a thickness of material exceeding two feet is used, the dye liquid becomes so weakened or spent before reaching the upper surface of the layer or column, that the materials are dyed unequally, the bottom being much darker than the top, which would be of a comparatively light tint. This might be remedied to a certain extent by reversing the flow of the liquid, that is to say, by causing it to be forced from the bottom upwards, and from the top downwards, alternately; but the means proposed to be adopted when such unequality of tint arises, consists in reversing the fabrics or materials under treatment in the dyeing vessel, so as to bring the top of the layer or column downwards, and the bottom of the same upwards. For this purpose the top and bottom perforated plates or discs are connected by a central bolt or other suitable means, to lift them out bodily with the materials between them. The whole are then reversed and the material and discs are deposited in the dye vessel again. The dye liquid in the vat, which supplies the force pipe, is heated by steam or other heat, the same means being applied for maintaining the heat of the liquid in the dye vessel; as it is important in some cases that the same temperature should be maintained in each vessel: thermometers are employed for the purpose of indicating immediately any variation of temperature in these liquids. One of these thermometers is applied to the liquid in the supply vat, and the other to the steam space surrounding the dye vessel.

Our illustrative engraving represents a longitudinal vertical section of the apparatus. A, is the dye vessel, enclosed in a steam jacket, B, and provided with a moveable perforated disc or false bottom, C, and a corresponding perforated disc, D, the latter or upper one being acted



upon by the spindle of a screw press, E, for the purpose of compressing slightly the goods or fabrics to be dyed, which is placed in layers so as to form a column of materials between the two perforated discs. F, is a chain for connecting the upper and lower discs, so that they may be both raised out of the dye vessel together with the goods or fabrics between them, such connection not interfering with the due compression of the fabrics. A force pump, G, communicating by the pipe, H, with the supply dye vat, I, enables a constant stream of dye liquid to be pumped through the pipe, K, into the bottom of the dye vessel, A; below the perforated disc, C, an air vessel, in connection with the pump, serves to maintain a regular and unintermittant flow of liquid. The supply vat, I, is also enclosed in a steam jacket, L, steam being supplied to the two jackets, B and L, respectively, by the pipes, M and N, by which means the liquid in the supply vat is heated, and its temperature maintained during its passage through the dye vessel. The dye liquid, on being forced into the bottom of the dye vessel, rises up through the perforations in the false bottom, C, and after permeating the goods enclosed between the two discs passes through the perforations in the upper disc, and thence flows off by the overflow pipe, O, back into the supply vessel. A circulation of the dye liquid is thus constantly maintained. The inventor has found, in practice, that a better result is obtained by having a short column or thinner layer of goods for the liquid to act upon; he has considerably reduced the height of this column as compared to its diameter, by which means he obtains more uniformity of tint than when a higher column or thicker layer of goods is used, as the liquid does not become so weakened or spent on arriving at the surface or top of the layer or column. For this same object also, the inventor proposes to reverse the position of the goods after a time in the dye vessel, so that the liquid may be caused to flow through it in alternately opposite directions, for which purpose the two discs and goods are raised entirely out of the vessel, and replaced again in an inverted position—the disc, C, being then uppermost, whilst the disc, D, forms the perforated false bottom. The same result might also be obtained, to a certain extent, by alternately forcing the dye liquid from the top of the column downwards, and from the bottom upwards. Two thermometers are placed, the one in the dye liquid in the supply vat, and the other in the steam space surrounding the dye vessel, A. Corks are fitted respectively in the steam jacket of the supply vat and of the dye vessel, for the purpose of running off, when necessary, the water of condensation collected in the bottom of those jackets. The liquid may be run off from the vat, I, by raising the conical plug, P, fitted into an opening in the bottom of the vat, and connected by a chain to the edge surface of the vessel. Although the patentee has more especially described the apparatus as applied to the dyeing or colouring of textile fabrics and materials, it is obvious that the same might be advantageously applied to the washing of such fabrics or materials, or the removal therefrom of foreign or extraneous matter.

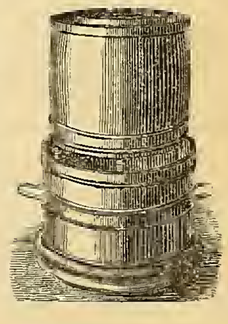
LINEN MARKER.

F. V. Hadlow, 8 *Prince Albert Street, Brighton.—Patent dated May* 9, 1859.

This is a very neat improvement upon the old marking apparatus—if apparatus it could be called. It is a neat combination of a relief engraved box-wood stamp, with Bond's marking ink—the whole being contained in a pretty little case. The case (of birch-wood) is turned in three pieces, screwing together for opening and closing. The central portion contains a very small bottle of fluid marking ink and the engraved marker, just large enough to hold firmly between the thumb and fingers. The top division, in the form of a deep hollow cap, with an ornamental moulding, screws down upon this, whilst the base screws on to the bottom of the central piece, and serves as the receptacle for an India-rubber disc, with a black cloth disc over it. On the base or lower face of the central piece there is attached a code of directions for use, so as to be ever at hand, and most conveniently accessible. All that is necessary is to spread a drop of ink upon the cloth disc resting upon its India-rubber base, press the face of the marker upon it, and then apply it to the linen to be marked. When warmed subsequently by an iron, the impression comes out clear, black, and indelible. The same apparatus answers for paper and other surfaces. If little ink is used, the markings are very sharp—quite different to the usual blurred hieroglyphics usually met with. The arrangement is so convenient and effective, that all who have frequent necessity for marking names, numbers, or addresses, must find it extremely useful.

CHEESE VAT.

Thomas P. Luff, *Shepton Mallet, Somersetshire.—Patent dated April* 6, 1859.



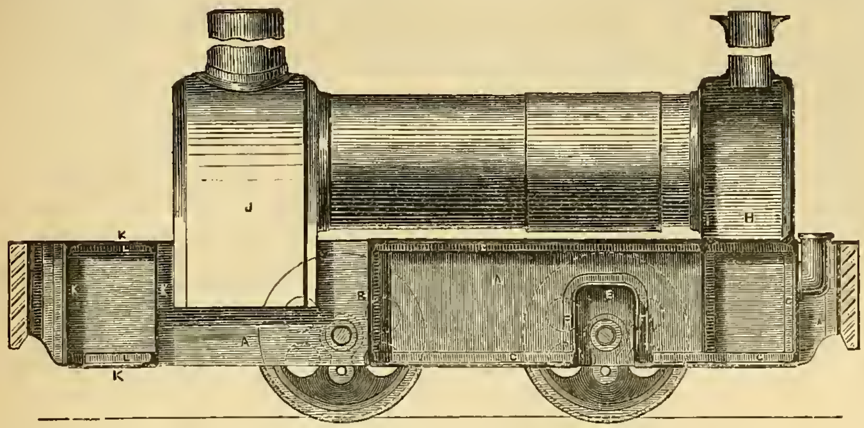
Our engraving represents Mr. Luff's invention in perspective elevation. In it there is a cheese on the top of a follower, inside the vat, which follower pushes up the cheese as the dairymaid pushes down the vat by the handles. The edges of the cheese are well preserved in this apparatus; and, from the close fitting of the follower to the vat, there is no necessity for even paring the edge of the cheese, from which many tons of cheese are injured. The vat is entirely of metal. The inner ring is 2 inches deep and about six inches diameter; it is secured to another of 15 inches diameter, resting upon iron props screwed to another bottom, 19 inches diameter, having $1\frac{1}{2}$ inch iron straps to stand on. The cheeses are each embossed with a suitable device.

TANK ENGINES.

S. D. Davison, *Leith.—Patent dated February* 3, 1859.

In directing his attention to the improvement of locomotive engines, Mr. Davison has succeeded in producing a very useful engine, so arranged as to carry a large quantity of water—compact in its construction, very steady, and admirably adapted for branch lines about coal and iron works.

The accompanying engraving is a sectional elevation, showing one mode of arranging the principal parts of a locomotive engine, according to this improved system. In arranging and constructing an engine according to the present invention, the side frames, A, are made sufficiently deep to form the sides of the tank. These side frames may be made either of iron or steel plate. As arranged in the accompanying engraving, the principal tank is shown as extending from the front of the smoke box backwards to within a short distance from the fire-box. This tank is formed by connecting the top, bottom, and end plates, B, to the side frames, A; these plates are connected to the framing by means of the angle iron, C, to which the side frames and plates are riveted and caulked in the same manner as in constructing a boiler. The angle iron, C, is used at all the junctions of the plates, and in this manner forms a solid and very efficient framing to connect the tank with



the side frames, A, and thus secure a superior foundation for the boiler and engine. At that part of the tank through which the leading axle, D, would otherwise pass, a bridge is formed by the bent plate, E, the recess thus obtained leaves ample space for the axle to pass through clear of the tank. The bridge plate, E, is connected to the side frames, A, by the angle iron, F, which is riveted and caulked in the same manner as the other parts of the tank. At the front part of the engine, immediately below the end of the boiler, the tank is further strengthened by the interposition of the transverse plate or diaphragm, G, which is riveted in between the angle irons, C; the lower part of this diaphragm is cut in an arched form, to allow of the passage of the water. Above the front part of the tank, the smoke box, H, is constructed in the ordinary manner, and connected to the tank by means of the angle iron, I. In this modification of the invention, a smaller tank is also formed beneath the foot-plate of the engine, just behind the fire-box, J. This tank is formed by the end, and top and bottom plates, K, which are connected to the side frames, A, by the angle iron, L. The tanks are furnished with man hole plates, M, for the purpose of affording access to the interior of the tanks, to clean out, from time to time, the deposited matter. In tank engines constructed according to these improvements, the cylinders, and the whole of the working parts of the engine, are arranged outside the side frames, A, affording instant access to any of the parts, without requiring a pit to get at the machinery. Another modification of the present invention consists in forming the tanks for these engines, of cast iron, and bolting the same to the steel or iron side frames, A, preference is, however, given to the mode of construction before described. In cases where it is not required to carry so large a quantity of water, the tank beneath the foot-plate may be dispensed with, and the larger tank not extended beyond the front end of the boiler. Where more than one tank is used, they are connected by means of water pipes, which are not shown in the engraving; the feed water is withdrawn from the tanks by the feed pumps in the ordinary manner. With these improvements the necessary quantity of water is carried with the engine, while, at the same time, its stability and steadiness are increased by the weight of the water being entirely below the boiler.

PULVERISING LAND.

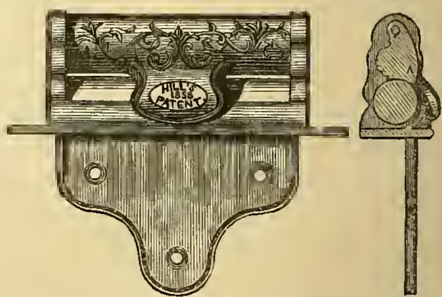
Henry Ellis, *Holbeach.—Patent dated November* 20, 1858.

Mr. Ellis' improved agricultural implement consists of a mechanical arrangement applicable as a land cleaner and pulveriser. The actual cultivator and pulveriser consists of one or more cylinders, fitted with curved spikes or long teeth, and carried in a vibrating frame, centred so as to work freely on the main axle as a fulcrum. Suitable suspending chains are connected to the after end of the vibrating frame, and are passed over an overhead roller fitted with a ratchet wheel and detent apparatus and cross arms, for the facility of elevating more or less the cultivating, cleaning, and pulverising cylinder or cylinders, according to the depth to which they are required to enter the ground. A rotatory motion is imparted to the cylinders from the running wheels by means of suitable toothed gearing, so that on drawing the machine over the land the rotation of the running wheels will impart a corresponding but more rapid motion to the cylinders in the contrary direction, the teeth of which, penetrating more or less deeply into the soil, will loosen and break it, and cleanse it from weeds, roots, and other similar foreign bodies. The cultivating, cleaning, and pulverising cylinders, which are fitted with the curved spikes or long teeth, are mounted loosely on an axle carried by a frame This frame is free to rock or vibrate on the bosses or naves of the cast-iron main supporting wheels, and is capable of being raised or lowered, so as either to lift the cylinders entirely from the ground or cause them to act thereon to a greater or less depth by means of chains, which are raised or lowered by a windlass. Rotatory motion in a contrary direction to that of the supporting wheels is imparted to the cylinders by means of spur wheels fast on the bosses of the supporting wheels, and gearing into corresponding smaller wheels fast on the bosses of the cylinders, so that, on the machine being drawn over the ground, the rotation of the supporting wheels will, through the toothed gearing, impart a rapid rotatory motion to the cylinders, causing the curved teeth or tines thereof to enter and disintegrate the soil, and also clear it from weeds. In order to increase the bite of the supporting wheels, the patentee proposes to apply to the rims thereof a series of teeth or spikes, which are removed when the machine is travelling along roads. In this case also the gearing is disconnected, by removing the retaining key, and sliding the cylinder axle down a slot in the rocking frame until the teeth of the two spur wheels are no longer in gear. The machine is fitted with a pair of ordinary shafts, by which it is drawn by horse-power, but it may also be hauled over the land by steam or other power, if desired.

CARRIAGE GLASS SPRING HOLDER.

Christopher Hill, *Chippenham.—Patent dated October* 6, 1858.

This invention relates to the arrangement and construction of apparatus for holding and retaining the window springs of railway or other carriages, and is intended to do away with the present inefficient system of eyelet holes in the string, and the still more troublesome plan of springs at the sides of the glass frames, which are so constantly out of order from the weakening of the springs. In the accompanying engravings we have shown the improved spring holder in elevation and vertical section. The patentee's arrangement consists of a neat ornamental frame-work which is screwed to the carriage door at the centre of the window opening. The vertical ends of this frame or case have fitted to them the journals of a small roller over which the window springs pass. Above the roller, and parallel thereto, is arranged a spring clip, at the lower part of which is a thumb bit that presses down upon the lower part of the frame-work or case. The string is fastened to the carriage window in the ordinary way, it passes over the roller and out below the thumb bit; when the window is to be raised, the string is drawn downwards and the window is kept up to the desired height by the pressure of the thumb bit upon the string. To lower the window, the thumb bit is slightly raised, and a gentle pressure kept on the string until the window is sufficiently low, when the releasing of the thumb bit retains it at the required elevation.



RUGS.

John Thomson, *Dundee.—Patent dated January* 12, 1859.

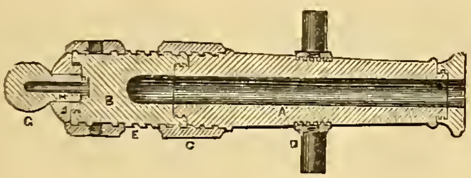
The kind of rugs which the patentee proposes to manufacture under his present improvements are known as "beam rugs." Woollen rugs manufactured according to this system or mode are, however, well known in the trade, the novelty of the patentee's invention being confined to the material made use of. In weaving rugs according to these improvements little or no alteration is required in the weaving machinery from that ordinarily used for the same kind of goods. The patentee prefers to wind the warp which is used to form the pile or "shag" of the rug upon a beam arranged at the back of the loom, and above a corresponding beam, upon which is wound the warp intended to form the back or lower side of the rug. The warp, which is wound upon the upper beam, and intended to form the pile of the rug, is composed of jute or jute hemp, which is used in lieu of the more costly fibrous material, wool. The jute warp is prepared in manner similar to wool, and is to be dyed or printed previous to being woven, or the printing operation may be effected subsequently. The pile and body warp is carried from their respective beams, and is passed through the heddles in the usual manner. As the weaving of the rug is proceeded with, the jute warp is cut through on the upper surface to form the pile or shag on the right side of the rug. In this manner rugs may be manufactured at a cost far below those in which wool is used to form the pile surface. The patentee does not confine himself to using jute alone for the surface warp, as in some cases it may be expedient to mix other fibrous materials with the jute to form the surface warp, and yet produce an article much lower in price than those in which the more expensive textile materials are made use of.

ORDNANCE.

Benjamin Wells, *London.—Patent dated January* 19, 1858.

The patentee's invention consists in constructing cannon in such manner that the piece of ordnance may be used as a cannon, or may have parts thereof removed, and be then used, with additions, as a mortar; in forming ordnance in segments; in making the bore of the gun, composed of segments, gas-tight; in rifling; in the construction and fitting of trunnions to guns; and in minor details employed in the construction of arms.

The barrel of the gun is constructed in two, three, four, or more segments, and made to screw into a breech, as illustrated in the subjoined engraving. A, are the segments; B, is the breech piece, into which



the segments screw; the periphery of the breech piece is made with a screw thread, E, over which a collar, C, screws to keep the segments firm and tight. There are other threads formed outside the segments, over which another collar or ring, D, is screwed, with the trunnions screwed thereon, or formed with contrivances for enabling the trunnions to be otherwise affixed thereto; these threads, outside the gun, together with the collar and trunnions, are applicable to ordnance generally, either for repairing and renewing old guns, or for other purposes. Screw threads may also be formed round the muzzle of the gun, and a third collar screwed over the same, and thus the whole barrel be held secure and tight. But, instead of this collar, the patentee prefers to form a muzzle in one piece, as shown in the figure, and screw it on to the segments; and sometimes he uses a collar to screw over all, where the parts are united. If the collars do not keep the parts of the barrel sufficiently solid, then he adds further collars, either plain or screw threaded. To prevent the collars from working loose, a screw pin is passed through each of them into each of the segments. To render the segments as nearly gas-tight as possible, each segment has a flange formed on it, of the same curve as that of the bore of the gun, and it fits in a groove made for its reception in the next adjacent segment, and so on all round and upon these flanges or plates—the rifling is formed or not as required. For the purpose of additional strength, and where needful, a tongue is inserted into one segment of a different metal to that of which the segments are made, and the tongue enters a groove made for its reception in the segment next to it.

To use the arm as a mortar, unscrew the segments forming the barrel from the breech, B, and screw therein a barrel or muzzle constructed in the form of a mortar. The part marked F may be unscrewed from the position there shown, and screwed into the fore end of the breech, to form the said muzzle, the knob, G, being of course withdrawn from F; after it has been unscrewed from the breech, then screw forward the collar over all, when the parts are united; disconnect the trunnion or trunnions from the ring, D, encircling the barrel of the cannon, and fix them into the breech, B, or into a ring placed for additional strength upon the breech, a stop preventing the said ring from passing beyond its proper position. The part, F, of the gun behind the breech proper, is screwed into the breech because great strength is there required. It forms an additional breech or strengthening piece, and into this piece is screwed a heavy knob (which may, if desired, be larger than the diameter of the bore) into the back of the additional breech. The cylindrical part of this knob passes through the part, F, and at its fore end is screw-threaded, and screwed into the breech. It may also be bored out, as shown at H, and be used separately for firing small shells. For this purpose it may be mounted in a bed, hollowed out spherically to receive it, and furnished with appliances for fixing it when aim has been taken; or it may be furnished with trunnions for the purpose.

In the patentee's improved mode of rifling, the segments are made with grooves in one side, and tongues on the other, both of which are formed parallel to the bore, to enable the sides to slide one within the other. On the inside of each segment, that is, on the side forming the bore, small rounded projections, to produce the rifling, are likewise made. These rifling projections or ridges may be made separately, and secured in their places in grooves, or in any other convenient manner; or they may be formed on and be part of the segments; they may likewise be made of a different kind of metal to that of which the segments are made, if desirable. In order to keep the segments in their proper places, they are secured by collars, rings, or bands, half bands or clips, which may be either plain or screwed on the inside. If half bands or clips are used, they must be furnished with lugs, through which screw bolts are passed. The nuts for screwing these bolts have handles placed vertically on them, for facilitating the screwing and unscrewing of the same. Rings may be let in and screwed to the ends of the segments for additional strength.

PROPELLING.

John Robb, *Aberdeen.—Patent dated October* 25, 1858.

In arranging his improved propeller the patentee has, to a certain extent, followed a natural example, and given it the motion of the foot of an aquatic bird. In urging the vessel forward it thus acts with a direct thrust upon the water, the whole of the superficial area of the propeller being brought into effective action, and as it may be placed as low down as the keel, it exerts a most powerful propelling force, so as to drive the vessel through the water with rapidity and ease. In the subjoined engravings we have shown two examples of the patentee's improvements; figs. 1 and 2 are elevations showing a direct action propeller open and closed. In this modification the propeller shaft, A, has hinged to it at B, two floats or wings, C, which move freely to and fro within a given distance. The wings are prevented from moving too far back by a stop, D, fitted at right angles to the propeller shaft. At the backward action of the propeller when it is making its thrust against the water, the floats are thrown wide open, as shown in fig. 1, but are prevented from moving beyond this position by the stop, D, so that throughout its stroke it exerts its full force upon the water. At the return stroke, when the propeller is drawn forward preparatory to making another thrust, the wings, C, close to in the position shown in fig. 2, they are, however, prevented from shutting quite close by means of the stop, E, the lower extremity of which is widened out to a wedge-like form. This stop is fitted in a groove at the upper part of the propeller, and is arranged to prevent the wings, C, from closing beyond the predetermined point, as shown in fig. 2. In the arrangement or modification, illustrated in side elevation and corresponding plan in fig. 3, the floats or wings, A, which are there shown as composed of wood, in lieu of metal, are hinged to one side only of the propeller shaft, B. This modification is intended to be worked at the sides of vessels. The shaft, B, slides to and fro longitudinally in the bearings, C, secured to the hull of the ship, some distance below the light water line, so that the propellers in all cases will be entirely submerged. In front of each float or wing is fitted on to the shaft an inclined projection, D, for the purpose of keeping the floats at a slight angle, or just sufficiently open, when in their closed position, as to enable them readily to open fully, when the resistance of the water acts against them on the forward thrust of the shaft. The arms or stops, F, are bolted or otherwise secured to the propeller shaft, which, for the sake of lightness and of affording a more ready means of hinging the floats or

Fig. 1

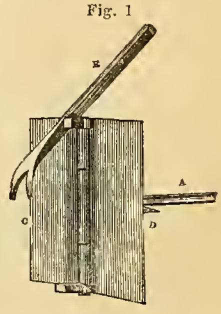
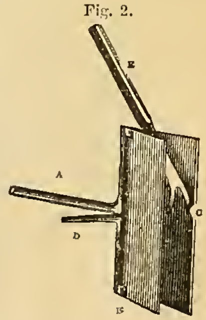


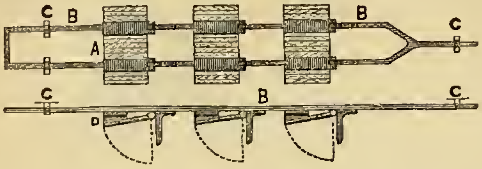
Fig. 2.



wings, is made double, or in the form of an open frame, at the part where the floats are connected.

The action of this propeller, being more direct than that of a paddle-wheel or screw, is not subject to the same amount of slip, and with less

Fig. 3.



power is more effective than either. At same time the motion of the vessel is much easier, the power being all expended in lines parallel to the keel, and consequently not calculated to give that vibratory and disagreeable motion resulting from the use of paddle-wheels and screws. The motion, indeed, is an imitation of nature in swimming-birds and fish, and on trial is found to be as gentle and easy as that of a fish or bird.

FIRE ENGINES.

Francis Fowke, *Kensington.—Patent dated September* 15, 1858.

This improved engine consists of a pair of single acting force pumps, fitted with metal valves and a suction and delivery air vessel; and to insure the proper action of the suction air vessel, an additional valve is provided. The pistons or plungers are connected to the slings by a joint in the centre of the body of the plunger, so as to prevent any objectionable vibration, by which the ordinary guide rods are dispensed with, and the pistons are enabled to be instantly withdrawn, thus affording immediate access to the suction valves. The delivery air vessel is so constructed that, by unscrewing the part to which the hose is fastened, immediate access is also obtained to the delivery valves. The pumps are fixed direct to a wrought-iron cranked axle, mounted on two high running wheels, and having a wooden pole attached, to the end of which a cross bar is fitted, which serves as a drag-handle when the engine is drawn by men, and when working, rests on the ground, with two or more men standing on it, their weight preventing the engine from moving. The wrought-iron frame for working the pumps, is fitted with swivel sockets to receive the working handles, which are parallel with the axle when in use; and when not in use, placed at right angles to it, being still supported by the swivel sockets, and serving as poles to carry the suction pipes. The fore-carriage may be detached from the engine, and may consist of a pair of high wheels, mounted on an axle and suitable shafts, with driving seat, footboard, and box to contain implements. The axle may be fitted with a reel, which revolves freely upon it, and on this reel the whole of the hose is coiled. When used merely as a hand engine, the fore-carriage may be dispensed with, and the hose and implements placed on the engine.

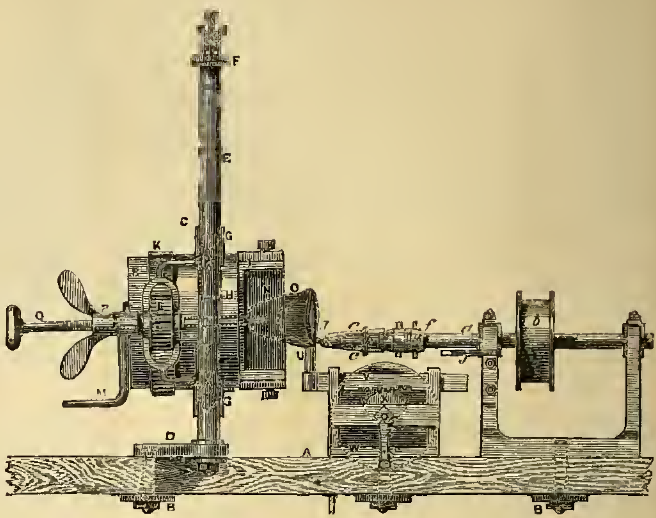
BOOTS AND SHOES.

W. H. Henry, *Sheffield.—Patent dated November* 29, 1858.

The patentee's improvements relate to a peculiar construction, arrangement, and combination of apparatus or mechanism for inserting the screws employed in some cases for attaching the soles and heels of boots and shoes to the upper leathers, and also to a novel form or construction of fastenings to be employed for such purpose.

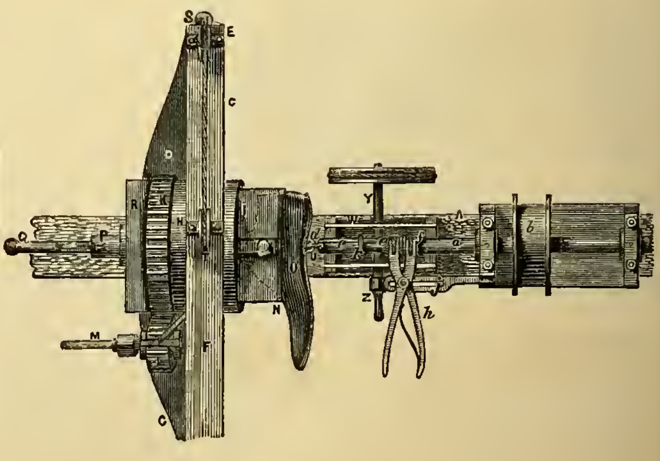
Fig. 1 of the subjoined engravings represents a side elevation of the patentee's boot and shoe screwing apparatus complete. Fig. 2 is a corresponding plan of the same, and fig. 3 is an end elevation of the holding frame. The apparatus is divided into two main parts, namely, the shoe holding and actuating frame, and the screw inserting mechanism. A, is a table or foundation similar to an ordinary lathe bed, upon which the various parts of the apparatus are fixed by means of bolts and nuts, as shewn at B; C, is the boot or shoe holding frame; it consists of a base plate, D, having a vertical column, E, secured to each extremity, the upper ends of which columns are connected by the cross bar, F. The columns, E, form the two guides for the vertically sliding frame, G, fitted at each corner with a sliding brass or bearing, and provided with adjusting nuts for the purpose of regulating to a nicety the width of the frame, G, and to allow of its sliding freely and steadily between its two guiding columns, E. Within the frame, G, is fitted, to slide freely in a horizontal direction, the hollow cylindrical holder, H. On the upper and under surfaces of this cylindrical holder are fitted sliding blocks, *i*, and *i*[1], which are grooved or channelled to fit on to the horizontal rods or bars of the frame, G, and so admit of the holder being slid to and fro therein in a lateral direction. Within this holder, H, is inserted a second holder, I, which is also of a tubular or hollow cylindrical form. This inner holder fits accurately inside the outer holder, H, and is capable of turning round therein as in a bearing. For this purpose a toothed wheel, K, is secured

Fig. 1.



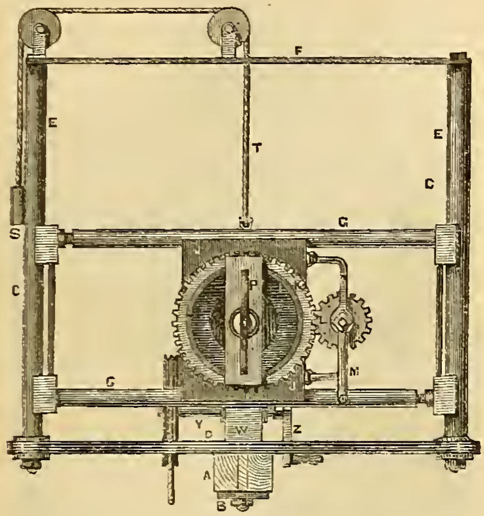
on to the end which protrudes through the outer holder, and is driven by the pinion, L, worked by the winch handle, M. The opposite end of the inner holder, I, is formed to receive a block of wood, N, which pivots between two screw centre pins, so as to assume any angle required. Within a recess in the block, N, is placed the last, O, of the boot or shoe requiring to be screwed. The last is held firmly fixed in its place in the block by means of the spindle, Q, passed inside the tubular holders, and having its point screwed and made similar to a gimblet. The point is inserted well into the body of the last, and the latter tightened up in its recess by turning the hand nut, P, working over a screw thread cut in the spindle, Q, and bearing against a cross-bar, R, (through which the spindle passes,) placed across the mouth of the holders. The weight of the vertically sliding frame, G, and of the sliding holders, H and I, con-

Fig. 2.



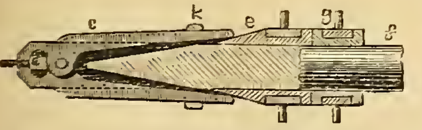
tained therein, is balanced by a counter weight attached to the cord, T, which is secured to the upper bar of the frame, G. The last is carried in a block pivoted in a tubular holder, which latter is capable of being rotated, whilst the block is capable also of receiving an angular adjusting motion between its two centre pins. The holder is also free to be slid to and fro laterally in the frame, G, and finally the frame, G, has a vertical motion imparted to it, as required, between its guiding columns, E, E. An angular adjusting movement of the outer holder, H, is also allowed for by having one or other of the sliding blocks, *i i*[1], connected therewith by a slotted lug and screw pin at *i*[1]; the screw pin is screwed into the holder, H, and is free to move along the slot in the lug. By raising or depressing one end of the holder, H, the screw pin will move along the slot in the lug at i^1, and will thereby admit of the holder being placed at a slight vertical angle, as shown in fig. 1. These several movements or adjustments of the boot or shoe holder, whether brought into play singly or in combination, admit of the boot or shoe assuming any angle required, so as to allow for the curvature of the sole, and admit of the fastenings being inserted therein as nearly as practicable in a radiating direction to the curve of that particular portion of the sole into which such

Fig. 3.



fastenings are being introduced. A metal plate is laid upon the bottom of the last to prevent the entrance of the screw fastenings into the wood of the last. Upon this metal plate is placed the inner sole, and over that again the outer sole, the edges of the uppers being folded in in the usual manner between the inner and outer soles. The last thus prepared is now placed in the block in the holder and secured firmly therein, in readiness for the operation of the screwing mechanism. In order that the parts of the sole and upper be well pressed together at the point of insertion of the fastening, the patentee employs a rest, U, which consists of a tool having a shoulder or projection formed thereon, upon which rests and moves the edge of the sole of the boot or shoe, whilst the vertical part, *v*, presses against the face of the sole at the point of insertion of the fastening, and thereby keeps the parts well together. This rest is fitted into a suitable socket in the end of the horizontal bar, V, which is carried by the head stock, W, and is formed into a toothed rack on its under side, the teeth of which gear into the toothed segment, X. This segment is fast on a spindle, Y, which carries a winch handle, Z, at one end, and a grooved pulley at the other; over the periphery of the latter is passed a cord with a counter weight, which by actuating the segment, X, causes the bar, V, to advance and press the rest, U, firmly against the sole. This pressure is removed when requisite, by partially turning the winch handle, Z, which is convenient to the hand of the attendant. The actual screw inserter consists of a spindle, *a*, capable of sliding freely in its bearings in a longitudinal direction, and fitted with a driving pulley, *b*, and nippers, *c*. The construction of these nippers will be better understood on referring to the enlarged detail sectional views of the same at fig. 4. It will be here seen that the end of the sliding spindle is slotted or cut away sufficiently to admit the two arms of the nippers, *c*. The jaws of the nippers are curved in such a manner as to enable them to pass over and work in front of the transverse piece of metal, *d*, allowed to remain in the spindle for the purpose of forming a bearing, against which the end of the fastening is brought when placing it in the nippers, and for assisting in pushing the same forward into the sole, the simple office of the nipper jaws being to hold the fastening sufficiently firm to screw it in to the sole, but not to exert any end pressure thereon, the whole of which is exerted by the transverse piece, *d*, before referred to. The point of insertion of fastening is regulated by the notch in the vertical projection, *v*, in the rest, U, the fastening being always directed by the spindle, *a*, through the centre of the lower portion of the notch. The gripping action or closing of the nippers is effected by the wedge-shaped or bevelled sliding collar, *e*, which by being slid towards the end or nozzle of the spindle, expands the arms, *c*, of the nippers, and causes

Fig. 4.

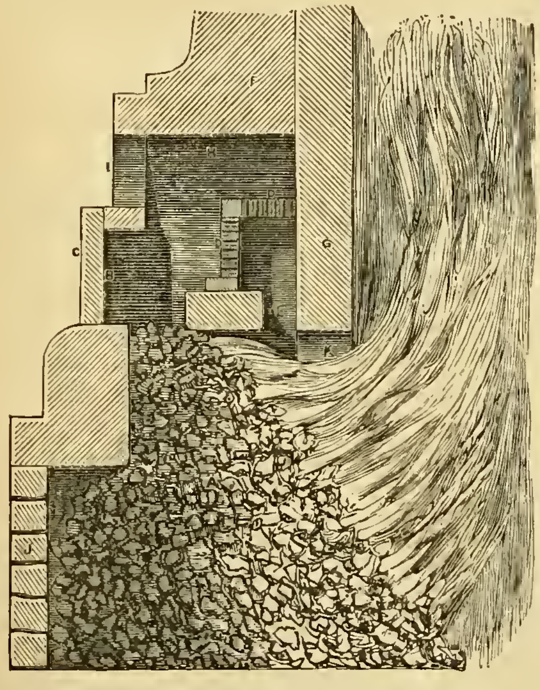


their jaws to close and grip the end of the fastening. This bevelled collar is fitted on to the spindle in such a manner as to revolve with the spindle and nippers, whilst at the same time it is free to slide longitudinally on the spindle. This sliding motion may be obtained by various mechanical contrivances, as will be obvious to the practical man, but the means which the patentee prefers adopting are those shown in fig. 4. There is a fixed collar, *f*, fitted or formed on to the spindle behind the bevelled collar, *e*, and both these collars are grooved to receive the semicircular brasses or bearings, *g*. These brasses are each provided with a stud pin, which pins are inserted into the slots of the forked or double jawed plyers, *h*. These plyers slide along and are guided by the slotted guide bracket, *j*, screwed to the screwing headstock. As the collar, *f*, is stationary as regards longitudinal motion, it follows that when the jaws of the plyers are opened or expanded by the workman compressing the arms or handles of the same, the bevelled collars will be slid forward slightly, according to the amount of opening of the plyer jaws, and will consequently close or tighten the nippers, and thereby firmly hold the head of the fastening; the workman then carefully brings the point of the fastening through the notch in the rest and against the sole by sliding the plyers (and with it the screwing spindle, the collar, *f*, being fast thereon,) along the slotted bracket, the spindle being rotated by a belt passed round the driving pulley during the whole operation, the rotation of the spindle speedily effects the insertion of the fastening, and when accomplished, the shoe is moved forward by the atttendant a distance corresponding to the intervals to be left between the fastenings. The screwing spindle with its nippers is then pushed back, by returning the plyers along their slotted guide bracket, and the nippers are allowed to open by the aid of the India-rubber or other spring, *k*, connected with the arms, *c*, which are released by the withdrawal of the bevelled collar therefrom. The patentee also shows in his drawings his improved self-entering helical or twisted shoe fastening. This fastening may be made either parallel or tapered, but preference is given to the tapered form, that is to say, the coils gradually diminishing in diameter towards the point of the fastening. A second form of shoe fastening consists of a tapered screw, having a sharp or gimblet point, whereby it enters the leather of the sole without the necessity of previous perforation. It is obvious that the heels of boots or shoes may also be secured to the soles by the machinery and fastenings before described.

LAW REPORTS OF PATENT CASES.

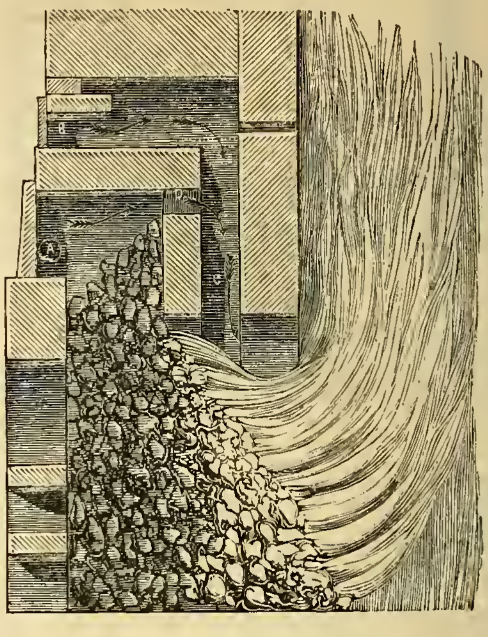
Pottery Furnaces—Smoke Consuming Apparatus—Infringement: Doulton *v.* Stiff.—This was an action in the Court of Queen's Bench, tried before Mr. Justice Hill and a special jury, at the Middlesex sittings after last Trinity Term, and it was brought for the alleged infringement of letters patent granted to the plaintiff in 1854. In February last the plaintiff filed a bill in Chancery against the defendant, for the purpose of obtaining an injunction to restrain the defendant from using the arrangement of furnaces or fire-places adopted and used by him in his pottery at Lambeth, and which the plaintiff complained of as an infringement of his patent, but upon the motion for the injunction, the Vice-Chancellor, Kindersley, directed the motion to stand over, the plaintiff being at liberty to bring an action. A report of the proceedings in Chancery will be found at p. 43, of the present volume of this *Journal*. The trial occupied three days. Mr. Bovill, Q.C, Mr. Lush, Q.C, and Mr. Webster, were counsel for the plaintiff, and Mr. Knowles, Q.C., and Mr. Hindmarch, instructed by Mr. J Henry Johnson, of Lincoln's Inn Fields and Glasgow, were counsel for the defendant. The letters patent, for the alleged infringement of which this action was brought, are dated the 11th May, 1854, and was granted to the plaintiff for his alleged invention of "improvements in kilns used in the manufacture of stoneware, earthenware, and china." The specification states the object of the invention to be an arrangement of fire-places or furnaces of kilns used in the manufacture of stoneware, earthenware, and china, so as to prevent the evolution of smoke into the atmosphere, and for that purpose, over each fire-place or furnace a fire tile or thick plate perforated with numerous holes is placed or fixed, and over that a chamber is formed to receive air, there being a slide or other means of regulating the flow of air into the chamber. By this arrangement the perforated tile or plate becomes highly heated by the fire below, and the draught of the fire being inwards to the kiln, the air passes down through the perforatious and becomes still more highly heated than when in the chamber above, and the heating of the air in the chamber may be assisted by having perforated or other plates or surfaces in the chamber, so as the air may become heated by passing in contact therewith. Drawings are annexed to the specification and a description of them given, which shew the ordinary furnace of a kiln—the perforated tiles over an opening at the upper part of the furnace—and a chamber over the perforated tiles capable of being partially closed by introducing a tile or brick, or otherwise, at an opening to the atmosphere in front of the chamber, to reduce the quantity of air passing into the chamber. And the *novelty* is stated to consist in the application and arrangement of the parts shown and described for admitting and heating the air. Since the year 1857 the defendant has been using in his pottery the ordinary kiln fire-place or furnace, with an opening at the back next the kiln, communicating with a flue descending to the lower part of the burning fuel The crown of the fire-place consisting of a double course of brick work five inches thick, and over this is an air flue with an opening to the atmosphere in front, the flow of air into this flue being regulated by a moveable brick or tile or other suitable means The inner end of this flue opens into the descending flue, down which the air passes. The defendant's arrangement did not include the perforated tiles mentioned in the plaintiff's specification, nor any contrivance of that nature. The effect produced by the defendant's fire-place was to prevent the formation of smoke. and consequently its evolution into the atmosphere. The defendant pleaded among other pleas, not guilty and want of novelty in the plaintiff's invention, and in his notice of objections delivered with his pleas, set forth as evidence of the prior publication of the plaintiff's invention the specifications following:—Charles Wye Williams, for his invention of "improvements in boilers and furnaces, and designed to economise fuel and heat," dated the 22d June, 1839. William Swain, for his invention of "certain improvements in kilns for burning bricks, tiles, and other earthen substances," dated 18th July, 1848. Richard Johnson, for his invention of "certain improvements in annealing articles of iron and other materials," dated the 31st January, 1851; and John Ferguson, for his invention of "improvements in kilns for baking or burning clay," dated the 25th July, 1853. The notice of objections besides alleging prior user of the plaintiff's invention by the before mentioned patentees, also alleged prior user by the following persons:—Stephen Green, John Northen, the Ainslie Brick and Tile Company, and others. In the accompanying engravings is shown in vertical sectional elevations the construction of the pottery furnaces used by the plaintiff and defendant. Fig. 1, is one of the modifications shown in the drawings annexed to the plaintiff's specification, and shows a section of a fire-place or furnace

Fig. 1.



of a kiln, where no fire bars are employed. A, is the fire-place or furnace into which the fuel is placed through the opening, B, to facilitate which the tile or slab, C, is taken away and then replaced; D, is perforated fire tiles over an opening, E, at the upper part of the fire-place or furnace; F, is part of the outer wall of the kiln; G, is part of the lining of the kiln; H, is a chamber above the perforated fire tiles which can be partially closed by introducing a tile or brick, or otherwise, at the opening, I, to reduce the quantity of air passing into the chamber, and, consequently, to the fire, when the coal has become ignited. There may be further perforated tiles used above those shown, to partially heat the air before it comes to those which are shown J, are bricks piled as heretofore, loosely at the lower part of the furnace or fire-place, as shown, between which air can pass to support combustion as well as down through the fuel from the chamber, H; by these arrangements the perforated tiles, D, become highly heated, and the atmospheric air is also highly heated in passing from the chamber, H, downwards through the perforated tiles into the upper part of the furnace or fire-place, and it enters above the fuel therein, and thence passes into the kiln through the opening, K, where it meets with the products passing off from the fuel, and is ignited with them as they enter the kiln. The parts of the kiln and the parts of the fire-places or furnaces shown by the engravings are similar to those ordinarily in use. Fig. 2 represents a vertical or longitudinal section of one of the furnaces or fire-places used by the defendants and which con-

Fig 2.

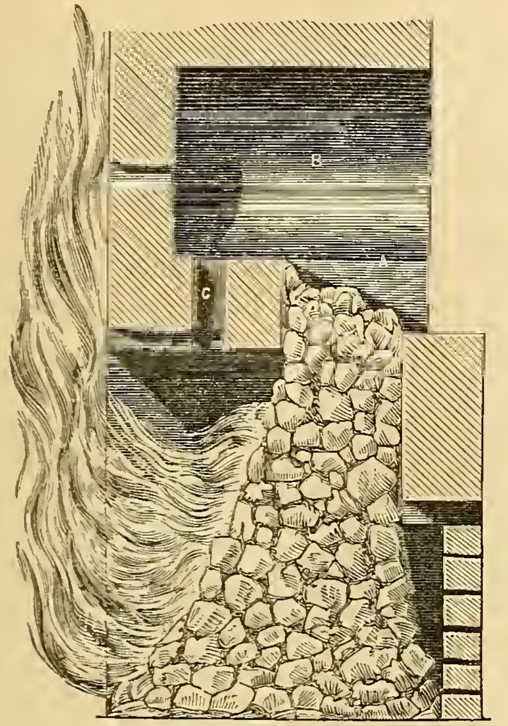


stitutes the alleged infringement. A, is the opening through which the fuel is supplied to the body of the furnace, which opening is closed when requisite by a fire tile or block. The air which supports combustion and prevents the formation of smoke by mingling with the gases as they arise from the fuel, enters by the air flue, B, and passes down through the descending flue, C, at the bottom of which it meets the products of combustion. In its downward passage this air mixes with the heated air from the surface of the fuel, which passes out by the back aperture, D, leading into the descending flue. The main supply of air is regulated by tiles placed at the mouth or entrance of the air flue, B. This air flue is constructed immediately above the crown of the furnace, and is separated therefrom by a course of five inches of brick work. The sole object of the air flue is to supply air to the fuel, which the defendant prefers to have as cold as he can get it, although it is impossible for the air to pass along the flues without becoming heated.

On the trial the plaintiff's counsel contended that the plaintiff's invention was for a combination of parts, comprehending a descending flue, referred to in the plaintiff's specification as the opening, E—perforated tiles over that opening—a chamber over the tiles and fire-place, with means in front of the chamber for regulating the admission of air therein. It was admitted that the defendant had not used the perforated tiles, but inasmuch as he had used a descending flue, an air flue (which the plaintiff's counsel insisted was an air chamber,) above the fire-place, with means in front of the flue for regulating the admission of air into the flue, the air by these means being conducted *down* to the burning fuel, and meeting the products of combustion at the same point as effected by the arrangement claimed by the plaintiff; that the defendant had used a subordinate and new and material combination of parts included in the plaintiff's invention, and by so doing had infringed the patent.

Part of the evidence adduced on behalf of the plaintiff, was a model of the old Staffordshire, furnace which was in use at the pottery of Mr. Northen at Vauxhall. Fig. 3 represents a vertical longitudinal section of the Staffordshire furnace referred to. A, is the opening through which the fuel is supplied to the body of the furnace. B, is a cavity or chamber over the fire-place entirely open in front. C, is a descending flue down which air may pass and meet the products of combustion evolved from the burning fuel, the regulation of air down this flue being effected by a moveable brick or tile at the top of the flue. It was admitted by Mr. Carpmael, a witness called on behalf of the plaintiff, that if the front of the cavity, B, of the Staffordshire furnace was closed, and means for regulating the admission of air into such closed cavity or chamber adopted in front, it would be, except in the omission of the perforated tiles and in its effect, identically the same as the furnace of the plaintiff,

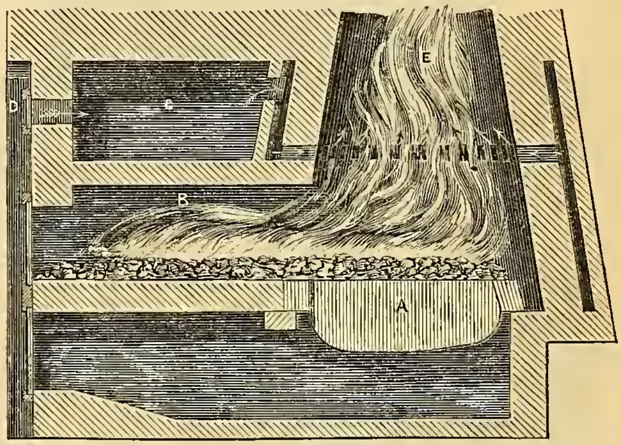
Fig. 3.



as described in his specification. The defendant's scientific witnesses, however, proved by actual experiment, and Mr. Saunderson, the Government inspector under the Smoke Nuisance Act, proved from his official experience, that the old Staffordshire kiln fire-place prevented the formation of smoke quite as efficiently as the fire-place the subject of the plaintiff's patent, and that adopted by the defendant. It will be seen, that the only material difference in the construction of the plaintiff's and the old Staffordshire kiln fire-place (omitting the perforated tiles), is that the arched chamber or cavity of the latter is *wholly* open to the atmosphere in front, but in the former, is only *partially* open in front, except when wholly closed by the regulator. The effect in preventing the formation of smoke is the same in both.

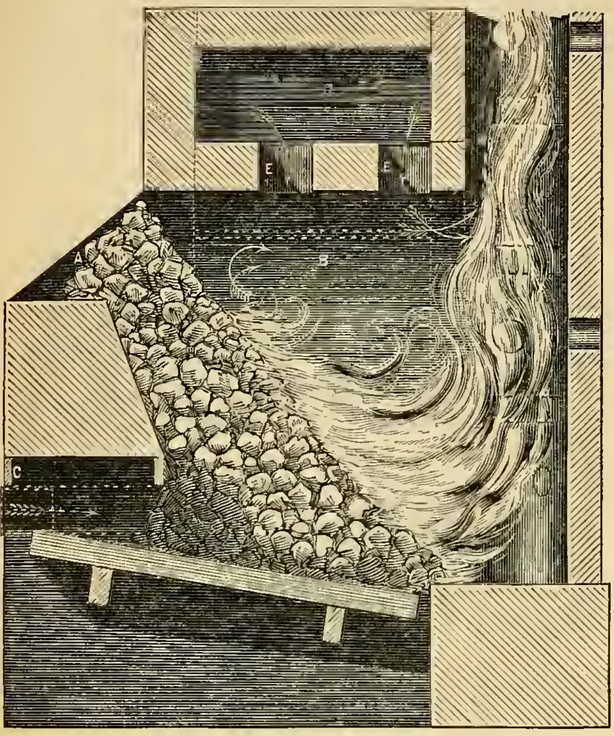
Of the prior inventions before referred to the defendant produced a model of John Ferguson's. A full description of this invention will be found in the *Journal*, vol. vii., p. 55, where it is illustrated. The object of Mr. Ferguson's invention is to prevent the formation of smoke and its consequent evolution into the atmosphere, by means of heated atmospheric air. The specification describes a kiln furnace, with a chamber immediately above the crown of the furnace, which is separated therefrom by brickwork. Air is admitted in front into passages constructed on each side of the furnace, and communicating with the chamber into which it is conducted, such admission being regulated by dampers. On quitting the chamber the air, in a highly heated state, passes through a number of interstices between the circles at the back wall of the chamber, and enters a vertical flue between the back of the furnace and the kiln, and there meets the gases as they are evolved from the fuel and arise from the furnace. The air and gases unite in the vertical flue at the point where the air leaves the chamber, and the formation of smoke is thus entirely prevented. If desirable, the specification states, the air may be admitted direct into the chamber by having an opening in front of the chamber above the crown of the fire-place, the admission of air still being regulated by dampers. It will be seen that this arrangement includes a combination of a chamber above the fire-place to receive air—means in front for regulating the admission of air into the chamber and interstices between the chamber and flue. The chief difference in the construction of Ferguson's arrangement and that of the plaintiff's is, that the latter applies perforated tiles between the chamber and flue, and the former, interstices between the bricks at the back wall of the chamber, which is between the chamber and the flue; and in operation there is this difference, that in the whole arrangement, the air on quitting the chamber and passing through the perforations, pursues a vertical *downward* course to the gases, and impinges upon them as they pass from the fuel in a *horizontal* direction to the kiln, whereas in Ferguson's the air on leaving the chamber and passing through the interstices, takes a *horizontal* course, and meets the gases as they pass from the furnace in a *vertical ascending* direction. However, in each case the new compounds, after their formation, ascend into the kiln for the purpose of burning the ware. Another objection relied on by the defendant was an arrangement of kilns and furnaces adopted in 1848 by the Ainslie Brick and Tile Company at their works at Alperton, Middlesex. The object of the arrangement used by the Ainslie Company was to prevent the formation of smoke, and its consequent evolution into the atmosphere, by means of heated atmospheric air. Fig. 4 illustrates one of these furnaces. A,

Fig. 4



are the fire bars. B, an arched fire-place leading to the fire bars, and leaving an adjustable door at its outer end to regulate the admission of air to support combustion. C, is a chamber immediately above the crown of the fire-place, from which it is separated by brickwork. Air is admitted into the chamber in front by opening the sliding doors, D, which are made adjustable so as to regulate the admission of the air into the chamber. The air acquires great heat in the chamber, whence it passes into an annular space formed in the thickness of the vertical flue, E, and there receives more heat. It then enters the vertical flue horizontally, through a series of holes opening directly from the annular space into the flue, and there meets the gases as they are evolved from the fuel and rise from the furnace. The air and gases unite in the vertical flue at the point where the air enters through the openings, and the formation of smoke is thus completely prevented. This arrangement, it will be seen, includes a combination of a chamber above the fire-place to receive air—the admission of the air therein being regulated in front of the chamber by adjustable doors. On leaving the chamber the air takes a downward direction into the annular space surrounding the vertical flue. From the annular space it passes through the openings in a *horizontal* direction into the vertical flue, and meets the gases and mixes with them as they arise, and the new compounds ascend into the kiln. The comparative remarks made upon the plaintiff's and Ferguson's arrangement, both as respects their main points of construction and operation, will equally apply to the arrangement adopted by the Ainslie Company and the plaintiff. The next objection upon which the defendant relied, was an arrangement of kiln fire-places or furnaces, invented by Mr. Stephen Green in 1853, and constructed and used by him in his pottery, known as the Imperial Potteries at Lambeth, Surrey, from the month of November in that year, until the year 1857. The object of this arrangement was to prevent the formation of smoke by means of heated air. Fig. 5 represents a vertical longitudinal section of one of Mr. Green's fire-places A, is the opening through which the fuel is supplied to the body of the furnace, which opening, in practice, is completely sealed by small coal immediately after charging the furnace. B, are air flues at the sides of the furnace, shown in dotted lines, with an opening, C, at the front for the admission of air therein—such admission being regulated by conical plugs. D, is a chamber above the fire-place communicating with the lateral flues. E, are two openings or flues in the crown of the fire-place. The air entering at C, passes along the lateral flues in a zig-zag direction, as shown by dotted arrows, and enters the chamber, whence it passes *down* through the openings, E, and impinges upon the gases as they pass from the fuel in a horizontal direction to the kiln. Mr. Green's arrangement of fire-place clearly discloses a combination of parts, consisting of a chamber above the fire-place, means for regulating the admission of air in front, and a descending flue at the back end of the chamber *down* which the air passes on quitting the chamber, and impinges on the gases as they issue from the burning fuel, and unites with them and prevents the formation of smoke. The judge having summed up the evidence, left two questions to the jury. First,

Fig. 5.



was the plaintiff's invention new? second, had the defendant infringed it. The jury having retired, returned into court and delivered their verdict, and finding "that the defendant had infringed the plaintiff's patent," and "that the parts of the plaintiff's combination taken by the defendant were not new." His Lordship, upon this finding, observed that that really was a verdict that the defendant had not infringed—that the patent was a good patent including the perforated tiles, which no one could use without the plaintiff's license; but then the defendant had not taken that. The jury coincided with his Lordship's remarks, and a verdict for the defendant upon not guilty, and for the plaintiff on the other issues subject to some points reserved for the defendant, in case he should determine to move upon them.

Solidified Milk: The Desiccated Milk Company *v.* Fadeuilhe.—This was a motion in the Vice-Chancellor's Court for an injunction to restrain defendant from infringing a patent for solidifying and preserving milk, under these circumstances:—It appeared that the plaintiff, Thomas Shipp Grimwade, took out a patent in 1855 for preserving and solidifying milk, which was effected by the following process:—The milk, being mixed with certain proportions of alkali and sugar, was then evaporated by being placed in a square tin tank with a chamber beneath containing hot water, and constantly agitated by means of a crank and quadrant beneath, until the mass became of the consistence of dough. This dough was then dried into hard cakes, which were again crushed between powerful granite rollers and bottled, the bottles being closely stopped. It was then fit for use. The defendant, Valentine Bernard Fadeuilhe, was the assignee of a patent taken out in 1848 by Felix Hiacynthe Folliet Louis, whose process was of this kind:—Sugar and alkali being mixed with milk or with curd turned in the ordinary mode by rennet, it was placed in circular pans with false bottoms, communicating with three upright hollow standards, and a reservoir at the bottom, into which, by means of a valve, steam was introduced, and the liquid in each pan, while evaporating, was kept in agitation by means of a spindle passing through the centre of each with fluid-tight collars, to which spindle in each pan a rake was attached, the spindle being turned by a handle acting laterally upon a toothed wheel at the top of the spindle. The milk thus evaporated was formed into cakes, and the defendant, after a time, grated these cakes into powder and bottled it. This was in 1853, but subsequently to the date of the plaintiff's patent he admitted that he had dried the mass, but in ignorance of the fact that this method formed a part of the plaintiff's invention. The plaintiff, having discovered that the defendant was manufacturing and selling the article in bottles, drying it by a process similar to his, which did not form a part of the patent of Louis, filed the present bill to restrain the alleged infringement of his patent. It appeared that the plaintiff's invention had been extensively used at Balaklava, and by Miss Nightingale during her attendance on the sick.

The Vice-Chancellor observed, that as it might turn out and must be assumed that the plaintiff's patent might be invalid, unless there was a user and enjoyment for a long time, he ought not to grant an injunction. The motion must stand over, with liberty to the plaintiff to bring such action as he might be advised, an account being meantime kept.

Our older readers will recollect that we described M. Fadeuilhe's process at page 155, vol. vi., *Practical Mechanic's Journal*, and an American process of a similar character at page 213, vol. vii. It is an extremely interesting and valuable process, and as we have tried M. Fadeuilhe's manufactured article, we can answer for its excellence.

Trade Marks—Fraudulent Imitation—Damages—"Cheilley" Gloves: Cheilley *v.* Leaf and Others.—This was an action tried before the Lord Chief Justice Erle and a special jury at the London sittings after last Trinity Term, and was brought by the plaintiff, who is a glove manufacturer in London and at Paris, against the defendants, who are warehousemen in Old Change, Cheapside, to recover damages for an alleged fraudulent imitation of the plaintiff's trade mark, and for stamping the same on inferior gloves, and selling them as genuine "Cheilley" gloves. The defendants, by their pleadings, admitted the cause of action, and paid £25 into court as sufficient compensation. It appeared from the evidence that the plaintiff for some years enjoyed considerable reputation for his gloves, which produced the highest price in the market. The defendants bought gloves from the plaintiff from 1853 to 1858, and in one year to the extent of £7000 in value. In 1858, the defendants ceased to make purchases from the plaintiff; but in the beginning of 1859 they bought fifty-five dozen pairs of gloves of one Dubois, who represented himself to the defendant's buyer as having been a foreman to the plaintiff, and then acting for a person, named Hegle, of Brussels, and that Hegle's gloves were made on the system of Cheilley. Some time afterwards the defendants bought seventy dozen pairs, and on another occasion ordered 400 dozen pairs of the same sort of gloves, 200 dozen only of which were ever delivered to the defendants. All these gloves were inferior to Cheilley's. The trade mark of the plaintiff was an asterisk stamped inside the gloves, with the designation "Cheilley Jne Paris." The imitation mark used by the defendants was an eagle, with the words "*Système Cheilley de Paris.*" The defendants proved that they had ceased to sell the gloves from April last, and never had more than the fifty-five dozen—the seventy dozen and two hundred dozen on account of the four hundred dozen; that of these they had sold only ninety-three dozen, the average profit per dozen of which was about 2s. 6d., and they doubled that, and paid £25 into court, which they submitted was a sufficient recompense. The learned judge, in his summing up, directed the jury that they ought to give such damages to the plaintiff as they should think him entitled to for the injury to his trade reputation by the admitted fraudulent imitation of his trade mark. The jury returned a verdict for the plaintiff for £100, in addition to the £25 paid into court.

Ships' Blocks: Clark *v.* Ferguson and Others.—This was a motion in the Vice-Chancellor's Court, before Sir J. Stuart, for an injunction on the part of Lieut. Wm. Clark, R.N., the plaintiff, to restrain the defendants, Messrs. C. A. & T Ferguson and James Nash, from manufacturing or selling any blocks made according to, or in imitation of, the mode described in the plaintiff's specification, and from infringing the plaintiff's letters patent, and from using the invention of the defendant, James Nash, without the leave and license of the plaintiff, and from proceeding with an application for the grant of letters patent to the defendant, James Nash. The plaintiff's case was, that in April last he had obtained letters patent for an improved safety block, to be used in lowering ships' boats and other analogous purposes, and that before filing his specification he had employed the defendants, Messrs. Ferguson, who are blockmakers at Millwall, to construct blocks for him according to his invention. In the progress of such manufacture the defendant, James Nash, who was the foreman of Messrs. Ferguson, invented an improvement on the plaintiff's invention, and the defendants thereupon proposed that such improvement should be introduced into the specification which was about to be filed, and that in consideration of such improvement, they should be allowed a share of the profits to be derived from the plaintiff's patent. The plaintiff not having acceded to the defendants' proposal, he alleged that they thereupon threatened to manufacture blocks according to the alleged improved mode discovered by the defendant Nash, and thereupon he filed this bill, on the ground that Nash's block was only a colourable variation from his. The plaintiff's invention consists of a certain combination of mechanism, by means of which and an eccentric hook attached to the bottom of the lower blocks of a boat's tackle, the boat can be freed from the tackle by which it has been lowered, immediately on touching the water.

It was argued for the defendants, that they were willing to give an undertaking not to use the plaintiff's patent, or that the motion should stand over, with liberty to the plaintiff to bring such action as he might be advised.

The Vice-Chancellor said this was not the ordinary case of the infringement of a patent, but the litigation arose in consequence of the plaintiff not having acceded to the defendants' proposal to embody in his specification Nash's improvement. It was in the discretion of the Court as to whether it would impose on a patentee the necessity of bringing an action to establish the validity of his patent, and he did not think that that was a case in which he should make any such terms; for it was only as an after thought, and after the plaintiff had declined to accede to the defendant's proposal, that the defendants called in question the plaintiff's invention. The plaintiff was entitled to an injunction restraining the defendants from manufacturing or selling any blocks made according to, or in imitation of, the mode described in the plaintiff's specification, and from infringing the plaintiff's letters patent; but there would be no order to prevent the defendants from using Nash's invention, or from applying to the Attorney-General for a patent for Nash's improvement. Lieut. Clark obtained his injunction accordingly.

Infringement after Notice—Damages: Carter *v.* Cockhead.—This was an action for an infringement of the plaintiff's letters patent, and was tried before Mr. Potter, the secondary of the City of London and a common jury. The material facts proved at the trial were, that the defendant had used seven gas lights, surrounded with cut glass drops in imitation of the plaintiff's invention, for a period of three years after notice from the plaintiff that he was infringing the plaintiff's patent. The only question of importance involved in the action was, how far the infringer of a patent is liable in damages, if he persist in using the invention after notice of its being an infringement. The jury in accordance with the direction of the learned secondary, found a verdict for the plaintiff, damages £21, being at the rate of £1 per annum for each light used by the defendant for three years after notice of the infringement.

Type-Founding — Injunction — Vagueness of Specification — Demurrer: The Patent Type Founding Company (Limited) *v.* Richard.—This was a demurrer to a bill filed by the assignee of an invention of John Robert Johnson, for "improvements in the manufacture of types and other raised surfaces for printing," and for which letters patent were granted in 1854. The statement in the specification to which the demurrer particularly referred is the following:—"In the manufacture of type and other raised surfaces for printing it has been usual for the most part to employ compounds of antimony and lead as the metal for casting the same, and in some cases a small per centage of tin has been added. Now the object of my invention is to obtain harder, tougher, and more enduring type, etc., by employing tin in large proportions with antimony, and greatly to reduce or wholly omit the use of lead with such metals when making type, by which means the type is so hard, tough, and enduring, as to allow of its being used as a punch on the ordinary type metal now used, and the best proportions I am acquainted with are 75 of tin and 25 of antimony, but this may be to some extent varied, and when lead is also used I find that it must not exceed 50 parts in 100 of the combined metals employed, for if the lead be employed in a much larger quantitity, the hardness and toughness of the alloy rapidly decreases, and the alloy then approaches the ordinary type metal in its properties, notwithstanding the presence of a considerable quantity of tin. When the antimony is tolerably pure the best proportions are as given above, one part of antimony to three of tin, or tin and lead, but when it contains other metals I find that the quantity of antimony should be diminished, or which is preferable, the metal should be repurified. If this be not attended to, the alloy, though of great hardness, does not possess the tenacity or hardness necessary for type of extreme durability." The defendant demurred to the bill, on the ground that the specification as set out in the bill was so vague, as to render the patent void, and at all events to deprive the plaintiffs of any title to relief upon it in equity. The Vice-Chancellor (Wood) said, that the question to be determined was, whether the specification was so clearly and manifestly bad, that the description would not enable workmen to carry it into execution, and whether there was anything to induce the court to hold that the invention was not new. As regarded a patent depending upon proportions, the patentee was not bound to limit his claim entirely to definite proportions. There was no vagueness in this specification, by reason of its stating that the precise proportions might be varied. The vital property of the patent was a large proportion of tin as contrasted with antimony, and though some slight variation might be made in the proportions, yet that would not avoid the patent. The patent as stated on the face of the bill was not void for indefiniteness. The demurrer was overruled. The defendant's counsel obtained leave to file a plea.

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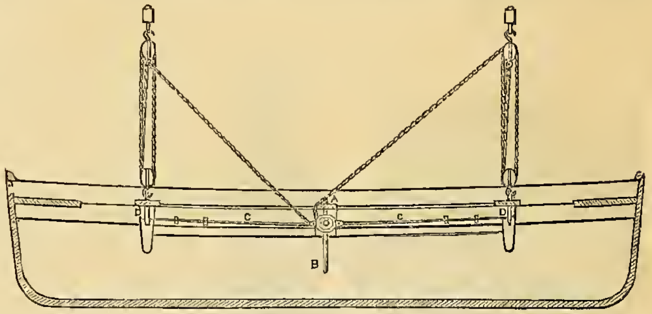
REGISTERED DESIGNS.

LOWERING BOATS.

Registered for Mr. E. H. Wood, *P. & O. S. Co.'s service, and* Mr. M. D. Rogers, *Master Shipwright, Blackwall.*

The object of Messrs. Wood and Roger's improvements is to afford safe and effectual means of disconnecting ships' boats, when lowered down within a safe distance from the water. According to this mode, the disconnection of the boat is under the control of the boat's crew, and can be effected at the most favourable moment, according to the rolling of the ship or the state of the weather. In the accompanying cut we have shown an elevation of a boat having the registered improvements applied



thereto. The boat is lowered from the davits in the ordinary manner, and whilst this is being done the lock bolt, A, is withdrawn, this liberates a transverse shaft, which is actuated by means of a pendent lever handle, B. The journals of the transverse shaft are carried in bearings fitted within the gunwale of the boat; and near its extremities are secured two discs, to which are jointed the rods, C. These rods extend fore and aft, and are guided along the boat's sides by means of staples screwed into the wood work; the free ends of the rods pass through the thimbles on the lower ends of the slings, D. When the boat is touching or sufficiently near the water, the lever, B, is pulled up towards a horizontal position, this draws the rod, C, inwards, and liberates the boat from the slings, and sets it free. In lowering the boat, if the ship is under weigh, the after tackle should be slackened out rather more than the bow tackle, so that the rudder may have hold upon the water to steer the boat off immediately from the ship's side. The arrangement is exceedingly simple, and appears well calculated to effect the object in view.

STUD BUTTON SHANK.

Registered for Mr. J. W. Scott, *Victoria Works, Worcester.*

This "stud button shank" is what Mr. Scott is now applying to his patent solid leather button, which is so important an improvement upon the old button for various purposes. This button is simply a solid disc of thick leather, moulded or cut out to an ornamental figure, and stained black or otherwise, as required; and as it does not crack or break off, it has deservedly come into extensive use. The coming off of buttons has always been a most serious difficulty, and the stud shank now introduced very efficiently provides for the evil. It is nothing more than a piece of flattened brass wire, doubled over in parallel lines close together, with an eye at the closed end. In fixing the solid leather button to a piece of leather or cloth, all that is necessary is to pass the open ended portion of the shank through its centre, and through the material on which the button is set, and the fixture is completed by expanding the two limbs of the entered shank. This gives a firm hold, and there is very little trouble about it.

SHADE FOR CANDLESTICKS.

Registered for Messrs. Brecknall & Turner, *Haymarket, London.*

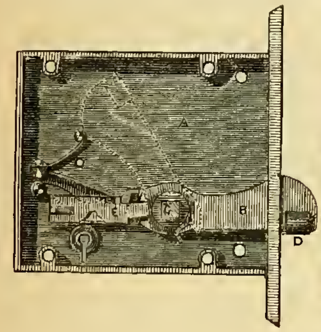
The accompanying illustration represents a design for a shade for candlesticks, recently registered for Messrs. Brecknall and Turner. The

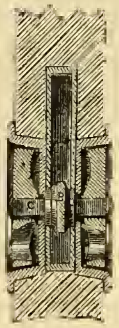
improved shade, A, is made with the upper part curved inwards in order to prevent the too sudden ingress of air, which by deflecting the flame causes the grease or wax to melt too quickly, and the consequence is that an uncovered candle, or even when protected by the ordinary shade, cannot be carried about without running over, and the too frequent spilling of the grease. The shape of the upper part of the registered shade shields the candle to a great extent from the downward flow of air, and it may be carried along rapidly without the annoyance arising from guttering, and the liability of dropping the grease or wax about the room or upon the dress. The lower part of the shade is fitted into the band or ring of metal, B, the size of which is made to fit the socket of the candlestick, to which the shade is to be applied. This improvement in the shade adds also to its ornamental appearance.

LATCH LOCK.

Registered for Messrs. Garton & Jarvis, *Exeter.*

Our illustrative engravings show in elevation and vertical section the arrangement of Messrs. Garton and Jarvis' improved latch lock. The case, A, of the lock is of the ordinary kind, but is sufficiently high to





admit of the elevating and partial rotation of the bolt, B, which is fast to the spindle, C. The turning of the spindle raises the bolt, and throws it back to the position indicated by the dotted lines in the engraving, or *vice versâ*. Each extremity of the spindle has fitted to it a flush handle which works in a case let into the door; by means of these handles the bolt is raised, or caused to catch on the roller or bolt fastener, D. In this position the bolt may be retained by means of the lock, E, which is arranged at the back of the bolt, B. When the bolt of this lock is shot forward by its key, the bolt, B, cannot be raised from the roller or bolt fastener, D. The combination affords all the security of a good lock as well as the convenience of an ordinary latch.

ADJUSTABLE VICE.

Registered for Messrs. John Walters & Co., *Globe Works, Sheffield.*

In arranging the parts of their improved vice, Messrs. Walters have sought to render the tool stronger on account of the adjustable leg passing down to the floor, which makes the vice much firmer and not so liable to strain the other leg. Also making one leg to move when required, so as to hold tapering or wedge-shaped articles securely between the jaws of the vice. Fig. 1 of the subjoined engravings is an elevation of the improved vice, fig. 2 is a front view of the lower part of the adjustable leg. The lower part or rest, A, of the tool has jointed to it the adjustable leg, B, the two parts having a crank piece between them, as shown in fig. 2. Through the upper part of this crank piece is passed a screw or pin, C, the lower part being fitted to work upon the pin, E, as a centre. When the vice is required to be used for ordinary purposes a cottar, D, is passed through the centre of the crank piece and the upper part of the rest, A. When the cottar is withdrawn the adjustable leg may be turned round with facility to suit the taper of the article to be held.

Fig. 1.

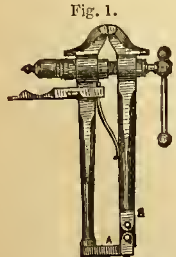


Fig. 2.

REVIEWS OF NEW BOOKS.

The Globe Telegraph: an Essay on the Use of the Earth for the Transmission of Electric Signals. By Septimus Beardmore, C.E. 8vo. Pp. 47. London: Stanford. 1859.

Mr. Beardmore's pamphlet has been written for the purpose of showing how much a M. Hoga and a Mr. Piggott have contributed to the present state of telegraphic science.

"In July, 1858," says Mr. Beardmore, "M. Hoga, who for many years has made electricity his study, remarked in a conversation with Mr. Piggott, that he thought, with an uninsulated wire and positive and negative plates apart, a current could be established sufficient for telegraphic purposes. At that time the subject of the Atlantic cable was in everybody's mouth; and the assurance that such a plan, if possible, would solve the difficulties of ocean telegraphy, led Mr. Piggott to turn the matter over in his mind. He went so far as to make some small experiments, and found that the loss of power was so little by placing the metals wide apart, that, one morning in August, he went up with M. Hoga to the Highgate ponds, and with a few hundred feet of wire, and a piece of zinc and copper, tried on a galvanometer what sort of current he could obtain. He was much surprised at the result, and considered there was sufficient evidence of a current to justify further trial.

"Shortly after, he brought the subject under my notice, explained his views, and requested me to enter into a series of experiments.

"I thought it desirable to make an experiment in the sea, and visited, with Messrs. Hoga and Piggott, Southend, in the month of September. Taking with us a quantity of copper wire, a square foot of zinc, and a square foot of copper, we got into a boat, and landed on a sequestered spot opposite Leigh. Placing the zinc in the water, and attaching the wire to a stake, we rowed along the shore for some distance, and then brought the wire on to land, and attached it to the galvanometer. Placing the plate of copper in the sea, we brought the wire from it to the other side of the galvanometer, and found, immediately we broke contact, a strong deflection. Nothing could exceed our delight. We imagined that we had found the solution of the Atlantic cable, for by this time the signals along that wire had ceased to come; and in much joy, but in a shocking dirty state from contact with Essex mud, we got back to the little watering-place.

"It was obvious that unless means could be found to get reverse currents, the application of the principle to the common needle-telegraphs was out of the question; it fortunately occurred to M. Hoga and Mr. Piggott, that a metal which held an intermediate relation to other metals would answer the purpose. I believe that the idea—which, if simple, is a valuable one—occurred to both at the same time; and that one morning they found that they had arrived at the same conclusion. Small experiments proved the truth of the theory, and every trial since has certified to its practical utility."

Further experiments were made, and a patent was obtained by the inventors in November, 1858; the essence of the scheme being stated to be the sending the currents by the earth, and using the line wire only for the return currents, instead of the converse as in general use; and this arrangement was termed the "globe telegraph."

By working on their principle, Messrs. Hoga and Piggott conceive that they can render the existing Atlantic cable quite serviceable, the cable being used for the return currents solely. In the present undecided and transitionary condition of the telegraphic question, Mr. Beardmore's essay will be read with interest.

A Letter from Captain Blakely, H. P., Royal Artillery, to the Secretary of State for War, claiming the Original Invention of an indispensable feature of the Armstrong Gun, with an authentic description of that weapon. 8vo. Pp. 54. London: Ridgway. 1859.

"In 1854," says Capt. Blakely, "Sir Wm. Armstrong and myself, independently of each other, discovered a method of making a much stronger cannon, from the same quantity of metal than is possible by the ordinary plan. Sir William has since proved the truth of the theory at the country's expense, *I at my own*, after taking a patent. Directly the Armstrong gun was definitely adopted, I wrote to General Peel, informing him of my patent rights, and I at the same period mentioned to several friends, that I had a patent for certain *indispensable* parts of Sir Wm. Armstrong's guns. As General Peel did not make up his mind before quitting office, as to the justice of my claim, much time has now elapsed, and many persons argue from that, that it must have been unfounded; on the other hand, others who know I forestalled Sir William in the discovery of the one great principle, erroneously believe I have forestalled him in other points. Justice, to him, therefore, no less than to myself, demands that the exact truth should be made known."

To these alleged facts, and to this view, we owe the appearance of the present letter. In it, the author shows that in February, 1855, he applied for a patent for "forming guns with an internal tube or cylinder of cast iron or steel, enclosed within a casing of wrought iron or steel." And he adds, that in his final specification he mentions that the outer casing might be applied in the shape of collars or rings, heated and shrunk upon the cylindrical surface of the inner tube—the internal diameters of such rings, previous to being heated, being so much smaller than the external diameter of the inner tube on which they are shrunk, that after being cooled, the outer casing formed by the rings is in a state of tension or permanent strain. In February, 1859, Mr. W. G. Armstrong, now Sir W. G. Armstrong, applied for a patent for "forming guns with the internal tube or cylinder of wrought iron or gun metal in one piece, surrounded by one or more cylindrical casings of wrought iron or gun metal, shrunk upon the internal cylinder."

This is Captain Blakely's case, and he now writes to endeavour to show that Sir W. Armstrong has simply plagiarized his plans, and by such plagiarizing, has achieved knighthood and various pecuniary advantages. This may be, but we doubt very much if the plans of either of the disputants were novel at the time of their production. We are, at any rate satisfied that no one point of importance in the Armstrong gun was in any way novel when the patentee divulged it. "Opportunity" well spelled, may do wonders. The present case affords, perhaps, the best case of the kind on record.

CORRESPONDENCE.

NORTH COUNTRY COAL BURNT IN STEAMERS WITHOUT SMOKE.

As you are aware, I have long endeavoured to show that with boilers properly constructed steamship owners would find that north country coal is very much superior to Welsh for all sea-going purposes, and that in the great majority of boilers now in use a very large proportion of the primary elements of the fuel is wasted and rendered destructive to the boilers, instead of generating steam. In illustration and further confirmation of these statements, I beg to give you the results obtained from two new boilers we have lately fitted on board steamers—the *Countess of Durham* and *Viscount Lambton*. The former boilers in both ships had only been in use for three years, and could not be called old; and that there may be no room for cavil or doubt, I give you an extract from a letter received from the Earl of Durham's engineer, Mr. R. P. Clark, who writes thus:—

"The consumption of coals in the *Countess of Durham's* old boiler for the average of four voyages, was 58½ tons per London voyage, with new boiler it is about 39 tons per voyage; but with the last alteration of bars, which has hardly been fairly tested yet, having only gone one voyage since, I expect the consumption will be below 39 tons per London voyage. The captain of the *Viscount* says his consumption with old boilers was 68 tons per London voyage; with the new boiler it is 35¾ tons per London voyage."

In reference to this last it is but right to say that the principle of superheating steam was carried to a larger extent in this steamer than in the *Countess of Durham*, and to that, as well as being fitted with an improved form of propeller, must be given a share of the increased economy obtained. In both these new boilers, I may remark that the fuel is consumed without the production of smoke.

Much has been said about the enormous expense attending screw colliers and screw steamships generally, but if we are to take the above as a specimen of the manner in which fuel has been thrown to the winds, simply from the fact that boilers have been constructed upon a false principle in detail, and if by the above fact such a direct amount of economy can be obtained by the substitution of correct principles to their construction, independent of the indirect and collateral saving, I may be pardoned for saying that steamship owners need not despair of making this kind of property both a profitable and satisfactory investment.

Geo. W. Jaffrey.

Hartlepool Iron Works, August, 1859.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ASSOCIATION OF FOREMEN ENGINEERS.

August 6, 1859.

At this meeting, a paper on the "rifle musket," was read in lieu of one on "superheated steam," which illness prevented a member producing. Mr. Joseph Newton, Royal Mint, presided on the occasion.

The anniversary dinner of the Society was fixed for the 7th September.

MONTHLY NOTES.

MARINE MEMORANDA.

The *Shannon*, West India Royal Mail Company's steamer, recently built and fitted out by Messrs. R. Napier & Sons, Glasgow, has now been put into commission. This fine vessel has two side-lever engines, of the collective capacity of 774 horse-power; the cylinders are 97 inches in diameter, with 9 feet stroke. She has tubular boilers, with 24 furnaces (7 feet by 2 feet 4 inches each), and is fitted with feathering paddle-wheels, 36 feet diameter over the floats. Her principal dimensions are as follows:—Length over all, 342 feet; length of keel and forerake, 330 feet; length on load line, 327 feet 6 inches; breadth of beam, 44 feet; depth of hold, from floor to spar deck, 35 feet; tonnage (builder's measurement), 3,092; registered tonnage, 2,187; gross registered tonnage, 3,500. She will carry 1,450 tons of coal. On her trial at Southampton her average rate was 14½ knots per hour; revolutions, 20¼; average pressure of steam, 21 lb. to the square inch; vacuum gauge, 24 inches. Strong S.S.W. wind blowing all the time. Her draught of water at starting was 17 feet 3 inches forward, and 17 feet 5 inches aft; wheel immersed, 6 feet 9 inches. She is flush-decked, and has accommodation on the main and saloon decks for about 280 first-class passengers, besides a proportionate number of second-class. The ship is provided with Dr. Normandy's patent distilling apparatus for the supply of fresh water, and two of the boats are fitted with Clifford's lowering tackle.

The perils through which the screw steamer *Edinburgh* passed on her last voyage from New York gives us a little insight as to the probable cause of the silent disappearance of the *President*, *Pacific*, *City of Glasgow*, and other ships, of which not a vestige ever reached the shore. The *Edinburgh* struck upon an iceberg on the port side, about forty feet from the bow, producing a tremendous indentation in her plates. Luckily her bulkheads kept her afloat, and she was taken into St. John's, Newfoundland, for temporary repairs. Here the bulkhead at the part was strengthened; and for this purpose it was lined with two partitions of strong planking firmly joined to it, and substantially caulked. Along this partition were placed three cross beams, against which shores of great strength were fastened, thoroughly propped against the next bulkhead and the ship's beams. The leakage through the bulkhead was easily carried off by a pipe attached to one of the engine pumps. In the fore-steerage the precautionary measures adopted are also worthy of observation. Between the deck beams were placed strong wooden planks as supports, so that neither of the decks in the fore-compartment would yield when the ship heaved. As an additional prevention against any sudden bursting of the decks by the force of the water, four square wooden ventilators were made, leading from the fore-steerage to the lower hold, and by this means air, spray, or water got vent, and relieved the pressure on the decks when the ship rolled. The fore-orlop deck was planked off from the other decks by erecting a strong partition between the hatches, which, for the time being, assumed the appearance of a pit shaft. The water by this means had ample outlet, and bubbled and burst up this shaft and up the ventilators during the passage with tremendous force. Previous to starting from St. John's, the chain cables were all taken aft, and the bow considerably lightened. There was, however, about seventeen feet depth of water in it during the passage, so that an idea may be formed of the perilous nature of the voyage home.

Messrs. Napier & Sons, of Glasgow, have received orders from Government to proceed with the construction of 18 pairs of marine engines of various sizes. This is the largest order of the kind ever executed on the Clyde. We do not know the price at which they are to be made, but we are told that it is very low.

Messrs. Burns, of Glasgow, and MacIver, of Liverpool, have contracted with Messrs. J. & G. Thomson for a paddle steamer for the Glasgow and Belfast Royal Mail service, and which is expected to surpass in speed anything which has as yet been attempted in steam navigation. They have also contracted with Messrs. Denny, of Dumbarton, for two clipper screw steamers for the Glasgow and Liverpool trade, and with Messrs. Napier and Messrs. Thomson for four large screw steamers for the Mediterranean service.

Messrs. Pearse & Lockwood, of Stockton, are about to put the use of steel in the construction of ships, to an extensive test. The craft is a Government barge, 372 feet long, to be used for the conveyance of troops to and from West India stations.

During the year 1858, 28,259 vessels, of 7,829,613 tons, entered inwards at the twelve principal ports of the United Kingdom; while 25,550, of 7,481,325 tons, cleared outwards. The respective number of vessels entered inwards was as follows, viz.: London, 11,172 vessels, of 2,961,309 tons; Liverpool, 4,512, of 2,320,334 tons; Hull, 2,845, of 651,476 tons; Bristol, 850, of 200,068 tons; Newcastle, 4,590, of 712,235 tons; Southampton, 1,020, of 299,380 tons; Leith, 1,229, of 175,165 tons; Glasgow, 495, of 127,594 tons; Greenock, 269, of 98,369 tons; Dublin, 565, of 119,748 tons; Cork, 405, of 98,348 tons; and Belfast, 307 vessels, of 65,587 tons. Although this statement does not include our great steamboat traffic, it yet tells us a satisfactory story of our general marine traffic.

New Life Boat at Whitburn, Durham.—The National Life Boat Institution does not slumber. It has just sent a new boat to Whitburn on the coast of Durham. The boat, which is 32 feet long and 7 feet 10 inches wide, is on the design of Mr. James Peake, and was built by the Messrs. Forrest, of Limehouse. Having been capsized by some tackling attached to a crane, her self-righting power was found to be perfectly effective. The water the boat thus shipped was self-ejected through six relieving valves in 25 seconds. With her crew of 13 men and gear on board, her line of flotation was found to be 5½ inches below the deck; 23 men had to rest on the gunwale or side of the boat before it touched the water's edge, an evidence of the boat's great stability or power against capsizing. The trial was in every respect satisfactory, and reflected much credit on all concerned in her construction. The boat is accompanied by an excellent transporting carriage, and a full equipment of stores, including cork life belts for each man of her crew. The coast about Whitburn figures extensively on the chart with wrecks, and the new boat must be a great boon to the stormy Durham shore. We have already had 937 wrecks on our coasts for the first half of this year. In January there were 177; in February, 165; in March, 151; in April, 159; in May, 110; in June, 94; and in July, 81. It is curious to see with what regularity the numbers diminish as summer comes on. But look at the number, 937, and then think what famous service the Institution is rendering to the world.

Magnitude of the Public Works of the United States.—It has been fashionable to compare unfavourably the works of this country with those of Europe. To such an extent has this been carried that it is not unfrequently said that we have to look to England or the Continent for most of our examples. We are continually told by travellers of the great extent, beauty, and durability of the continental works, and of the enormous strength of the English structures. Now it is perfectly true that Europe can boast of the railroads, canals, bridges, and aqueducts unrivalled in the world for beauty and excellence of workmanship and design, but it is equally true that America can point to works of utility that, in the magnificence of their proportions, are not exceeded anywhere. The Julian aqueduct, of Rome, is two miles longer than the Croton aqueduct, of New York, built by John B. Jervise and Horatio Allen, but the Croton carries more water than all the seven aqueducts of Rome put together, and more than any other aqueduct in the world, and is longer than any other, excepting the Julian. The Illinois Central railroad, built by Col. Mason, is the longest line ever constructed by one company, and in point of workmanship is equal to any European road. The National road over the Cumberland mountains, built by the United States Engineer Corps, is more extensive and durable by far than the Appian Way.

The stone arch over Cabin John's Creek, on the Washington aqueduct, built by Captain Meigs, is about fifty feet greater than any other stone arch in the world, and is more beautiful in proportion than the arch over the Oca, so long celebrated for its magnificence. The tunnel built by Mr. Haupt, on the summit of the Pennsylvania railroad, was a more difficult work than the tunnel under the Thames. The structures on the Baltimore and the Ohio railroad at Harper's Ferry, and beyond the summit, built by Latrobe, and the Starrocca viaduct, on the New York and Erie railroad, built by Julius Adams, are equal in magnificence and excellence of workmanship to anything Brunel ever did in England, or Morin in France. The suspension bridge over the Niagara river, at Lewiston, built by Major Serrell, is 1042 feet 10 inches in one span, and is 43 feet greater than any other single span in the world, being nearly twice as great and quite as strong as Telford's celebrated bridge over the Menai Straits in England. The United States dry dock at Brooklyn is the largest dry dock in the world by many feet. The workmanship, done under the direction of Mr. McAlpine and General Stuart, is equal, if not superior, to anything of the kind anywhere. The plates of iron used in the gates of this dock are the largest that had been made up to the time they were rolled. The flight of combined locks on the Erie canal, at Lockport, built by the State Engineers, is equalled only in one other place in Christendom—Sweden. The railroad suspension bridge, built by Rœbling, over the Niagara, is within a few feet of twice the span of Stephenson's great tubular bridge in England, the largest structure of the kind. It is 800 feet in one span, and is two stories high, the railroad being above the public highway. Nothing like this exists anywhere else. The Lighthouse on Minot's Ledge, being built by Captain Alexander, is in a more exposed situation, and, as far as proceeded with, is more securely bolted together than the famous Eddystone lighthouse in England. The bridge at Wheeling, built by Charles Ellet, is exceeded only in span by the Lewiston bridge, and is heavier than it; it is the second largest span in the world, and is much more beautiful than the Fribourg bridge, its European rival. In carpentry we are unexcelled in the world. Such structures in timber as the dry docks at San Francisco and Philadelphia, McCullam's and Col. Seymour's bridges on the Erie railroad and branches, the timber viaducts on the Cattawissa railroad, built by Stancleff, Colonel Long's bridges on the various New England railroads, and How's trusses at Harrisburg, have not their equals across the Atlantic.

Then, again, in Europe many structures are built that might have been avoided—a few hundred rods of detour would have saved the great Box tunnel. Now we maintain that the location of Sidell's division, for example, on the Erie, evinced more skill in avoiding the necessity of great structures than could be shown in building them. The stones on either corner of the Exchange in Boston, built by Rodgers, are larger than any single stone in Cleopatra's Needle, and those now being put into the United States Treasury, at Washington, are much heavier than any stone of Pompey's Pillar, or the Pyramids of Egypt.

As to the difficulties of location, there is no country where more science and skill have been brought to bear than in ours, and it is a remarkable fact that, in point of time, last year, our average travelling was faster by two and a half miles per hour than in England, comparing our principal lines with theirs, while the charges on the American lines were but little over half the English rates.

The reason why these things are not generally known is, that here we build a great work, announce its completion in the same advertisement that heralds the opening of the road, and no more is said about it, except, perhaps, what may appear in one or two scientific periodicals, where dry feet and inches, stress, strain, and torsion are discussed, and are never read except by the professional engineer.—While on the contrary, in England and France, as soon as a great work is built, and while it is being erected, pictures by thousands are published, medals are struck and circulated, glass models are made, and the illustrated newspapers show it in every stage of progress and from every point of view; the engineer is knighted, if he is not already of the nobility, and the fame of the structure is sent from land to land; while with us, as we have shown, may be found some of the most gigantic works ever undertaken that are passed by and over without hardly any notice. It is remarkable that the best popular descriptions of our own public works of great magnitude are to be found in the journals of France and Germany.—*Salem Register.*

Vegetable Leather. — At the extensive and curious works of Messrs. George Spill and Co., Stepney Green, there is now made a large quantity of what is called "vegetable leather," which is an excellent substitute for the ordinary material, and for waterproof goods. The samples which we have before us show that the basis of the fabric is a thick, close, twilled textile material, coated on the outside with caoutchouc and other matters. Either woven or felted fabrics may be used in the manufacture, and the coating of caoutchouc and other vegetable matters is so chemically treated as to defy the destructive action of the atmosphere and weather. It is made in all colours, and these are vivid and good, and the composition coating has a grain imparted to its surface in imitation of leather, this being done by engraved rollers. The makers produce very good imitations of enamelled, Russia, morocco, and other leathers, well adapted for carriage tops and aprons, linings, furniture coverings, book binding, and army accoutrements. It can be manipulated in the ordinary manner, and gilt, embossed, or varnished, whilst it is supple and glossy, and is unaffected by alkalis or oils. Nearly all the omnibuses of the London General Omnibus Company have been fitted up with aprons made of it, at the same price as the old tarpaulin ones, and certainly with far superior effect. It can be made of any size up to 300 feet long by 5 feet wide. It is said to be stronger than leather, and only one-third of its cost.

Apparatus for Expediting Postal Communication in Towns.—It is proposed that this apparatus should consist of a subterranean rectangular tube, having a division equidistant from the top and bottom, running its entire length, with a continuous line of small boxes or carriages travelling within it, and so connected as to form a kind of "endless band;" one portion travelling in the upper, or collecting division, receiving letters dropped through pillar letter-boxes, and conveying them to the central station, and the other (the distributing portion) bringing back parcels of letters to be taken off at the local subterranean stations for delivery, in the lower divisions of the tube.

Fig. 1.

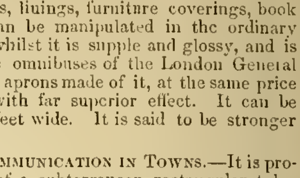
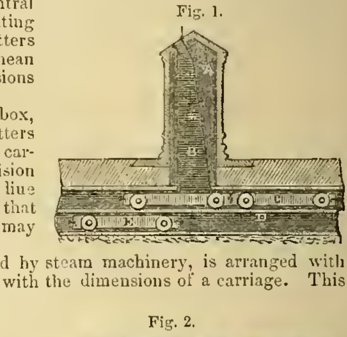


Fig. 1 represents a pillar letter-box, with a tube, b, for guiding the letters from the aperture to the moving carriages, c, which travel upon the division in the tube, d. e, is the returning line of carriages; they are so constructed that letters can be carried whichever side may be uppermost.

A drum, f, fig. 2, which is worked by steam machinery, is arranged with six planes, each plane corresponding with the dimensions of a carriage. This drum is fitted at the central station, and is to give motion to the line of carriages, and to form a terminus for the same, returning the carriages to the lower portion of the tube by an inclined plane, g. h, is a receiving box, into which the letters are thrown from the inclined box. A carriage, j, is shown in position to receive parcels of letters for transmission to sub-stations for distribution.

Fig. 2.



At the distributing station the lower division of the tube is here brought down an incline, in order to allow room for the attendant to take the proper parcel off the removing carriage.

By this arrangement of pillar letter-boxes, subterranean tube, and constantly moving line of carriages, drawn at the central station, with steam as a motive power, it is presumed that fully three-fourths of the time now occupied in transit would be saved. The carriages would be of very light construction, and travelling upon rails, the traction would be small. It is proposed that lines of tube be laid down, as nearly as possible, in right lines, radiating from the general post-office, or some central position. A convenient size for the tube and contained apparatus would be about eighteen inches. This apparatus is the invention of Mr. O. H. Hodges of Crown Street, Finsbury; and as the subject is one of high importance to the commercial community, we should be glad to see it tried upon an experimental scale.

Discovery.—All great practical discoveries are the result of much study, the exponent of a long series of observations, and often arise out of those truths of science which appeared least promising on their first announcement. The daily progress of the arts abounds in new applications of objects the most familiar. Practical, like abstract science has no limits.—*Dr. Lyon Playfair.*

Industry.—Industry is much promoted by the knowledge inseparable from ages of art and refinement; as on the other hand this knowledge enables the public to make the best advantage of the industry of its subjects. Laws, order, police, discipline, these can never be carried to any degree of perfection before human reason has refined itself by exercise, and by an application to the arts of commerce and manufacture. Can we expect that a government will be well modelled by a people who know not how to make a spinning-wheel, or to employ a loom to advantage?—*Hume's Essays.*

Hardening or Marbleising Plaster Casts.—The facility and economy with which sculptural works can be reproduced in plaster of Paris, are important practical features sadly marred by the drawbacks of extreme fragility and liability to discoloration of the material. These defects have often afforded food for remedial invention and all sorts of remedies, such as washes with oleaginous, waxy, and aluminous matters, have over and over again been tried for the purpose of infusing strength into the plaster and putting a good skin upon the surface. None of these schemes have answered. Now, however, Mr. Abate, of Naples, a man of some note as an inventor, has put within our reach a new and practically successful plan of accomplishing the desired end. According to this process, the plaster is placed in a dry condition in a horizontally revolving cylinder, to which a pipe from a steam boiler is fitted, and in this way the material is thoroughly melted by the steam, so as to produce the desired effect with a minimum proportion of aqueous matter. The steamed plaster, which is still in the form of powder, is then placed in the mould and subjected to severe hydrostatic pressure. The pressure is continued for but a few moments, and the cast is then removed. The moulded plaster in this way obtains great hardness, with a marble-like brilliancy of surface and peculiar sharpness. How Mr. Abate proposes to make his moulds we do not know, but they must be of metal we presume, to withstand the hydrostatic pressure. This appears to be a difficulty in the way of the extension of the process, as the cost of making and finishing such moulds must be too great for all works, except those for which the demand is inordinately wide spread.

Progress of Mechanical Invention.—A new class of ideas was furnished by the many wonderful effects of science in the application of the elements and mechanical powers. The people saw human intelligence so effectually inspiriting inanimate matter as to create a new and mighty order of agency, appearing in a certain degree independent of man himself, and in its power immensely surpassing any simple immediate exertion of *his* power. They saw wood and iron, fire, water, and air, actuated to the production of effects which might vie with what their rude ancestors had been accustomed to believe of giants, magicians, alchymists, and monsters; effects, the dreams of which, if any one could so have dreamed, would have been scoffed at by even the more intelligent of the former race.—*John Foster.*

Yorkshire Agricultural Society, Hull, 1859.—The Yorkshire Agricultural Society's show opened this year with a collection of 1029 implements. There was both a public and private trial of reapers, which mustered very strongly. There were eight several machines brought into the field. These were the trustees of Wm. Crosskill's (Bell's) Reaper; the Cuthbert Reaping Machines; Dr. Eddy's Patent Reaping Machine; Wood's Combined Reaper and Mower; Samuelson's Britannia Reaping Machine; Burgess and Key's (M'Cormick's) Reaper; and Wray's Reaping Machine. They were tried first on beans in which Crosskill's machine cut the roads for the others in a most effective manner. Although, of course, the performance of the different machines varied a good deal, the farmers did not look long upon them without being satisfied that the time for the general use of this machine was really come. The following is the prize list:—

Reaping machines.—The prize of £20 was equally divided between Mr. T. Watson, of Gembling, for Burgess and Key's patent, and Mr. Cuthbert, of Bedale.

Plough for ploughing six inches deep, £7, to Mr. S. Gibson, of Barton-on-Humber. for Howard's; second, £3, to Mr. Busby, of Newton-le-Willows, Bedale, for general purposes plough.

Plough for ploughing nine inches deep, £7, to Mr. Busby; second, £3, to Mr. J. Cooke, Lincoln.

Heavy harrows for three horses, £3, to Mr. Gibson; for Howard's light barrows for two horses, £3, to Messrs. Bentall, Malden.

Drill for turnips and mangel wurzel on the flat, £5 to Messrs. Coultas and Son, Grantham.

Drill for turnips and mangel wurzel on the ride, £5, to Messrs. Reeves and Co., Westbury.

Corn drill, £5, to Messrs. Coulson and Son.

Liquid manure drill, £4, to Mr. W. Watkinson, of Louth.

Broadcast manure distributor, £5, to Messrs. Reeves.

The judges also awarded £3 to Messrs. Hancock, of Gloucester, for a patent pulverising plough; £3 to Mr. Kittmer, of Fulstow, Louth, for a patent machine for blowing and sifting corn; £1 to Mr. H. Marshall, York, for a Cambridge roller with seed drill; £2 to Mr. C. Lambert, of Hull, for his metallic horse collar; £1 to Mr. Busby, of Bedale, for his steel-pointed crow-bar plough, and the silver medal of the society to Mr. Isaac Speight, of Brigg, for his horse hoe for corn and turnips. The judges highly commended Mr. Cook's (of Lincoln) light land plough, Mr. Bentall's heavy three-horse harrows, Mr. Busby's general purpose harrows, Mr. Clarke's (of Lincoln) ridge drill, and Mr. Winder's (of Sheffield) rotatory pump; and commended Mr. Cranston (of London), for Wood's reaper, and Mr. Busby, for his Northumbrian harrow.

Kincardineshire Farmers' Club Show at Stonehaven.—This was the first exhibition of stock, implements, poultry, and dairy produce, of the newly formed Kincardineshire club, and it turned out to be a complete success. The implements, however, were not so numerous as they might have been; but future shows will, no doubt, bring them out to a greater extent. John Murray, of Laurencekirk, had a number of serviceable implements for exhibition, comprising horse-rakes (for one of which a premium was awarded), oilcake bruiser, and guano breaker (both of which obtained premiums), sowing machines, turnip cutters, a very useful sack-holder, with wheels, and harrows. A double mould board plough, fitted also for a potato lifter, shown by Andrew Ritchie, Dykelands, attracted a good deal of notice. A portable rope-twisting machine, shown by Mr. R. Brown, Megray, and another by David Stratton, Farrochie, obtained prizes. A mowing and reaping machine, shown by Gardner and Lindsay, of Stirling, was commended. The following is the list of prize implements:—

Horse Rake—J. Murray, Laurencekirk.

Cake Bruiser—J. Murray.

Guano Breaker—J. Murray.

Drill Grubber—C. Wyness, Stonehaven.

Portable Rope Twisting Machine—R. Brown, Megray; D. Stratton, Farrochie.

Mowing and Reaping Machines—Messrs. Gardner & Lindsay, Stirling—commended.

Iron Bedstead—C. Wyness, Stonehaven—commended.

Turnip Sower—J. Finlayson & Sons, Gighty Burn.

Implement Cart—F. Shepherd, Millbank—commended.

American Stove—Messrs. Smith & Wellstood, Glasgow.

Farmers' Boiler—Messrs. Smith & Wellstood, Glasgow.

Harrows—J. Murray—commended.

Plough made to shift for lea or stubble—D. Waldie, Carmont.

Plough made to change for double or single board—D. Stratton—commended.

Double-mould Plough, fitted for a potatoe-lifter—A. Ritchie, Dykelands.

Sir J. S. Forbes, Bart., of Fettercairn, took the chair at the dinner, in the absence of the Earl of Kintore, and in his speech of the evening, he made some good practical remarks, which farmers and machinists would do well to lay to heart. Among other matters he expressed his desire to see the Club make some attempt at the improvement of farrier practice, and instanced the necessity of instituting a competition in making horse shoes. We are always glad to see practical hints of this kind thrown out, and it is to be hoped that in the future shows they will not be forgotten.

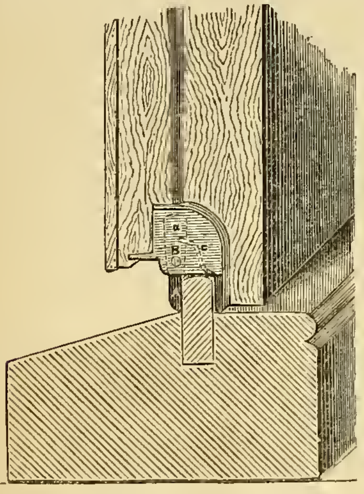
Bridlington Agricultural Society's Show.—This was the twenty-fourth annual show of the society, when £300 was distributed in prizes. The entries of implements numbered 195, or 35 more than those of last year. The following is the list of implement prizes:—F. Binnington, Bridlington, 7s. 6d., for improved patent mangles. Thomas Gardner, Bridlington Quay, 5s., for improved portable mangle. Thomas Robson, Grindale, Bridlington, 10s., for improved plough. W. Sawney, Beverley, 5s., for linseed mill (improved); 20s., for self cleaning corn screen (by Boley); 20s., for assortment of implements. Geo. Pinkney, Bridlington, 10s., for new waggon, improved; 5s., for new and improved beast turnip cutter; 20s., for No. 4 B straw cutter, improved; 5s., for large chisel tooth harrow; £2, for best assortment of implements. William Smith, Foston, 5s., for improved sheep rack. John Keddy, Bridlington, 5s., for improved horse rake. Messrs. P. and W. Smithson, Bridlington, 20s., for new waggon; 10s., for two horse cart. William Hodgson, Sewerby, 5s., for improved iron scruffler. The trustees of W. Crosskill, Beverley, 20s., for assortment of implements. John Summers, Wold Newton, 5s., for improved winnowing machine. Matthew Dale, Bridlington, 10s., for improved iron skim; 10s., for improved diagonal harrow; 10s., for improved nine-rowed corn drill; 20s., for improved 3-rowed turnip drill; 5s., for iron horse rake; 5s. for hand-power straw cutter; 20s., for Patterson's patent mill; £3, for best assortment of implements. Messrs. Puckering and Houlgate, Beverley and Scarbro', 10s., for new improved Malvern dog cart. Wm. Jackson, Bridlington, 20s., for machine for making drain pipes and tiles, and sanitary pipes. John Harrison, Bridlington, 10s., for six wood ploughs.

Agricultural Show at Serayingham, Yorkshire.—This show, which comprehends the productions of Skirpenbeck, Serayingham, Buttercrambe, and Sand Hutton, was a very satisfactory one. Mr. H. Marshall, of York, showed a large collection of cutters, mills, harrows, carts, &c. Mr. Lambert, of York, exhibited oilcake mills, harrows, troughs, forks, scythes, &c. Mr. Barker, of Dunnington, had a large show of carts, scarifiers, rakes, harrows, rollers, &c. Mr. Humphrey, of Foss Bridge, York, showed two dog carts. Mr. D. Harland, of Osbaldwick, exhibited his Yorkshire Prize Cart, which has taken prizes at all the shows in the neighbourhood. Mr. Steel, of Market Weighton, exhibited several ploughs, as also did Mr. R. Saunders, of North Cave. Mr. W. Hill, of York, showed some mangles and washing machines, which were much admired by the ladies. Mr. G. Wilkinson, of Skirpenbeck, showed a corn-dressing machine. The following is the prize list for implements:—G. Wilkinson, Skirpenbeck, 2s. 6d. for an improved corn-dressing machine. R. Saunders, North Cave, 5s. for three improved ploughs. David Harland, 5s. for a Yorkshire cart. W. Hill, 2s. 6d. for patent mangle, &c., and washing and wringing machine. H. Marshall, York, 10s.; Mr. Lambert, York, 5s.; and Mr. J. Barker, Dunnington, 10s. respectively, for a collection of useful implements.

The Royal Agricultural Society at Canterbury, 1860.—The citizens of quaint, charming, old Canterbury will have this Society amongst them next year, and they have already been bestirring themselves for sometime, to make the most of the occasion. Long and serious discussions have taken place among the city magnates as to the best locality for the show, and Barton Fields and Hales Place have had their respective pretensions put forward with considerable effect. Mr. Wightwick very properly, as we think, urged the choice of the former place, on the ground that the access for strangers to it, was through the main street; and that not only would the visitor see more of, and be more enamoured of the fine old place, but would better help the local trade by passing before the best shops, where purchases were most likely to be made. Mr. Collard, the Secretary, visited the Warwick Show to see how matters were managed there, and taking the preparations all in all, we feel satisfied that Canterbury—which, in other respects, is a most desirable place for the purpose—will render due honour to our great Agricultural Society.

The Raw Material of our Cotton Factories.—The total receipts of raw cotton in 1858 were 1,031,342,176 lb. (the largest aggregate yet reached), and of this enormous quantity, 833,237,776 lb. came from the United States, 18,617,872 lb. from the Brazils, 38,248,112 lb. from the Mediterranean, 132,722,576 lb. from British India, 367,808 lb. from the West Indies and British Guiana, and 11,148,032 lb. from other sources. The importations in 1858 from the United States were considerably in excess of any former year. In 1848 the total receipts from all countries were 713,020,161 lb., so that the trade has expanded about 45 per cent. in 10 years. The proportions of the various sources of supply in 1848 were as follows:—United States, 84¼ per cent.; the Brazils, 2½ per cent.; the Mediterranean, 1 per cent.; British India, 12 per cent., and the West Indies, British Guiana, and other countries not specified, about ¼ per cent. In 1858 the United States contributed 80½ per cent., the Brazils about 1¾ per cent., the Mediterranean 3¾ per cent., British India, 12¾ per cent., and the West Indies, British Guiana, and other countries not specified about 1¼ per cent. It thus appears that while the demand for cotton has increased in the period under review 45 per cent., the efforts made by the Manchester interest to render themselves less dependent on the United States have succeeded to the extent of about 4¼ per cent. The Americans, however, sent us last year 233,009,712 lb. in excess of the quantity they exported to Great Britain in 1848. The receipts from British India fell off very seriously last year, the diminution being no less than 117,615,568 lb. But for this circumstance the proportion of the American supplies would not have been so great. The receipts from the Mediterranean in 1858 were larger than in any former year, but the West Indies and British Guiana retrograded. From "other countries" the supplies increased considerably. The efforts of the Manchester Cotton Supply Association seem to be slowly producing the desired result. Taking the imports of raw cotton in 1858, and comparing them with those of 1848, it appears that in the ten years the supplies from other sources besides the United States, have increased 4 per cent. The demand for raw cotton has, however, increased in the ten years no less than 45 per cent., so that there is plenty of scope for further effort. The bales of Sea Island cotton from Moreton Bay, Australia, have been received at Manchester very recently.

Water Bar For French Casements.—This improvement is the invention of Mr. T. Smith, of Queen Street, Oxford Street, and is represented in our engraving in partially sectional elevation. The water bar, A, is arranged to turn easily upon its centre, B, and is kept in a vertical position when the window is open by the weight at the back part of the bar; the weighted part, *a*, is indicated by dotted lines in the figure. Upon closing the casement the catch, C, which is connected with a spring, not shown in the engraving, strikes against the iron sill bar, and this action throws the water bar, A, over the sill bar. The parts are then in the position shown in the accompanying figure, in which it will be seen that the bar effectually prevents water from flowing in over the side, and thus removes an evil attending the otherwise convenient and elegant folding casements.



Government Examinations in Science.—The following minute has just been issued from the Science and Art Department of the Committee of Council on Education:—Teachers wishing to attend the examinations of the Science and Art Department in—

1. Practical and Descriptive Geometry, with Mechanical and Machine Drawing, and Building Construction.
2. Physics.
3. Chemistry.
4. Geology and Mineralogy (applied to Mining).
5. Natural History,—

for the purpose of obtaining augmentation grants to their salaries (under the science minute of the 2d June, 1859), must send their names, addresses, and present occupation, to the Secretary of the Department, South Kensington, on or before the 31st of October, 1859. The examinations will be held in the Metropolis in the last week of November. Certificates of three grades will be granted in each subject, giving the holder an augmentation grant of £10, £15, or £20 a year on each certificate while giving instruction to a class of operatives in that subject. These payments will be in addition to the value of any certificates of competency for giving primary instruction, should the teacher have already obtained any such from the Committee of Council on Education.

Abstract Science and Practical Art.—One great duty which we owe to the public is to encourage the application of abstract science to the practical purposes of life—to bring, as it were, the study and the laboratory into juxtaposition with the workshop. It is one great object of science to bring more easily within reach of every part of the community the rational enjoyments as well as the necessaries of life; and thus not merely to contribute to the luxuries of the rich, but to minister also to the comforts of the poor, and to promote the general enlightenment so essential to our moral progress and to the real advance of civilisation.—*Mr. Hopkins' Address: British Association*, 1854.

Paper in America.—Books and Newspapers have multiplied to such an extent in the United States of America, that it now takes 750 paper mills, with 2,000 engines in constant operation, to supply the printers, who work night and day. These mills produced 270,000,000 lb. of paper last year, which immense supply sold for about 27,000,000 dollars. A pound and a quarter of rags are required for a pound of paper, and 340,000,000 lb. were therefore consumed in this way.

Reclamation of Land from the Sea.—To snatch broad acres from the sea has, very naturally always been a favourite idea with those land owners whose tracts of country fringe the waste of waters. The Earl of Leicester has just finished a gigantic piece of work of this kind upon the ground belonging to the Coke Family in Norfolk. He has secured 700 acres of what will become splendid soil, by operating upon the tract of low marshy lands near the little port of Wells, Norfolk. For this purpose a great embankment, involving an outlay of about £12,000, has been carried from the Holkham side of Wells in a straight line towards the sea, which has been, it is hoped, effectually shut out by this means from the land sought to be reclaimed. The bank forms a marine road of considerable width, is 1 mile and 132 yards long, and upwards of 20 feet in height, and it is stated that the cubic content of the work exceeds any thing of the kind attempted in England, although there are some longer embankments of a similar character. With the view of assimilating the bank to an ordinary beach, the slope next the sea for the first 15 feet of the height is five to one, while for the remainder of the elevation attained, it is only four to one. It is not expected that ordinary tides will rise higher than the point at which the five to one slope terminates; but as the tides sometimes attain an extraordinary height at Wells, flowing over the quay, and almost drowning the inhabitants, the bank has been carried up about 7 feet more. The embankment has already had the effect of increasing the scour, and consequently deepening the channel in the harbour, and it is expected that ships of a greater burden will now be enabled to get up. Mr. J. Buxton was contractor, and Mr. Arthur Saunders engineer. Further works of a similar character in the direction of Stiffhey and Blakeney, between which places and Wells about 3,000 acres await reclamation, are talked of.

Dumont's Insecticide Apparatus.—This little apparatus, which is very effective in destroying insects of various kinds, is the invention of Mr. P. Dumont, of 17 Southwark Square, London. It consists simply of a hollow India-rubber ball, fitted with a wooden jet piece, and filled with a powder, the nature of which has not been explained to us. A slight pressure upon the ball or spherical receptacle sends out a jet of the powder, and this being directed upon the insects or injected into their haunts, effects their destruction in the most complete manner.

Coal Mines in Scotland.—In the eastern district of Scotland there were 31 coal pit accidents in 1858, causing the death of 35 persons, namely, 27 men, 6 boys, and 2 women. The fatal accidents were three less than in 1857. There has only been one explosion of fire-damp causing loss of life in the eastern district, which occurred in a new pit only partially opened up, at Parkhill Colliery, near Hamilton, by which 2 men and a boy were suffocated. 19 of the fatal accidents occurred from falls of coal and roof, 5 occurred in shafts, and 8 are reported under the head "miscellaneous," of which 4 took place under ground and 4 above ground. The quantity of coal raised in this section of the country, is closely estimated at 4,598,000 tons. In the western district there were 34 fatal accidents, resulting in the loss of 36 men and 5 boys. The accidents in 1857 were 37 in number, causing 41 deaths. Of the accidents in 1858, there were 6 caused by explosions of fire-damp, which resulted in 12 deaths. A large proportion of these has been occasioned by rashness or want of consideration on the part of the sufferers themselves, although the fact of fire-damp being found in some places was quite incompatible with a due observance of the first general rule of the Mine Inspection Act, which makes it obligatory on the part of owners and managers of mines to provide a safe and efficient ventilation. The estimated produce of coal is 5,620,000 tons.

New Carbonaceous Matter for Gunpowder.—Messrs. Bickford, Smith, and Davey, the well-known safety fusé manufacturers in Cornwall, have lately commenced to make gunpowder according to a new process, the patented invention of Mr. Simon Davey, of Rouen. The new powder is intended for blasting purposes, and the chief novelty in its manufacture consists, in the employment of flour, bran, starch, or other glutinous or starchy matter, as a substitute for a portion of the charcoal ordinarily employed. The patentee considers that by this change in the constituent parts, he can produce the necessary pasty condition of the treated mass in a very easy manner, so as to enable the particles to combine thoroughly, whilst there is less danger of explosion in the combination and graining. According to the existing process, gunpowder is made by triturating together nitrate of potash, sulphur, and charcoal, the mixture being subsequently pressed into cakes and dried, and then broken up into grains of different sizes, according to the particular service for which the gunpowder is intended, the grains being finally polished by mutual attrition. In the new process, instead of grinding the powder, the nitrate of soda or potash is primarily dissolved in sufficient water to make a thick paste of the whole of the ingredients when they are added, and the mass is then kneaded to insure homogeneity. It is then rolled out in the form of paste into cakes and cut up into grains, or, whilst in a paste, it is pressed through a sieve to shape the paste into strings. As the strings exude from the sieve, they fall upon an endless cloth which traverses them slowly through a drying room, and when dried the strings are broken up into grains by a pair of rollers. In this process water is used to the extent of 30 per cent., and the coagulation of the damp strings is prevented by keeping the canvas in motion. Parties who have tried the new gunpowder in blasting, assert that there is a saving in it to the extent of 37 per cent. in weight as compared with the ordinary gunpowder. In other words, the new gunpowder, bulk for bulk, does the same work as the old material, whilst the former is 37 per cent. lighter, and therefore so much cheaper. Less nitre is used in it, and the process of manufacture is quicker than under the old system. Whilst we admit the value of the idea of incorporating carbonaceous matter in the form proposed by Mr. Davey, as being better suited perhaps for insuring a thorough admixture, we cannot quite see how he secures the other good qualities for which he contends. Perhaps the result may really be good for blasting purposes where a slow explosion is required, but we doubt if the new gunpowder will answer for other uses, such as for sporting, where rapidity of combustion is so essential. We shall be glad to hear that the improvement is right for all purposes.

An Impenetrable Safe.—One of the oddest of all odd ideas, and ingenious withal, has just come from a blacksmith of Frankfort-on-the-Maine. Despairing of contriving any lock which should be unpickable, so long as there was an approach to its wards from the exterior, this deep thinking mechanician schemed a strong box or safe, hermetically sealed from the external world, and which even the owner himself cannot open. This seems rather paradoxical, and we may therefore at once explain that it is so contrived, as to be automatically opened for the owner, from the interior, when required. There is no keyhole in it, nor any channel of communication whatever from the outer to the inner side; but inside there is an arrangement of clockwork, the hand of which the owner places at the hour and minute when he again wants to have access to the box. The clockwork begins to move as soon as the lid is shut, and opens the lock from the inside at the moment at which the hand indicates. Time, dependent upon the owner, is the key to the lock—a key which can neither be stolen from him nor imitated. This eccentric plan does certainly secure complete safety, for entry is impossible, except by a process of smashing. There is the drawback, however, that the owner must always bide his time for admittance, and if be makes a mistake in setting his clock or changes his mind, he will naturally find himself as well as the safe—in a fix.

Gas Light for Picture Galleries.—The common prejudice against the use of gas as a means of illumination—in the south of England—is the cause of very great surprise in the minds of all resident in the northern districts, who have felt the full blessings arising from this grand aid in the comforts of human life. Gas light is commonly said—in gross ignorance of course—to produce serious evils as regards oppressive heat, a bad atmosphere, and the discolouration of gilding and decorations. Perhaps the following "Report of the Commission appointed to consider the subject of Lighting Picture Galleries by Gas"—coming, as it does, from some of the first men of the time, may somewhat disabuse the public mind of its false and injurious notions.

The Commission, consisting of Professors Faraday, Hofmann, and Tyndall, Mr. R. Redgrave, R.A., and Captain Fowke, R.E.,—appointed for the purpose of reporting to the Lords of the Committee of Privy Council on Education, *On the Lighting of Picture Gallerie by Gas, and on any precautions (if necessary) against the escape of Gas, and the products of its combustion*,—having met at various times, and considered the subject referred to them, now make the following report:—

There is nothing innate in coal gas which renders its application to the illumination of picture galleries objectionable. Its light, though not so white as that of the sun, is equally harmless; its radiant heat may be rendered innocuous by placing a sufficient distance between the gas jets and the pictures, while the heat of cumbustion may be rendered eminently serviceable in promoting ventilation.

Coal gas may be free from sulphuretted hydrogen compounds, and in London is so at the present time; it then has little or no direct action on pictures. But it has not as yet been cleansed from sulphide of carbon, which, on combustion, yields sulphurous acid gas, capable of producing 22½ grains of sulphuric acid per 100 cubic feet of present London coal gas.* It is not safe to permit this product of the combustion to come in contact with pictures, painted either in oil or water colours; and the Commission are emphatically of opinion that, in every system of permanent gas lighting for picture or sculpture galleries, provision should be made for the effectual exclusion or withdrawal of the products of combustion from the chambers containing the works of art.

The Commission have examined the Sheepshanks' gallery as an experimental attempt to light pictures with gas, and are of opinion that the process there carried out fulfils the condition of effectually illuminating the pictures, and at the same time removing the products of combustion. According to the indications of the thermometer required and obtained, it does this in harmony with, and in aid of, the ventilation, and does not make a difference of more than one degree Fahrenheit at the parts where the pictures are placed, between the temperatures, before and after the gas is lighted.

Certain colour tests, consisting of surfaces covered with white lead, or with vegetable and mineral colours (especially the more fugitive ones), and in which also boiled linseed oil, magylp, and copal varnish were employed as vehicles, had been prepared, and were, when dry, covered one-fourth with mastic varnish, one-fourth with glass, one-fourth with both mastic varnish and glass, and one-fourth left uncovered. Sixteen of these have been placed for nearly two years in different situations, in some of which gas has been used, in others not. They give no indications respecting the action of coal gas (except injury from heat in one placed purposely very near to and above the gas burners), but seven of them shew signs of chemical change in the whites, due to either a town atmosphere or want of ventilation. The most injured is that from the National Gallery, Charing Cross, and the next is from a country privy; the third, much less changed, is from the House of Commons; the fourth is from the Barber Surgeons' Hall; the fifth from the Bridgewater Gallery; the sixth from the Royal Society's Rooms, Burlington House; the seventh from the British Museum.

The remaining tests hung in—

1. Sheepshanks' Gallery, South Kensington.
2. Secretary's Room at South Kensington, where no gas is used.
3. Mr. Henry Drummond's Drawing-room at Albury Park, Surrey.
4. Sealed up and kept in a closet in the Secretary's Room, at South Kensington.
5. Lambeth Palace, Vestibule of the Staircase.
6. British Institution, Picture Gallery.
7. Windsor Castle, Room with a North aspect without gas.
8. Mr. Thomas Baring's Picture Gallery, 41 Upper Grosvenor Street, frequently lit with gas.—present no observable change in this respect.

Though apart from the special subject submitted to the Commission, the Members cannot resist a recommendation that this kind of trial, which is especially a painter's experiment, should be continued for a longer period, and, indeed, be carried out on a more extensive scale.

The Commision think it right to state that they were unanimous on all the points to which their attention had been called, or which are referred to in this Report.

(*Signed*) M. FARADAY.
A. W. HOFMANN.
JOHN TYNDALL.
RICHD. REDGRAVE.
FRANCIS FOWKE, Capt. R.E.

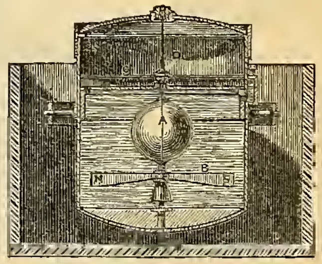
South Kensington, 20th July, 1859.

* Hoffmann.

Railways in Egypt.—Egypt now possesses the following lines: Alexandria to Cairo, 131 miles; to Mariouth, 17; to Meks, 6; to Rassateen, 3. From Tanta to Samanud there is a railway for 21 miles; from Cairo to Suez, 91; to Barragd, 15; to Beni Sueff, 76—in all 360 miles. Besides these there are smaller branches, from Cairo to the Citadel and Kasr Nin; from Samanud to Mansoura and Damietta, from Damanhour to Afte, which last extends to Rosetta. The mileage of these minor lines is not accurately known. The bridge of Kasr Zayat across the Nile which will not be completed before next June promises to be a splendid work. When the railway system is properly developed our government will save £20,000 per annum in the expense of forwarding the Indian mail.

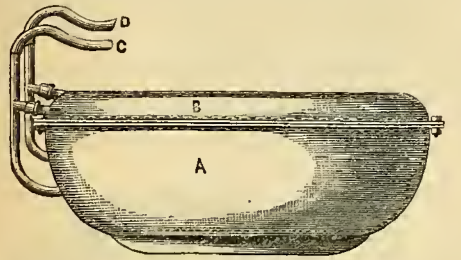
Russian Adaptations of Felt.—In Russia, felted fabrics are used to such a wide extent, that in the depots of St. Petersburg, which are as gay as flower gardens in full bloom, articles made of it are to be found ranging from the delicate white boot of a lady, to a portable bath. This manufacture has attained great perfection, and is acquiring considerable renown. The prettiest things are made of it, such as vases, jugs, toilet sets, candlesticks, waiters, baskets, card-racks, fire-screens, foot and other baths, &c. They are light, and will bear a good deal of rough usage without cracking, for they do not break. The felt appears to be covered with some composition which hardens like clay; upon this any design may be painted, and the whole polished. Foreigners in St. Petersburg patronise this new and elegant ware very largely. It is most valuable in a nursery for instance, instead of crockery-ware, from which so many accidents arise by its being broken.

Hydrostatic Compass.—Messrs. Buss and Adkins, of the Admiralty chart office, 3 Upper East Smithfield, have recently obtained letters patent for a hydrostatic compass, a partially sectional elevation of which is here shown. In this compass the object is to so arrange the magnetic needle, that it may remain steady in the roughest weather, and thus be free from the oscillations to which all ordinary compasses are subject. This is accomplished by suspending a ball, A, in fluid; to the spindle of this ball the needle, B, is attached, the whole being arranged within a fluid-tight box, which is supported on jimbals in the ordinary manner. The spindle of the ball, A, passes through a stuffing box in the diaphragm, which encloses the lower part of the compass box, and has attached to it the card, C. The upper extremity of the spindle, D, is tapered off to a fine point, which bears against a cup fitted in the glass. The fluid reservoir is filled by means of a tubular opening at the side, which opening is closed by a screwed cap. The arrangement of the floating needle admits of its weight being greatly increased, without increasing the friction on the point of suspension; the needle is thus rendered far more efficient in use. By means of the shadow projected from the part, D, of the spindle, the local and terrestrial variation may be readily ascertained at any part of the world.



Manchester Association for the Prevention of Steam Boiler Explosions.—The last report shows that the Association has now under inspection 571 mills and other works, and 1603 boilers, being an increase since the 28th ult. of 7 mills and 18 boilers. The inspectors have made 208 visits, and examined 552 boilers and 445 engines; of these 4 visits have been "special," and 3 boilers specially, 24 thoroughly, 15 internally examined, exclusive of those specially examined. 229 diagrams have been taken from 125 cylinders; of these 1 cylinder and 18 diagrams have been "special," and 6 cylinders and 12 diagrams additional. The principal derangements are as follows:—Corrosion, 6 (1 dangerous), fracture, 4; safety valves out of order, 29; pressure gauges out of order, 12; water gauges out of order, 11; feed apparatus out of order, 2; blow-off cocks out of order, 4; fusible plugs out of order, 4; deficiency of water, 1; furnaces out of shape, 12; total, 85; 1 dangerous. 20 boilers were without glass water gauges, 9 without blow-off cocks, 7 without back pressure valves. The inspectors still meet with numerous safety valves on the old plan of passing the spindles through stuffing boxes, as alluded to in the last report; and they have had one case where the spindle was packed, and two corroded fast, whilst others are still subject to the bad practice of loading with odd pieces of iron, instead of with one fixed weight. Care should be taken with all safety valves to see that the levers are not bent, which often prevents the spindles from working freely. Another instance has occurred of a "Salter's balance" being screwed down, so as to render the valve inoperative. Mr. Harman wishes it to be clearly understood that the frequent allusions he is compelled to make in reference to these "spring balances," are not meant in condemnation of them *per se*, as in principle they are doubtless good and efficient instruments, as witness their use on nearly all locomotive engines; but in the hands of the unskilful they afford the opportunity of creating mischief, if not a disaster by the facility with which they can be screwed down, and thus fix fast the valves to which they may be applied. The cases of blistered plates often met with, seem to show that the quality of iron supplied to manufacturers is not what it should be. Amongst other defects are the following:—Pressure gauges with columns of water upon them, which consequently register above the steam pressure; furnaces out of shape from over heating, through carelessness in not keeping the water at the proper level, and corrosion of plates by the action of the water used. Dr. R. A. Smith's analysis on this subject is now concluded, and he hopes shortly to lay his report before the Association. The inspector refers with satisfactorily good reasons to the great increase in the number of engines examined and indicated, and more particularly so from the circumstance that some few of the members are not inclined to attach to this part of the proceedings the value that he believes to belong to it; whilst on the other hand, all "special" requests to have indications performed, necessarily show that the inspectors' labours and the results of their experience are sought after and appreciated. Doubtless, in so large a number of members, it will always be difficult to please all, and it often requires much care and watchfulness on the part of the officers to avoid giving umbrage, by issuing too faithful reports of the defects met with, and the remedies recommended. The steady increase, however, in the numbers associated will probably appear to be a sufficient guarantee of the Association's usefulness, and it is satisfactory to know that most of the inspectors' suggestions for improvement in the management of steam boilers are being carried out readily by the majority of the members.

Sub-Aqueous Boat and Air Reservoir.—This apparatus for the use of divers working under water, is the invention of Mr. John White of Finchley, and forms a part of other improvements which Mr. White has introduced in diving apparatus, and to enable persons to breathe in places filled with dense smoke or noxious vapours. The apparatus we have engraved forms a reservoir for supplying the diver with air, as well as a boat by means of which he can readily propel himself from place to place while beneath the water. The reservoir and boat consists of two metallic vessels, A and B, fastened together at the flanges so as to be water-tight, the upper one of these vessels is considerably smaller than the lower one. The two vessels are separated by means of a gutta percha or other flexible holder, which is fastened to a ledge extending round the interior of each vessel, these holders are made to fit the two vessels, as indicated by the dotted line. The interior of each holder communicates respectively with the pipes,



C and D, the upper extremities of which are connected to the mouth-piece of the diver, whilst the lower ends of the pipes enter the lower reservoir. If both the holders are filled with pure air, the diver inhales that contained in the larger through the pipe, D, the communication with the air in the smaller vessel being shut off by taps or valves fitted between the junction of the pipes, C and D, and the vessel, B. The diver inhales the air in the larger vessel through the pipe, D, the vitiated air passing back into the vessel, A, through the pipe, C; as this air passes into the vessel the diaphragm is raised, the air occupying the space exterior to the holder. The displacement of the pure air goes on until the whole is exhausted, the buoyancy of the boat being maintained by the ingress of the expired air. The smaller vessel, B, contains a supply of air for the diver, when that in the vessel, A, is exhausted; upon the diver perceiving that the supply from the larger vessel is becoming short, he has only to turn the taps and valves between the pipes, C and D, which opens the communication between the smaller vessel and the breathing tubes. This supply of air enables the diver to reach the surface of the water in safety in order to obtain a fresh charge of air for the holders. Part of the weight necessary to sink the boat is attached to it in the form of a leaden keel, and a part is under the control of the diver, so that he may by dispensing with a part of it be enabled to rise at pleasure to the surface. Mr. White proposes to use these sub-aqueous boats as a means of enabling the diver to move readily from place to place; the diver seats himself across the back of the boat and propels himself along by means of webbed contrivances attached to his feet.

Speedy Mode of Currying Leather.—Mr. Gregg, a Sheffield currier, has recently introduced what appears to be a most valuable improvement in that transitionary process of the leather manufacture known—for what reason we certainly know not—as "currying." This is the process which fits the leather as received from the tanner, for the purposes of all users of finished leather, such as shoemakers and harness makers. Mr. Gregg, looking at the matter with the eyes of a practical man, had long seen that the currier undid a vast amount of the tanner's work by his unscientific practice in finishing leather. According to the existing process, the routine of the currier may be thus stated: Soaking in water, shaving or splitting, stoning after shaving, scouring, double scouring, sumaccing, scouring out, stuffing in shed wet, bruising or softening, slicking down grain, whitening, slicking down, graining up, and waxing. Mr. Gregg's processes are these: Stuffing dry, soaking in water, shaving, setting flesh and grain, stuffing in the russet, graining up, and waxing. This reduces the processes from fourteen to seven; and whilst fourteen days are required for the completion of the old routine, but two are necessary for the new one. Mr. Gregg has had more than one meeting of the trade, for the purpose of demonstrating to its members that under the old processes not only are many of the old processes quite unnecessary, but that they require others to undo the harm which they have brought about. In particular, he speaks strongly of the folly of stuffing when the leather is wet—a part of the routine which must be very plainly wrong. This is the keystone of Mr. Gregg's process, and we are glad to be able to say that it is quite right, and that the inventor has conferred a real benefit on the leather trade.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When city or town is not mentioned, London is to be understood.

Recorded June 21.

1495. William C. Fuller, 2 Bucklersbury, Cheapside — Improvements in India-rubber shackles, and in springs for carriages, and the metal fittings connected therewith.

Recorded June 23.

1507. Marc A. F. Mennons, 39 Rue d'lEchiquier, Paris—Improvements in machinery for the manufacture of bolts and rivets.—(Communication from J. L. Vergniais, Paris.)
1512. George C Grimes, Wandsworth, Surrey—Improvements in cigar or such like lights, and in the means of producing them.

Recorded June 28.

1538. George Dawes and Charles J. Carr, Hoyland, Yorkshire—Certain improvements in atmospheric and vacuum hammers and stamps, part of which improvements is also applicable to steam and other engines.

Recorded June 29.

1545. William Wray and John Wray, Leeming, Yorkshire—Certain improvements in reaping machines.
1546. Thomas Wight, Middlesborough-on-Tees, Yorkshire—Improvements in the apparatus used in the manufacture of cast metal pipes and castings, termed core bars or spindles and chaplets.

Recorded June 30.

1560. John Lawson and Stephen Cotton, Leeds, Yorkshire—Certain improvements in machinery for roving, twisting, and spinning flax, cotton, wool, and other fibrous substances.

Recorded July 5.

1595. Charles Barlow, 89 Chancery Lane—Improvements in capstans.—(Communication from Samuel Huse, Boston, U. S.)
1596. Arsene Beaulieu, 25 Rue du Chemin de Fer, Porte de Cologne, Brussels, Belgium—Improvements in crinolines, and in machinery for manufacturing springs for such and other purposes.—(Communication from Henri T. V. Eycken, 25 Rue Terre Neuve, Brussels.)

Recorded July 6.

1602. Joze Luis, 1B Welbeck Street, Cavendish Square—An improved mode of manufacture of wheel tires for railway carriages and engines, by means of the therein described apparatus.—(Communication from Duplay Vidal, Lachase, and Co., 10 Rue Magador, Paris.)
1604. Charles Hagan, Tower of London—Improvements in apparatus for curing smoky chimneys, and preventing down draught.
1606. Sampson Lloyd, Wednesbury, Staffordshire—Improvements in the manufacture of cast steel tyres.

Recorded July 7.

1616. John Smith, Norton Street, Cherry Square, New Radford, Nottinghamshire—Improvements in propelling ships and other vessels.

Recorded July 8.

1623. Joseph Gibbs, Brentford—Improvements in the manufacture of brushes, brooms, coverings for floors, mats, scrapers, and other scraping and rubbing surfaces.
1629. William H. Harfield, Fenchurch Street—Improvements in ships' capstans and riding bits.
1630. Henry Brimsmead and Jeremiah Lawrence, Ipswich—Improvements in rotatory screens.
1631. John Taylor, Roupell Park, Streatham Hill, Surrey—Improvements in the construction of walls to prevent damp from rising, and also in tiles to be used for this purpose in building walls.
1632. Thomas D. Duppa, Longville, Winstanton, Shropshire—Improvements in carpenters' benches.
1633 William Woof, Gloucester—Improvements in ploughs.
1634. William N. Nicholson, Newark-on-Trent—Improvements in machines for making and collecting hay, and for cutting thistles and weeds, which improvements in whole or in part are applicable to other agricultural implements where teeth or tines are used.
1635. William N. Nicholson, Newark-on-Trent—Improvements in clod crushers and land and garden rollers.

Recorded July 9.

1636. Michael Henry, 84 Fleet Street—Improvements in the manufacture of over-shoes and other articles worn on the feet, and in apparatus employed therein.—(Communication from Louis A. d'Hennin, Mathilde C. G. Ponceot, and Caliste B. Chiche, Paris.)
1637. Bernhard Samuelson, and John Shaw, Banbury, Oxford—Improvements in reaping and mowing machines.
1638. Frederick Ayckbourn, 27 Henry Street, Vauxhall Gardens, Surrey—Constructing certain articles of dress, so as to prevent drowning.
1639. Charles Iliffe, Birmingham—Improvements in the manufacture of buttons.
1640. William MacKean, Paisley, Renfrewshire—Improvements in the manufacture or treatment of farinaceous matters for the obtainment of starch and food.
1641. Elijah Livermore, New York, U. S.—Improvements in generating gas for the purpose of lighting and heating.
1642. John Smith, Bradford, Yorkshire—Improvements in apparatus for heating and cooling water.

Recorded July 11.

1643. Edward F. Hutchins, Northfleet, Kent—Constructing the jaw or jaws of vices and holding tools in general with a ball and socket joint.
1644. Robert Clegg, Islington—Improvements in machines for cutting wood and metal and in the means of fixing saws thereto.—(Communication from Felix Cramp, 107 Rue de Vangirard, Paris.
1645. Henry Davies, 13 Leicester Buildings, King Street, Liverpool—Improvements in the manufacture of soap.
1646. John C. Pickard, Burnley, Lancashire—Improvements in weft forks for looms.
1647. William E. Newton, 66 Chancery Lane—Improvements in magneto-electric machines.—(Communication from George W. Beardslee, Flushing, New York, U S.)
1648. James Dibble, Northam, Hants, and William H Graverley, Upper East Smithfield —Improvements in apparatuses for ventilating and lighting ships.
1649. Francis Burden, John Street, Adelphi, Westminster—Improvements in the permanent way of railways.
1650. Jules A. Hartmann, Mullhouse, France—Improvements in the manufacture of colours for printing cotton and other vegetable fibres and silk.

Recorded July 12.

1651. Joze Luis, 1B Welbeck Street, Cavendish Square—Imitation leather.—(Communication from Auguste Legeay, 10 Rue Magador, Paris.)
1652. Joze Luis, 1B Welbeck Street, Cavendish Square—Improvements in railway car seats and arm chairs.—(Communication from Bernard J. la Mothe, 10 Rue Magador, Paris.)
1653. Camille J. Froal, 4 South Street, Finsbury—The application of photographic impressions or pictures upon fabrics or tissues, for rendering such fabrics or tissues applicable to various useful purposes.—(Communication from Jules Bernard, Paris.)
1655. George White, Mansfield, Nottinghamshire—Improvements in apparatus for counteracting the effects of collisions in railway trains.

Recorded July 13.

1656. William A. Munn, Throwley House, near Feversham, Kent—Improvements in reaping machines.
1657. Charles S. Walker and Robert Hoyle, Bury, Lancashire—Improvements in machinery or apparatus for promoting the consumption of smoke in steam boiler and other furnaces, and for preventing the explosion of steam boilers.
1658. Allan Cooper, Birmingham, Warwickshire—Improvements in the manufacture of the grips of swords and sword bayonets.
1659. James S. Thomson, Kilmarnock, Ayrshire—Improvements in steam engines.—(Communication from Henry Blandy and Frederick T. L. Blandy, Zanesville, U. S.)
1660. William Cotton, Loughborough, Leicester—Improvements in means or apparatus for connecting together or uniting looped fabrics.
1661. James Combe, Belfast—Improvements in machinery for hackling flax and other fibrous substances.
1662. John Taylor, Roupell Park, Streatham Hill, Surrey—Improvements in stoves and fire-places, and in the arrangement of flues connected therewith.

Recorded July 14.

1663. William Walker, Liverpool—Improvements in the manufacture of metallic packages, and in machinery for manufacturing the same.—(Communication from James Wilson, Charles Green, and William Wilson, the younger, Wilmington, Newcastle County, Delaware, U. S.)
1664. Robert Mushet, Coleford, Gloucestershire—Improvements in the manufacture of shot and shell and other projectiles.
1665. Robert Mushet, Coleford, Gloucestershire—A new or improved manufacture of certain metallic compounds or alloys.
1666. Joseph Atkinson, Lancaster—Improvements in fire-arms.
1667. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in the manufacture of artificial fuel.—(Communication from Monsieur de la Fenestre, 24 Rue Meslay, Paris.)
1668. Joseph Morgan, Manchester—Improvements in apparatus for making candles.
1669. John Bailey, Manchester—Improvements in machinery or apparatus for stretching woven fabrics.
1670. Richard Longstaff, Mornington Road, and Abraham Pullan, Fortie Cottage, New Cross, Kent—Improvements in traction or locomotive engines.

Recorded July 15.

1671. Christopher Kingsford, Seaton, near Wingham, Kent—Improvements in the preparation of peat and charcoal for fuel, in the manufacture of coke therefrom, and in the machinery and apparatus employed for effecting the same.
1672. William Clark and William Williams, Manchester—Improvements in finishing woven fabrics.
1673. Frederick Brown, City Road—The preparation and manufacture of a new fibrous pulp for making paper, and for other useful purposes.
1674. Robert Mushet, Coleford, Gloucestershire—New or improved methods of manufacturing a certain metallic compound or alloy.
1675. Hector G. de Chateauneuf, Paris—An improved coverlet called zephyr-cider-down coverlet.
1676. John P. Farrier, New York, U. S.—Improvements in the treatment of iron.
1677. William M'Andrew, 57 King William Street, and Charles W. Boyd, Sochia, Asia Minor—Improvements in treating poppies, to obtain a product resembling opium therefrom.
1678. William O. Carter, 12 South John Street, Liverpool—Improvements in machinery for sawing slate.
1679. Frederic Prince, 133 New Bond Street—An improvement in breech-loading fire-arms.

Recorded July 16.

1680. John Musgrave, jun., Bolton-le-Moors, Lancashire—Improvements in the construction of steam boilers.
1681. Julian Bernard, Albany, Piccadilly—Improvements in the construction and arrangement of hydraulic and other pumps, for forcing liquids and for obtaining pressure.
1682. Julian Bernard, Albany, Piccadilly—Certain improvements in the manufacture of boots and shoes, and in the machinery and apparatus to be employed therein.
1683. Christopher Pottinger, Anstruther, Fifeshire—Improvements in machinery or apparatus for dredging or excavating, and for driving piles.
1684. Henry Cunnew, Triangle, Hackney—Improvements in elastic bands.
1685. Paul A. A. Trouttet, Dijon, France—A new moveable stopper for gaseous liquids.
1686. O'Donnell Grimshaw, Belfast, Ireland—Improvements in safety letter boxes or bags.
1687. William M. Smith, Northampton—The construction of fare-boxes for the prevention of fraud on the part of drivers, conductors, &c.—(Communication from J. B. Slawson, New Orleans, Louisiana, U. S.)
1688. Myron H. Chapin, Boston, Massachusetts, U. S.—Improvements in the manufacture of galloons, tapes, or ribbons for supporting steel or other hoops used for distending ladies' dresses.
1689. Thomas Carlieli, Union Street, Portsea, Hampshire—Improvements in vent pegs.
1690. William M. Cranston, 11 New Broad Street—Improved delivery apparatus for harvest machines.—(Communication from Walter A. Wood, Hoosick Falls, Renselaer, New York, U. S.)

Recorded July 18.

1691. Julian Bernard, Albany, Piccadilly—Improvements in the manufacture of boots and shoes and in the means employed therein.
1692. Henry C. M. Cramer, Paris—Improvements in bedsteads.
1693. James Shaw, Teignmouth, Devonshire—Improvements in the manufacture of artificial fuel.
1694. Andrew Phillips, Glasgow—Improvements in weaving carpets, and in the machinery or apparatus to be used therein, parts of which machinery or apparatus are applicable to the weaving of other fabrics.
1695. William H. Harfield, Fenchurch Street—Improvements in apparatus employed in getting ships anchors and in shackling chains.
1696. William E. Newton, 66 Chancery Lane—Improvements in the method of constructing and operating batteries for generating or exciting, by chemical action, electricity for telegraphic purposes.—(Communication from Thomas C. Avery, New York, U. S.)
1697. Alfred V. Newton, 66 Chancery Lane—Improvements in the manufacture of India-rubber, and other like fabrics.—(Communication from Jonathan T. Trotter, New York, U. S.)

Recorded July 19.

1698. Joze Luis, 1B Welbeck Street, Cavendish Square—A new system of eccentric socket adapted to axletrees.—(Communication from Jean B. Gaugand, 10 Rue Magador, Paris.)
1699. Frederick C. Bakewell, 6 Haverstock Terrace, Hampstead—Improvements in extracting oils from coal and other minerals.—(Communication from David Alter and Samuel A. Hill, Pittsburgh, U. S.)
1700. James Shanks, Arbroath, Forfarshire—Improvements in mowing machines.
1701. Henri Parent, Roubaix, France—Improvements in or applicable to looms for weaving.
1702. John C. Riddel, Belfast, Antrim, Ireland—Improvements in stall, loose boxes, and enclosures for horses, cows, pigs, or other animals.

Recorded July 20.

1703. James Erskine, Newton Stewart, North Britain—Improvements in breech-loading fire-arms.
1704. Thomas Curtis and Jonathan Haigh, Leeds, Yorkshire—Improvements in the finishing of cloths.
1705. William E. Gedge, 4 Wellington Street South—Improved apparatus for the prevention of accidents in mines, to be called a mining parachute.—(Communication from Mr. Fontaine, France.)
1706. William J. Gradwell and David Gradwell, Manchester—Certain improvements in bearings or journals employed in machinery, which improvements are also applicable to the bearings of railway and other wheels and axles.
1707. Right Honourable James Earl of Caithness, Hill Street—Improvements in the permanent way of railways.
1708. Zephirin G. A. N. P. Orioli, 29 Boulevart St. Martin, Paris—New application of hypochloride of alumina to bleaching and dyeing, and to the disinfection and preservation of organic matters.
1709. William E. Newton, 66 Chancery Lane—Improvements in self-acting lithographic printing machines.—(Communication from William H. Stubbe, Boston, U. S.)

Recorded July 21.

1710. Henry B. Preston, Liverpool—Improvements in apparatus for superheating steam.
1711. James Todd, the younger, Castlemains, Haddington—Improvements in machinery or apparatus for dressing or cleansing and separating grains and seeds.
1712. George Welch, Birmingham, Warwickshire—An improvement or improvements in the manufacture of frames for mirrors, pictures, and other articles.
1713. Isaac Robson, Dalton, near Huddersfield, Yorkshire—Improvements in means or apparatus for drying and cuttling cotton warps after being dyed or sized, or after any other process of wetting, and when quick drying is required.
1714. Charles Tapp and James B. Tapp, Chesterfield, Derbyshire—Improvements applicable to steam boilers and furnaces for consuming smoke and economising fuel in the generation of steam, and in the apparatus connected therewith.
1715. Michael Henry, 84 Fleet Street—Improvements in apparatus or machinery for the manufacture of corks and bungs.—(Communication from Paul A. A. Dalverny, 33 Boulevart St. Martin, Paris.)
1716. Edward J. Scott and Samuel F. Scott, Glasgow—Improvements in the manufacture of boots and shoes.
1717. Henry Healey, Ashby Decoy Cottage, near Brigg, Lincolnshire—Improvements in machinery for destroying flies and other insects on growing crops.

Recorded July 22.

1718. Joseph Hartly, Romiley, near Stockport, Cheshire—Improvements in machinery for regulating the velocity of steam and other engines.
1719. Joseph G. Isham and Stephen D. Albertson, New York, U.S.—An improved machine for cutting and shaping bottle and other corks.—(Communication from Albert Albertson.)
1720. Samuel A. Bell and John Black, Bow Lane, Cheapside—An improved manufacture of fusee.
1721. William E. Newton, 66 Chancery Lane—Improvements in sewing machines.—(Communication from George Kugler, Boniface Plaz, and Jacob Rexroth, Paris.)

Recorded July 23.

1722. John B. Whitehall, Nottingham, and Samuel Wheatcroft, New North Road—Improvements in the construction of certain parts of the apparatus or machinery made use of for manufacturing bonnet and cap fronts, rouches, and such like articles of millinery.
1723. Horatio N. Harrop, jun., Manchester—Certain improvements in a cigar lighter and fusce box.
1724. James Broadley, Saltaire, Yorkshire—Improvements in means or apparatus used in weaving.
1725. John Tenwick, Clarendon Street, Portsmouth, Hampshire—Improved steering apparatus for ships.
1726. William H. Harfield, Fenchurch Street—Improvements in capstans, riding bits, and stoppers for working with chains.

Recorded July 25.

1727. Henry Ambler, Halifax, Yorkshire—Improvements in explosive projectiles.
1728. John Rowland, jun., and George Hall, Oldham, Lancashire—Improvements in machinery or apparatus for sizing yarns or threads, which said improvements are also applicable to dressing machines, or other similar apparatus.
1729. George Davies, 1 Serle Street, Lincoln's Inn, and 18 St. Enoch Square, Glasgow—Improvements in dyeing yarns, threads, or woven fabrics of wool, silk, cotton, linen, or other fibrous or filamentous materials.—(Communication from François X. Hurstel, Paris.)
1730. Edmund Hunt, Glasgow—Improvements in apparatus for indicating and regulating speed.
1731. William E. Newton, 66 Chancery Lane—Improvements in extracting oil from coal and other substances yielding pyrogenous oils.—(Communication from Franklin W. Willard, New York, U. S.)

1732. Charles F. Vasserot, 45 Essex Street, Strand—Preventing and removing incrustations in steam boilers.—(Communication from Jean C. Chavanne, Lyons, France.)

Recorded July 26.

1733. James King, Glasgow—Improvements in the treatment of materials used in or resulting from the distillation of spirits.
1734. William H. Buckland, Glamorganshire—An improved preparation of peat
1735. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in slide valves for steam engines.—(Communication from Richard C. Bristol, Chicago, U. S.)
1736. Philo D. Mickles, Syracuse, New York, U. S.—An improved spring for railroad and other carriages, and for other uses and applications where springs are required.—(Communication from Danforth Johnson, Chicago, Illinois, U. S.)
1737. John Hinks and George Wells, Birmingham, Warwickshire—An improvement in, or a substitute for, the hook of the ordinary hook and eye dress fastening.
1738. Joseph Gillot and John Morrison, Birmingham, Warwickshire—New or improved machinery for the manufacture of the handles of penholders, which machinery or a part or parts thereof may also be employed for manufacturing other cylindrical articles.

Recorded July 27.

1740. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved comb-cleaner.—(Communication from Hippolyte Gaudibert, Paris.)
1741. Edward Winstanley, Ashton-under-Lyne—Improvements in indicators for registering the quantity produced by spinning machinery.
1742. John Davies, Tetbury, Gloucestershire—A new or improved self-adjusting ventilating apparatus.
1743. Thomas Dickins, Middleton, Lancashire—Improvements in dyeing and discharging warps or other yarns or threads, and woven fabrics of silk, wool, cotton, and other fibrous materials.
1744. John Scoffern, 4 Barnard's Inn—Improvements in water-proofing, cementing, and stiffening fabrics and fibrous materials, and also in dyeing fabrics and fibrous materials.
1745. Charles L. Blum, 29 Boulevart St. Martin, Paris—A mechanical apparatus for smoking and colouring pipes.

Recorded July 28.

1746. William Hudson and Christopher Catlow, Burnley, Lancashire—Certain improvements in looms for weaving.
1747. Edward Hunt and Henry D. Pochin, Salford, Lancashire — Improved resin and resinous substances.
1748. Alfred Sidebottom, Crown Street, Camberwell, Surrey—Improvements in the mode or process of separating animal fibre from mixed fabrics of animal fibre and cotton or other vegetable fibre.
1749. Charles W. Smith, Evans, Erie, New York—Improvements in electric telegraphs, and in the apparatus connected therewith.
1750. William Kent, Paternoster Row—A self-acting fan.
1751. John W. D. Brown, Lewisham, Kent — Improvements in signal and lighthouse lamps and lanterns.
1752. John Aspinall, Charing Cross—Improvements in evaporating and in apparatus for the same, especially applicable to the evaporation of sugar.
1753. William E. Newton, 66 Chancery Lane—Improvements in grinding mills.—(Communication from Joseph C. Lyons and James S. Wyckoff, Sennet, Cayuga, New York, U. S.)
1754. William Clark, 53 Chancery Lane—Improved apparatus for turning over music leaves or sheets.—(Communication from Hermine M. Basset, Boulevart St. Martin, Paris.)
1755. John Jackson, Church Street, Spitalfields—Improvements in metal pens.
1756. Patrick Robertson, Sun Court, Cornhill—Improvements in the manufacture of beer, ale, porter, and spirits.

Recorded July 29.

1757. Thomas Culpin, 25 Royal Hill, Greenwich, Kent—Improvements in water-closets, water-cisterns, urinals, baths, lavatories, and other sanitary apparatus, and in the mode of supplying water thereto.
1758. Isaac M. Lindley, Stately Bridge, Cheshire—Improvements in cop-tubes.
1759. James Wright, 42 Bridge Street, Blackfriars—An improved method of raising or drawing up the skirts of gowns or dresses.—(Communication from M. Bresson, Paris.)
1760. Samuel Wilson, Manchester—Certain improvements in the construction of presses for compressing cotton and other articles.
1761. Polynice A. Viette, 25 Faubourg de Shaerbeck, near Brussels—Improvements in engraving on metal or on other substances decomposible by acids or corrosive salts.
1762. James Chandler, Deptford, Kent—Improvements in apparatuses for indicating the water levels in boilers and other vessels, parts of which are also applicable for inspecting the interior thereof.
1763. Thomas J. Terrell, Poplar—An improvement in ships, riding bits, and timber heads.
1764. Alfred V. Newton, 66 Chancery Lane—Certain improvements in that class of fire-arms known as revolvers, and in bullets for the same.—(Communication from John Walch, New York, U. S.)

Recorded July 30.

1765. Joseph Wood, York City—An improved truss for hernia.
1766. François Haeck, Schaerbeck, near Brussels, Belgium—Improvements in refrigerating apparatus especially adapted to pumps and other apparatus for the supply of beer and other liquids.
1767. Goldsworthy Gurney, Woodleigh, Cornwall—Improvements in electric telegraphic conductors.
1769. Thomas Firth, Sheffield, Yorkshire—An improved breech-loading cannon.
1771. Arthur B. Wilson, Cockermouth, Cumberland—Improvements in the manufacture of hats.
1772. William Jamieson, Stoney Middleton, Derbyshire—Improved churn.—(Communication from Oliver Gunnell, Moline, Illinois, U. S.)
1773. Perceval M. Parsons, Arthur Street, West—Improvements in switches and crossings of railways.

Recorded August 1.

1774. William Campbell and George Worstenholm, Birmingham—Certain improvements in machinery for the manufacturing of wrought nails, as also in the treatment of the iron from which such or other kinds of nails may be made.—(Communication form George W. Allen, Rhode Island, U. S.)
1775. John Mollady, Manchester — An improved form or construction of hat, cap, or covering for the bead.
1776. Thomas W. G. Treeby, 1 Westbourne Terrace Villas, Upper Westbourne Terrace—Improvements in targets.
1777. Thomas G Messenger, High Street, Loughborough, Leicester—Improvements in the construction of buildings or erections to be used for horticultural or other purposes.
1779. James Rowland, Salisbury—An improved apparatus for mashing and mixing.
1780. William E. Newton, 66 Chancery Lane—An improved mode of and apparatus for making metal cylinders suitable for steam boilers and other purposes.—(Communication from Reiner Daelen, Hoerde, Westphalia.)
1781. William E. Newton, 66 Chancery Lane—An improvement applicable to salinometer cases for steam boilers.—(Communication from Joseph Grice, New York, U. S.)

Recorded August 2.

1783. James C. Ashwell, Dorchester Street, New North Road—Improvements in wheels for railway and other carriages.
1785. Henry Olorenshaw, Coventry, Warwickshire—An improvement in neck-ties.
1786. Bryan Donkin, Bermondsey, Surrey—Improvements in and in connection with slide and other valves.—(Communication from Thomas Coates, Sommerfield, Silesia)

Recorded August 3.

1787. Auguste Pin, Castelnaudary, France—The compounding, preparing, and application of a new sort of paint.
1788. John Hewett, High Street, Sheffield, Yorkshire—Improvements in self-acting water closets.
1789. William K. Peace, Sheffield, Yorkshire—An improvement in canisters for hermetically sealing paints and other substances.—(Communication from Frederick L. Whiton and John W Masury, New York, U. S.)
1790. Mark Mason, Manchester—Improvements in machinery for printing, and in apparatus connected therewith.
1791. William H. Tooth, 3 Spring Terrace, Wandsworth Road, Surrey—Improvements in machinery or apparatus for the manufacture of iron or steel.
1793. John Petrie, the younger, Rochdale, Lancashire—Improvements in machinery or apparatus for washing wool.
1794. Joseph H. Phipson and William A. Watson, Birmingham—A new or improved lubricator for lubricating shafts and other articles requiring lubrication.
1795. William H. M. Blews, Birmingham—A new or improved regulator for gas burners.
1796. Edward Dowling, Little Queen Street, Holborn — Improvements in rosettes or ornaments applicable to harness, and for other purposes.

Recorded August 4.

1797. Thomas Lister, Sheepbridge, Derbyshire—An improved sanatory water-closet.
1798. James Holton, Handsworth, Staffordshire—A new or improved water gauge for steam boilers.
1799. Richard A. Brooman, 166 Fleet Street—Improvements in mills for grinding coffee, corn, and other substances.—(Communication from Joseph P. Pirsson, New York.)
1801. Frederick Walton, Haughton Dale, Denton, near Manchester—Improvements in the manufacture of ornamental fabrics, suitable for bookbinding and other uses, and in machines employed in such manufacture.

Recorded August 5.

1803. Edward B. Gowland, Brecknock Street, Camden Town—Improvements in piano-fortes.
1804. Edward Swainson, Preston, Lancashire — Certain improvements in looms for weaving.
1805. Nicholas D Maillard, 18 York Street, Dublin, Ireland—Improvements in compasses for indicating the course and time of ships at sea, without the use of needles or magnets.
1807. Nathaniel Berry, Paris—An improvement in the manufacture of knitted fabrics.—(Communication from William Benjamin, New York.)
1809. William E. Newton, 66 Chancery Lane—An improvement in billiard and bagatelle cues.—(Communication from Jonathan H. Green, Christiansburg, Iowa, U. S)
1810. Francis W. Beaumont, Clapham, Surrey — A hydraulic apparatus applicable to transmitting, regulating, and measuring the supply or flow of liquids.
1811. Warren Thompson, 45 Essex Street, Strand—An improved printing telegraph.

Recorded August 6.

1815. Augustus B. Childs and Lemuel D. Owen, 192 Tottenham Court Road—Improvements in machinery for cleaning grain and seeds from smut and other extraneous matter.
1816. Alfred T. de Lisle, 14 Addison Road, Kensington—Improvements in clarifying and decolorising solutions of sugar and other liquids.
1817. Edward A. Süwerkrop, Leith, Mid-Lothian—Improvements in reaping and mowing machines.—(Communication from Francois Leroy, San Francisco.)
1818. Albert F. Delannoy, Paris—Improvements in lubricating the axles or journals of wheels, also applicable to lubricating apparatus for the transmission of motion in general.
1819. John W. Welch, Manchester—Improvements in machinery or apparatus for sizing or dressing yarns or threads for weaving.
1820. Edward T. Hughes, 123 Chancery Lane—Improvements in machinery or apparatus for manufacturing chenile.—(Communication from Jean B. Mallion, St. Chamond, France.)

Recorded August 8.

1821. Joseph Weston, Fenton, Staffordshire — Improvements in breaks for railway carriages, and in the method of applying the same, and in conveying signals from one part to another of the same train, parts of which are applicable to breaks for other purposes.
1823. Henry Liddle, Middleton, Lancashire—Improvements in machinery or apparatus for polishing yarns or threads.
1829. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in apparatus for steering ships, applicable also in all cases where a rotatory or partial rotatory motion is required.—(Communication from Messrs. François A. Harel and Michael Boniere, the younger, Paris.)
1831. Barnet S. Cohen, Magdalen Row, Great Prescot Street—Improvements in ever-pointed pencils.
1833. Thomas Blinkhorn and Richard Blinkhorn, New Road, Spalding, Lincolnshire—An improved composition for removing scale or fur from the interior of boilers, and also for preventing the formation of scale or fur therein.

TO READERS AND CORRESPONDENTS.

J. Becke (Liverpool).—Our letters to him have been returned through the Post Office.

Plate. 246.

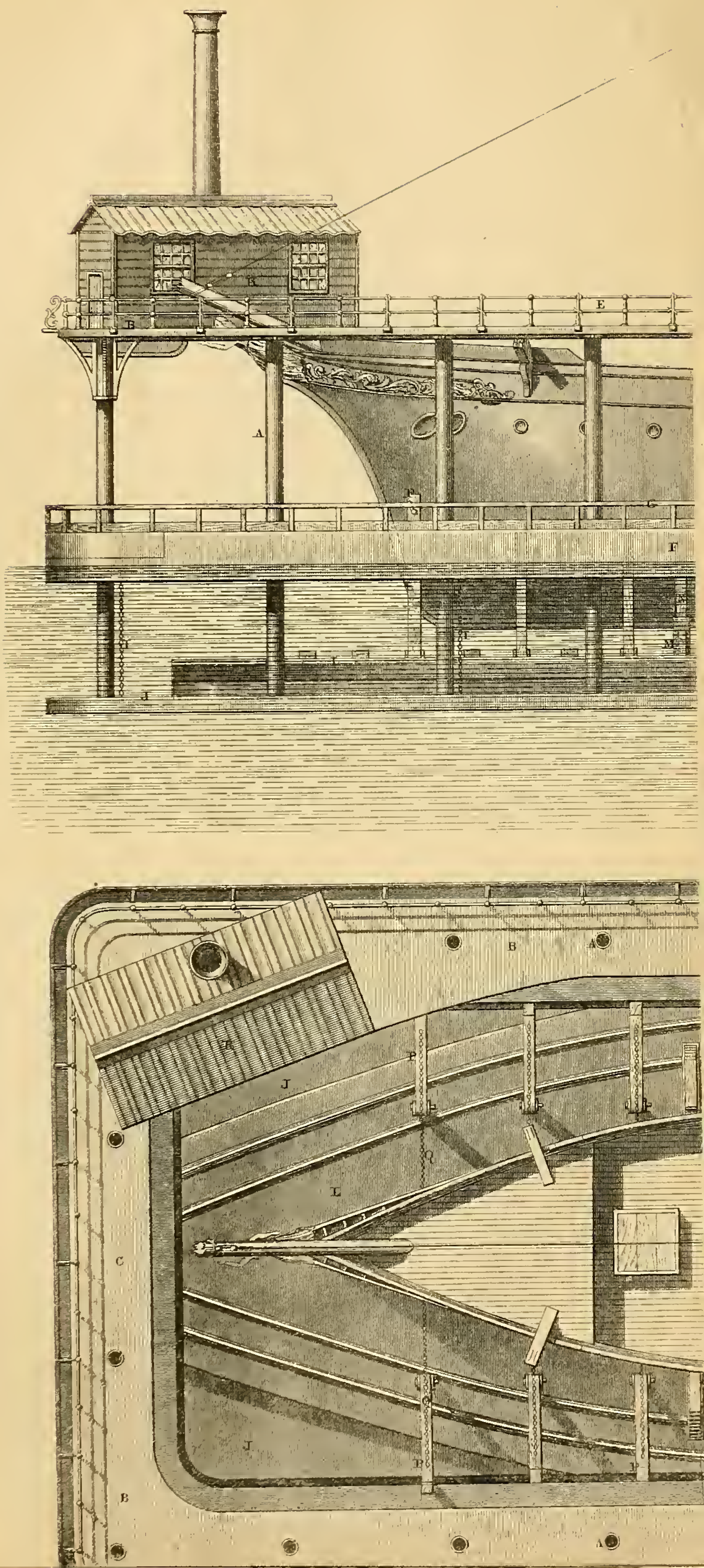
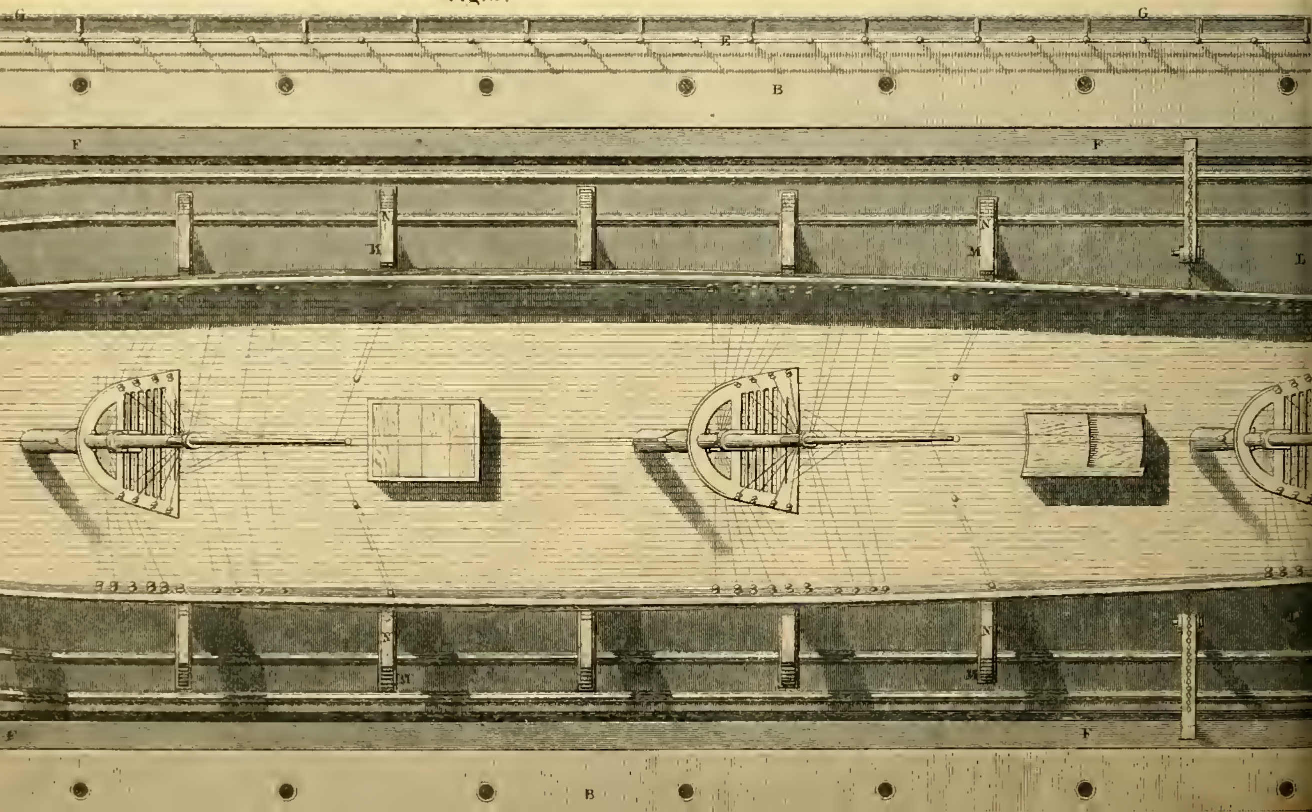


Fig.1.

Fig.3.



1ST OCTOBER 1859
Second Series
Vol. IV.

FLOATING DOCK,

JOHN PILE ESQR. WEST HARTLEPOOL,

PATENTEE.

Fig. 2.

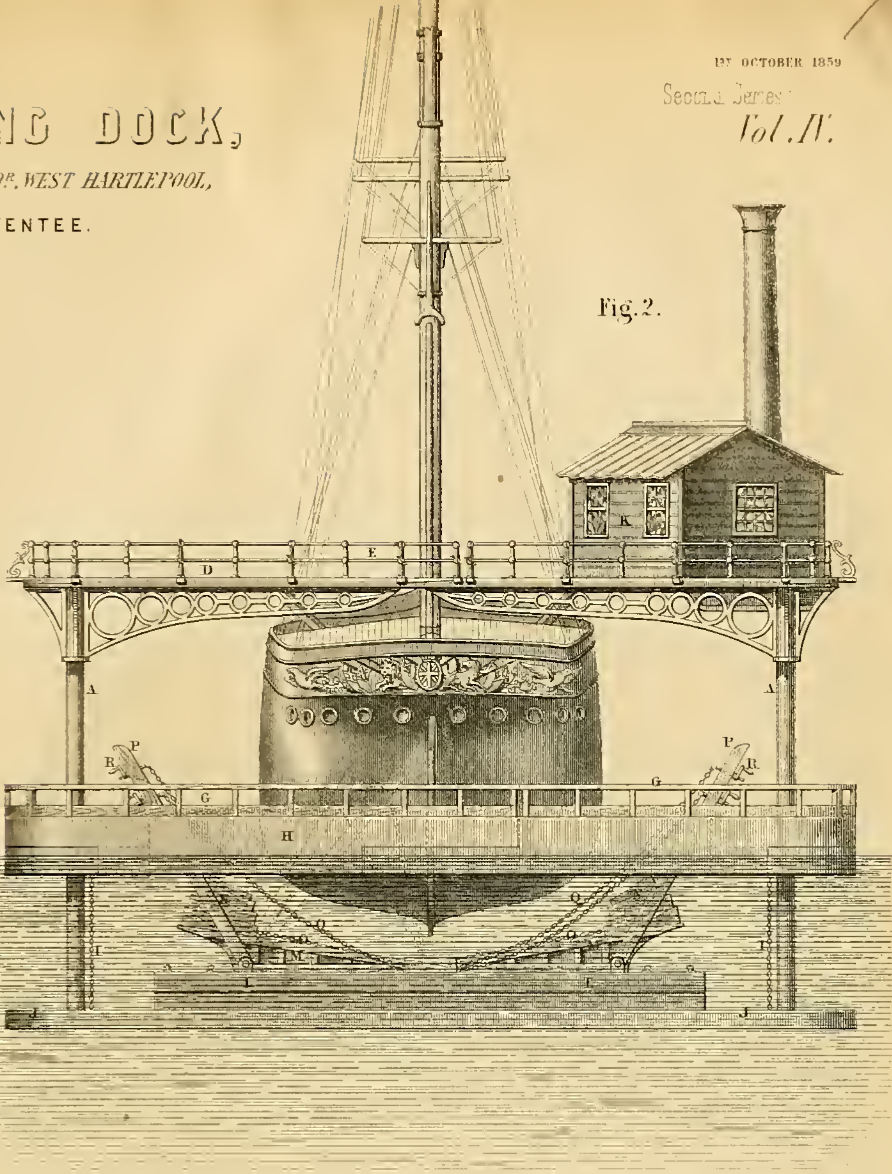
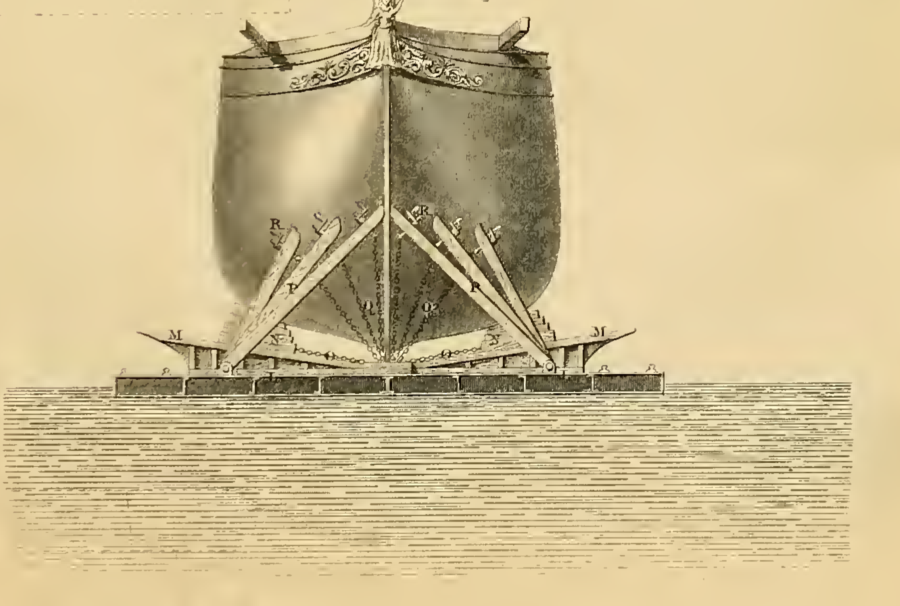


Fig. 4.



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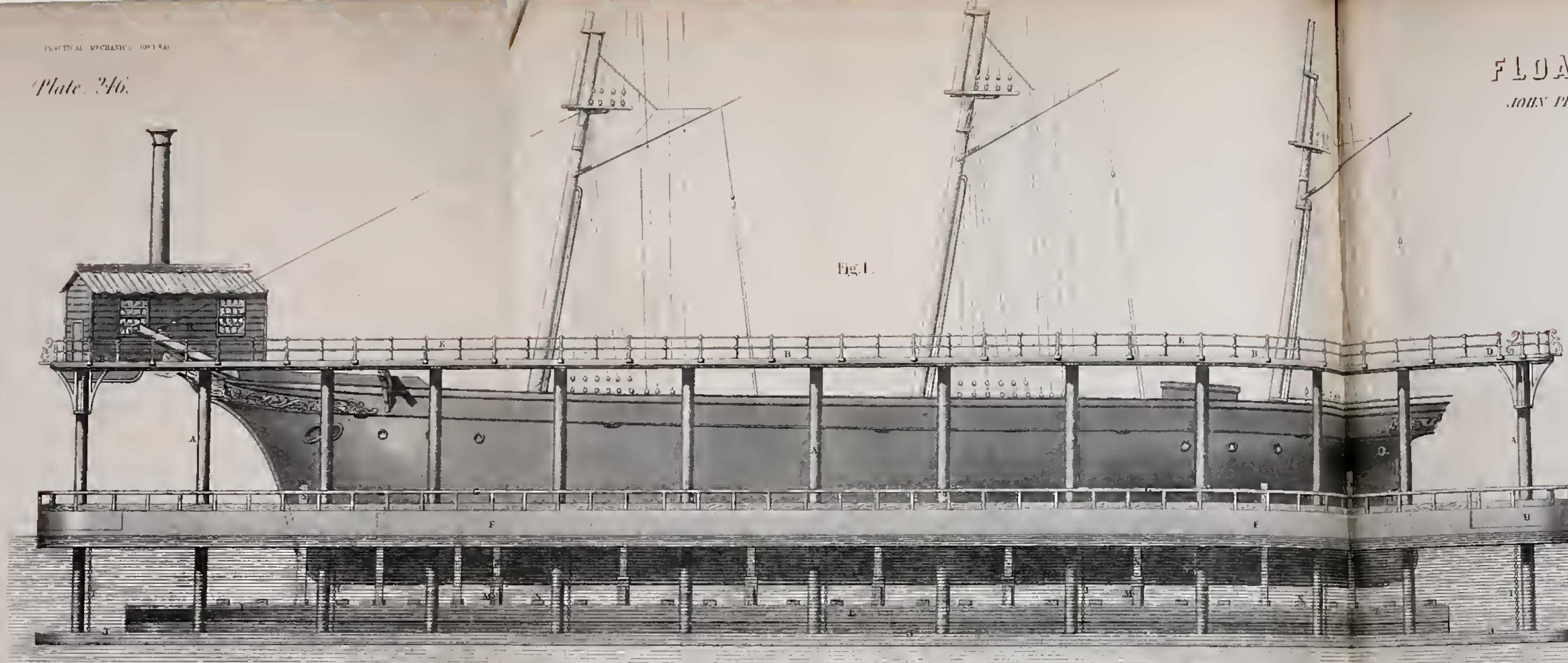


Fig. 2.

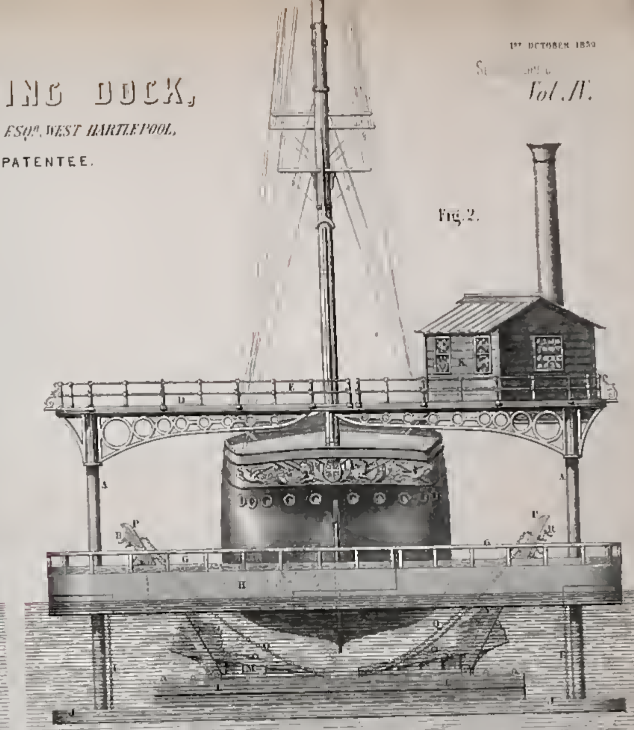


Fig. 3.

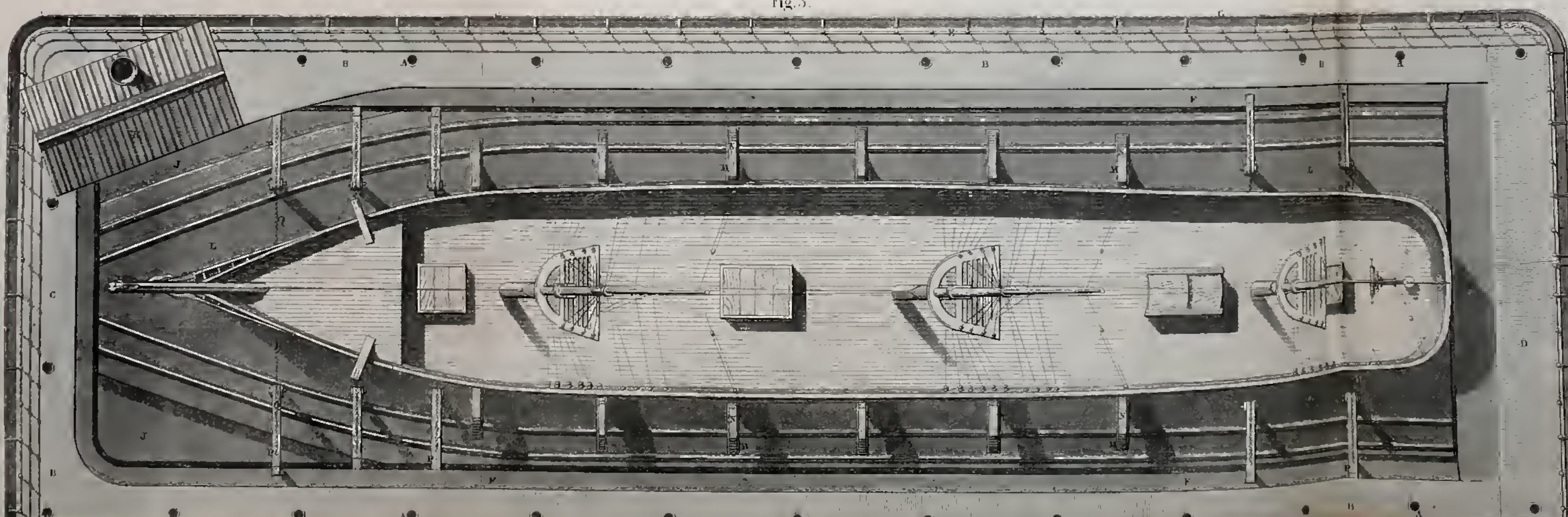
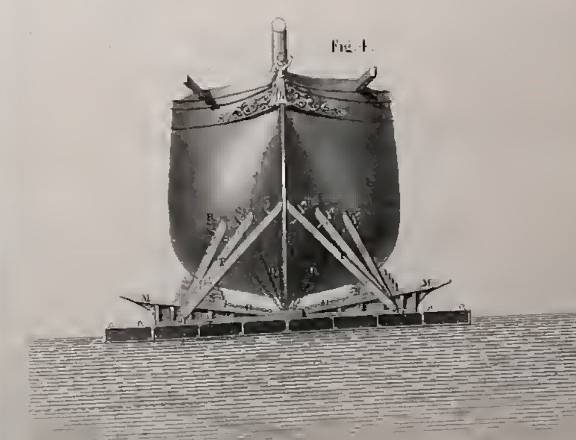


Fig. 4.



FLOATING DOCK.

By John Pile, Esq., *West Hartlepool, Durham.*

(*Illustrated by Plate* 246.)

Recent engineering practice has shown, in the clearest manner, how much is to be gained by adopting the floating system for ships' docks. This plan has really every point in its favour. It possesses the elements of economy, both in the first cost of engineering construction, and permanent working; and it has manifest advantages, as regards the facilities for getting completely at the hulls of vessels, both for examination and repair. Mr. Pile, the eminent ship builder of West Hartlepool, has lately developed what must be considered as at once the latest and best practical contribution to this branch of engineering construction; and we now have the pleasure of illustrating his perfected views in the fullest manner. Mr. Pile's plan consists in the application and use of two sets of pontoons, one set being kept constantly floated upon the surface of the water, and the other set being alternately submerged and floated for the purpose of sinking beneath the bottom of the ship, and of then rising and lifting the ship up with it, the water for such purpose being pumped out of the submerged pontoon by rotatory pumps, or other water elevating apparatus. The first set of pontoons serves as a means of steadying the ship, and the second pontoon, her bed, when elevated by reason of the top of the elevating pontoon bearing against the underside of the floating pontoons. The floating pontoons are guided over the elevating pontoons by suitable uprights passing through apertures made in the floating pontoons, and connected with the elevating pontoon. Chains and winches carried on the floating pontoon, and connected with the elevating pontoon, serve to prevent its immersion to an unnecessary depth, whilst during its elevation, the slack is duly taken in. The dead weight of the elevating pontoon is neutralised by having air-tight spaces attached thereto, so that it may be more easily supported by the chains before referred to. In some cases a third pontoon may be used, upon which the ship is floated away for repairs.

Fig. 1, on our plate 246, is a longitudinal elevation or side view showing one arrangement of Mr. Pile's floating dock; fig. 2 is a front elevation of the dock entrance; fig. 3 is a plan corresponding to fig. 1; and fig. 4 is an end view of a floating pontoon having a vessel supported thereon. The improved floating dock consists of a series of columns, A, arranged at equal distances asunder in two parallel lines; the space between these lines of columns forming the area of the dock. The columns, A, are, by preference, hollow pillars of cast or wrought-iron, the lower extremities of which are firmly fixed to the bottom pontoon or lift, and act as air tubes to admit the air into the pontoon or lift as the water is pumped out—these pillars or columns rising and falling with the pontoon. On the upper extremities of the columns, A, is built a gangway or platform, B, which is carried completely round the dock, as shown in the plan, fig. 3, of the engraving. The inner end of the gangway is closed in at C. The outer end of the gangway at D, forms a swing bridge to admit of the entrance of vessels when the bridge is swung open or drawn aside. A handrail, E, is carried round the gangway, B, to provide for the safety of those traversing to and fro. The columns, A, serve also as guides for the floating pontoon, F, which extends from end to end, and from side to side of the dock, and is constructed of wood or sheet-iron, riveted and caulked so as to make it water-tight.

A series of tubular apertures corresponding to the number of the columns, A, are made in a vertical direction through the pontoon, F. These tubular openings encircle the columns, A, and they are made sufficiently large to admit of the pontoon rising and falling easily with the tide. The pontoon forms a platform, extending outwards beyond the stern of the ship, and at the inner end it converges like the bows of a vessel; the area between the inner sides of the pontoon affording ample space for the admission of the vessel. The upper surface of the pontoon, F, forms a stage or platform for the shipwrights to work upon, and a handrail, G, is carried round the pontoon to protect the men from accident on the outer side. The outer end, H, of the pontoon is formed in two parts, and these are made to swing back when required, by means of a circular rack fitted round the parts on which the swinging ends are centred, and actuated by a pinion fitted on the lower end of a vertical shaft, which may be wrought by a winch handle or other convenient means. In lieu of this arrangement, the ends, H, of the pontoon may be caused to move laterally by means of a rack and pinion, or other equivalent mechanical contrivance. The floating pontoon, F, has pendant from its lower side, a series of chains, I, the lower ends of which are secured to the submerged pontoon, J, by means of which chains the submersion of the pontoon or lift, is regulated to any depth. This elevating pontoon, J, is constructed of wood or sheet-iron, and carefully caulked, so as to be thoroughly water-tight; it carries the columns, A, which are securely fixed thereon. It is so arranged that it may be partially filled with water, so as to give it a greater specific gravity than the surrounding fluid, in order that it may be submerged with facility; upon discharging this water from the pontoon, sufficient buoyant power is imparted to it to lift a vessel out of the water.

The depth to which the pontoon, J, is to be sunk prior to floating a ship thereon, is regulated by means of the chains, I, which are wrought either by means of windlasses, or by a shaft extending along each side of the dock, and having winding drums fitted thereon opposite to the several chains, the longitudinal shafts being primarily actuated by a steam engine. These hollow columns, A, may either form the suction pipes of the pumps, or separate suction pipes may be placed therein as desired, the pumps being worked by a steam engine arranged in the engine-house, K. By this means, when the buoyant power of the pontoon, J, is required for the purpose of raising a vessel out of the water, air is pumped into the pontoon or water pumped out, thus obtaining the full effect of its buoyant force.

In addition to the pontoon, J, there is a secondary pontoon, L, which is constructed so as to be easily attached to it; this pontoon is made to any required size, according to the weight of the vessel to be lifted, and is attached to the pontoon, J. Upon this secondary pontoon, L, the cradle, M, and chock-blocks, N, for preventing the ship from heeling over, are arranged. Prior to the vessel being docked for examination or repair, the pontoon, L, is secured to the lower pontoon, J, as shown in the end view, fig. 2, of the accompanying plate. The vessel is then floated into the dock, and the pontoon, J, is raised by pumping air into, or water out of, the interior thereof, the vessel being kept meanwhile equidistantly from the columns, A. When the pontoon, L, touches the keel of the vessel, the blocks, N, are brought beneath the hull, in order to keep the ship in an upright position. The blocks, N, are drawn down the inclined surface of the cradle by means of the chains, O, which are carried away below the cradle, and on to windlasses fitted for the purpose on the platform of the pontoon, F. The bow and stern of the ship is further steadied and supported by means of the shores, P, which are jointed to the pontoon, L, so that they may be readily thrown back out of the way when it is desired to release the vessel. When the ship is floated over the cradle, M, and rests upon the blocks, N, the shores, P, are brought up against the bow and stern of the vessel by the chains, Q, which may be actuated in manner similar to the chains, O. Or the chains may be made fast to eyes screwed into the cradle, M, the slack of the several chains being taken up on spindles actuated by means of the winch handles, R.

When it is desired to remove the ship from the dock, the pontoon, L, is cast off from the pontoon, J, and she is floated out thereon. To float the ship from off the pontoon, L, after repairs, the pontoon and ship are again brought into the dock and placed over the elevating pontoon, J; water is then let in to both pontoons, J and L, and they sink accordingly, leaving the ship floating on the surface. The elevation, fig. 4, shows the ship floating upon the pontoon, L, and free from the dock.

With these arrangements of floating docks, ships may be examined or repaired with greater facility and ease than by any other principle now in existence. Neither foundation, masonry, nor fixed position is requisite, as the dock can be floated anywhere, and to dock a ship requires neither rise nor fall of the tide; the lift can be worked either in docks or rivers where there is sufficient water. The pontoons are so constructed, that when requiring repairs they can raise each other out of the water for that purpose, without moving from the place where the work is generally carried on, with the greatest ease. These pontoons or docks may also be used for lifting ships in the present graving docks now built of stone or otherwise, by being put into the graving dock, the water pumped out of the dock, and the pontoon allowed to rest on the bottom. The pontoon is then filled with water, and the dock also filled, when a ship may be introduced. The water is then pumped out of the dock till the ship rests upon the pontoon. In order to undock the ship, the water is run out of the pontoon, the sluices of the dock shut, water let into the dock, and the pontoon with the vessel upon it rises, and may be floated out.

REPORT OF COMMISSIONERS OF PATENTS FOR 1858.

The report of the Commissioners of Patents as to the patent business of 1858 is now before us, reminding us in the most complete manner of the state and progress of invention. From it we find that the number of applications for provisional protection recorded within the year 1858 was 3,007; the number of patents passed thereon was 1,954; the number of specifications filed in pursuance thereof was 1,880; the number of applications lapsed or forfeited, the applicants having neglected to proceed for their patents within the six months of provisional protection, was 1,047.

The Act 16 Vict., c. 5, enacts that all letters patent for inventions to be granted under the provisions of the Patent Law Amendment Act, 1852, shall be made subject to the condition that the same shall be void at the expiration of three years and seven years respectively from the date thereof, unless there be paid, before the expiration of the said three years and seven years respectively, the stamp duties in the schedule thereunto annexed, viz., £50 at the expiration of the third year, and £100 at the expiration of the seventh year.

Two thousand and forty-four patents bear date between the 1st July, 1855 and the 30th June, 1856; the additional stamp duty of £50 has been paid on 568 of that number; and 1,476 have become void by reason of non-payment.

All the provisional, complete, and final specifications filed in the office upon the patents granted under the Act have been printed and published in continuation, with lithographic outline copies of the drawings accompanying the same, and within three weeks of the respective dates of filing, according to the provisions of the Act 16 and 17 Vict., c. 115.

The provisional specifications filed in the office and lapsed and forfeited have also been printed and published in continuation.

Printed certified copies of the specifications filed in the office, as also certified copies of patents, and of the record book of assignments of patents and licences, with copies of such assignments and licences, have been sent, in continuation, to the office of the Director of Chancery in Edinburgh, and the enrolment office of the Court of Chancery in Dublin, pursuant to the Act of 1852 and the Act of 16 and 17 Vict., c. 115.

The work of printing the specifications of patents under the old law, 12,977 in number, and dating from 1711 to 1852, having been completed, the Commissioners of Patents have directed short abstracts or abridgments of specifications, grouped under the different heads of invention, to be prepared and published; for example, abridgments of the specifications of patents relating to the propulsion of vessels, commencing in the year 1618 and ending 1857, comprising nearly 1,000 inventions, have been published in three parts, making one small volume.

Abridgments relating to the following subjects of invention have also been published:—

- Drain tiles and pipes.
- Manufacture of iron and steel, 3 parts.
- Manures.
- Sewing and embroidering.
- Preservation of food.
- Aids to locomotion.
- Steam culture.

Other series are in the press, and it is intended to publish at the rate of six or eight series in each year, completing the work in eight or ten years.

These abridgments are sold at prices a little above the cost of printing and paper.

The following report of the Commissioners of Patents on the subject of the building of a patent office and a public library has been transmitted to her Majesty's Treasury.

To the Lords Commissioners of her Majesty's Treasury.—The Right Honourable Frederic Lord Chelmsford, Lord High Chancellor of Great Britain, The Right Honourable Sir John Romilly, Master of the Rolls, Sir Fitzroy Kelly, her Majesty's Attorney-General, and Sir Hugh M'Calmont Cairns, her Majesty's Solicitor-General, being four of the Commissioners of Patents for invention under the said Act, report as follows:

The 4th section of the said Act enacts, that "it shall be lawful for the Commissioners of her Majesty's Treasury to provide and appoint from time to time proper places or buildings for an office or offices for the purposes of the said Act."

In pursuance of the requisition of the Lords Commissioners of her Majesty's Treasury, dated in 1853, the Commissioners of her Majesty's Board of Works provided certain offices for the Commissioners of patents, being the ground-floor rooms of the Masters' offices in Southampton buildings, Chancery Lane, theretofore occupied by Masters in Chancery, abolished under the act 15 and 16 Vict., c. 80; and an annual rent of £490 is now paid out of the Fee Fund of the Patent office to the Suitors' Fund of the Court of Chancery for the hire of the same.

This arrangement was not considered to be permanent; no lease has been granted, and as these offices are now required for the occupation of the registrars and other officers of the Court of Chancery, due notice has been given to the Commissioners of patents, requiring them to give up possession as soon as other suitable offices can be procured.

These offices were in 1853 sufficient in number and accommodation for the ordinary business of the office.

In the year 1855 the Commissioners of patents established a free public library within their office, containing works of science in all languages, the publications of the Commissioners, and the works upon patented and other inventions published in the British colonies and in foreign countries.

This library has greatly increased and continues to increase, partly by purchases, but in a great measure by gifts and loans of valuable and useful books. It was resorted to at the first opening by inventors, engineers, and mechanics, as well as by barristers, solicitors, and agents engaged in patent business; it has become a collection of great interest and importance, and the number of readers has gradually so much increased that at this time convenient standing room cannot be found in the two small rooms within the office which can be appropriated to the library. It is the only library within the United Kingdom in which the public have access not only to the records of the patents and inventions of this country, but also to official and other documents relating to inventions in foreign countries, and this without payment of any fee.

A largely increased accommodation is urgently required.

No suitable building can be found in the immediate neighbourhood of Southampton Buildings, either to be rented or for purchase.

The new offices to be provided must be fire proof, for the preservation of the original specifications and other records of the office; the offices now occupied are fire-proof throughout.

The Commissioners of Patents are in possession of a collection of very valuable and interesting models of patented machines and implements, as also of portraits of inventors, many of them gifts, and others lent by the owners for exhibition. They are now exhibited daily, and gratuitously, in a portion of the Museum at Kensington assigned to the Commissioners of Patents for that purpose by the Lords of the Committee of Privy Council for Trade.

A museum of this nature necessarily increases, and the number of models now exhibited may be considered as forming only the foundation of a great national museum.

The great work of printing the old specifications of patents, with the drawings attached thereto, enrolled in Chancery under the old law, dating from 1623 to 1852, and 12,977 in number, was commenced in September, 1853, and fully completed in July last (1858). All have been fully indexed in series and subjects, and the indexes printed and published. These prints of specifications form about 900 volumes (450 imperial octavo volumes of drawings, and the like number of imperial octavo volumes of letter press.) The indexes form seven imperial octavo volumes.

The cost of these valuable works has necessarily been great, amounting to £92,000

Notwithstanding this great outlay, the balance sheet of income and expenditure for the year 1857, prepared for the annual report of the Commissioners, and laid before Parliament, shows a surplus income from the commencement of the Act, 1st October, 1852, to the end of 1857, of £6,000.

The balance sheet of income and expenditure for the year 1858, prepared, and shortly to be laid before Parliament, shows a surplus on the year of £5,900, thereby increasing the total surplus to £11,900.

The work of printing the old specifications being completed, as above stated, the expenditure on that head ceases altogether, and consequently the surplus income of the current year (1859) is estimated at £21,600; adding this sum to the present available surplus of £11,900, and leaving a margin of £3,500, £30,000 may be safely estimated as the sum available for building purposes at the end of the current year, 1859.

The balance sheet of income and expenditure for the current year, 1859, is estimated as follows:—

Receipts.

Stamp duties,	£86,000 0 0
Sale of printed specifications,	1,300 0 0
	£87,300 0 0

Payments.

Fees to the law officers,	£8,700 0 0
Do. their clerks.	800 0 0
Salaries of officers and clerks,	5,600 0 0
Compensations,	4,600 0 0
Current and incidental expenses.	7,500 0 0
Cost of stationery supplied to the patent office by her Majesty's stationery office,	700 0 0
Cost of purchase of books for library, and binding,	500 0 0
Rent of offices,	500 0 0
Letter-press printing, lithographer's bills for drawings, and estimated cost of paper supplied to the printer and lithographer by her Majesty's stationery office,	17,500 0 0
Expenses in respect of the museum at South Kensington, and clerks' salaries for ditto,	3,000 0 0
Revenue stamp duties,	16,300 0 0
Balance or estimated surplus income of the current year 1859,	21,600 0 0
	£87,300 0 0

The Act of 1853 (16 Vict., c 5) converted all the fees imposed by the Act of 1852 into stamp duties, thereby passing the whole income of the office to the consolidated fund.

The expenditure of the office is estimated and voted annually by Parliament.

There is no appearance of diminution in the number of applications for patents, and they may be safely estimated to continue for future years at 3,000 in each year.

This number will produce £86,000 in stamp duties, and adding thereto £1,300 for the average annual proceeds of sales of printed specifications, the future annual gross income may be taken at £87,300. The gross income is, however, liable to a deduction of £16,300, on account of revenue stamp duties, leaving the real available future income of the Patent Office at £70,000 per annum, or thereabouts.

The Patent Law Amendment Act, 1852 (15 and 16 Vict., c. 83), imposed certain revenue stamp duties upon patents. These duties have hitherto produced £15,300 per annum, and that sum has been charged against the office in the annual balance sheet of income and expenditure.

These duties are estimated in the balance sheet above set forth for the current year, 1859, to produce £16,300, or thereabouts.

The work of printing the old specifications being completed, as above stated, the yearly future cost of the current specifications, abstracts of specifications, journals, indexes, &c., in letter-press printing, lithographic printing, and paper, will not exceed £17,500 per annum, as contrasted with the average yearly expenditure on those three heads of £39,375 within the years 1856-7-8.

The Commissioners of patents are of opinion that it is not expedient, for the present at least, to propose to Parliament a reduction of the scale of stamp duty fees, imposed by the Act of 1852.

They are of opinion that the fees paid upon the passing of a patent are not too heavy; the large number of applications (3,000 in each year) accounting for the large amount of income. Any material reduction in the amount of fees would undoubtedly tend to increase the number of useless and speculative patents; in many instances taken merely for advertising purposes.

The fee stamp duties and the revenue stamp duties are as follows:—

	Fee Stamp Duties.	Revenue Stamp Duties.
Within the first six months from the petition for provisional protection to the filing of the specification,	£20 0 0	£5 0 0
On the patent at the expiration of the third year,	40 0 0	10 0 0
On the patent at the expiration of the seventh year,	80 0 0	20 0 0

(The patent is granted for fourteen years.)

There are 3,000 petitions for provisional protection presented in each year, or thereabouts. Of this number, 1,950 reach the patent, and 550 patents pay the £50 additional stamp duty required at the expiration of the third year; 1,450 patents, or nearly three-fourths of the whole, thereby becoming void. Probably not more than 100 of the surviving 550 will pay the £100 additional stamp duty, required at the end of the seventh year.

Considering the beneficial results of the additional payment of £50, in sifting useless patents, the Commissioners are of opinion that it is not expedient to reduce the amount, for the present at least, and so long as the surplus can be expended for the benefit of patentees, and that portion of the community which is principally interested in, and connected with, the practical application to public purposes of discoveries and improvements in science and art.

They are of opinion that the surplus income, calculated, as before stated, to amount to £30,000 at the end of the current year, 1859; and to increase in each succeeding year at the rate of £20,000 per annum, may be beneficially applied in the purchase of ground in a central situation, and in the erection thereon of a sufficiently spacious fire-proof building, for the Patent Offices and public free library attached thereto; and that the surplus fund may also be beneficially applied in the purchase of ground, and the erection thereon of a permanent and spacious building for the Patent Office museum; sufficient ground being taken for the extension of the building, from time to time, as may be required.

This is the more necessary, inasmuch as models of the most interesting and valuable description lie scattered over the kingdom, in many instances constructed at a great expense, for legal and other purposes, for which the owners have no present use, and many of which occupy a space inconvenient to them. These models, or many of them, would, as the Commissioners confidently expect and believe, be presented or intrusted to them for exhibition in such museum, provided the public are allowed free access to it at all reasonable times.

The Patent Office is the place of constant daily and hourly resort of patentees, agents, and all others concerned in obtaining patents, and in ascertaining what discoveries and improvements have already been made. It should be conveniently placed with reference to the courts of law, the Government offices, and the offices of the Attorney and Solicitor General.

With respect, however, to the proposed new museum, the Commissioners of patents are of opinion that the same reasons for a central position do not exist, and that it might be placed upon any spot easily accessible to the inhabitants of the metropolis, and that the place in which the models are now exhibited would be an elegible position, sufficient ground being there purchased or assigned for the purpose. A large space will be required for the building in the first instance, and a larger extent must be provided for its future extension; and sufficient ground cannot be found in the centre of the town for a building of the extent required, unless at an enormous cost.

The Commissioners are anxious to establish a library in conjunction with the museum, showing the patents already granted by foreign Governments, and those which from time to time are so granted; and from the facilities afforded by foreign Governments, the Commissioners have every reason to believe that this may be accomplished without difficulty.

These are the two objects which the Commissioners of patents present to the consideration of the Lords Commissioners of her Majesty's Treasury, and for which they are desirous to obtain their sanction:—

1st. The erection of a museum for the preservation and exhibition of the models, as above mentioned.

2d. The erection of suitable offices.

The latter of these objects ought properly to precede the former; but if the offices they at present hold in Southampton Buildings can be retained for the present, this object may be postponed till a convenient site can be obtained.

For the accomplishment of the former object, a very favourable opportunity at present occurs, as the Lords of the Privy Council constituting the Committee of Trade are (as the Commissioners are informed) willing to allot to them a portion of the land recently purchased at South Kensington, sufficient in extent both for the purpose of the erection of the building now required, and to provide for the future extension of the museum.

The Commissioners of patents, therefore, request that the Lords Commissioners of her Majesty's Treasury will be pleased to sanction the application of a sufficient portion of the surplus, now derived from the fees paid on patents, for the purpose of accomplishing the objects above-mentioned, and that with this view their Lordships will be pleased to give the necessary directions to her Majesty's Board of Works, to obtain a proper site for the proposed new Patent Office and Library, to be selected with the approbation of the Commissioners of patents, and with the sanction of the Lords Commissioners of her Majesty's Treasury; and also to prepare the necessary plans, elevations, and specifications for this purpose, also to be submitted to the Commissioners of patents for their approval; and to make contracts for the building of the same when approved.

If their Lordships consent to to these proposals, the Commissioners of patents have to request that a sufficient sum for the purpose, so far as the same may be required for the year 1858-9, may be included in the estimate to be laid before Parliament in the present session for Patent Office expenses.

RULES AND REGULATIONS.—CLERKS AND OFFICERS.

No additional Rules or Regulations were made under the Act, or additional clerks appointed within the year 1858.

An account of the salaries paid to the clerks and officers appointed under the Act for the year 1858:—

Clerk of the Commissioners, ...	£600 0 0
Chief Clerk in the Patent Division of the Office, . .	470 0 0
First Clerk, ...	280 0 0
Second Clerk, . . -	280 0 0
Third Clerk, ...	200 0 0
Fourth Clerk, ...	140 0 0
Fifth Clerk, ...	120 0 0
The Superintendent of Specifications, ...	1,000 0 0
First Clerk in the Specification Division of the Office, .	300 0 0
Second Clerk, ...	250 0 0
Third Clerk, ...	250 0 0
Salaries of occasional and extra Clerks, ...	778 15 0
	£4,668 15 0

FEES TO THE LAW OFFICERS.

No alteration was made within the year 1858 in the allowance of fees to be paid to the law officers and their clerks in cases of opposition to the grant of Letters Patent under the 47th section of the Act, or in the allowance of fees to be paid to them upon certificates of provisional protection under the 48th section of the Act.

Payments made to the Attorney and Solicitor-General for England, and their respective Clerks, for the year 1858, on account of fees upon patents for inventions, in pursuance of the Report of the Commissioners of Patents to the Lords of the Treasury, of the 1st of May, 1853 :—

To Sir Richard Bethell, her Majesty's Attorney-General, for certificates of allowance of protection on provisional specifications, 201 at two guineas each, ...	£422 2 0	
Ditto, for fiats on reference of complete specifications, 5 at two guineas each, . .	10 10 0	
Ditto, for signing warrants, 151 at one guinea each, from the 1st January to the 1st March, 1858, ...	158 11 0	
		£591 3 0
To the Clerk of the Attorney-General on provisional and complete specifications, 206 at five shillings each, . .		51 10 0
To Sir Henry Singer Keating, her Majesty's Solicitor-General, for certificates of allowance of protection on provisional specifications, 198 at two guineas each, ...	415 16 0	
Ditto, for fiats on reference of complete specifications, 4 at two guineas each, . .	8 8 0	
Ditto, for signing warrants, 145 at one guinea each, from the 1st January to the 1st March, 1858, ...	152 5 0	
		576 9 0
To the Clerk of the Solicitor-General on provisional and complete specifications, 202 at five shillings each, . .		50 10 0
To Sir FitzRoy Kelly, her Majesty's Attorney-General, for certificates of allowance of protection on provisional specifications, 1,272 at two guineas each, ...	2,671 4 0	
Ditto, for fiats on reference of complete specifications, 18 at two guineas each, . .	37 16 0	
Ditto, for signing warrants, 755 at one guinea each, from the 2d March to the 31st December, 1858, . . . - .	792 15 0	
		3,501 15 0
To the Clerk of the Attorney-General on provisional and complete specifications, 1,290 at five shillings each, . .		322 10 0
To Sir Hugh M'Calmont Cairns, her Majesty's Solicitor-General, for certificates of allowance of protection on provisional specifications, 1,272 at two guineas each, . .	2,671 4 0	
Ditto, for fiats on reference of complete specifications, 23 at two guineas each, . .	48 6 0	
Ditto, for signing warrants, 806 at one guinea each, from the 2d March to the 31st December, 1858, ... -	846 6 0	
		3,565 16 0
To the Clerk of the Solicitor-General on provisional and complete specifications, 1,295 at five shillings each, . .		323 15 0
		£8,983 8 0

COMPENSATIONS.

In pursuance of several awards and minutes of the Lords Commissioners of the Treasury, under the provisions of the 50th section of the Act, allowing compensation to the under-mentioned officers, the following sums have been paid out of monies granted by Parliament for the purpose, for the year 1858 :—

To Mr. David Graham Johnstone, patent clerk to the Attorney and Solicitor-General for England, ...	£850 0 0
To Mr. Moses Poole, clerk in the Patent Office of the Attorney and Solicitor-General for England, ...	130 0 0
Carry forward, . .	£980 0 0
Brought forward, . .	£980 0 0
To Mr. Thomas Lynch, assistant clerk in the Patent Office in Ireland, ...	50 0 0
To Mr. Bartholomew M'Namara, copying clerk in the Crown and Hanaper Office in Ireland, ...	16 0 0
To Mr. John Charles Walsh, copying clerk in the same Office,	14 0 0
To the Attorney-General for Ireland, ...	1,200 0 0
To the Solicitor General for Ireland, ...	800 0 0
To the Lord Advocate for Scotland, ...	850 0 0
To the clerk of the Attorney-General for Ireland, . .	300 0 0
To the clerk of the Lord Advocate for Scotland, . .	300 0 0
To Mr. Thomas Stinton, trainbearer to the Lord Chancellor of Ireland, ...	12 0 0
To Mr. J. P. Halley, clerk in the Office of the Director of Chancery in Scotland, ...	30 0 0
To Mr. D. M'Neillie, ditto, ...	22 0 0
To Mr. John M'Neillie, ditto, ...	10 0 0
	£4,584 0 0

CURRENT AND INCIDENTAL EXPENSES.

The 49th section of the Act empowers the Lords Commissioners of the Treasury to allow the necessary sums for providing offices under the Act, for the fees, salaries, and payments to be allowed, and for the current and incidental expenses of the office, to be paid out of such monies as may be provided by Parliament for the purpose.

An account of the current and incidental expenses in the office of the Commissioners, for the year 1858:—

Paid for two copies of *Gazettes* for the use of the office, .	£13 2 0
Paid for translating titles of foreign specifications, . .	1,251 4 0
Paid for compiling index of journals, and copying titles of French patents, &c., ...	134 14 0
Paid office keepers, carpenter's bill for packing cases for specifications, &c., sent to public offices in Edinburgh and Dublin, and work done in library, chimney sweep, &c., . .	218 17 9
Paid for gas, postages, porterage, and sundries, . .	102 15 9
Paid for 1,875 tin boxes, to hold the impressions of the Great Seal attached to the patents, at one shilling each, . .	93 15 0
Paid the sealer of the Court of Chancery for wax expended by him upon 1,875 impressions of the Great Seal, . .	140 13 6
Paid to the law stationers employed by the Commissioners for copying out of the office, at the rate of three halfpence per folio, and for writing clerks employed in copying in the office, and paid by time, ...	4,052 18 2
This charge stands in the place of the salaries of at least thirty copying clerks, which number of clerks must otherwise have been placed upon the establishment of the office, in addition to the nine clerks permanently appointed.	
The documents copied consisted principally of specifications of patents and provisional specifications for the printer, mostly of great length; copies of indexes for the printer; office copies of specifications, patents, and other records, made for persons applying for the same, the fees thereon being paid in stamp duties; office copies of patents sent to the public offices in Edinburgh and Dublin pursuant to the Act; three copies of each deed of assignment of a patent or licence of patent right recorded in the office pursuant to the Act, one copy for the record books of the office, the other two for the public offices in Edinburgh and Dublin, and two copies of the record book for the same offices in Edinburgh and Dublin. These assignments and licence deeds are, with few exceptions, of great length, and the fee of 5s. on recording each deed is paid in a stamp duty; copies of notices for the *Gazette*, and various other records and documents.	
Paid the lithographers employed by the Commissioners, for lithographic forms, &c., ...	171 12 7
Consisting of forms of certificates of allowance of provisional protection, notices to proceed, notices of objections, forms for patents, for the warrants of the law officer, and for transcripts of patents, &c.	
Paid messenger to the Lord Chancellor for obtaining the seals to patents during his Lordship's absence from town (vacation 1858), ...	42 6 11
Paid Mr. MacGregor for abridging 805 specifications of patents relating to marine propulsion, for publication, at 7s. each specification, ...	281 15 0
Paid Mr. Ashton for abridging 693 specifications of patents relating to iron and steel, at 7s. each, ...	242 11 0
Paid Mr. Coryton for abridging 714 specifications of patents relating to printing, at 7s. each, ...	249 18 0
Paid Mr. Campbell for abridging 814 specifications of patents relating to paper, papier-mâché, &c., at 7s. each, . .	284 18 0
Paid Mr. Ashton for abridging 922 specifications of patents, relating to fire-arms, &c., at 7s. each, ...	322 14 0
Paid Mr. Graham for abridging 1,258 specifications of patents relating to bleaching, dyeing, and printing, at 7s. each, .	440 6 0
Carry forward, . .	£8,044 1 8

Brought forward,	£8,044	1	8
Paid Mr. Walenn for abridging 761 specifications of patents relating to electricity, at 7s. each,	266	7	0
Paid Mr. Forster for abridging 985 specifications of patents relating to the combustion of fuel, &c., at 7s. each,	344	15	0
Paid Mr. Campbell for abridging 249 specifications of patents relating to manures and preparation of food, at 7s. each,	87	3	0
	£8,742	6	8

The Commissioners have thought it expedient to lay before Parliament, in the schedule to this report, an account of stamp duties in lieu of fees received under the provisions of the Act, with a balance sheet of their receipts and expenditure.

SCHEDULE.

An account of stamp duties, received under the Act, to substitute stamp duties for fees (16 Vict., c. 5), for the year 1858:—

3,007 petitions for grant of letters patent, at £5 each,	£15,035	0	0
2,174 notices of intention to proceed with application, at £5 each,	10,870	0	0
50 notices of objection to the grant of letters patent, at £2 each,	100	0	0
1,954 warrants for patents, at £5 each,	9,770	0	0
1,954 patents sealed, at £5 each,	9,770	0	0
1,880 final specifications filed, at £5 each,	9,400	0	0
51 complete specifications filed, at £5 each,	255	0	0
553 entries of assignments of patents and licences, at 5s. each,	138	5	0
360 searches and inspections, at 1s. each,	18	0	0
13,011 folios of office copies of documents, at 2d. per folio,	108	8	6
558 patents upon which the progressive stamp duty of £50 has been paid,	27,900	0	0
8 duplicate patents issued in lieu of original patents lost or destroyed, £5 each,	40	0	0
28 petitions on application for disclaimers, £5 each,	140	0	0
16 caveats against disclaimers, at £2 each,	32	0	0
1 patent granted upon her Majesty's Order in Council, under the 40th section of the Act (1852), being a prolongation of a patent granted previous to the Act,	5	0	0
	£83,581	13	6

Balance Sheet of Income and Expenditure for the Year 1858.

Receipts.

In stamp duties in lieu of fees,	£83,581	13	6
By sale of prints of specifications, indexes, &c.,	1,371	2	0
Surplus income on balance of accounts from the 1st Oct., 1852, to the end of the year 1857, (Report to Parliament for 1857),	6,005	5	6
	£90,958	1	0

Payments.

Fees to the law officers of England,	L8,235	3	0
Their clerks,	748	5	0
Salaries of the officers and clerks in the patent office,	4,668	15	0
Compensations,	4,584	0	0
Current and incidental expenses in the patent office,	8,742	6	8
Cost of stationery supplied by her Majesty's stationery office, books for the free library, and binding,	1,670	0	3
Rent of offices,	490	0	0
Messrs. Eyre and Spottiswode for printing specifications of patents, indexes, &c., and lithographer's bills for drawings accompanying specifications,	25,011	8	1
Cost of paper supplied to the printer and lithographer by her Majesty's stationery office,	5,644	13	2
Cost of coals and other fuel supplied to the patent office by her Majesty's office of works,	56	7	0
Expenses incurred in respect of the museum at South Kensington,	1,362	6	2
Salaries of clerks for ditto,	575	0	0
*Revenue stamp duty account as below,	15,350	0	0
Surplus income,	13,819	16	8
	£90,958	1	0

* The Act of 1852, in lieu of the old duties upon patents, imposed a revenue stamp duty of £5 upon the warrant of the law officer, £10 upon the certificate of payment of the progressive fee of £40 at the expiration of the third year, and £20 upon the certificate of payment of the fee of £80 at the expiration of the seventh year of the patent.

The Act of 1853 (16 Vict., c. 5) converted all the fees imposed by the Act of 1852 into stamp duties.

The *Revenue* stamp duty account for the year 1858 is as follows:—

1,954 warrants of the law officers for patents at £5 each,	£9,770	0	0
558 patents on which the progressive duty of £50 has been paid at the end of the third year from their respective dates (£10 being *Revenue* stamp duty, and £40 fee stamp duty); 558 at £10 each,	5,580	0	0
	£15,350	0	0

HISTORY OF THE SEWING MACHINE.

ARTICLE XIX.

Julian Bernard, Esq., obtained a patent on the 18th of April, 1854, for "Improvements in stitching, and machinery and apparatus connected therewith." This invention relates generally to a means of tightening the stitch, and actuating the needle in stitching machines, and to a mode of inserting the needle into and through the material; also, to combining stitching machines with ornamental tables, and the peculiar mode of constructing such tables.

The peculiar mode of tightening the stitch in a sewing machine where a continuous thread is used, consists in pulling that portion of the thread which is between the eye of the needle and the material, by means of two jaws or thread grippers, shown in edge view, detached in fig. 132, and in side elevation applied to a machine in fig. 133. This thread tightener consists of two arms, A B, the arm, A, sliding vertically in collar bearings, C, screwed into the front of the main bracket of the machine, and kept down near to the surface of the material by an India-rubber spring, D. The arm, B, is jointed at E, to its fellow arm, and is kept in close contact therewith at the lower extremity by the tail-piece or prolongation, F, which is made of steel, and bears against one of the collar bearings so as to keep the jaws of the tightener closed. A detached plan view of this jaw is shown at fig. 134, with the thread engaged

Fig. 132.

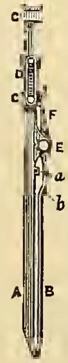


Fig. 133.

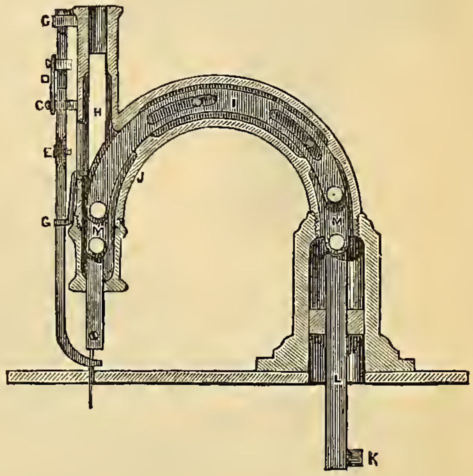
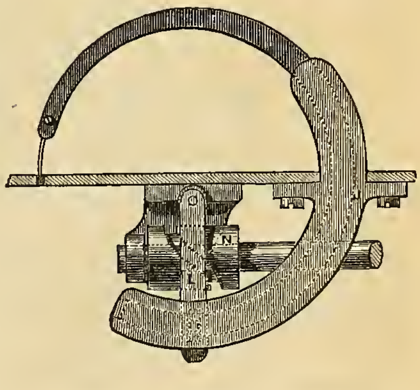


Fig. 134.

therein. G, fig. 133, is a pin connected with the middle slide or carrier, H, and working between the two arms of the tightener. On the arm, A, there is a projection formed at *a*, and upon the arm, B, there is an incline, *b*; this projection and incline being operated upon by the ascent and descent of the pin, G, in the following manner. As the needle slide or carrier, H, descends for the purpose of inserting the needle into the material, the pin, G, acts upon the incline, *b*, and opens the jaws to allow the needle and thread to pass freely therethrough; but by the time the needle has risen again and has just left the material, the pin, G, will have again passed the incline, *b*, and allowed the jaws to close and grip the thread, as in fig. 134. The further ascent of the needle carrier brings the pin against the projection, *a*, which has the effect of raising the two arms bodily in the bearings, C, and of drawing or tightening the stitch without applying any strain whatever to the needle. Fig. 133 also serves to illustrate the peculiar and ingenious means adopted by Mr. Bernard for actuating the needle carrier. This he proposes to do by connecting

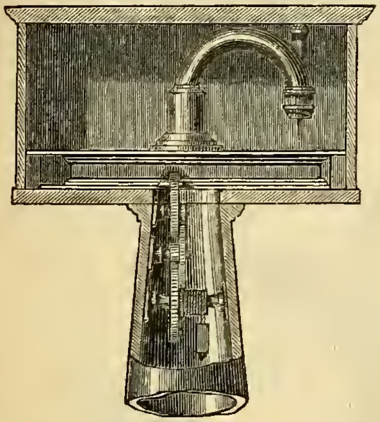
Fig. 135.



the slide or carrier, H, which is made in the form of a round rod, to a curved or semicircular slide or rod, I, contained within the correspondingly curved bracket, J, and sliding in a circular course corresponding to its own arc. The requisite reciprocating motion is imparted to the curved slide by means of a cam engaged with the small roller, K, on the bottom of the central vertical rod, L. M, are short links for connecting the needle carrier and the rod, L, to the curved slide. This is really a most elegant and simple contrivance for working a sewing machine needle: it enables the general design of the machine to be greatly improved and heightened, whilst at the same time, the mechanism itself is entirely concealed. Fig. 135 shows another modification of the curved slide, the slide itself in this case forming the needle holder. It works in its own circular course, within a semicircular tubular bracket, J, bolted to the end plate of the machine. The slide, I, is provided with a pin which works in the slotted end of the vibrating lever arm, L, worked to and fro by the cam, N.

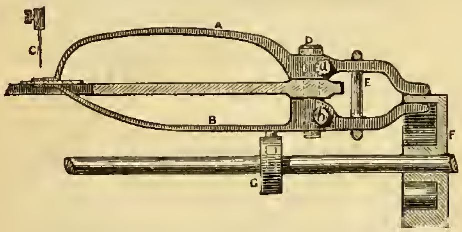
We have previously referred in our notice of Mr. Bernard's patent of the 6th of December, 1853, to his notion of driving sewing machines by *clock work*. We now give an illustration, at fig 136, of an elegant mode of applying this clockwork to a lady's boudoir machine, the whole of the mechanism being concealed within the hollow supporting pillar or stand of the table, which Mr. Bernard proposes to ornament and elaborate, with a view to its general introduction into the boudoir. The upper part of the table is made to open when required for work, and to close in and conceal the machine entirely when not in use, as shown in our cut, which speaks for itself without any further reference thereto.

Fig. 136.



On the 6th of May, 1854, Mr. Bernard obtained another patent, comprising, amongst other devices, a mode of feeding the material to be stitched or ornamented, illustrated at fig. 137, which is one of two very similar modifications described in the specification; A and B represents the upper and lower arms of a pair of pliers, which hold the fabric between their flattened jaws at C. These arms work on the respective centres, *a b*, in the vertical stud pin, D, carried by the table or end plate, and serving as a fixed centre round which the pliers move laterally or in a horizontal direction over the bed-plate. An India-rubber spring, E, serves to keep the jaws open, whilst the cam, F, is so formed as to press them together at the proper time, and grip the material. A second cam, G, fast on the same shaft which carries the first-mentioned cam, imparts a lateral motion to the pliers through a stud pin fixed on the lower arm, B, and is is maintained pressed against the periphery of the cam by a spring. It will readily be understood, that on this feed motion being set to work, the cam, F, will first cause the pliers to grip the material and hold it during the lateral or feed motion of the pliers derived from the cam, G, on the completion of which, the cam, F, allows the pliers to open and return again in readiness for a next grip and pull of the fabric, the extent of each lateral movement being regulated to suit the length of stitch required. By another modification a fixed spring may be substituted for the upper arm, A, and the pliers may be made to move in a straight lateral direction, in place of round a centre point or pivot. Mr. Bernard proposes to secure the needles of sewing machines into their carriers by splitting the end of the carrier and forcing the needle into the split, which is opened to receive it by an instrument for that purpose, thus dispensing with set screws. Another portion of the invention consists in the substitution of marble, china, porcelain, stone or earthen-ware, for the ordinary and less elegant materials employed in the manufacture of the table, presser foot, or other parts of a sewing machine, by which novel application the appearance of the machine will be very greatly enhanced; whilst such application offers also the important advantage of great cleanliness, as compared with wood or iron. Another portion of the invention consists in the employment of two endless travelling feeding bands or chains, for traversing the fabric beneath the needle which passes between the two bands. These bands are carried by rollers, and an intermittent motion is imparted to them by any convenient contrivance.

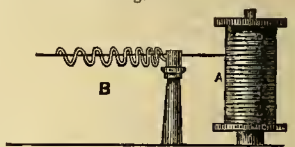
Fig. 137.



Mr. Bernard obtained another patent on the 9th of June, 1854, the details of which are too complicated to be illustrated in our necessarily curt notices. Amongst these improvements there is described a mode of passing one thread over another in the form of a loop, by enlarging such loop sufficiently to pass over a reel bobbin or holder containing another thread, and held between two fingers or levers, which are made to release their hold of the bobbin alternately by means of a cam. This invention relates also to improvements on the machine for making or sewing the edges of button holes, previously referred to in our notice of Mr. Bernard's patent of the 6th of December, 1853, and consists of an arrangement for carrying the thread over the edge of the material without passing behind the needle, so that instead of forming the "button hole stitch," it will merely pass through and overlap the edge of the material, and produce what is known as "over-cast stitch" Other portions of this invention consist of a peculiar mode of taking up the slack of the thread, discontinuing the travelling action of the material at pleasure, and causing the needle and parts connected therewith to travel, whilst the material itself remains stationary.

George Holloway took out Letters Patent on the 17th of June, 1854, for certain improvements bearing upon the sewing machine. The first of these improvements consists of a means of holding the thread of sewing and embroidering machines in tension, so that whatever the quantity of thread upon the bobbin or bobbins, the same amount of tension will be preserved without putting any injurious drag upon the thread. Fig. 138 represents the means proposed by Mr. Holloway for imparting an elastic tension to the thread. A, is the bobbin, and B, a wire bent in a zig-zag form, and having the thread from the bobbin passed on alternate sides of a greater or less number of the several bands, according to the amount of drag to be imparted to the thread. On any sudden increased resistance occurring, the elasticity of the bent wire will admit of its yielding, or extending longitudinally, in place of exerting a rigid tension or drag upon the thread.

Fig. 138.



Another improvement relates to the Lancashire sewing machine, and consists of a mode of adjusting the circular needle, and otherwise insuring the better working of such machines.

George R. Chittenden obtained a patent for an invention, communicated to him from abroad, on the 20th of June, 1854, which invention consists almost entirely of the application to sewing machines of peculiar apparatus, for folding bindings for the edges of hats and other articles, and for holding such bindings correctly during the operation of sewing; also for folding or turning over the edges or selvages of fabrics, for the purpose of hemming the same, and, when desired, introducing cords into the hems or folded edges; also for holding and regulating the letting off of the thread employed.

Edward Joseph Hughes obtained a patent for certain improvements in stitching, which had been communicated to him from abroad, on the 30th of June, 1854. The specification of this invention is very voluminous, and contains many devices, too numerous to detail seriatim, for producing good and firm stitching. According to one arrangement, a single thread stitch is produced by means of a needle and a hook, the latter taking the loop of the thread, after it has been taken up through the cloth and down again; in another plan, round a spool or thread case, which supplies the single thread used, thereby producing a perfectly full stitch from one thread only. As we have already had occasion to dwell upon the desirability of a *really full* single thread stitch, we give an illustration of the mode by which Mr. Hughes' correspondent proposes to solve this problem It certainly has simplicity of construction in its favour. Fig. 139 represents a sectional view of the spool and spool case, the thread from the spool after passing round an internal guide eye, passes out from the case by an aperture at the centre. The spool case with its spool winder is placed in a cup-shaped hollow, fitted on to the extremity of a horizontal shaft, beneath the end-plate or table of the machine, and in such a position as to allow the needle, which is in the form of

Fig. 139.

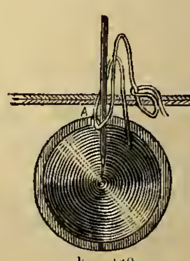


Fig. 140.

a hook, to pass down freely on the outside or front of the spool case, as shown in fig. 140. A rotatory motion is imparted to the spool case by suitable slides connected with the cup-shaped holder, which slides engage and disengage themselves successively with the spool case as it rotates, to allow of the free passage of the loop of thread round it, as we shall see presently; the spool case making one turn for every stitch produced. On the spool case there is formed a hook, A, fig. 140, extending from the side of the case furthest from the needle, to the side next to the needle, and is so formed as to take the loop from the crooked needle and draw it over or round the case, and cause it to be looped round that portion of the thread which extends from the spool to the cloth. A suitable thread guide is employed for guiding the thread into the hook of the needle. The needle having descended through the cloth, receives the thread in its hook and draws it up in the form of a loop, back through the cloth. The fabric is now fed forward one stitch, and the needle again descends with the loop still in it, which is carried down through the cloth. On being released by the needle, this loop is caught up by the hook, A, of the spool case, and is carried round the case thereby, when a fresh portion of the thread is placed in the hook of the needle, which is carried up through the cloth in the form of a loop as before, at the same time drawing the previous stitch close and firm. The peculiar stitch produced by these movements is shown at fig. 141. By means of similar arrangements of parts with certain additions thereto, a stitch resembling the above may be produced, but having a twist in each loop on the surface of the fabric, as shown in fig. 142. This is accomplished by imparting a semi-rotatory motion to the hooked needle, by means of a return inclined groove on the needle carrier, in which works a fixed stud or projection. This, and Mr. Bernard's previously referred to by us, are the only twisted loop stitches we have come across up to the present time. We shall again refer to several of Mr. Hughes' modifications in our next month's article.

Fig. 141.

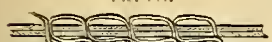


Fig. 142.

STEAM CULTIVATION.

We have frequently had occasion to notice Mr. John Allin Williams' able endeavours to assist the carrying out of the great idea of the present time, namely—steam cultivation; and it is with much gratification that we are again called upon to lay before our readers Mr. Williams' latest improvements regarding this most interesting and important subject.

Fig. 1 of the accompanying illustrations represents a perspective view of a double ploughing machine, to be used in connection with steam haulage for ploughing land. This implement is composed of a suitable frame, supported at the middle on a pair of central running wheels, and provided with a small wheel at or near each extremity, capable of adjustment by means of a crank handle, for the purpose of maintaining the frame as nearly as possible in a horizontal position, and of carrying the additional weight caused by the second set of ploughs with which the implement is fitted, when such ploughs are elevated or out of the ground. Two or more ploughs are carried at each end of the machine—the two sets of ploughs being respectively right and left handed—one set being raised out of the ground whilst the other is in work; and, as the two sets are used alternately, the machine never requires turning at the headlands. The axle of the central running land wheel is slotted, to allow of its vertical adjustment by means of a screw or rack and pinion, and is extended beyond the linch-pins for the purpose of carrying a pulley for running the slack rope upon, when Fowler's "endless rope" system of haulage is used. The steerage of the plough may be effected by lever handles at each end of the frame, or by disc swivel wheels, one of which is placed at each end of the machine, as shown in our illustration, and worked by suitable steering handles from a seat or platform in the centre of the machine. Each plough has a separate beam of its own, which is jointed at its head to a vertically adjustable block, working by means of a screw, along vertical standards, which are rigidly fixed to the frame, whilst the rear end of each beam is raised or lowered by one or more overhead windlasses, which actuate both sets of ploughs, taking up one set whilst the other is being let down. The power of the engine is transmitted, through the hauling rope or ropes, to a whippletree fixed under each set of ploughs, and fastened to the axle or frame by means of hooks and chains. From the body of each plough a wire-rope or chain is taken and passed through a hole or slot in the main axle, and connected to the whippletree by means of a set screw; by this arrangement, when power is applied to the rope, the whippletree draws the whole of the ploughs into the ground; and when shifting at the end of the furrow, the ropes taking against the holes in the axle prevent any side pull on the plough, which might otherwise damage them. When an endless rope is used, it is proposed to place two capstans on the framework, for taking up or giving out the slack. For the purpose of travelling, a pair of shafts may be placed at one end of the machine.

The improved scarifier or grubber, illustrated at fig. 2, consists of a suitable carriage or frame, supported by a pair of large central running wheels, and small guide or steering wheels in front, working on a vertical guide shaft or spindle. The axle of the large running wheels is made to work in two slotted boxes attached to the frame, and works at one end on a fixed centre or pin, whilst the other end is allowed to slide horizontally, and is fastened at any desired angle, by means of wedges, for the purpose of facilitating the steerage of the implement.

In the front of the frame-work are a suitable number of vertical standards, to which are attached a similar number of blocks, which are rigidly connected to each other by means of a lifting bar, so that the whole can be lifted up and set at any required depth, by means of a long lever working on a fulcrum on the top of the frame, and actuated from the rear of the machine.

Fig. 1.

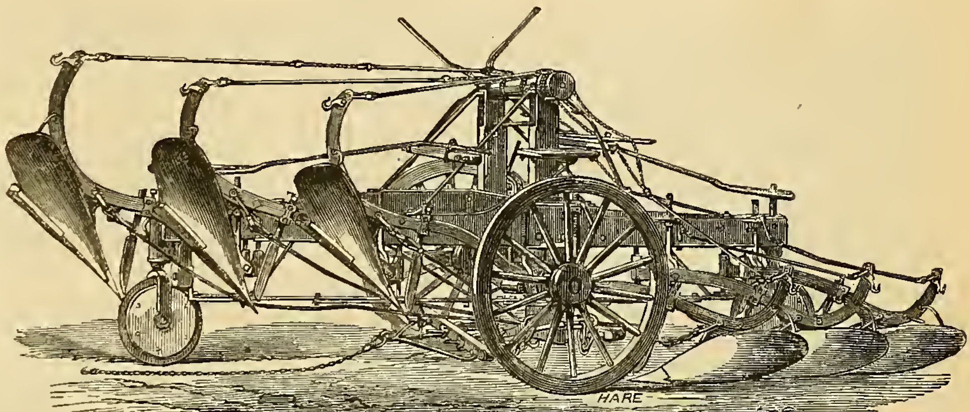
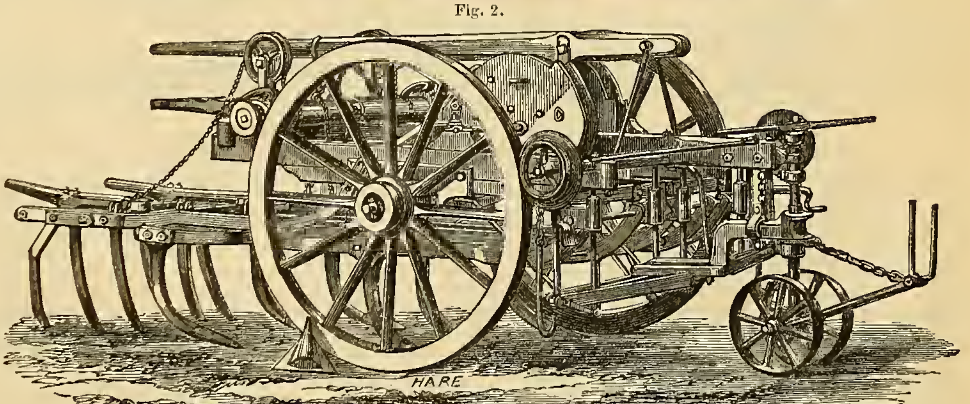


Fig. 2.



This frame-work contains any convenient number of tines or cultivating instruments, which are bolted or otherwise secured to suitable lever frames, working vertically on centres in the blocks at the front end, and, if required, on one or more single beams placed between the lever frames, each working as before mentioned from the blocks in the front. The patentee prefers to use seven or five tines or cultivators; when seven are used, three are placed in each of the lever frames and one on the single beam in the centre. These lever frames are so constructed by ramping or bending, that the outside tines or cultivators shall follow in the track of the large running wheels, so that after the wheels have travelled over the uncultivated land, the soil shall be perfectly broken up, thereby showing no wheel tracks on the cultivated soil. If five tines are used, three can be placed in one frame and two in the other, or two in each of the frames and a single one in the centre, if found desirable. These several lever beams and frames are prevented from spreading laterally by means of connecting chains and links.

In addition to the above lever frames and beams carrying tines and cultivators within the frame-work, it is further proposed, to place in the rear of the machine a lever frame carrying two or more broadshares. In this case, chisel points or grubbers are placed on the front tines, (which are capable of carrying either chisels or broadshares,) these points by breaking up the ground more easily admit the broadshares to follow, thereby performing two operations at once. The hauling ropes can be applied either to the vertical spindle or shaft, or to the head or any other suitable part of the frame, but in either case, the attachments to the front wheels are so constructed, that by means of suitable rods and chains, a fork or slot shall precede the wheels through which the hauling rope shall work, allowing sufficient play for steering them, but securing the proper action of the said wheels when turning and at work.

The steerage is still further assisted by means of a cross-bar on the top of the vertical shaft or spindle of the front wheels, actuated from the rear by means of an ordinary pair of plough reins. The whole of the lever frames, beams, and broadshare frame, are lifted in the rear by means of a windlass placed in the top of the frame, two pulleys being elevated above the frame for the purpose of facilitating the lift of the broadshares. The broadshare beams are fixed by means of a bolt at each side of the frame, and having several holes, can be put at any required depth. When using an endless rope, two capstans may be placed on the frame, as shown, for the purpose of giving out or taking up the slack, suitable means being employed for obtaining a central draught. A pulley is placed on each end of the axle, or attached to the side of the frame, for the purpose of running the slack rope upon, if required. On each side of the front part of the frame is placed a hook and chain, for the purpose of locking the pivot wheel when turning, by placing the hook in one of the spokes of that wheel.

The improved drag and harrow, also patented by Mr. Williams, consists of the same frame as the scarifier or grubber above described, the lever frames and beams being removed, and a suitable frame or frames substituted, extending in width to a greater extent in the rear of the wheels, if found desirable, to which frame are attached drag tines, these frames being actuated by means of the lever and windlass, as before described in reference to the scarifier; or the grubbers or chisel points can remain to form the drag. In that case he substitutes for the broadshare before described, one or more harrows, working on a lever frame centred at the end in a similar manner to the broadshare, each harrow being capable of being lifted separately for the purpose of cleansing, and the whole being lifted together by means of the windlass on the frame. Or a separate rectangular frame, on the same principle as the scarifier, may be constructed, and the drag placed inside with suitable appliances for working the drags, the harrows following in the rear.

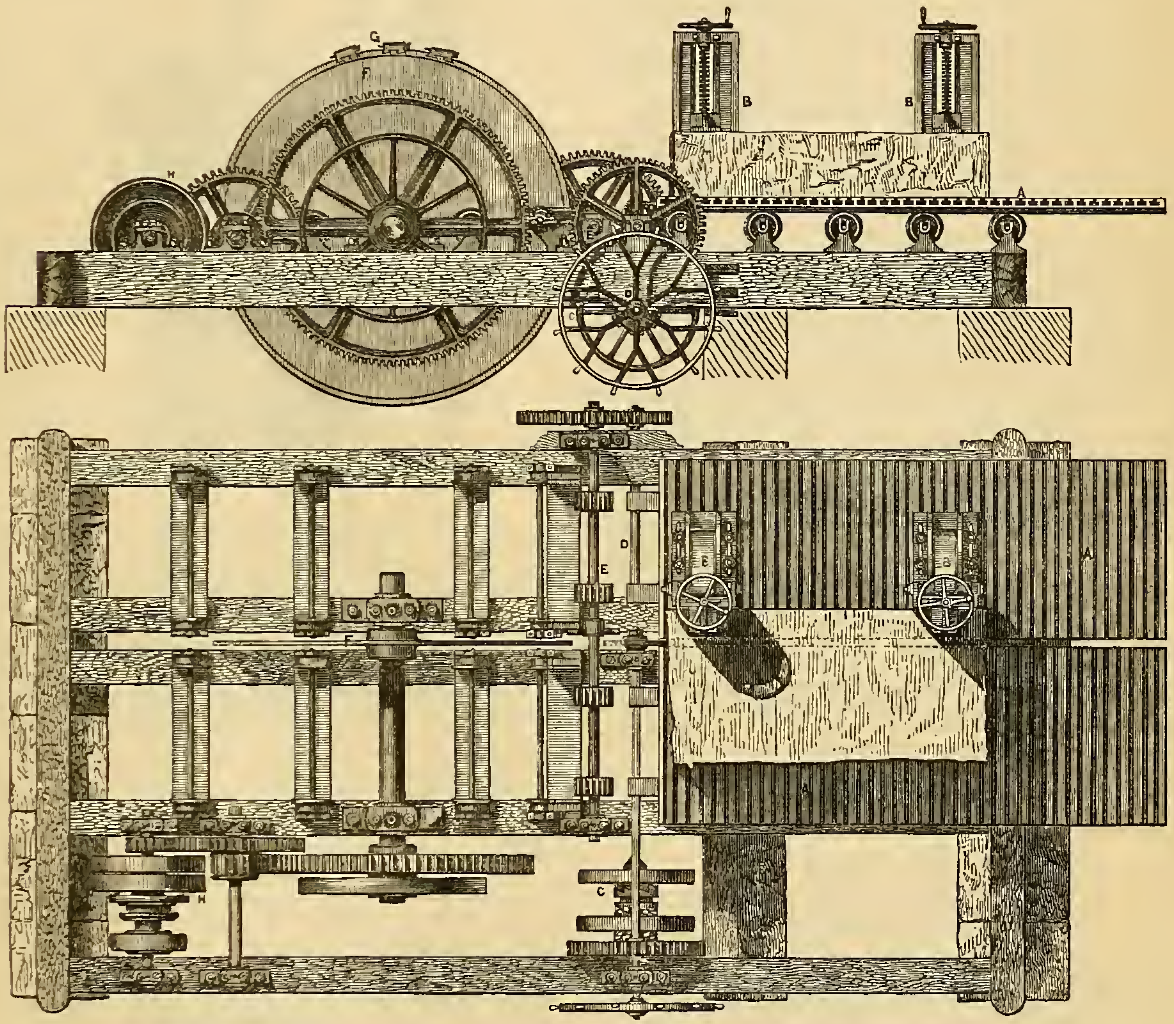
THE SPREAD OF USEFUL INVENTIONS.

The laws which ought to protect the rights of inventors unhappily slight them too much, and appear even to create obstacles to their progress rather than to encourage them. This is a good reason why inventors should appeal to legislatures for the redress of their wrongs, against which, both moral philosophy and logic, together with the very spirit of the laws themselves, protest. Nothing should be neglected, indeed, which could tend to the preservation or guarding of their interests all the more watchfully the more they are assailed. The legislatures of the various European countries pronounce forfeiture of rights on failure of applying the invention in a certain given time, more or less restricted. Nevertheless, nothing is more difficult than to effect the reduction into practice of a new idea, process, or any other innovation, whatsoever may be the utility and advantages accruing therefrom. They are met, alas! too often with a degree of indifference and apathy not easy to conquer. Inventors, also, who wish to gain the results of their ingenious labours, do not know how to give sufficient publicity and notoriety to them. In Paris their exists an institution which is calculated, in this respect, to do great service;—it is the *Scientific Press Club.* The inventions submitted to each public sitting of this young and free academy are already very numerous, and their examination forms the subject, not only of a minute, detailed, and profound discussion, but frequently very animated—the notice of which by the press, leaves no longer a pretext of ignorance, even by the foreigner. The object of this institution will be all the more fulfilled, the more these reports are disseminated. We would wish to see similar institutions established in all manufacturing countries, the press spreading in all quarters the useful results and labours; also, permanent expositions of processes and products, the advantages of which have been fully established, whereby they may be all the better propagated and appreciated. Inventors will here find a means of arriving at a better and more ready result of their labours, whilst industry will be kept informed of what is most useful and desirable to be put in practice.

STONE CUTTING BY MACHINERY.

It is when the engineer applies his earnest and active mind to so arrange the iron limbs with which he works, that they shall fashion and mould to his will the crude but valuable materials so abundantly placed at his disposal, that he is fulfilling his mission and occupying the highest position in his profession. Stone is one of those common things, the very abundance of which makes us forgetful of its value, and oblivious of the extent to which this mineral product enters into our daily comfort. Familiarity has, indeed, begotten contempt to such an extent, that its absence is almost necessary to teach us its true worth. Were we asked to point out the greatest and yet most useful example of ancient or modern engineering, we should pass by buildings and machinery, and direct the attention of the querist to the little-noticed old and modern artificial "highways and byeways." Things of mere shreds and patches as it were, yet more wonderful, and a thousand times more useful than the so much vaunted pyramids of Egypt, which are pointed out as marvels of gigantic constructive skill. It is somewhat singular that, notwithstanding the vast demand for stone for paving and building purposes, the mechanical appliances for shaping it readily and quickly has received comparatively little attention from the machinist.

Our purpose in the present article is to describe a mechanical stone cutter, the invention of Messrs. J. & G. Hunter, of Coleford, Gloucestershire, which machine has been brought into somewhat extensive use with the most satisfactory results. The accompanying engravings represent the machine in longitudinal elevation and plan. The working details of the apparatus are carried upon a strong rectangular framing of timber, which is supported upon a bed of masonry. The longitudinal side pieces of the framing have fitted thereto rollers, which carry the bed, A, on which the stone to be cut is placed; this table is divided lengthways into two to admit of its passing the saw, and the surface of the table is formed of a number of parallel bars, which form a series of transverse grooves. These grooves are made to receive the longitudinal feathers which are cast on the under sides of the holding brackets, B; the arrangement of the grooved surface is to admit of the brackets being shifted to and fro as required. The standards of the brackets are made with a central vertical opening, which forms a guide for the projecting bracket piece which holds down the block of stone. These holders are fast to the vertical screws which work out through the crosshead of the standards; the screws are actuated by the hand wheels fitted on their upper ends. The bracket standards are jointed at the lower part, to admit of their being thrown back from the slab when cut, so that it may be readily removed. The bed, A, moves forward at the rate of about six inches per minute, according to the quality of the stone; motion is communicated to it from the pulley, C, which is driven by means of an endless belt carried from the pulley on the main shaft carrying the cutter. The pulley, C, is fast to the transverse shaft, D, the pinion on the end of which gives motion to the wheel on the feed shaft, E, which works in pedestal bearings bolted to the outer or main ribs of the framing. The shaft, E, has fast to it four pinions, which take into longitudinal racks on the under side of the bed, A, and so move it forward at a regular rate of speed. The stone is cut or divided by means of a circular saw, F, which has the cutters, G, mounted on its periphery; the disc, F, is carried upon a main transverse shaft, the pedestal bearings of which are bolted to the inner longitudinal bars of the framing. The overhanging end of the shaft has fast to it a main driving spur wheel, and the pulley which gives motion to the pulley, C, through the belt. The main spur wheel is driven by spur gearing from the fast and loose pulley, H, which is fitted on a short transverse shaft, and driven by an endless belt from a steam engine or other prime mover. On this first shaft is a pulley which, by means of a belt, gives motion to the loose pulley on the shaft, D; when this pulley is coupled with the pulley, C, the bed, A, is moved backwards in a direction the reverse of that of the pulley, C. The hand wheel on the extremity of the shaft, D, is for the purpose of moving the bed, A, in either direction, by hand, when required. The cutting tools, which practically form the teeth of the saw, consist of a cylindrical and partly tubular steel stem, the cutting end of which is expanded outwards to a trumpet-mouth form. These cutters are severally fitted into tubular holders, the lower parts of which are made to fit dovetail grooves cut in a transverse direction in the periphery of the disc, F; this arrangement admits of the tools being readily removed during the operation of the machine. The cutters are held in their tubular holders by a spring of vulcanised India-rubber fitted in a recess in the lower part of the holder, and serving to press the cutter against the upper part of the holder. Several of these useful machines have been made, and the work done by them has been most satisfactory. We are informed that the cutting of the Portland stone costs less than 1d. per foot, and the Glasgow stone a trifle more. Mr. G. Hunter has also a modification of this ma-



chine working successfully in Aberdeenshire, and adapted for cutting quoins or angle blocks suitable for building purposes. This arrangement consists of two saws working at right angles, so as to cut the blocks one out of another, with great rapidity and economy of material.

MECHANIC'S LIBRARY.

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RECENT PATENTS.

GENERATING STEAM.

S. S. Bateson, *London.—Patent dated December* 30, 1858.

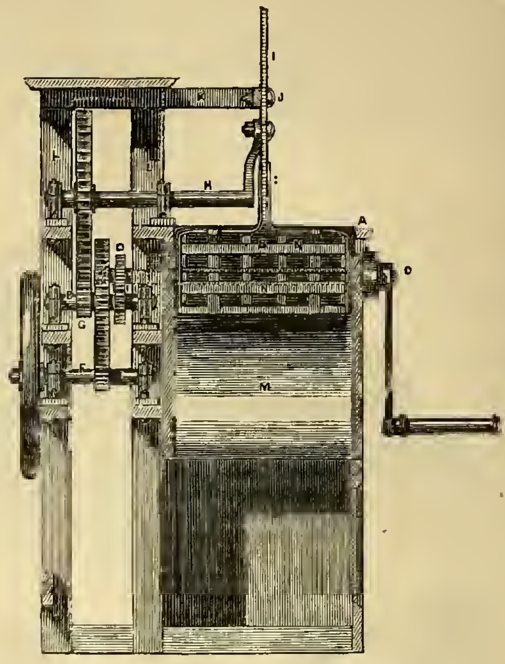
This invention relates to an economic system or mode of generating steam, whereby a considerable saving of fuel is effected, and consists in causing a supply of water to be forced, by means of a suitable feed or force pump, through a coiled pipe, placed inside the body of the furnace fire and opening into the boiler. By this means the water before entering the boiler, is raised to steam of a high temperature, which greatly assists the ordinary generation of steam in the body of the boiler. This system is applicable to stationary, marine, or other locomotive engines. It is also proposed to adopt the same system of coiled pipes placed within the body of the burning fuel in the furnace, but in place of forcing water through such coil, a supply of steam is allowed to pass therethrough into the main boiler—such steam being supplied originally from one or more small sized separate boilers. As applied to a stationary or land boiler, the cold feed water, as taken from the reservoir or source of supply, is pumped or otherwise forced in the ordinary way, into a pipe or tube governed by a valve of suitable construction, which pipe, and its valvular arrangement, is in direct communication with a longer pipe or tube, or series of connected tubes, which are placed in the actual boiler furnace. This tubing is formed into a series of arched zig-zags or serpentines. That is to say, it passes horizontally into the furnace at one side, in a straight horizontal line, and then assumes the form of a series of crossing and re-crossing tubes, with suitable connecting elbows at each side; each line of these crossing or transverse tubes being arched upwards to afford space for the fuel in the furnace. This arrangement is continued until the whole of the fuel space in the furnace has been covered with the tubing, and it then terminates in a straight tube which is led out of the furnace on the opposite side to that of the entering line. This exit portion of the continuous zig-zag or serpentine tube has a valve fitted upon it, and it passes directly into the steam boiler at a part below the water line. In this way the furnace acts directly both upon the tubing therein, and upon the bottom of the boiler, as well as upon the water in the boiler, through the intervention of any necessary or suitable flues. The tubing may also be arranged in coils or in other forms in the furnace; and in place of being over the fuel, it may be actually in the mass of incandescent fuel; but it is preferred to use it in the arched zig-zag or serpentine form, as being the most convenient, and as not interfering with the ordinary functions of the furnace. With these arrangements, the feed water, as supplied to the boiler, is converted into steam, or steam mixed with water; and it thus enters the water in a super-heated or very highly heated condition, and materially aids the generation of steam in the boiler. As the water leaves the feed pump or supplier in a perfectly cold state, or in a but slightly warm condition, the pump operates exactly in the ordinary way, and quite as effectually as if no heating apparatus were used, there being always a quantity of cold, or comparatively cold water interposed between the pump and the heating apparatus. The heating tubes are proportioned to the quantity of water evaporated by the boiler in working, so that the whole of the feed water will be, if possible, converted into steam prior to entering the boiler; and hence, the steam generating powers of the boiler are very greatly increased, as the hottest portion of the fuel in the furnace operates directly upon the water in very thin strata, as in passing through narrow tubes; and the steam or hot water so produced operates in the most effective manner upon the boiler water, by being at once diffused completely amongst it. Instead of thus heating the feed water, and passing it either in the form of hot water or steam, or both, into the body of the boiler, steam itself, obtained from a separate source, is used for a similar purpose. For this purpose a separate supply of steam is raised in a separate small boiler, and passed thence through a coil or arrangement of heating pipes in the furnace. The steam is in this way highly superheated or surcharged with caloric, and as it at once permeates the mass of water in the boiler, it generates steam with great rapidity and effect therein. The steam applied in this way may act either in conjunction with the ordinary furnace of the boiler, as in the case of the use of heated feed water, or it may operate upon water in a boiler which has no furnace of its own. In this latter case, of course, the injected steam acts entirely in the place of fuel. It is well known that air injected into a high pressure boiler very greatly increases the elasticity of the steam being generated, and the present invention also comprehends the improvement of the working powers of steam boilers by using air for a similar purpose, but heated, by being first passed through a coil or arrangement of pipes in the furnace, either of the boiler or an independent one. In this way the air conveys heat into the water in great quantity, and it is in itself instrumental in improving the elastic effect of the steam.

KNEADING MACHINE.

J. H. Johnson, *London and Glasgow*, (M. Valee).
Patent dated November 16, 1858.

The improvements specified under these letters patent, relate to a peculiar construction and arrangement of machinery or apparatus especially adapted for kneading dough in the making of bread on board ship, or for working and mixing plastic substances of all kinds requiring such treatment. The apparatus consists of a suitable frame or support, fitted with a kneading trough having a curved or semicircular bottom, and within which the kneader works. This kneader consists of a metal frame fitted with a trellis, which is capable of being removed at pleasure. The kneader so formed fills the transverse area of the trough, and is caused to pass to and fro along the bottom and upper surface of the trough by the aid of a long slotted arm, extending upwards from the upper edge of the kneader, and working over a fixed guide pin in a portion of the framing of the machine. Motion is imparted to this kneader by a revolving crank or eccentric, the pin of which is screwed to the slot in the arm before referred to. As the crank revolves it causes the kneader to travel along the bottom of the trough until it reaches the end, when it rises to the surface, bringing with it the paste which was below, and travels back again along the surface to the opposite end of the trough. Suitable spur gearing and a fly-wheel is employed for imparting and regulating the motion of the machine. When out of use, the trough may be covered over by a board, when it will serve as an excellent kitchen table; whilst the under part of the machine forms a species of safe or larder.

The accompanying engraving represents a vertical section of the kneading machine. The machine, as illustrated, is more particularly adapted for use on board ships. When required for kneading dough, the board, A, is removed, and the kneader, B, is put in motion by a winch handle which turns



the shaft, C, and by the intervention of the pinions, D, and endless chain, drives the shaft, E. The shaft, E, carries at one part a spur wheel, gearing into a pinion on the fly-wheel shaft, F, and at another part it carries a pinion, G, which gears with a spur wheel on the crank shaft, H. The shaft, H, is mounted in two bearings, and carries an overhung crank, to the pin of which is connected the rod, I, of the kneader, B. A slot is made in the upper part of this rod, in which works the antifriction roller, J, carried on a stud in the bracket, K, which is bolted to the main framing, L, the roller, J, serving as a guide for the rod, I. The movement imparted to the kneader rod by the crank is of a peculiar kind, since the extremity of the rod is controlled by the fixed guide, J, which, by working within the slot in the rod, I, causes the kneader to oscillate on the crank pin. The curvilinear path or course of the kneader, resembles in figure that of a crescent having the horns rounded of. The lower part of the kneader thus describes nearly a semicircle while the crank is passing the lower centre, and nearly a straight line while passing over the top centre, at the surface of the trough, M, into which the dough is put; so that the kneader, after having well mixed and worked up the dough while travelling over the curved bottom of the trough, spreads this dough, when returning, in a straight line, thereby imitating as nearly as possible the operation of hand kneading. The kneader, B, is provided with a species of trellis, N, which may be removed at pleasure, so that having completed the first part of the operation with the frame, B, in combination with the trellis, N, the trellis may be removed for the purpose of completing the operation with the frame, B, open.

WEAVING.

Elijah Dixon *and* Henry Whittaker, *Preston—Patent dated January* 27, 1859.

The object of the patentee's improvements is to prevent "floats" or imperfect sheds occurring during weaving, by means of self-acting mechanism or apparatus applied to the ordinary shuttles, whereby the stoppage of the loom is accomplished by the breaking of the weft thread whenever a float or imperfect shed occurs.

According to one modification of the patentee's improvements, the shuttle is made with two studs or pivots fitted transversely across it, and near to one end of the opening therein, which studs carry respectively two levers, which work freely thereon; these levers may be distinguished by the letters A and B. The lever, A, is formed with a broad head at right angles to its shank, over which head the weft thread from the cop passes on its way from the shuttle. The lever, B, is extended in the form of two fingers or feelers slightly above and below the upper and under edge of the shuttle, which is slightly recessed or cut away, to admit of the fingers projecting without offering any obstruction to the warp threads, so long as the shed is properly formed. The boss of the lever, B, is made sufficiently wide to support the shank of the lever, A, the part upon which the lever rests being cut down to form a flat surface; so that in the event of the lever, B, being turned slightly in either direction, the corresponding motion of the flattened portion of its boss will elevate the lever, A, so as to bring its broad head above the level of the end of the shuttle tongue, thereby offering a certain amount of drag or resistance to the weft, which will instantly cause it to break, and bring the ordinary fork or weft protector into action, thereby stopping the loom. This result is obtained whenever a float in the warp occurs, as such float, by coming in contact with either of the fingers or feelers, will push or turn them slightly in one direction or the other, and so bring into play the weft breaking mechanism, when the stoppage of the loom will be effected.

In another modification the studs and pivots are still retained, as well as the two levers, but in a slightly modified form. The lever, A, works freely on a stud, and is connected to the broad head or slide by a pin, on which pin the slide is free to play loosely, but is guided and maintained in its proper position by a guide fitted in to one side of the shuttle. The lever, B, works freely on the second stud, and one end bears upon the underside of the lever, A, whilst the other is acted upon by the free end of the curved feeler. This feeler works loosely upon a stud, and is curved upwards so as to protrude slightly above the notched portion of the shuttle. A hooked catch is jointed to the lever, A, and hooking on to the second stud so long as the mechanism is not brought into action, the object of this catch being to prevent the lever, A, and head or slide to which it is connected, from being accidentally elevated by the motions of the shuttle, and causing thereby an unnecessary breakage of the weft. When a float occurs in the warp, the thread or threads of such float will come in contact with the feeler, and will depress the free end of the same. This depression of the feeler elevates the tail of the lever, B, which bears upon the underside of the lever, A, and the catch, and elevates both simultaneously, thereby lifting the slide or head above the end of the shuttle tongue, which produces sufficient drag or resistance to break the weft thread, when the loom will stop as before described.

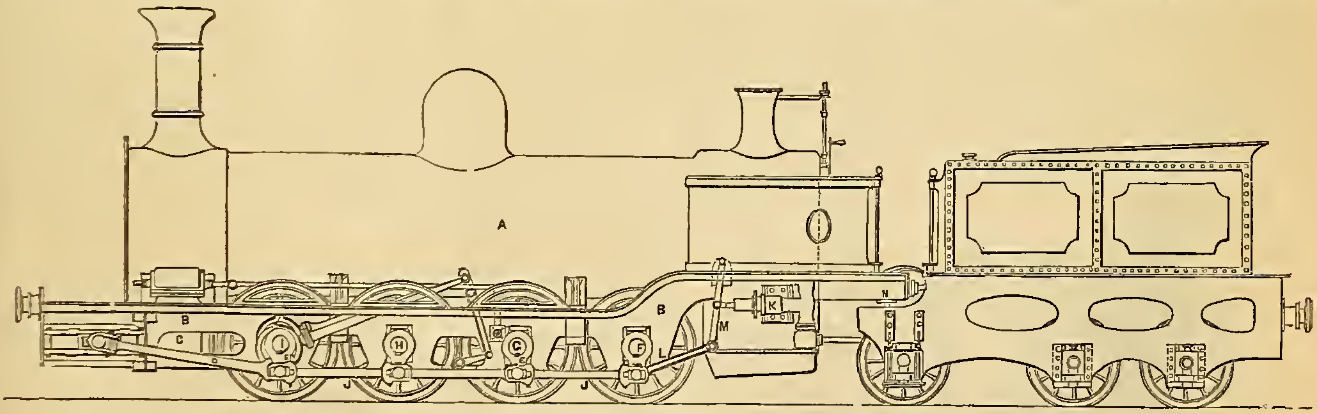
LOCOMOTIVE ENGINES.

J. H. Johnson, *London and Glasgow (communication)*.—*Patent dated November* 29, 1858.

These improvements consist principally of a novel combination of the axles with the locomotive framing, and of an improved construction of framing, whereby a transverse or lateral play is allowed to the hind axles and wheels, whilst the leading axles and wheels are stationary, as regards lateral motion of their axle boxes. Any convenient number of running wheels may be used, but eight are preferred, arranged in four pairs between the smoke box and the fire box. The axles of the two leading pairs of wheels are carried in suitable boxes in the fixed framing of the engine, whilst the axles of the hinder pairs or trailing wheels are carried in boxes in internal frames, connected by sliding pivots to transverse beams secured to the outer or rigid framing. The front axle is the driving axle: it is fitted at each extremity with a single crank outside the wheels, and may also be formed with intermediate double cranks, but these latter may be dispensed with in some cases. When constructed with the intermediate cranks, the motion of each piston, the cylinders of which are placed beneath the smoke box, is transmitted to the axle by means of two connecting rods jointed to the opposite ends of a cross-head on the piston, which works in suitable guide bars: one of these rods is connected with the outside single crank, and the other with the corresponding intermediate crank. The whole of the wheels are coupled, and the feed pumps are worked from the cranks of the trailing wheels. The eccentrics for working the slide valves and gear are disposed in the centre of the front or driving axle, between the double cranks. A suitable water tank is placed across the barrel of the boiler, and a second one is fitted behind the axle of the trailing wheels, with which latter tank the feed pumps are connected. A coke receptacle is carried by the foot plate, and an ordinary tender is added to the whole. The frame of the front part of the tender extends beneath the frame at the hind part of the engine, and below this junction is fitted the axle of the leading pair of wheels of the tender. Two vertical spring buffers are fitted to the front end of the framing of the tender, and bear against the under sides of the hinder overlapping part of the locomotive framing, so that, on ascending inclines, or when the load of the hinder part is increased, this load will be borne partly by the vertical buffers and bearing springs of the leading wheels of the tender.

The subjoined engraving represents a longitudinal external elevation of a locomotive and tender constructed according to this invention. On each side of the boiler, A, upon the external frames, B, and internal frames respectively, the two frames being connected by the transverse bars, are arranged the two cylinders, C. The connecting rods, D, which are attached to a cross-head on the piston rod, and are jointed the one with a double inner crank, and the other with the outside crank, E. Or, if desired, three cylinders may be used, two being placed outside, and one inside, the engine. The four axles, F, G, H, I, are divided into two groups or pairs, the two trailing axles or the three hind axles, if desired, being free to move transversely by means of the internal frames, which are centred on a pivot in the cross-bars, so that the axle boxes may move slightly in a transverse direction to the roadway without disturbing the parallelism of the axles. For this purpose the axle boxes of the internal moveable frame, which support the main weight of the engine, are uncontrolled by guard irons, being solely connected with the internal frame and their springs by vertical sliding bearing rods or spindles, whilst the boxes in the rigid frame, B, which have no weight to carry, but serve merely to preserve the parallelism of the axles, may play with slight friction in their guides, so as to allow for the transverse displacement required. The coupling of the four axles, F, G, H, and I, is accomplished by means of the outside cranks, E, and ordinary coupling rods, J. The feed pumps, K, are connected with the lower water truck, and worked from the crank of the hind axle by means of the rod, L, and lever, M. Two vertical spring buffers, N, are carried by the tender, and bear against the under side of the hind portion of the engine, so as to cause a portion of the weight of the engine, when running over gradients, to be transferred to the leading axle of the tender.

The principal advantages to be derived from the use of this engine, are the obtainment of great tractive powers, combined with lightness; that although the eight wheels are coupled, the engine is capable of traversing the sharpest curves; the absence of dead weight, as the whole of the parts co-operate to increase the adhesion of the eight wheels; the avoidance of oscillation, by the perfect balancing of all the working parts; the absence of counterweights and the non-rigidity of the axles, thereby greatly reducing the wear and tear of the tyres; facility in separating the parts, the inner and outer frame being easily taken asunder.



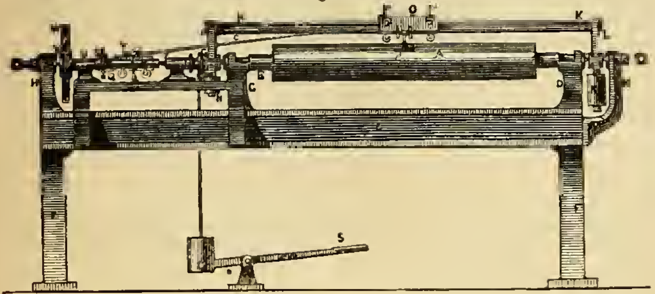
ENGRAVING DESIGNS.

Robert Whittam, *Accrington*.—*Patent dated December* 13, 1858.

This invention consists in the arrangement of certain machinery or apparatus intended to trace upon metallic surfaces used as dies by engravers to calico printers, the same design as on an engraved roller, or from an original or enlarged engraver's sketch. Fig. 1 of the accompanying engravings is a front elevation of a machine for transferring designs from an engraved roller to a metallic surface; figs. 2 and 3 are views of detached parts; and fig. 4 is a front elevation of a machine for transferring designs from an enlarged engraver's sketch. The required designs are obtained upon the metallic surfaces by working two motions, one in the direction of the length, and the other, the circumference.

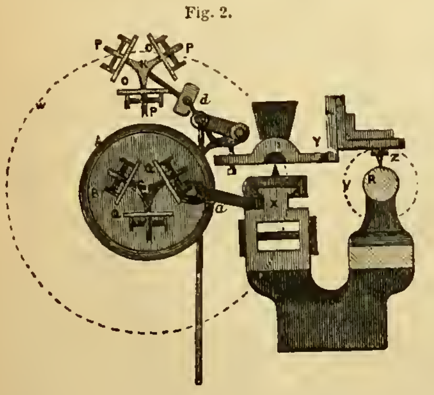
In fig. 1, the engraved roller from which it is intended to trace or transfer the design is shown at A, placed upon the mandrel, B, the ends

Fig. 1.



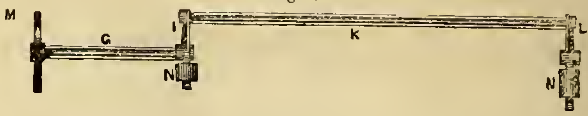
of which are fixed in the steps or headstocks, C and D, which are bolted to the bed or table, E, of the machine, which bed is placed at any required height on the standards or frames, F. At one end of the mandrel, and in line with it, is placed a triangular rail, G, working upon two centres, one fixed to the headstock, C, and the other to an additional headstock, H. To the rail, G, is fixed a vertical lever, I, and connected by another triangular rail, K, with a similar vertical lever, L, which works upon centres in the headstock, D, and small frame, M, all the centres being perfectly in line with each other. The levers, I and L, are furnished with weights, N, to counterbalance the rail, K, and parts connected with it. The rail, K, is mounted with a carriage, O, running on friction bowls, P, and is allowed to slide the entire length of the engraved roller, the rail, G, being furnished with a similar carriage, Q. The die upon which the design is to be transferred or traced is shown at R, fixed at one end in the chuck, S, and resting at the other on the centre, T; the said chuck is fixed to a spindle passing through the small headstock, U, and is mounted with a pulley, V, of any required diameter, connected by a strap with a larger pulley, W, fixed to the rail, G, so that when the latter is moved on its centres in either direction, the large pulley, W, moves with it, and transmits motion to the smaller pulley, V, and metallic surface, R, according to their diameters. Between the rail, G, and the intended die is placed another rail, X, running on friction bowls; the said rail carries the lever, Y, which holds the diamond point, Z, for tracing the design upon the metallic surface. Attached to the rail, X, is a bracket, *a*, which clips a plate, *b*, fixed to the sliding carriage, Q, so that, when the latter is moved, the rail, X, lever, Y, and diamond point, Z, move simultaneously with it. The two carriages, O and Q, are connected together by the rod, *c*, so that the movement of the one is transmitted to the other. To the carriage, O, is connected a lever, *d*, with a small handle and point, *e*, which is traced over the design on the engraved roller, and transfers an exact copy of the design upon the metallic surface. Instead of the pulleys, V and W, toothed wheels or other suitable gearing may be employed; and instead of the engraved roller, an original sized engraver's sketch may be attached to a plain roller, and by tracing the point, *e*, over it, is transferred to the metallic surface. When required to trace with extreme accuracy a design upon a metallic surface, the patentee employs an enlarged engraver's sketch, which is secured to the segment of a roller of large diameter. In the engraving, fig. 4, the enlarged engraver's sketch is shown at *f*, attached to the half roller, A, which is fixed by the arms to the standards, *g*, bolted to the bed of the machine. The metallic surface upon which the design is to be traced

Fig. 2.



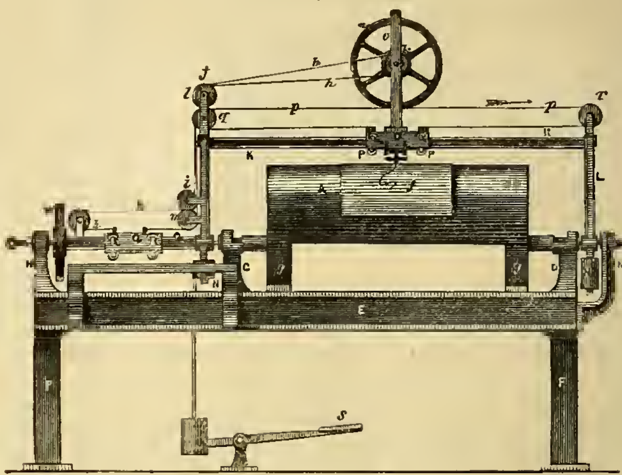
or transferred is placed in a similar position, and circular motion given to it in the same manner as that described in figs. 1, 2, and 3. Similar triangular bars and sliding carriages are also employed, but the upper bar shown at K is raised to the required height above the surface of the engraver's sketch, so that the pointer can be conveniently traced upon it. In order to give motion sideways to the carriage, Q, on

Fig. 3.



the lower triangular bar, G, the patentee connects a band, *h*, to one end of the carriage, and passes it over a pulley working in a bearing attached to the rail or other suitable part; the band then passes under the guide pulley, *i*, and over another guide pulley, *j*, to a drum or pulley, *k*, to which the band is made fast, and is then carried onwards to a guide pulley, *l*, and passes under a guide pulley, *m*, and connected to the other end of the carriage, Q. The pulley, *k*, is fixed to the same shaft as the larger pulley, *n*, the said shaft working in bearings in the standard or frame, *o*, fixed to the triangular bar, K. To one end of the carriage, O, on the

Fig. 4.



upper triangular bar, is attached a band, *p*, which passes over the guide pulley, *q*, and onwards to the pulley, *n*, which it encircles, and then passes in the direction of the arrow to the guide pulley, *r*, from whence it passes to the other end of the carriage, O, so that when the carriage is moved to and fro according to the design on the engraver's sketch, the band causes the pulleys, *n* and *k*, to revolve, and moves the carriage, Q, exactly in proportion to the difference of the diameters of the pulleys, *n* and *k*, which difference corresponds with the difference of proportion between the original and enlarged size of the engraver's sketch. The diamond point, Z, is raised from the surface of the die when required by means of a rod and treddle, *s*.

The aforesaid system of tracing designs from an engraved roller, or from an engraver's sketch, upon steel or other metallic surfaces used as dies, dispenses with the usual tedious and expensive mode of cutting or engraving the said designs upon the said metallic surfaces by hand, as hitherto practised.

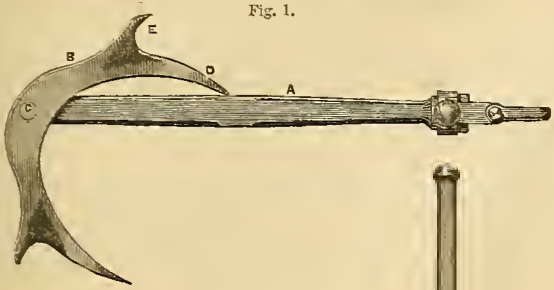
ANCHORS.

Samuel Hunter, *Newcastle.—Patent dated December* 20, 1858.

The patentee's improvements relate to the construction of the arms and palms of anchors, and consist in enclosing the "palm" at the end of the arm, and making the arm open up to the point of junction with the shank, for which purpose the arm is divided in two parts whereby the earth in front of the palm or fluke is not crushed or divided during the dragging of the anchor, but passes through the arm and over the upper edge of the palm in a comparatively compact and solid state, thereby greatly increasing the hold of the anchor, by creating a more perfect downward pressure. The arms, palms, and portion of each toggle or horn, may be all forged in one piece, and the two parts or sides of the arm are so forged, one into each side of the palm, that they thereby entirely enclose it.

Fig. 1 of our illustrative engravings respresents a side elevation, partly in section, of an anchor fitted with oscillating arms and palms, constructed according to the preseut invention. Fig. 2 is a corresponding plan of the same. A, is the shank of the anchor, which may be of the

Fig. 1.



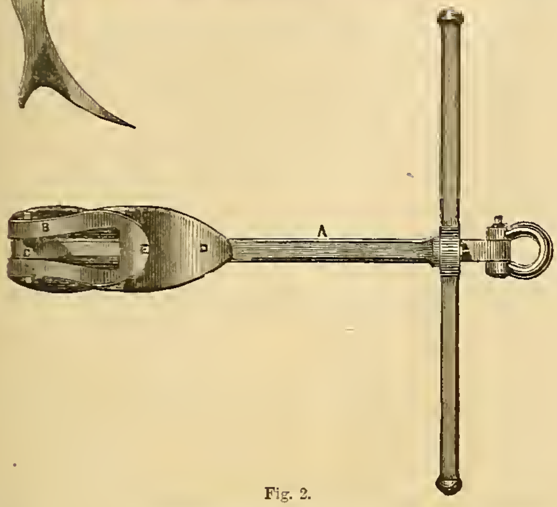


Fig. 2.

ordinary square or reetangular construction, and B, are the arms eonnected by a bolt at C, to the end of the shank in the ordinary manner adopted in the manufacture of auchors with oscillating arms. These arms are, however, of a peculiar construction, being made furcated, so as to leave an open space hetween them. The form of the palm, D, and toggle or horn, E, is shown by the sectional view of one of the palms and horns in fig. 1. The extremities of the two parts, B, of the arms are forged one on to each side of the palm, D, thereby entirely enclosing it, and leaving no portion of the palm projecting heyond the sides of the arms. The front or inside of the palm is made slightly convex; in its length it also admits of being set at the most favourable angle, and the curve of the palm is not liable to be altered in the manufacture hy the reverse eurve of the arm.

The patentee also shows in the drawings appended to his specification, figures of an anchor formed with fixed arms, constructed according to his invention; that is to say, having the arms open from the top of the palms to the crown end of the shank, and having each palm forged with the arms in such a manner as to enclose the whole of the palms between the two portions or sides of the arm, as hereinbefore described. If found desirable, one or more plates may he inserted within the openings in the arms parallel to, and above the palms, for the purpose of increasing the friction of the earth while passing through the arms.

RAILWAYS.

J. H. Johnson, *London and Glasgow (Communication).—Patent dated December* 31, 1858.

The improvements specified under these letters patent consist in the application and use of fish plates or bars, which hold the rails at their hase, and by their lower rib or flange, in place of holding such rails on the sides of the web or narrow portion thereof. These fishes, which may be termed "under fishes," make use of the lower part of the rails for the purpose of consolidating their union, and are shaped to suit the varions forms of rails to which they may be applied. Another important feature attendant npon the use of these "under fishes" is, that the perforating of the rails for the passage therethrough of fish bolts is entirely obviated. For the ordinary double headed rail the fish is made in the form of two grooved jaws, which fit on to opposite sides of the lower flange of the rail, and are held together by transverse bolts underneath the rail, and are bolted or pinned down on to the sleepers. These fishes may also be used in combination with a cast-iron chain bolted to the sleeper.

When a triangle rail is used, the fishes are holted down on to a separate sole or bar plate, and their edges protrude over the expanded flange of the rail, and, in some cases, a strengthening rib may be formed longitudinally along the under side of the sole or lever plate. This plate may be applied in combination with the fishes to the bridge rail and to the ordinary flanged rail, suitable projections being made on the upper surface thereof for the fish plates to rest upon. Lugs may he formed, if uecessary, upon the sole plates, for the purpose of pinning them down to wooden sleepers when sleepers are employed, but in many cases this system of support will enable the rails to he laid directly upon the ballast, thus forming an entire metal way.

Fig. 1.

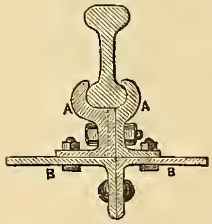


Fig. 2.

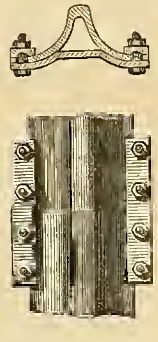


Fig. 3.

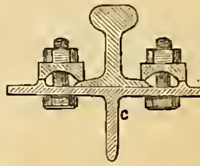


Fig. 1 of the accompanying illustrations represents a sectional elevation of one of the improved modes of securing the rails of railways. Fig. 2 represeuts a transverse section and plan of a rail with base plate. Fig. 3 is a sectional view of a rail with base plate and fishes, the base plate having a strengthening rib cast longitudinally along the under side, aud projections on the upper surface to receive the fish plates.

For the double headed rail (fig. 1) the under fishes are composed of two grooved or channelled plates, A, which grip the bottom flange of the rail, and extend downwards to receive the transverse bolts, and laterally so as to form a base plate or flange for securing the whole to the sleepers. The two plates, A, being screwed up tight, exert a powerful grip or hold upon the two opposite sides of the uuder flange. For this purpose nice adjustment is no longer requisite, as the grooving of the plates, A, is effected in such a manner that, on being applied to the flange of the rail, it comes in contact with the base and its sides; the arrangement is, moreover, not subjected to any powerful lateral strain or pressure, as it is in part destroyed by the cheeks of the plates, A, the bolts themselves receiving but little strain. The bending of the rails is prevented by the resistance of the cheeks. These fish plates may be made of wrought-iron, and fitted or formed with lugs. If the plates are lengtheued and widened, and if to increase their streugth and avoid transverse movement, a rib is added to the sole or base plate, B, an excelleut sleeper will be obtained suitable where the rail is laid upon the ballast. In this arrangement, where the sleepers are of the same length as the rails, care should be takeu to break joint between the rails and sleepers. The fish plates may be made short, and provided with oval holes to allow of any slight difference in the length of the sleepers, and the gauge of the rails may be maintained by wrought-iron cross ties of a lenticular section, so as to be able to rise and fall in the ballast without bending and injuring the gauge. The sectional view and plan, fig. 2, is sufficiently explanatory of this system of arrangement without requiring detailed description. Fig. 3 represents a sleeper for the flanged rail. By this system the rails themselves may be made very light, and when the line requires renewing, the change is limited to the upper parts solely. When the sole or lower plates are used, the projections may be made on the fishes, or on the lower plate, which latter is preferable.

PLOUGH MOULD BOARDS.

John Fraser, *Banff.—Patent dated March* 5, 1859.

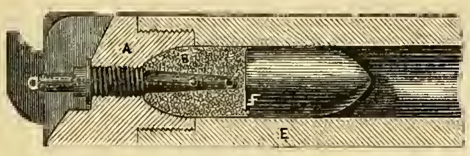
Mr. Fraser's invention relates to the manufacture of what are technically known as the "mould boards" of ploughs, in such a manner as to have one portion harder than the rest. The part exposed to severe wear is chilled in the casting, whilst the other part is left soft. In order to prepare the mould boards of ploughs according to the patentee's system, it is necessary to make a "chill" or castiug, forming a reverse of that part of the mould board which is more particularly exposed to wear, so that that portion may be made as hard as possible, to withstand the more severe work to which it is exposed. The part which wears away the soonest in the mould hoard varies to some extent according to its particular shape, attention must therefore be directed, iu the first instance, to the particular conformation of the mould board, in order that the cast for the "chill" be adapted to the precise part of the mould board which it is desired to harden. In preparing mould boards for "chilling," two casts in plaster of Paris, or other suitable plastic or moulding composition or material, are taken from that part of the mould board which is to be hardened. One of these casts serves as a pattern for the "chill," and for this purpose it is embedded in moulding sand, in a suitable flask or moulding box, the upper part of which is "parted" in the usual manner, and the pattern is taken out. The two parts of the moulding box are again put together, and the "chill" is cast in the ordinary way. The other cast is used in conjunction with moulding sand, the mould or "caulin" in which the mould board is cast, is used as the pattern board in the final operation of casting from the chill. In preparing the mould for casting from the "chill," it is suitably disposed in the moulding sand, so as to insure an exact correspondence or uniformity between the pattern and "chill." In this way, when the casting operation takes place, which is effected in the usual manner, the "chill," by its rapid abstraction of the heat, serves to harden the mould board at the part exposed to the greatest amount of wear, resulting in the production of mould boards greatly superior in point of efficiency to those of the ordinary make.

FIRE ARMS.

J. D. Dougall, *Glasgow.—Patent dated March* 3, 1859.

In our *Journal* for August, we inserted a brief description of Mr. Dougall's improvements, but as the invention is one of high importance as regards the comfort of those in the habit of using fire arms, we deem it our duty to give our readers an illustrated description of the means by which the patentee prevents the recoil of fire arms and ordnance. We understand that the recent experiments of the patentee have proved most satisfactory; but that he has not arrived at this desirable result without passing through a long and trying ordeal of experimental failure. In these days of popular arming, to have the means of ensuring the non-recoil of the musket or rifle, must be a boon which the military tyro can hardly be too grateful for.

The subjoined engraving represents a longitudinal section of one arrangement of the improved front ignition breech, as adapted to a double-barrelled gun in which the nipple is arranged in a line with the



charge. The breech, A, has the usual chamber, B, bored out of the front part of the metal. At the backward extremity of this chamber an aperture is made, this is tapped to form an internal screw, in which is fitted the conical tube, C, forming one piece with the nipple. The front portion of the tube, C, extends outwards in front of the breech, and enters a short distance into the barrel, E, of the gun. In addition to the tubular aperture made through the cone, a hole is bored at right angles thereto, so that the fire of the ignited percussion powder escapes into the charge, F, laterally as well as at the front extremity. With the breech of the gun arranged in this manner, when the percussion cap is exploded, the fire traverses to the front extremity of the tube, and ignites the charge of powder at the outer part. In this way the full explosive force of the powder is obtained, as it is impossible that any of the gunpowder can be blown away unconsumed, as is the case when the charge is ignited at the backward end, in the usual manner. A still more important advantage is, however, gained by means of this arrangement, and this is the absence of recoil, which particularly characterises fire arms constructed upon this principle. The highly unpleasant effect produced by the recoil or "kicking" of the piece is familiar to every one in the habit of using fire arms, and is caused by the ignition of the charge at the rear end of the cartridge, so that the elastic force of the suddenly evolved gaseous matters is produced in a backward direction, as well as forward. But by igniting the charge at the front end, the whole of its explosive force is exerted in a forward direction, which produces a better effect in propelling the shot, as well as avoiding recoil, the comfort of which to the shooter can scarcely be too highly estimated.

In another modification, the breech, A, is made generally similar to that shown in the figure; but in this arrangement the tube, C, is bored out of the solid metal of the breech, in place of being screwed therein. In fire arms arranged in this manner, the traverse of the fire is very short, retaining at the same time all the advantages of the improvements. The practice of biting or otherwise tearing open the cartridge is rendered no longer necessary, when the breech of the piece is constructed upon this principle, because, in ramming home the cartridge, the charge is perforated by the tube, C.

The patentee also shows the application of his improvements to ships' guns, and to artillery. The gun is made with a horizontal aperture through the breech, and opening into the chamber or bore of the gun. The orifice is tapped with an internal screw, to which is fitted a plug; the front part of this plug is turned to form a cone, which extends forward to about the centre of the charge of powder. The cone has a tubular aperture made through it, which communicates with the touch-hole. The gun is arranged upon the percussion principle; the lock being caused to strike the nipple, by drawing back the lanyard attached thereto. When the cap on the nipple is exploded, the fire passes down the tubular passage, and, by means of the cone, is conveyed to the centre of the charge, so as to produce the most effective ignition of the charge, and materially lessen the recoil of the gun. The arrangement of guns upon this principle, may, if found preferable, be modified so as to have the touch-hole in a line with the tube of the cone, corresponding to the arrangements shown in our illustrative figure.

BOILERS AND ENGINES.

George Price *and* William Dawes, *Wolverhampton.—Patent dated September* 2, 1858.

This invention consists, firstly, of a new or improved boiler for generating steam and consuming the smoke from the fuel used in working the boiler, as shown in the accompanying engravings, wherein fig. 1 is a longitudinal vertical section; and fig. 2 a front end elevation, one-half shown in section. The outer shell or body, A, of the boiler is of the ordinary cylindrical form and construction, with flat, convex, or hemisperical ends, and having one or more cylindrical longitudinal tubes, B, inside, from end to end of the boiler, between which and the lower half of the circumference of the shell or body of the boiler, the patentees insert any convenient number of oblique taper tubes, C, being open at each end, the larger ends joining with the shell or body, A, and the smaller ends joining and opening into the main longitudinal tube or tubes, B; the patentees prefer making the tubes, C, of boiler plate, welded, and flanged, and riveted to the boiler and main tubes; and where extreme economy of fuel is necessary, in addition to the before named arrangement of parts, a number of parallel tubes, D, are placed vertically or diagonally across the main longitudinal tube or tubes, B, the water being inside of them, and the hot air and gases from

Fig. 1.

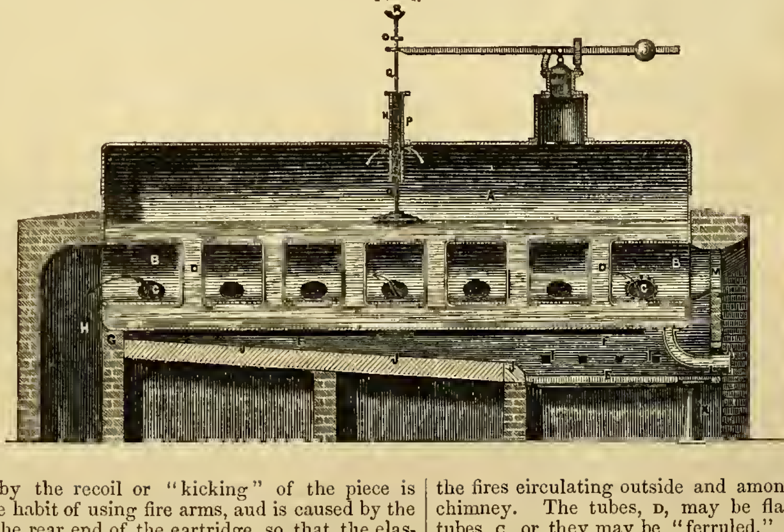
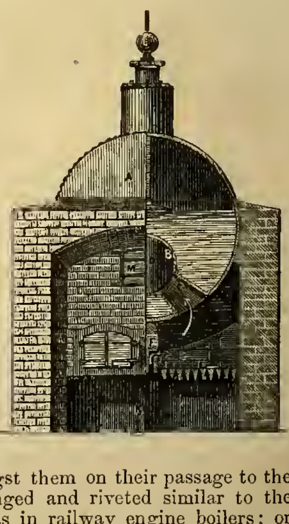


Fig. 2.

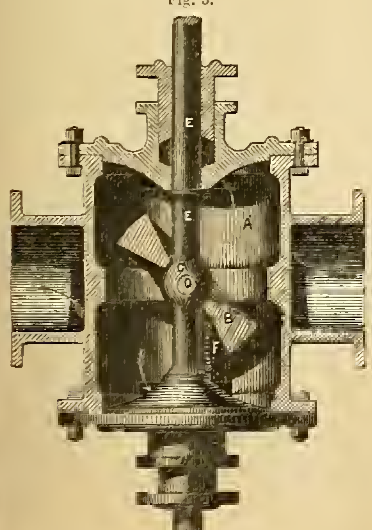


the fires circulating outside and amongst them on their passage to the chimney. The tubes, D, may be flanged and riveted similar to the tubes, C, or they may be "ferruled," as in railway engine boilers; or "ground" in with taper ends. The patentees prefer using two sets of fire bars, E, and two fires underneath the boiler, with a nine-inch fire-brick division wall, F, between them; and the termination of the "invert," G, being built close up to the back end of the boiler, it will be understood that the final and only means of exit for the gases, &c., to the chimney, is from the main longitudinal tube or tubes, B, thus causing the whole of the products from the fires to pass through the oblique taper tubes, C, into the main tube, B, where they unite, and whence only they escape to the damper flue, H, and to the chimney.

By the before mentioned arrangement of parts and "alternate firing," thus causing the products of the "green" fire to meet the products of the "bright" fire in the main tube, B, the patentees purpose consuming the greater part of the smoke made by the fires, and for assisting the ignition and consumption of the smoke, they allow an admission of air to the fires, through the apertures, I, in the division wall, F. The parts not named in the foregoing are the bridge and "invert," J; a pillar, K, for supporting the dead plate and front end of division wall; the dead plate and fire doors, L; additional door with peep hole, M, for observing the action of the fires; the mud pipe and blow-off cock; steam dome with safety valve on top; alarm whistle, N, for high and low water; O, the collar upon the pipe or tube of the alarm whistle. This whistle or improved "safety apparatus" for steam boilers, is shown in vertical sections in fig. 1, being a bored cast-iron or brass pipe, reaching about fifteen inches inside and fifteen inches outside of the boiler (according to the diameter of the boiler), through the centre of which pipe passes a tube of iron or other metal, Q, having a float at the bottom end to rest upon the water in the boiler, and at the upper end (outside of the boiler) a whistle, R, for calling attention to high or low water; the currents or action of the steam for actuating the whistle being controlled by holes or perforations at S, in the pipes or tubes, P and Q, and by four metallic pistons, T, of brass or other metal fitted upon the inner tube, Q, and working freely in the outer pipe, P. A graduated plate may be attached to the outer pipe, P, and an index or pointer fixed upon the inner tube, Q, for showing the height of the water in the boiler, and for preventing explosions from "shortness of water," or turning the feed water into the boiler upon the hot plates; the tube, Q, passes through the back end of the ordinary safety valve lever, and by means of the collar, O, which is fixed upon Q, and the weight of the float in the boiler, the valve is opened and the steam "blown off" whenever the water is allowed to to sink below the level of safety; and it must be understood that the length of the lever and the weight of the float must be sufficient to retain the safety valve open, after the pressure of the steam is removed until the water is restored to its proper level, when the valve will, of course, be closed again, and allow the steam to be raised to its usual pressure. This apparatus may be applied complete and entire, as described, or in part only, to fulfill all or a portion of the above duties.

The patentees' improved governor or regulator for steam engines, is shown in fig. 3 of the accompanying engravings. A, is a cast-iron cylinder or vessel of any convenient form, through which the steam passes on its way from the boiler to the engine, being also forced to pass through a circular bored neck or collar in the same. Inside this vessel is a heavy ring of metal, B, turned and fitted outside to the size of the neck or collar in the cylinder, and also fitting accurately the globe or sphere, C, upon which, by means of a pin, D, passing through them, this ring, B, is made to hinge or swing round and upon the globe, C, and is in appearance not unlike the planet Saturn and his belt. The globe, C, is upon or forms part of a revolving shaft or spindle, E, which passes through a packing-box in the bonnet or cover of the cylinder, the inside end of the spindle running in, and the thrust of the steam being borne by a cup in the opposite end of the cylinder, or the shaft may pass through the cylinder, as shown in the engraving, the shaft, E, being placed in the cylinder, A, in such a way that, when the ring, B, is at right angles to the shaft, E, (or as the rim of a wheel would be,) the ring fills, and is concentric with the bored neck or collar in the cylinder, A, and consequently forms with the globe or sphere, F, a stop or impediment to the steam in its passage to the engine; but by the application of a spring, F, or a weight, when not applied to marine engines, the ring, B, is induced to hinge round upon its pin, D, and rest with its opposite sides near to the shaft, E, and produce an opening for the passage of the steam to the engine; it is only by giving this shaft, E, with the globe and the ring, B, a revolving motion by band and pulleys or by toothed wheels, that it can be thrown (by its centrifugal power overcoming the spring or weight), into the stop or closed position first named; and it follows, that the extent of the opening, and the quantity of steam allowed to pass to the engine, will be inversely in proportion to the speed given to the governor, that is to say, the faster it revolves, the less will be the quantity, and vice versa.

Fig. 3.



The fourth head of the specification refers to improved arrangements of gearing for closing the steam valves of engines working expansively, and which are especially applicable to those engines wherein "chest-nozzles" and lifting valves are employed; the "cutting-off" action being produced in one case by telescopic lifters, having a rule or "knuckle joint," or a catcher action gearing appended for closing the steam valves; or in the other case, the same being effected by a catcher action applied with the ordinary "gearing," without the telescopic action, as the case may require.

The patentees have also described a new and improved lever for opening the plate or lifting valves of large steam engines, which is also applicable to such valves, for whatever purpose they may be employed; the object of this part of the invention being to produce, by means of a changing or travelling fulcrum, a greater amount of power at the commencement of the action, or when the valve is closed and the full pressure is upon it, and then afterwards for the power to diminish, as less is required; and thus (in the case of steam engines) to obtain a light and easy action without the use of "bell" or equilibrium valves, and also a stop when open without the use of "check straps." The lever is curved on its under edge, it rests and works upon a stationary level bed or plane, and is prevented from "roving" or being misplaced by the teeth or rack which run in a longitudinal direction along the under side of the lever and the upper side of the bed. This rack might be either single or double; but in any case, the bearings for the lever upon the bed or plane should consist of two or more plain surfaces, curved in accordance with the "pitch line" of the teeth in the racks, and running longitudinally along the outside edges of the under side of the lever and the upper side of the bed. The lever and bed may be made of cast or wrought-iron, as the case may require.

RAILWAYS.

J. H. Johnson, *London and Glasgow* (C. E. Detmold, *New York.*)—*Patent dated December* 24, 1858.

This invention relates to an improved mode of joining and fastening the ends of the rails of the permanent way of railways, whereby the rail ends are kept in the same vertical and horizontal planes without any additional chairs or plates, bolts, rivets, or any other description of fastening, the rails being also left entirely free to expand and contract. According to this invention, it is proposed to cut notches or slots in the webs or shanks of the rails at their ends, and to insert into such notches or slots wrought or cast-iron joint pieces, of such a section as to enable them to fit accurately into the slots, and at the same time to fit against the sides or under the head of the rail at the ends. In order to afford facility for taking up the rails, certain of the rails (say every tenth) should have the slot made of extra length, so as to admit of the joint piece being slid along such slot, and consequently unlocked from the adjoining rail end, when the unlocked rail may be taken up. At these parts the joint pieces may be retained in their places when locked by means of wooden wedge pieces driven behind them into the slot, and secured therein by a pin. Fig. 1 is an end view of an ordinary rail, having the improvements applied thereto, and fig. 2 is a side view of the same. A, represents a slot or long notch, cut out of the shank or stem of the rail, B, which is readily effected by a circular saw of suitable thickness, when the rail is hot, or by any other suitable means. The width of this slot or notch may be from one-half to three-quarters of an inch, more or less, in proportion to the size of the rail—its length varying from three to five inches more or less, but the efficiency of the joint is diminished by making it too short; on the other hand, the difficulty and

Fig. 1.

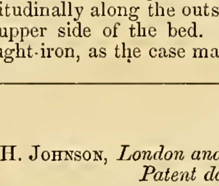
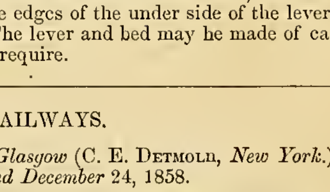
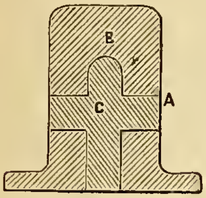


Fig. 2.



cost would be uselessly increased by making it much longer than mentioned. The joint piece, C, is made of wrought iron rolled to the desired pattern, and cut into proper lengths by a circular saw or other means. It is so shaped that its narrow part or neck fits precisely into the slot or notch, A, in the ends of the rails, whilst the upper groove clasps the underside of the head of the rail, B, and the lower groove fits close to the under part of the shank or neck and the inner portion of the bottom web or base of the rail, as shown in fig. 1. The ends of the rails into which the slots are cut are slipped up on this joint piece, and thus a perfect joint is formed, which entirely prevents all lateral or vertical displacement of either rail, whilst at the same time it affords the rails full liberty to expand and contract, the rails being simply spiked upon the cross ties with hook-headed spikes. The same principle of joints is applied to the so-called bridge rail, by cutting a slot or notch through both shanks at the ends of the rails, of the same dimensions as above indicated, and as shown in fig. 3, which represents a sectional end view of such a rail. A, indicates the slots or notches, which are slipped upon a cruciform joint piece, C. This joint piece is also rolled of malleable iron, and of such a shape as to fit precisely into the inner groove of the rail, B, whilst the arms of the cross fit exactly into the slots or notches cut in the shanks of the rails. The joint pieces may be made of cast-iron, but wrought-iron rolled will be found the cheapest and most efficient.

Fig. 3.



An additional and important advantage of this mode of making rail joints consists in the support which the joint piece affords to the head of the rail, which is more apt to be crushed at the joint than elsewhere.

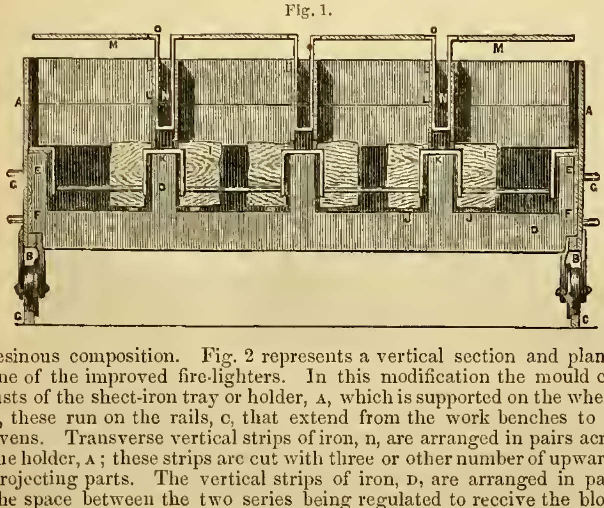
ARTIFICIAL FUEL.

James Templeman, *Glasgow.—Patent dated March* 1, 1859.

The very useful fire-lighters introduced by Mr. Templeman, the demand for which is daily extending, have received a further addition to their utility in the present mode of manufacturing them. As described under the inventor's former patent in our *Journal* for November last, the fire-lighter consisted of a small block of veneer dust and resin, forming a highly inflammable mass, so proportioned and blended as not to drop when lighted. But it was found that in most cases a small quantity of wood was required to make the fire burn up quickly; therefore, to combine wood in an economical and effective way with the patent composition, and so that the lighters can be manufactured upon a commercial scale of magnitude, and sold at a small price, is the object of Mr. Templeman's present system. This combination of hard wood and resinous matter render these useful little things perfect in their way. In making this improved fuel, it is preferred to deposit slips or blocks of wood in regular order in suitable holders or moulds, and the mixture of powdered resin and saw-dust is then deposited upon or over the wood. When the necessary heat is applied for caking the composition, the wood adheres strongly to it, the whole forming a solid mass.

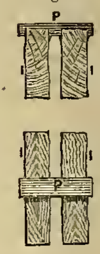
Fig. 1, of the accompanying engravings, is a longitudinal vertical section of a mould for combining wood with a certain proportion of the

Fig. 1.



resinous composition. Fig. 2 represents a vertical section and plan of one of the improved fire-lighters. In this modification the mould consists of the sheet-iron tray or holder, A, which is supported on the wheels, B, these run on the rails, C, that extend from the work benches to the ovens. Transverse vertical strips of iron, D, are arranged in pairs across the holder, A; these strips are cut with three or other number of upwardly projecting parts. The vertical strips of iron, D, are arranged in pairs, the space between the two series being regulated to receive the blocks or pieces of wood to be cemented together. The ends of each series of the strips, D, are severally attached to a longitudinal rib or strip of iron extending along the sides of the holder, A; one of the series of strips, D, being attached to the longitudinal rib, E, and the other to the corresponding rib, F. Each of the longitudinal ribs has a stud or short handle, G, which projects out through a slot made in the sides of the holder, A. These projecting handles are arranged one below the other, when the strips, D, are in contact with each other; the spaces between the contiguous strips or holders, D, are calculated to receive the thickest pieces of the prepared wood. Prior to filling a number of the holders, A, the wood is divided into parcels or lots, in which the several pieces are of a generally uniform thickness and depth, so that the operator is enabled to adjust the distance between the holders, D, to the thickness and depth of the parcel of wood to be made up. The holders, D, are moved asunder by shifting the handles, G, in opposite directions along the slots, and they are held in this position by means of the screws or pins, H; the shifting arrangement of the holders, D, enables the operator to adjust the spaces for the average thickness of the pieces of wood. The holders, D, having been arranged, the spaces are filled with pieces of wood, I; any irregularity in the height of the several pieces being made up by small pieces of iron, J, being placed beneath the block or blocks of wood, so as to bring them to a tolerably uniform level. An open barred frame, K, is next laid upon the upwardly projecting parts of the holders, D; this frame is made of bent strips, connected to each other by wire, or the bent strips may be formed of one piece of metal. The ends of the frame, K, rest upon an inwardly projecting flange on the inner sides of the holder, A, or the ends of the several strips may be attached to a rectangular frame, which may be supported in this or any other convenient way. The object of this frame is to cover the upper extremities of the holders, D, and so prevent the resin or powdered material from falling between them. To mould the resinous compound into blocks or ridges extending across the pieces of wood, the cellular frame, L, is used; this frame rests upon the higher parts of the frame, K, which thus form a base or floor to each of the longitudinal cells. A given quantity of the compound of resin and veneer dust is put into each of the cells. The resinous material is pressed down and caused to assume a ridge of uniform thickness, by means of a secondary cellular frame, M, which is placed in the cells of the frame, L, the lower faces of the cells, N, resting upon the resinous material. The several trays of the fuel prepared thus far are now wheeled into the oven, and are allowed to remain therein until the resinous material is melted and firmly cemented to the wood. When the trays are withdrawn from the oven, additional pressure may be applied to the resinous material if required. The longitudinal ridges of the resinous matter are then cut transversely by means of a compound cutter, the blades of which are arranged to enter the slots, O, in the frame, M. The cutters descend on to the ridges of the frame, K, and cut completely through the resinous material, P, leaving each block of fuel formed of two pieces of wood, cemented together by a transverse bar or block of highly inflammable composition. The side strips or cellular pieces are removed whilst the composition is hot; but the latter is allowed to cool, so as not to break away in detaching the moulded blocks from the frame.

Fig. 2.



Another mode of preparing this improved fuel, consists in forming cakes of the resinous composition, which are divided into small blocks. A quantity of these blocks, and pieces of split wood, prepared with the resinous material on the outsides, is placed before the operator, who has also one or more heated irons, the shape of which corresponds to the space on either side of the central ridge, Q, of the resinous block. The operator taking one of the heated irons, places it on one of the blocks so as to melt the resinous composition on the surface of the block and the side of the ridge; a piece of wood is then placed in a vertical position on, and against the melted surfaces. The other side of the block is treated in like manner, the resinous composition serving to bind or cement the wood firmly thereto. But if still greater strength is required, the ridge may be made higher, or a small piece of wood coated with the resinous material, may be cemented between the pieces. Artificial fuel, prepared in this way, lights with great rapidity, gives out an intense heat, and does not throw out sparks; nor is their any dropping from the resinous material, which is prevented by the blending therewith the veneer dust.

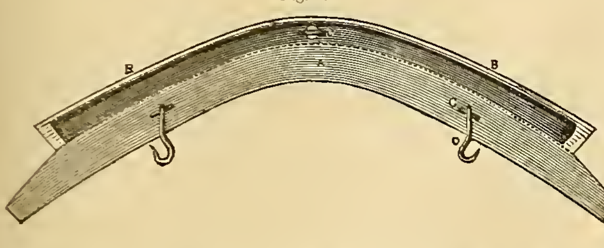
SADDLE TREES.

James Yuill, *Glasgow.—Patent dated March* 10, 1859.

The patentee's improvements relate to the manufacture of what are technically known as "saddle trees," or the supporting troughs or curbs for the chains or back-bands of cart and other harness, of malleable or softened cast-iron.

Fig. 1, of the subjoined engravings, is an elevation of one modification of the patentee's improved trough or curb for saddle trees; fig. 2 is a transverse vertical section of the same; and fig. 3 is a transverse section showing another mode of manufacturing these saddle trees. According to the modification shown in figs. 1 and 2, the iron work, A, which forms the trough or "curb," is made of cast-iron, which is by prefer-

Fig. 1.



ence annealed, to render it malleable. The casting is in the first instance made as nearly as practicable to the desired shape, but should there be any deviation therefrom, the malleability of the metal admits of its being bent exactly to the required figure, or if ordinary cast-iron is used, the fitting may be done with the file. The sides of the trough or curb are strengthened by the raised ridges, B, and screw holes are made in one of the sides to receive the eyes, C, to two of which are fitted the hooks, D, to which the breeching of the harness is attached. The under part of the trough or curb is filled in with wood, as shown in fig. 2. The wood may be inserted in two or more pieces, which are fastened to the trough or curb, A, by rivets or screws, which pass through the wood in a vertical direction. In this way, short pieces of wood with the grain running in different directions may be used, for the purpose of filling in the undersides of the troughs or curbs. An important advantage is gained in this mode of construction; if the several pieces of wood are selected with the grain of each piece running in a longitudinal direction, this part of the trough or curb is rendered stronger, and will wear a greater length of time; it is also more easily made, and in a shorter time than if in one piece, according to the usual mode. In the modification shown in fig. 3, the trough or curb is formed of wrought-iron. The central part, F, is a strip of malleable iron, to which the broad or expanded ends, G, are welded; at the upper or inner part of the broad ends the metal is cut inwards to the extent of about five-eighths of an inch on each side, and these cut parts are turned up at right angles to the parts, G. The part, F, of the trough or curb is riveted to the underside wood, which in this case is made in one piece. The side pieces, A, which are plain pieces of malleable iron, are riveted through to the wood, and likewise to the upwardly turned parts of the ends, G. In this manner the upwardly turned parts serve to protect the inner surfaces of the side pieces, A, as the chain in its lateral action comes in contact only with these projecting parts, produced by turning up the metal of the board ends in the manner hereinbefore described. The upper edges of side pieces, A, are strengthened by means of the tubular ridges, B, these ridges are tubular pieces of wrought-iron which are split longitudinally, and when bent to the form of the trough or curb, are sprung on to the edges of the side pieces. In making the troughs or curbs according to this modification, the central part, F, may, if prepared, be made in two pieces, the inner ends being made to simply abut one against the other, and the two parts riveted to the wood. The external surfaces of the side pieces are made smooth, so as to be easily polished and kept bright when in use, or if preferred, they may be japanned. Another mode of constructing the wrought-iron troughs or curbs consists in riveting the two side pieces near their upper edges, to a bent or trough-shaped plate of metal, which is also riveted to the wood. The side pieces have riveted to them two lower plates, which may or may not be secured to the wood; these pieces may, if required, be japanned or otherwise blackened so as not to require polishing, and thus avoid the rubbing of the leather of the saddle when in use, or if preferred, the whole surface may be polished. The ends of the bent plates of metal are bent over and beaten down, in order to obtain the increased strength and thickness required at that part of the trough or curb, as before described, and and an increased thickness may in this way be obtained at the sides of the trough, to meet the lateral wear of the chain. The saddle trees made according to Mr. Yuill's plan are in every respect superior to the ordinary make.

Fig. 2.

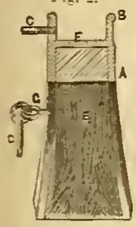
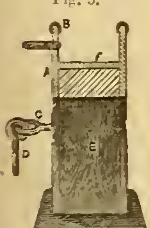


Fig. 3.



LAW REPORTS OF PATENT CASES.

Polishing Thread: Ermen *v.* Liddle.—This was an action tried at Liverpool before Mr. Justice Hill and a special jury.

This was an action for the infringement of a patent for polishing cotton threads by the application of friction to the threads when in the hank, and while in a state of tension, by means of brushes. The defendant, by his pleas, denied the infringement, and also alleged that the plaintiff's invention was not new, that it was not properly described in the specification, and that it was not properly the subject of a patent. The plaintiff is a manufacturer at Eccles. His machine effected its object by passing the hank (which had been previously dipped in size and squeezed) over two rollers, which were turned with considerable velocity. Against the hank, thus distended and revolving, a cylinder, armed with brushes, and turned with a much greater velocity than the hank, sharply brushed. The effect was to make those threads which had slight excrescences to twist and gradually to absorb into their whole length the excrescences. A high polish was given to all the threads, which also became by the heat of the friction perfectly dry. The polished thread thus produced was ea·ier to sew with, and when worked up with a little silk make a very fine silk fabric, equal in appearance to a fabric containing 20 or 30 per cent. more silk, but in which ordinary unpolished cotton was used. On the 8th of this month the plaintiff and his attorney inspected, under a judge's order, the defendant's mill at Middleton. Two machines were first shown to them, identical in principle with the plaintiff's, and the only difference in detail being that there were, instead of one, two sets of rollers on which the thread was spread, and that teazles were used instead of brushes. Afterwards several other machines were shown by the defendant, in which brushes like those of the plaintiff were used. Notice had been given by the defendant of three or four patents for the same invention as the plaintiff's, but these, it was contended, were essentially different.

For the plaintiff, Mr. Fothergill, the engineer, and several other witnesses were called, by whose evidence it appeared that the chief merit of the plaintiff's machine was its high velocity and great friction applied to the thread, which thereby became very compact and bright, and greatly resembled silk.

For the defence, it was contended, first, although the plaintiff's machine might be more complete and effective than any other, particularly in the speed with which the brush cylinder was made to revolve, yet that, so far as the principle of his invention was described and claimed in his specification, which was the brushing of distended hanks of cotton thread, so as to render it smooth and polished, such invention was not new, but had been long previously to his patent known and used. The learned counsel called Mr. Ireland and several other witnesses, who spoke to having used, so far back as 1823, a ruder machine than the plaintiff's, but which did polish by means of brushes fixed to a cylinder hanks of cotton thread distended on rollers. A model of this old machine was produced, but it appeared to have been only recently made from the description of some old persons who remembered the machine.

His Lordship summed up, and left the jury to decide,—1. Whether the invention was new; 2. Whether the plaintiff was the true and first inventor; 3. Whether the specification was sufficient. The infringement was admitted by the defendant's counsel. Upon the plea that the invention was not the proper subject-matter for a patent, his Lordship should direct a verdict for the plaintiff. The learned judge thought that the defence rested mainly upon the evidence given as to the prior use of Ireland's machine; but the proof of its nature depended mainly on the accuracy of the memory of an old witness as to what he saw when he was a boy. The machines which had been previously patented were different from the plaintiff's.

The jury, without retiring from the box, gave a verdict for the plaintiff, thus establishing the validity of his patent.

Printed Zebra Fabrics: Macnee *v.* Nimmo.—This was the new trial, at Liverpool, the order for which on behalf of the plaintiff we reported in July last. The patent claimed by the plaintiff—as is now pretty well known—was a twilled or plain fabric backed so as to make it of soft or spongy texture, and printed in shawl patterns to imitate a manufacture, called "Zebras," for the Eastern market. The alleged infringement was the making of a figured fabric with raised figures, upon which a shawl pattern was printed, the raised pattern giving the fabric a soft and spongy texture. This was said to be in reality the plaintiff's patent, and a mere colourable evasion of it. Many witnesses were called to show that the production of the defendant was essentially the same as that made under the plaintiff's patent.

For the defendant, it was urged that the case was simply "Glasgow *v.* Manchester," for, with one exception, the witnesses who had been called for the plaintiff were all from Glasgow. There was the important distinction between the goods manufactured by the two processes—that the defendant's could be printed upon both sides, and the plaintiff's could not; and the defendant's could also be used for a variety of purposes besides zebras. The jury, after a few minutes consultation, returned a verdict for the plaintiffs, his Lordship intimating that the damages would only be nominal, as the action was brought to try the right of patent.

It is perhaps all very well, under the circumstances, to award nominal damages; but we really think that the defendant's pertinacity in this extraordinarily protracted affair ought to be substantially rebuked.

REVIEWS OF NEW BOOKS.

On Liberty. By John Stuart Mill. London: J. W. Parker & Son. 1859.

This little book, containing scarcely more than 200 pages, has attracted the attention of the thinking part of the community, from the importance of the topics handled, and the admirable specimen of reasoning displayed in their treatment. The liberty of which the writer here presents a study, has no reference to slavery, or to the government of a monarch, or to the philosophical questions connected with freewill and predestination; but is that liberty of thought and action which each member of a free community ought to possess contemporaneously with those restrictions which the most liberal and enlightened government must necessarily impose. The writer undertakes to investigate the nature and limits of the power which can be legitimately exercised by society over the individual. Those who are acquainted with Mr. Mill's previous works, need not be informed that the question propounded is one of great importance to the well-being of society, and that it is discussed in clear and temperate language, with acumen, boldness, and force of logic. The conclusion at which he has arrived, and which he here expounds, is summed up in the simple principle, that the sole end for which mankind are warranted, individually or collectively, in interfering with the liberty of action of any of their number arrived at years of discretion, is self-protection. He first enters on the subject of the liberty of thought and discussion, arguing that society has no right to prevent any of its members from publishing his opinions on any subject whatever, however erroneous those opinions may be generally thought. Society is not infallible, as we very well know; for has not every age held opinions which have been subsequently proved false, and often absurd? and is it too much to say that many opinions now general, will be rejected by the people of future times? It is therefore quite possible, that when society suppresses the opinions of an individual, it is suppressing what may be founded on truth. And granting that the opinions are in reality, erroneous, yet so much benefit arises to truth in its collision with error—still, even in that case, the publication of such opinions ought not to be forcibly stopped. The best ground we can have for believing our opinions to be certainly true, is the fact that the whole world is at liberty to controvert them, and has failed in the attempt. How is it possible for us to know that any given dogma is true, if we are not permitted to listen to the arguments that can be brought against it? It is free discussion alone that can help us to certainty—the feeling of certainty in its absence, is, we may be sure, insecure and unsound. "Men," says Lord Macaulay, "are never so likely to settle a question rightly as when they discuss it freely. A government can interfere in discussion, only by making it less free than it would otherwise be. Men are most likely to form just opinions when they have no other wish than to know the truth, and are exempt from all influence either of hope or fear. Government, as government, can bring nothing but the influence of hopes and fears to support its doctrines. It carries on controversy, not with reason, but with bribes and threats. If it employs reasons, it does so not in virtue of any powers which belong to it as a government. Thus, instead of a contest between argument and argument, we have a contest between argument and force. Instead of a contest in which truth, from the natural constitution of the human mind, has a decided advantage over falsehood, we have a contest in which truth can be victorious only by accident." Moreover, the liability of free thought to legal persecution or the ban of social opinion, has an evil effect upon the mind of the entire community. Mental development is cramped, and hypocrisy is fostered by the present system. Men are afraid to reflect lest reflection should take them whither they are afraid to go; or they outwardly conform to the opinions of the world lest the world should visit them with its hatred. To a large number of persons to brave the scorn of the world is to deprive themselves of subsistence, and there are many of those not thus dependent whose moral courage is insufficient to face the dislike of those around them. But no one, we are told, "can be a great thinker who does not recognise that, as a thinker, it is his first duty to follow his intellect to whatever conclusions it may lead. Truth gains more, even by the errors of one who, with due study and preparation, thinks for himself, than by the true opinions of those who only hold them because they do not suffer themselves to think."

One of the chapters is a protest against the despotism of custom, and an eucomium of originality. The one is everywhere the standing hinderance to human advancement, the other the source from which spring all good things. As the only means of cultivating originality, the members of a community must cultivate their individuality; for individuality is the same thing as development, and it is only the cultivation of this that produces, or can produce, well-developed human beings. The spirit, therefore, that is daily gaining ground on modern society, namely, the spirit of conformity, is one to be discouraged as inimical to all progress and improvement. It would reduce all persons to the same standard, and would compel them to adopt the same style of thought, the same habits, even the same dress, thus destroying everything that is peculiar and individual. "Among the mass of men (says another writer upon this topic) there is little or no resistance to conformity. It is hard to say in what department of human thought and endeavour it has triumphed most. Could the history of opinions be fully written, it would be seen how large a part in human proceedings the love of conformity, or rather the fear of nonconformity, has occasioned. It has triumphed over all other fears; over love, hate, pity, sloth, anger, truth, pride, comfort, self-interest, vanity, and maternal love. It has torn down the sense of beauty in the human soul. It has contradicted nature in the most obvious things, and been listened to with abject submission. Its empire has been no less extensive than deep seated."*

Mr. Mill afterwards proceeds to discuss the question of the limits to the authority of society over the individual, and enunciates the propositions, that the individual is not liable to society for his actions, in so far as these concern the interests of no person but himself; and that for such actions as are prejudicial to the interests of others, the individual is accountable, and may be subjected either to social or to legal punishment, if society is of opinion that the one or the other is requisite for its protection. The application of these maxims to various cases of social life is ably expounded, and instances are given both where society unwarrantably interferes with the conduct of individuals, and where society might properly interpose its authority, but yet abstains from doing so. The Maine liquor law falls under the first head, and the question of popular education under the second The whole book is full of weighty matter, and deserves the deep attention of the philanthropist and the philosopher.

Outlines of Astronomy. By Sir John F. W. Herschel, Bart. Fifth Edition. Longmans and Co. 1859.

The number of editions which the public has called for of this work, by the first of British astronomers, sufficiently shows the estimation in which it is held. It is the remodelled form of a treatise which appeared many years ago, as one of the series termed the *Cabinet Cyclopædia*, a series that embraced treatises of great merit, but none of greater merit than the volume on astronomy. In preparing the present work, its author has rewritten many of the chapters upon a more comprehensive plan; and has introduced much new matter, with the view of bringing it up to a level with the present state of the science, so far as it can be expounded as a whole to the popular mind. The work is cast altogether in an elementary mould, and is conspicuous among scientific treatises of that class, for the clearness and simplicity of its expositions, exhibiting at once an appreciation of the wants of students, and the fulness of a master's knowledge. Would that the entrance to every branch of science were illuminated by such lights as those held out by Sir Charles Lyell, Dr. Carpenter, and Sir John Herschel. In the books of these philosophers how fascinating become the stern features of science; how easy the acquisition of knowledge; what a broad basis they present for future advancement into the countries of which the outlines are clearly mapped out. The warmest thanks of the studious public are due to the men who abandon for a while their profound speculations, and the absorbing study of details, to spell over the alphabet of science, and sketch its elements for their benefit. To do this well is no easy matter, whatever appearances may say to the contrary. The work calls for consummate ability, for it is only men of consummate ability that succeed in its execution. Among the valuable traits of Sir John Herschel's writings, every reader must be frequently struck by the generality of his reflections. In studying them we obtain not only an acquaintance of the subject professedly under treatment, but are brought into contact with principles that lie at the base of all knowledge, and rules that arm or forwarn the mind in pursuing its enquiries in other departments of positive science. Thus, "the process by which knowledge is built up in the mind of each individual, and by which alone it can obtain any extensive developement, or any grand proportions, is one of frequent demolition, renewal, and rectification. No man can rise from ignorance to anything deserving to be called a complete grasp of any considerable branch of science, without receiving and discarding, in succession, many crude and incomplete notions, which, so far from injuring the truth in its ultimate reception, act as positive aids to its attainment, by acquaint-

* The essay on Conformity is not the least valuable portion of Mr. Arthur Helps' little work, *Friends in Council*; and is in precisely the same spirit of hostility to the deprecated tendency of the age as Mr. Mill's subsequently published volume.

ing him with the symptoms of an insecure footing in his progress. To reach from the plain the loftiest summits of an Alpine country, many inferior eminences have to be scaled and relinquished; but the labour is not lost. The region is unfolded in its closer recesses, and the grand panorama which opens from aloft is all the better understood and the more enjoyed, for the very misconceptions in detail which it reetifies and explains."

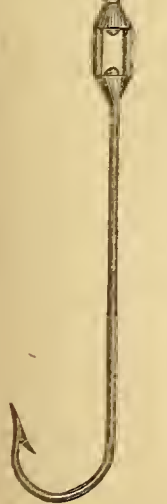
All the recent discoveries connected with the subject have been noticed in their proper places, sucb as the discovery of Neptune, and the calculations of the mathematicians which led to its detection, the discovery of the dark, semi-transparent ring of Saturn, and of the latest asteroids; the gyroscope of M. Foucault also receives mention. With reference to the question of the heat reflected by the moon, Sir John Herschel says that we *feel* no heat from it, and even in the focus of large reflectors it fails to affect the thermometer. Now Professor Piazzi Smyth when at Teneriffe was able to perceive that the mercury rose under the influence of the coneentrated rays of the moon. But this fact had probably not been published in time to be mentioned by Sir John.

Not long ago there was a coutroversy carried on in the public prints as to whether the moon had a rotation on an axis, the fact being undoubted that the same face is always turned towards the earth. "Strange to say, (says Sir John) there are persons who find it difficult to regard as a rotation on its own axis, that peculiarity of the moon's motion which consists in its keeping the same face always towards the earth. Should any of our readers be in this predicament, we recommend him to plant a staff npright in the ground, and grasping it with both hands walk round it, keeping as close to it as possible, with his face always turned towards it, when the unmistakeable sensation of giddiness will effectually satisfy him of the fact of his rotation on his own axis. Or he may walk round a tree, always facing it, and carrying a compass in his hand, and while watching the needle for a few circuits endeavour to persuade himself that he does not turn upon his own centre."

Remarks on the Patent Hook in Sea Fishing. By W. H. Box, M.D. 8vo. Pp. 5. Thomas Hemming and Son, Redditch, Worcestershire: 1859.

Apart from the immediate object of the author, the introduction of his new form of fish-hook, the little treatise before us is very succinctly instructive. We shall let him introduce the subject in his own way, and, to a certain extent, tell his own tale:—

"Deep-sea fish, when hooked, appear to make the line the chief object of their attack, on which at first they seem to try the effect of their teeth. Some of the larger kinds, especially, as the conger, ling, &c., attempt either to drill it np so tightly into knots, by a rotatory motion of their bodies, as to make it a point for resistance, or it may chance by the same action reversed they nnlay the strands, so that it becomes divided in detail. Many others, as the hake, and many river fishes, combat it with their tails, and by a sharp stroke either knock the hook ont of their months or part it. This practice of the hake is ascertained by the fact, that the tails of those caught on the hook are almost invariably split or jagged, by its violent attacks, while the tails of such as are taken in nets are always perfect. The dogfish, the most destructive to hooks of all the fisherman's enemies, is said also to assail it with the spine on its back, and so divides it.



"With the old hook, by one or other of these operations, almost one-half of all deep-sea fish that fasten on it contrive to make their escape, and if not snccessful in freeing themselves, they invariably take the hook and part of the gear with them; occasionally, so great is the loss of hooks sustained in this way, chiefly by the dogfishes, that although the poor men go to the sea provided with a stock of several dozens, they have been known to lose them all in a short time, and have been compelled to retnrn withont a successful fishery.

"The essential qnalification of the new hook consists in the peculiar mechanical application of a donble swivel to its top end, to the box of which the hook is directly attached by means of a knob or pin-like head, so that it turns ronnd without slipping through the box, while the npper part is completed by the usual ronnd eye, or one of an elongated figure fitted with a spring, which thus combined allows the hook to make a double revolving action. It is also electro-plated with silver, and like the rudely shaped hook commonly nsed by nncivilized tribes, which is nsnally formed ont of some brilliantly white or iridescent shell, its appearance is rendered so attractive in the water, that it has been found to take certain fish withont hcing baited—it is also snpplied with a nnzzle of brass wire of thirteen or fonrteen inches in length, on the top of which is another swivel like the former, with a ronnd eye for attaching the line, and with its lower end tnrned np in the shape of a noose, by which means it may be slipped off or on to the hook with perfect ease.

"In conseqnence of its appearing so late in the season of last year, its employment as yet has been very limited; it has been freely used however, and with unparalleled snccess, at some of the chief fishing places on the coast of Cornwall, in which country it was first exhibited, and among others at Polperro, where its materials have been thoroughly tested under the scientific supervision of Mr. Couch, F.L.S., the well-known icthyologist. This gentleman having placed it in the hands of some of the best fishermen in Cornwall, than whom there are none more experienced and intelligent to be found, has from their reports and his own observations, expressed his conviction of its great superiority over every other fish-hook for the general purposes of sea-fishing. One of the fishermen assured this gentleman that he considered it to be ten times as valuable as the old hook, and another who employed it for catching hakes, that he had taken thirty in succession without missing a fish, an unheard of exploit in the history of deep sea-fishing as with the old hook; according to the average success, out of thirty hooked nearly one half would have escaped, and have taken with them most probably several of the hooks.

"Every experienced person who has tried it concurs in the opinion, that when a fish is on it, the constant revolving action imparted both to the hook and the line, by means of the swivels, so completely disarms the animal of all power to make effectual resistance, that its capture is almost certain. They also consider that being protected by a wire nuzzle no fish will succeed in carrying it off while the gear proves strong enough to support the strain."

Our diagram illustrates the simplicity of the contrivance, as applied to the Polperro or Exeter bend hook. As knowing something about fishing, we may say that we quite concur with the statements which we have quoted, and we shall be glad to see the new hook fairly and widely tried.

Le Moniteur du Travail National. Journal des Inventions, des Produits Nouveaux, de l'Industrie et des Travaux Publics. (The Monitor of National Labour. Journal of Inventions, New Products, Industry, and Public Works.) Folio. Pp. 4. Weekly. Nos. I to IX. Brussels: 1859.

Brussels is for many reasons a fit country for the publication of a journal professing to deal with the facts and prospects of Belgian industry; and, as one of the most industrious of nations, Belgium has clearly a right to a good literary representation of her productive and convertive efforts. As far as the preliminary parts before us permit us to judge, the present undertaking promises well. It deals, as far as its modest limits will allow, with both theoretical and practical seience; the law, as regards scientific invention, and patents; and commerce as bearing upon the arts and manufactures. Its publishing price is $7\frac{1}{2}$ francs per annum for Brnssels, 9 francs for the provinces, and 12 francs for abroad.

CORRESPONDENCE.

LOCOMOTIVE STEAM CARRIAGES FOR COMMON ROADS.

Being an admirer of steam locomotion on common roads, I have hailed with delight the various notices of traction engines which I have seen in *our Journal* and elsewhere, as indicating a gradual extension of the use of steam power over the domains of the toll collector.

Whilst observing the mechanism of the present common road locomotives, and especially of that described in the last monthly part of the *Practical Mechanic's Journal*, my attention was drawn to that important part of all locomotives—the boiler. The boiler in the Marquis of Stafford and Mr. M'Connel's engine may answer its intended purpose, but I really think that the boiler invented by the late Mr. Walter Hancock, and used by him in his steam carriages twenty-five and thirty years ago, is a much superior boiler for that purpose. That boiler belonged to the vertical class, and was composed of chambers made from one-eighth inch plate (a small piece of which I enclose) doubled, something like the covers of a book with the leaves out, and the three open sides drawn together and riveted. About eighteen or twenty of such chambers were placed side by side, with the feed and steam pipes composed of rings within them and between them, and the whole bolted through the pipes, and stayed by six additional bolts. Each chamber was about $1\frac{1}{2}$ inches or 2 inches wide, 2 feet 6 inches or three feet high, and 2 feet from back to front; the sides of each chamber was also embossed in such a manner that each boss met at the apex of the corresponding boss on the next chamber, to prevent the flues collapsing. Amongst the advantages arising from the use of such a boiler are—a great extent of heating surface, and consequently, quick and economical generation of steam; lightness, with great strength; simplicity in its manufacture, and safety if an explosion takes place. An explosion occurred with one of Mr. Hancock's boilers, when a man, who was on the carriage within two or three feet of the boiler, received no more harm than a sudden report so close would give. The stay bolts gave way, and the exploded chamber presented the appearance of a pillow. The pressure Mr. Hancock worked his boiler at was seldom below 100 lb., and it was frequently pushed much higher. The steam pipe ran close to the wooden side of one of the carriages, and I remember seeing the wood scorched, almost charred by the over heated steam pipe, where it came in contact with the inner side of the panel.

Though the attempts at common road locomotion in those days did not result in an established conveyance, yet there were some features in the former undertakings which I think we should do well to adopt in modern carriages, and the chamber boiler is one; for to the rapid generation of steam by it, Mr. Hancock attributed his success. He frequently travelled at twelve, fifteen, and eighteen miles an hour; and surely the modern engineer, with thirty years of improvements and experience, can produce a steam carriage to run continuously, when steam power is so much cheaper than horse power.

WILLIAM SERVICE.

Mitcham, Surrey, September, 1859.

THE CARBON GAS FIRE.

SEVERAL patents have been taken out for gas fires in open grates, the patent being for the *material* used, such as "pumice," "asbestos," the material called the "polytechnic fire," "lump asbestos," and other materials, the use of which is very limited in consequence of the expense. The "lump asbestos" is valued at a guinea a pound, and the "polytechnic fire" material, although not so expensive in itself, requires more gas to get up a red heat; it also becomes very brittle by use, so that when taken out of the grate to clean the gas pipes—the holes requiring broaching occasionally—it breaks in pieces, destroying the effect intended. Finding this to be the case, and yet anxious to introduce gas fires, I have been trying experiments with material of various kinds, and have succeeded in producing a gas fire superior, I believe, to any yet introduced. I have taken out no patent for it, that all gas companies whose interest it is to introduce gas fires to the public, may do so at the cheapest possible rate. The material I find best suited for use is the carbon, removed by the process called scruffing, from gas retorts; it should be broken up in lumps of about 2½ or 3 inches, and piled in the grate by hand, not thrown on in a mass. I find this material absorbs the gas, and causes a perfect combustion, making an excellent fire and throwing out a great heat, with a less consumption of gas than any other material. Gas companies can sell the carbon at 2s. 6d. per bushel ready broken, so that the cost of material will be trifling—one bushel lasting from three to six months, according to the heat required.

MAGNUS OHREN.

Gas Works, Sydenham, September, 1859.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

THE BRITISH ASSOCIATION.

The twenty-ninth session of this Association opened at Aberdeen, on Wednesday evening, September 14th, in the New Music Hall. A brilliant company of noblemen, *savans*, and others interested in the Association assembled to do honour to the occasion.

Professor Owen, before retiring from the chair said:—Gentlemen of the British Association, in rising to discharge the brief concluding duty of your retiring President, I beg to congratulate you on the sound and vigorous state of the Association. I am happy to be able to say that I leave your affairs in a more prosperous condition than I found them, and yet that state of prosperity has been for some years progressive. Our founders and executive have ever sought to harmonise our course of action with the characteristic national habits, feelings, and institutions. Accordingly, in the choice of names, associated with our highest office, we have sought alternately those who are habitually occupied in the pursuits of science, and those who combine such pursuits, or a love of science, or a deep interest in its progress, with high social rank and its attendant influence. And so we recal with satisfaction our very successful meetings and years of progress, under the Earl of Rosse, the Marquis of Northampton, and the Duke of Argyll; and now our last presidential election is ratified by the presence amongst us of the highest personage nearest the Sovereign of these realms. I shall not trespass longer on your time than to thank you for the confidence you have reposed in me during the past year, and to assure you that I entertain a most grateful sense of the advantages to myself thus accruing, not among the least of which I note to be the present honourable relation in having, as the final act of my office, to resign it and this chair to his Royal Highness the Prince Consort.

His Royal Highness the Prince Consort then took the chair amidst enthusiastic applause, and proceeded to read the following address:—

Gentlemen of the British Association, your kind invitation to me to undertake the office of your President for the ensuing year could not but startle me on its first announcement. The high position which science occupies, the vast number of distinguished men who labour in her sacred cause, and whose achievements, while spreading innumerable benefits, justly attract the admiration of mankind, contrasted strongly in my mind with the consciousness of my own insignificance in this respect. I, a simple admirer, and would-be student of science, to take the place of the chief and spokesmen of the scientific men of the day, assembled in furtherance of their important objects!—the thing appeared to me impossible. Yet, on reflection, I came to the conclusion that if not as a contributor to or director of your labours, I might still be useful to you, useful to science, by accepting your offer. Remembering that this Association is a popular Association, not a secret confraternity of men jealously guarding the mysteries of their profession, but inviting the uninitiated, the public at large, to join them, having as one of its objects to break down those imaginary and hurtful barriers which exist between men of science and so-called men of practice, I felt that I could, from the peculiar position in which Providence has placed me in this country, appear as the representative of that large public, which profits by and admires your exertions, but is unable actively to join in them, that my election was an act of humility on your part, which to reject would have looked like false humility, that is like pride, on mine. But I reflected further, and saw in my acceptance the means, of which necessarily so few are offered to her Majesty, of testifying to you, through the instrumentality of her husband, that your labours are not unappreciated by your Sovereign, and that she wishes her people to know this as well as yourselves. Guided by these reflections, my choice was speedily made, for the path of duty lay straight before me. If these, however, are the motives which have induced me to accept your flattering offer of the presidency, a request on my part is hardly necessary that you will receive my efforts to fulfil its duties with kind indulgence. If it were possible for anything to make me still more aware how much I stand in need of this indulgence, it is the recollection of the person whom I have to succeed as your President—a man of whom this country is justly proud, and whose name stands among the foremost of the naturalists in Europe, for his patience in investigation, conscientiousness in observation, boldness of imagination, and acuteness in reasoning. You have no doubt listened with pleasure to his parting address, and I beg to thank him for the flattering manner in which he has alluded to me in it. The Association meets for the first time to-day in these regions, and in this ancient and interesting city. The poet in his works of fiction has to choose, and anxiously to weigh where to lay his scene, knowing that, like the painter, he is thus laying in the background of his picture, what will give tone and colour to the whole. The stern and dry reality of life is governed by the same laws, and we are here living, feeling, and thinking under the influence of the local impressions of this northern seaport. The choice appears to me a good one. The travelling philosophers have had to come far, but in approaching the Highlands of Scotland, they meet nature in its wild and primitive form, and nature is the object of their studies. The geologist will not find many novelties in yonder mountains, because he will stand there on the bare back-bone of the globe, but the primary rocks which stand out in their nakedness exhibit the grandeur and beauty of their peculiar form; and in the splendid quarries of this neighbourhood are seen to peculiar advantage the closeness and hardness of their mass, and their inexhaustible supply for the use of man, made available by the application of new mechanical powers. On this primitive soil, the botanist and zoologist will be attracted only by a limited range of plants and animals, but they are the very species which the extension of agriculture and increase of population are gradually driving out of many parts of the country. The Aberdeen whaler braves the icy regions of the Polar sea to seek and to battle with the great monster of the deep. He has materially assisted in opening these ice-bound regions to the researches of science. He fearlessly aided in the search after Sir John Franklin and his gallant companions, whom their country sent forth on this mission, but to whom Providence, alas! has denied the reward of their labours—the return to their homes, to the affectionate embrace of their families and friends, and the acknowledgments of a grateful nation. The city of Aberdeen itself is rich in interest for the philosopher. Its two lately united universities make it a seat of learning and of science. The collection of antiquities formed for the present occasion enables him to dive into olden times, and by contact with the remains of the handiwork of the ancient inhabitants of Scotland, to enter into the spirit of that peculiar and interesting people, which has always attracted the attention and touched the hearts of men accessible to the influence of heroic poetry. The Spalding Club, founded in this city, for the preservation of the historical and literary remains of the north-eastern counties of Scotland, is honourably known by its important publications.

Gentlemen,—This is the 29th anniversary of the foundation of this Association, and well may we look back with satisfaction to its operation and achievements throughout the time of its existence. When, on the 27th September, 1831, the meeting of the Yorkshire Philosophical Society took place at York, in the theatre of the Yorkshire Museum, under the presidency of the late Earl Fitzwilliam, then Viscount Milton, the Rev. W. Vernon Harcourt eloquently set forth the plan for the formation of a British Association for the promotion of science, which he showed to have become a want of his country. The most ardent supporter of his resolution could not have anticipated that it would start into life, full-grown, as it were—enter at once upon its career of usefulness, and pursue it without deviation from the original design, triumphing over the oppositions which it had to encounter, in common with everything that is new and claims to be useful. Gentlemen, this proved that the want was a real and not an imaginary one, and that the mode in which it was intended to supply that want was based upon a just appreciation of unalterable truths. Mr. Vernon Harcourt summed up the desiderata in graphic words, which have almost identically been retained as the exposition of the objects of the Society, printed at the head of the annually appearing volume of its transactions. "To give a stronger impulse and more systematic direction to scientific inquiry; to promote the intercourse of those who cultivate science in different parts of the empire with one another, and with foreign philosophers, and to obtain a more general attention to the objects of science and a removal of any disadvantages of a public kind which impede its progress." To define the nature of science, to give an exact and complete definition of what that science is, and to whose service the Association is devoted, means, has, as it naturally must at all times, occupied the metaphysician. He has answered the question in various ways, more or less satisfactorily to himself or others. To me, science in its most general and comprehensive acceptation means the knowledge of what I know—the consciousness of human knowledge. Hence to know is the object of all science, and all special knowledge, if brought to our consciousness in its separate distinctiveness from, and yet in its recognised relation to, the totality of our knowledge, is scientific knowledge. We require, then, for science—that is to say, for the acquisition of scientific knowledge—those two activities of our mind which are necessary for the acquisition of any knowledge, analysis and synthesis. The first, to dissect and reduce into its component parts the object to be investigated, and to render an accurate account to ourselves of the nature and qualities of these parts by observation; the second, to recompose the observed and understood parts into a unity in our consciousness exactly answering to the object of our investigation. The labours of the man of science are therefore at once the most humble and the loftiest which man can undertake. He only does what every little child does from its first awakening into life, and must do every moment of its existence; and yet he aims at the gradual approximation to Divine truth itself. If, then, there exists no difference between the work of the man of science and that of the merest child, what constitutes the distinction? Merely the conscious self-determination. The child observes what accident brings before it, and unconsciously forms its notion of it. The so-called practical man observes what his special work forces upon him, and he forms his notions upon it with reference to this particular work. The man of science observes what he intends to observe, and knows why he intends it. The value which the peculiar object has in his eyes is not determined by accident, nor by an external cause, such as the mere connection with work to be performed, but by the place which he knows this object to hold in the general universe of knowledge by the relation which it bears to other parts of that general knowledge. To arrange and classify that universe of knowledge, becomes, therefore, the first, and perhaps the most important object and duty of science. It is only when brought into a system by separating the incongruous, and combining those elements in which we have been enabled to discover the internal connection which the Almighty has implanted in them, that we can hope to grapple with the boundlessness of His creation, and with the laws which govern both mind and matter. The operation of science, then, has been systematically to divide human knowledge, and raise, as it were, the separate groups of subjects for scientific consideration into different and distinct sciences. The tendency to create new sciences is peculiarly apparent in our present age, and is perhaps inseparable from so rapid a progress as we have seen in our days, for the acquaintance with and mastering of distinct branches of knowledge, enables the eye, from the newly-gained points of sight, to see the new ramifications into which they divide themselves, in strict consecutiveness and with logical necessity. But in thus gaining new centres of light from which to direct our researches, and new and powerful means of adding to its ever-increasing treasures, science approaches no nearer to the limits of its range, although travelling further and further from its original point of departure—for God's world is infinite—and the boundlessness of the universe whose confines appear ever to retreat before our finite minds, strikes us no less with awe when, prying into the starry crowd of heaven, we find new worlds revealed to us by every increase in the power of the telescope, than when the microscope discloses to us in a drop of water or an atom of dust, new worlds of life and animation, or the remains of such as have passed away. Whilst the tendency to push systematic investigation in every direction enables the individual mind of man to bring all the power of which he is capable to bear on the specialities of his study, and enables a greater number of labourers to take part in the universal work, it may be feared, that that consciousness of its unity which must pervade the whole of science, if it is not to lose its last and highest point of sight, may suffer. It has occasionally been given to rare intellects, and the highest genius, to follow the various sciences in their divergent roads, and yet to preserve that point of sight from which alone their totality can be contemplated and directed. Yet how rare is the appearance of such gifted intellects, and if they be found at intervals they remain still single individuals, with all the imperfections of human nature. The only mode of supplying, with any certainty, this want, is to be sought in the combination of men of science representing all the specialities, and working together for the common object of preserving that unity, and presiding over that general direction. This has been to some extent done in many countries by the establishment of academies embracing the whole range of the sciences, whether physical or metaphysical, historical or political. In the absence of such an institution in this country, all lovers of science must rejoice at the existence and activity of this Association, which embraces in its sphere of action, if not the whole range of the sciences, yet a very large and important section of them—those known as the inductive sciences, excluding all that are not approached by the inductive method of investigation. It has, for instance —and considering its peculiar organization and mode of action, perhaps not unwisely—eliminated from its consideration and discussions those which come under the description of moral and political sciences. This has not been done from undervaluing their importance and denying their sacred right to the special attention of mankind, but from a desire to deal with those subjects only which can be reduced to positive proof, and do not rest on opinion or faith. The subjects of the moral and political sciences involve not only opinions, but feelings; and their discussion frequently rouses passions, for feelings are "subjective," as the German metaphysician has it — they are inseparable from the individual being—an attack upon them is felt as one upon the person itself; whilst facts are "objective," and belong to everybody: they remain the same facts at all times, and under all circumstances; they can be proved — they have to be proved, and when proved, are finally settled. It is with facts only that the Association deals. There may for a time exist differences of opinion on these also, but the process of removing them and resolving them into agreement is a different one from that in the moral and political sciences. These are generally approached by the deductive process; but if the reasoning be ever so acute and logically correct, and the point of departure, which may be arbitrarily selected, is disputed, no agreement is possible; whilst we proceed here by the inductive process, taking nothing on trust—nothing for granted—but reasoning upwards from the meanest fact established, and making every step sure before going one beyond it, like the engineer in his approaches to a fortress. We thus gain ultimately a roadway—a ladder by which even a child may, almost without knowing it, ascend to the summit of truth, and obtain that immensely wide and extensive view which is spread below the feet of the astonished beholder. This road has been shown us by the great Bacon; and who can contemplate the prospects which it opens, without almost falling into a trance similar to that in which he allowed his imagination to wander over future ages of discovery. From amongst the political sciences it has been attempted in modern times to detach one which admits of being severed from individual political opinions, and of being reduced to abstract laws derived from well authenticated facts—I mean political economy, based on general statistics. A new association has recently been formed imitating our perambulating habits, and striving to comprehend in its investigations and discussions even a still more extended range of subjects in what is called "social science." These efforts deserve our warmest approbation and good will. May they succeed in obtaining a purely and strictly scientific character. Our Association has, since its meeting at Dublin, recognised the growing claims of political economy to scientific brotherhood, and admitted it into its statistical section. It could not have done so under abler guidance and happier auspices than the presidency of the Archbishop of Dublin. Dr. Whately, whose efforts in this direction are so universally appreciated; but even in this section, and whilst statistics alone were treated in it, the Association, as far back as 1833, made it a rule that in order to insure positive results, only those classes of facts should be admitted as were capable of being expressed by numbers, and which promised, when sufficiently multiplied, to indicate general laws. If, then, the main object of science—and I beg to be understood henceforth as speaking only of that section which the Association has under its special care, viz., inductive science, —if, I say, the object of science is the the discovery of the laws which govern natural phenomena, the primary condition for its success, is accurate observation and collection of facts in such comprehensiveness and completeness as to furnish the philosopher with the necessary material from which to draw safe conclusions. Science is not of yesterday. We stand on the shoulders of past ages, and the amount of observations made, and facts ascertained, have been transmitted to us, and carefully preserved in the various storehouses of science. Other crops have been reaped, but still lie scattered on the field. Many a rich harvest is ripe for cutting, but waits for the reaper. Economy of labour is the essence of good husbandry, and no less so in the field of science. Our Association has felt the importance of this truth, and may well claim as one of its principal merits, the constant endeavour to secure that economy. One of the latest undertakings of the Association has been, in conjunction with the Royal Society, to attempt the compilation of a classified catalogue of scientific memoirs, which, by combining under one head the titles of all memoirs written on a certain subject, will, when completed, enable the student who wishes to gain information on that subject to do so with the greatest ease. It gives him, as it were, the plan of the house and the key to the different apartments in which the treasures relating to his subject are stored, saving him at once a painful and laborious search, and affording him at the same time an assurance that what is here offered contains the whole of the treasures yet acquired. While this has been one of its latest attempts, the Association has, from its very beginning, kept in view that its main sphere of usefulness lay in that concentrated attention to all scientific operations which a general gives to the movements of his army, watching and regulating the progress of his impetuous soldiers in the different directions to which their ardour may have led them, carefully noting the gaps which may arise from their independent and eccentric action and attentively observing what impediment may have stopped or may threaten to stop the progress of certain columns—thus it attempts to fix and record the position and progress of the different labours by its reports on the state of sciences published annually in its Transactions; thus it directs the attention of the labourers to those gaps which require to be filled up, if the progress is to be a safe and steady one; thus it comes forward with a helping hand, in striving to remove those impediments which the unaided efforts of the individual labourer have been or may be unable to overcome. Let us follow the activity of the Association in these three different directions. The reports on the state of science originate in the conviction of the necessity for fixing at giving intervals, with accuracy and completeness, the position at which it has arrived. For this object the General Committee of the Association entrusts to distinguished individuals in the different branches of science, the charge of becoming as it were the biographers of the period. There are special points in different sciences in which it sometimes appears desirable to the different sections to have special reports elaborated; in such cases the General Committee, in its capacity of representative assembly of all the sciences, reserves to itself the right of judging what may be of sufficient importance to be recorded. The special subjects which the Association points out for investigation, in order to supply the gaps which it may have observed, are either such as the philosopher alone can successfully investigate, because they require the close attention of a practised observer, and a thorough knowledge of the particular subject, or they are such as require the greatest possible number of facts to be obtained. Here science often stands in need of the assistance of the general public, and gratefully accepts any contributions offered, provided the facts be accurately observed. In either case the Association points out what is to be observed, and how it is to be observed. The first is the result of the same careful sifting process which the Association employs in directing the issue of special reports. The investigations are entrusted to specially appointed committees or selected individuals. They are in most cases not unattended with considerable expense; and the Association, not content with merely suggesting and directing, furnishes, by special grants, the pecuniary means for defraying the outlay caused by the nature and extent of the inquiry. If we consider that the income of the Association is solely derived from the contributions of its members, the fact that no less a sum than £17,000 has since its commencement been thus granted for scientific purposes is certainly most gratifying. The question how to observe resolves itself into two—that of the scientific method which is to be employed in approaching a problem or in making an observation, and that of the philosophical instruments used in the observation or experiment. The Association brings to bear the combined knowledge and experience of scientific men, not only of this but of other countries, on the discovery of that method which, while it economises time and labour, promises the most accurate results. The method to which, after careful examination, the palm has been awarded, is then placed at the free disposal and use of all scientific investigators. The Association also issues, where practicable, printed forms, merely requiring the different heads to be filled up, which, by their uniformity, become an important means for assisting the subsequent reduction of the observations for the abstraction of the laws which they may indicate. At the same time, most searching tests and inquiries are constantly carried on in the Observatory at Kew, given to the Association by her Majesty, the object of which is practically to test the relative value of different methods and instruments, and to guide the constantly progressive improvements in the construction of the latter. The establisbment at Kew has undertaken the further important service of verifying and correcting to a fixed standard the instruments of any maker, to enable observations made with them to be reduced to the same numerical expression. I need hardly remind the inhabitants of Aberdeen that the Association, in one of the first years of its existence, undertook the comparative measurement of the Aberdeen standard scale with that of the Greenwich—a research ably carried out by the late Mr. Baily. The impediments to the general progress of science—the removal of which I have indicated as one of the tasks which the Association has set for itself—are of various kinds. If they were only such as direction, advice, and encouragement would enable the individnal or even combined efforts of philosophers to overcome, the exertions of the Association which I have just alluded to might be sufficient for the purpose, but they are often such as can only be successfully dealt with by the powerful arm of the State, or the long purse of the nation. These impediments may be caused either by the social condition of the country itself, by restrictions arising out of peculiar laws, by the political separation of different countries, or by the magnitude of the undertakings being out of all proportion to the means and power of single individuals of the Association, or even the voluntary efforts of the public. In these cases the Association, together with its sister society, the Royal Society, becomes the spokesman of science with the Crown, tbe Government, or Parliament—sometimes even through the Home Government with foreign Governments. Thus it obtained the estahlishment by the British Government of magnetic and meteorological observatories in six different parts of the globe, the beginning of a network of stations, which we must hope will be so far extended as to compass by their geographical distribution the whole of the phenomena which throw light on this important point in our tellurian and even cosmical existence. The Institute of France, at the recommendation of M. Arago, whose loss the scientific world must long deplore, cheerfully co-operated witb our Council on this occasion. It was our Association, which, in conjunction with the Royal Society, suggested the Antarctic Expedition, with a view to further the discovery of the laws of terrestrial magnetism, and thus led to the discovery of the Southern Polar Continent. It urged on the Admiralty the prosecution of the tidal observations which that department has since fully carried out. It recommended the establishment in the British Museum of the conchological collection, exhibiting present and extinct species, which has now become an object of the greatest interest. I will not weary you by further examples, with which most of you are better acquainted than I am myself; but merely express my satisfaction that there should exist bodies of men who will bring the well considered and understood wants of science before the public and the Government, who will even hand round the begging box and expose themselves to refusals and rebuffs, to which all beggars are liable, with the certainty besides of being considered great bores. Please to recollect that this species of bore is a most useful animal, well adapted for the ends for which nature intended him. He alone, by constantly returning to the charge, and repeating the same truths and the same requests, succeeds in awakening attention to the cause which he advocates, and obtains that hearing which is granted him at last for self-protection, as the minor evil compared to his importunity, but which is requisite to make his cause understood. This is more particularly the case in a free, active, enterprising, and self-determined people like ours, where every interest works for itself, considers itself the all-important one, and makes its way in the world hy its own efforts. Is it then to be wondered at that the interests of science—abstract as science appears, and not immediately showing a return in pounds, shillings, and pence—should be postponed at least to others which promise immediate tangible results? Is it to be wondered at that even our public men require an effort to wean themselves from other subjects, in order to give their attention to science and men of science, when it is remembered that science, with the exception of mathematics, was until of late almost systematically excluded from our school and university education—that the traditions of early life are those which make and leave the strongest impression on the human mind, and the subjects with which we become acquainted, and to which our energies are devoted in youth, are those for which we retain the liveliest interest in after years, and that for these reasons the effort required must be both a mental and a moral one? A deep debt of gratitude is, therefore, due to the bodies like this Association, which not only urges the wants of science on the Government, but furnishes it at once with well-matured plans how to supply them with the greatest certainty, aud to the greatest public advantage. We may be justified in hoping, however, that by the gradual diffusion of science, and its increasing recognition as a principal part of our national education, the public in general, no less than the Legislature and the State, will more and more recognise the claims of science to their attention, so that it may no longer require the begging box, but speak to the State like a favourite child to its parent, sure of his parental solicitude for its welfare—that the State will recognise in science one of its elements of strength and prosperity, to foster which the clearest dictates of self-interest demand. If the activity of this Association, such as I have endeavoured to describe it, ever found or could find its personification in one individual, its incarnation as it were, this has been found in that distinguished and revered philosopher, who has been removed from amongst us, in his 90th year, within these last few months. Alexander Von Humboldt incessantly strove after dominion over that universality of human knowledge, which stands in need of thoughtful government and direction to preserve its integrity; he strove to tie up the *fasces* of scientific knowledge, to give them strength in unity. He treated all scientific men as members of one family, enthusiastically directing, fostering, and encouraging inquiry where he saw either the want of, or the willingness for it. His protection of the young and ardent stndent led many to success in their pnrsuit. His personal influence with the Courts and Governments of most countries of Europe enabled him to plead the cause of science, in a manner which made it more difficnlt for them to refuse than to grant what he requested. All lovers of science deeply mourned for the loss of such a man.

Gentlemen,—It is a singular coincidence that this very day on which we are here assembled, and are thus giving expression to our admiration of him, should be the anniversary of his birth. To return to ourselves, however. One part of the functions of the Association can receive no personal representation, no incarnation—I mean the very fact of meetings like that which we are at present inaugurating. This is not the thoughtful direction of one mind over acquired knowledge, but the production of new thought by the contact of many minds, as the spark is produced by the friction of flint and steel. It is not the action of the monarchy of a paternal government, but the republican activity of the Roman Forum. These meetings draw forth the philosopher from the hidden recesses of his study, call in the wanderer over the field of science to meet his brethren, to lay before them the results of his labours, to set forth the deductions at which he has arrived, to ask for their examination, to maintain in the combat of debate the truth of his positions and the accuracy of his observations. These meetings, unlike those of any other society, throw open the arena to the cultivators of all sciences, to their mutual advantage. The geologist learns from the chemist that there are problems for which he had no clue, but which that science can solve for him. The geographer receives light from the naturalist, the astronomer from the physicist and engineer, and so on. And all find a field upon wbich to meet the public at large, invite them to listen to their reports, and even to take part in their discussions—show to them that philosophers are not vain theorists, but essentially men of practice—not conceited pedants, wrapped up in their own mysterious importance, but humble inquirers after truth, proud only of what they may have achieved or won for the general use of man. Neither are they daring and presumptuous unbelievers,—a character which ignorance has sometimes affixed to them—who would, like the Titans, storm heaven, hy placing mountain upon mountain, till hurled down from the height attained, by tbe terrible thunders of outraged Jove; but rather the pious pilgrims to the Holy Land, who toil on in search of the sacred shrine, in search of trutb—God's truth, God's laws, as manifested in His works, in His creation. His Royal Highness concluded his address amid loud and prolonged cheering.

ASSOCIATION OF FOREMEN ENGINEERS.

The seventh anniversary dinner of this valuable association was held on the 17th inst., at the "Bay Tree," St. Swithin's Lane. The chair was taken by the President, Mr. Newton, of the Royal Mint, and the members and their friends to the nnmber of seventy, sat down to an excellent dinner. The usual loyal toasts having been given and responded to, the chairman very appropriately gave the "*Navy* and Army," observing that the company assembled looked a great deal more to the navy than to the army for supplying a field for their labours. This toast met with an enthusiastic reception. In proposing "Our Employers," the chairman regretted much that the master engineers had not afforded them more frequently the light of their countenances; he feared, indeed, they were "under a cloud" as regarded their employers, and felt that the association was apt to be viewed more in the light of a trade union, than as a society for promoting friendly intercourse and intellectual enjoyment. He especially wisbed tbat the members of the press would assist him in disabusing the minds of the employers of this feeling, and stated that they were always anxious to have, and delighted to see, employers with them; and that any intermeddling between master and man, in a pecnniary point of view, was never contemplated by this society. This toast was very ably acknowledged by Mr. Fowler, who, we believe, was the only employer present.

We have very great pleasure in endorsing every word nttered by the chairman in proposing this toast, and cannot but think that were employers to recognise more fully the useful labours of this society, it would tend greatly to the preservation of that good feeling and reciprocity, which is so essential between master and man. We trust that the employers will rally round this thriving association, either as honorary members or mere visitors, and lend that moral aid and recognition so all important to a young society.

Mr. E. J. Reid, of tbe *Mechanics' Magazine*, in returning thanks for the "Scientific Press" with which his name had been coupled, strongly urged upon the society the absolute neeessity of fuller and more detailed reports of their proceedings being supplied, as from the present meagre reports it was impossible for the scientific press to do that justice to the society, and to its individual members, which he felt they so well merited.

We have great pleasure in congratulating the Association of Foremen Engineers upon the success and prosperity which it has attained, and we trust in future to see it steadily progress, as we are convinced the Institution is one well worthy of the support of the intelligent class for whom it is intended.

ROYAL SCOTTISH SOCIETY OF ARTS.

List of Prizes for Communications read and exhibited during the session 1857-8.

1. To Mr. William Hart, Philosophical Instrument Maker, 7 North College Street, Edinhurgh, for his "Drawing and description of an improved electric lamp."—The society's Silver Medal and Plate, value Ten Sovereigns.

2. To Professor C. Piazzi Smyth, Edinburgh, Vice-President, for his communication "On photographical illustrations for books."—The society's Silver Medal and Plate, value Ten Sovereigns.

3. To Henry Cadell, Esq., Mining Engineer, Grange, Bo'ness, for his communication "On explosions of carburetted hydrogen in coal mines, with the points to which we may look for their radical cure."—The society's Silver Medal, value Five Sovereigns.

4. To James Stark, Esq., M.D., Vice-President, for his paper "On an improved stove for heating apartments, greenhouses, &c. – The society's Silver Medal.

5. To Mr. T. B. Stewart, Mining Engineer, Wanlockhead Mines, Leadhills, for his description of the Wanlockhead syphon, contained in his communication "On the scientific application of the syphon to purposes of industry."—The society's Silver Medal.

6. To Henry Craigie, Esq., of Falconhall, for his "Description of a book-clip." —The society's Silver Medal.

The *Special Thanks* of the society were voted to the following gentlemen, viz.:

1. To James Leslie, Esq., C.E., for his "Description of an apparatus for seeing through tubular drains from the surface of the street."

2. To Mr. Cadell, Grange, for his "Description of an improvement in graduated lever steelyards."

3. To Professor Smyth, for his communication "On the forms of plants in Teneriffe."

4. To Professor Elliot, of Queen's College, Liverpool, for his paper "On an improved method of graduating hydrometers."

5. To Mr. G. H. Slight, Engineer, for his "Description and drawings of the machinery employed in the manufacture of biscuits."

6. To Edward Sang, Esq., the President, for exhibiting and describing an experiment for showing the contraction of water above the freezing point."

7. To Dr. Stark, for his paper "On the fall of rain in Scotland, during the year 1857, with remarks on the best form of rain gauges, and their position; and on the causes which appear to influence the deposit of rain in different localities."

8. To Dr. Robert M. Ferguson, for exhibiting and describing "The Vienna electrical machine."

9. To Mr. Andrew Carrick, 4 Holmhead Street, Glasgow, for his "Description and drawing of an Anti-effluvia syphon sluice."

Three Sovereigns were also awarded to Mr. William Fordie, 4 Lower Greenside Street, Edinburgh, for the ingenuity displayed in his model of "A safety cage for coal pits."

The Keith, and Reid and Auld prizes have not been awarded this year, no communication of sufficient merit, for the former, and none in competition for the latter prize, having been given in.

MONTHLY NOTES.

MARINE MEMORANDA.

Things are quite lively in the neighbourhood of Newcastle. Messrs. Palmer and Co., of Jarrow, are making considerable progress with the two express steamships for the Galway Company. The first vessel is in frame, and the engines and boilers are in a forward state. The second vessel is in considerable progress. Iron steamboat building for the large rivers of Europe and Asia, is becoming an important branch of industry on the Tyne. Messrs. C. Mitchell and Co., of Walker, have fourteen vessels of that class in hand, the greater portion of these vessels not drawing more than two feet water when fully equipped for service. Great efforts are being made in the northern ports to afford additional facilities to vessels of large tonnage taking out coals to distant parts of the world. The river Wear commissioners having become possessed of the Sunderland Dock, are making use of the sea outlet for the accomodation of large vessels. Lately a large American vessel left the Sunderland Docks by the sea outlet, drawing twenty-two feet water, and carrying close upon 2000 tons of coal, the largest cargo that has been despatched from that port in one bottom. The commissioners are also about to erect five new coal drops in the dock. The Tyne Improvement Commissioners propose, by means of powerful dredgers, to greatly improve the channel in Shields harbour, leading from the Jarrow and Hayhole Docks to the sea; a movement is also on foot among the coal owners connected with the steam coal field, and the inhabitants of North Shields, with a view to make a dock at the easternmost part of Shields harbour, and close to the sea, for loading large first-class vessels.

The *Bogota*, which, like the *Callao*, *Lima*, and *Valparaiso*, has been re-fitted with double cylinder expansive engines, by Messrs. Randolph and Elder, of Glasgow, is said to be very successful as regards economy of fuel. With a nominal power of 320 horses, worked up to 1000, she consumed on her trial, something less than a ton of coal per hour. She measures 1650 tons, and performs 12¾ knots per hour.

The following incident shows with what energy the work of the National Life Boat Institution is carried out. A few days ago the Norwegian brigantine *Oprei ingen*, of Arendal, 69 tons, laden with timber, struck on a rock in Castletown-bay, Isle of Man, about 5 p.m. It was blowing at the time a gale from the westward, but being then off shore a harbour boat was enabled to reach her. The rudder was soon carried away, and it was decided to procure warps to try to get her under weigh. For this purpose the master and carpenter went ashore in the harbour boat, leaving the rest of the crew, three in number, on board. Before they could return the gale increased, and the wind veered round to W.S.W., when it soon became impracticable to communicate with the vessel in an ordinary boat. At 11.30 at night it was decided to launch the new life-boat stationed by the Royal National Life-boat Institution at this place, which was effected at midnight. The night was very dark; tide, four hours' flood. On reaching the brigantine she was found to be full of water, and the crew in great danger. Notwithstanding the fury of the elements the poor fellows were safely taken on board the life-boat and landed at 2 a.m. The Institution has promptly paid the gallant crew of the life-boat £1 each man for their laudable services. It is to be regretted that the demands on the limited funds of this valuable institution are at present very heavy for new life-boats and their equipments.

Isambard Kingdom Brunel.—The death of this most distinguished engineer has come just as his last, and probably his most notably great work, was touched up to completion. It is fitting that a man who has done so much for the profession to which we are proud to belong, should have some record placed to his credit in the pages of the *Practical Mechanic's Journal*. From the days of the block machinery at Portsmouth, down to those of the *Great Eastern*, the name of Brunel, in the persons of father and son, has been nearly always before the public in the shape of the accomplishment of some great work. The works of the Brunels were all great, but the engineering name will no doubt be best remembered in connection with the Great Western Railway, and the railway bridge over the Tamar. Both in professional and private life, Mr. I. K. Brunel was a most estimable man; but the good which will be spoken of him in professional matters will relate rather to the boldness, and occasional eccentricity, of his conceptions, which helped other engineers to the determination of what to do and what to avoid, and opened up many an avenue to the elaboration of engineering fame. But after all, it must be said that Mr. Brunel's comparative failures were many, and his real successes few.

Continuous Action Rotatory Pump. — Mr. Winder of Sheffield, has recently introduced a very good arrangement of a continuous action rotatory pump, of which we here engrave two views. Two oval pistons, each upon an axis, revolve together in a double case, and they are so placed therein, that one of the surfaces in the largest diameter of each piston constantly forms a packing with the case, whilst the larger radii of each piston alternately make contact with the smaller radii of the other. In some cases the surfaces of these pistons are formed with teeth, so that the teeth of one work into the teeth of the other, and so form close contact therewith, by which their correct relative motion will be maintained. Fig. 1 of the accompanying engravings represents a vertical section of one arrangement acting as a single engine or pump, and fig. 2 a transverse section of the same. A, is the casing; B, are the two oval toothed pistons, which are caused to rotate together, and fixed upon and give motion to the axes, C, which pass through suitable stuffing boxes in the case, in order to prevent the passage of steam at such parts, and when the pistons are not toothed they have applied to each of them a toothed wheel, D, by which they are geared to rotate together. E, is the inlet psasage for the steam, and G, the outlet thereof, after it has acted upon the pistons in causing them to rotate in the direction of the arrows; H, are sliding pieces in each piston, acted upon from behind by springs or other elastic pressure in order that they may preserve close contact with the case. There is also suitable packing at the ends of such pistons to prevent escape of steam at those parts. These pumps, which deliver a large volume of water with peculiar smoothness and steadiness of action, and with a very slight expenditure of power, may be seen in effective operation on the premises of Mr. Thomas Bayne, George Square, Glasgow.

Fig. 1.

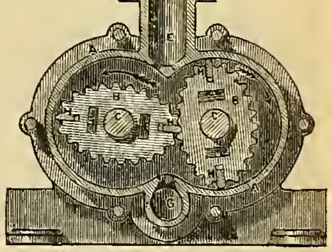
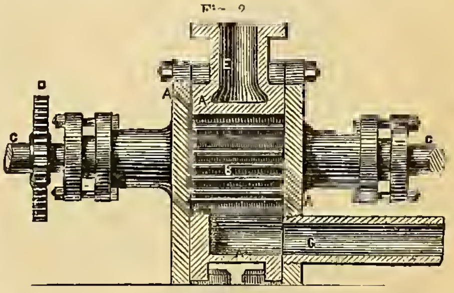


Fig. 2.

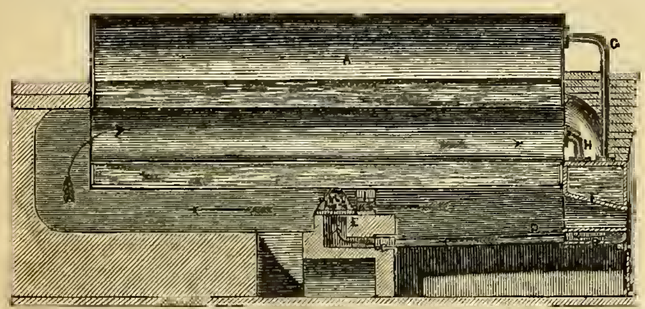


Preparation of China Grass, or Rheea Fibre.—A new and improved mode of primarily preparing China grass or *Rheea Fibre*, has been proposed by Mr. Thomas Scott, of Belfast. In preparing China grass or other fibrous material according to this process, the raw material is primarily deposited in a chamber containing a cold or heated alkaline solution, or a solution composed of alkali and soap or oleaginous matter; common soda, or soda and potash is preferred for use in the preparation of this alkaline solution. After treatment in this solution, the fibrous material is removed and it is then laid in a heap, or in bulk to enable the mucilaginous or gummy matter to become separated from the actual fibre. The treated fibre is then beetled, washed, and finished for hackling and subsequent manufacturing treatment in the ordinary way. Or, instead of this proceedure, the fibrous material after being exposed to the alkaline action, is operated upon in a washing apparatus working in combination with a hackling or disintegrating apparatus, or with an arrangement of beaters, pressers, or rubbers, for the purpose of gradually and effectually opening or disintegrating the minute fibres, so as to leave the material comparatively free from "runners" or undivided fibres. Or this latter apparatus may be combined with the chamber containing the alkaline solution, so that the fibrous material need not be removed until it has undergone both operations, or both processes may be carried on simultaneously. Instead of subjecting the fibrous material to the action of an alkali combined with soap, the alkaline treatment may come first, and the soapy or oleaginous treatment afterwards, or it may be immersed in a solution of oily matters, or be disposed in heaps or "batches," and subjected to the action of the oily solution. In opening or disintegrating the treated fibrous material, a hackle or opener of a peculiar kind is used, the hackle teeth being made with spring joints, and inclined towards the line of draught of the fibre, so as to yield or give when clotted portions of the fibre occur. In this way the opening or hackling, or disintegrating operation is effected gradually, but yet properly, without injuring or breaking the fibrous staple. A solution of ordinary soap may also be used alone in the primary hot steeping treatment, instead of alkali.

Smoke Consuming Furnace.—The subjoined engravings illustrate the improvements which have been patented by Messrs. Leake and Sykes of Barnsley.

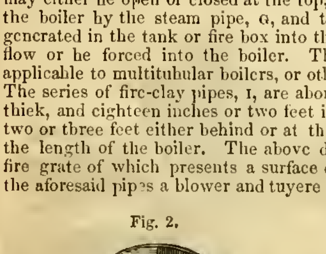
Fig. 1 is a longitudinal and vertical section of a two-flue steam boiler. Fig. 2 is a front elevation of fig. 1, partially in section. A, is a cylindrical steam boiler, with the improvements attached thereto for consuming smoke. Fig. 2 shows the "ash-pit" closed by two doors, being divided by a central brick wall. Above are the dead plates, B and C, which are formed hollow to allow the air to pass through them into the grate bars, D, (which are also formed hollow), into the back dead plates, C, which form the under part of one side of the bridge, E, the said bridge is also formed hollow, with a slit or opening along the entire length thereof. The fire box, F, together with the fire doors attached thereto, are placed on the top of the front dead plates, and are designed to save the expense of the ordinary fire doors and frames, and also to save a fire-brick arch,

Fig. 1.



which is necessary to separate the fire from the flues, and also to heat the feed water before it enters the boiler, by which a great saving of fuel will be effected. An iron tank is made about the same length and width as the fire grate of the furnace; upon the bottom of this said tank the heat from the fire acts; the tank may either be open or closed at the top, and in the latter case is connected with the boiler by the steam pipe, G, and the water pipe, H, to convey the steam generated in the tank or fire box into the boiler, and also to allow the water to flow or be forced into the boiler. The foregoing arrangements are equally applicable to multitubular boilers, or other boilers, made with internal fire boxes. The series of fire-clay pipes, I, are about four inches inside diameter, one inch thick, and eighteen inches or two feet in length; the pipes being placed about two or three feet either behind or at the front of the split bridge, according to the length of the boiler. The above dimensions are suited for a furnace, the fire grate of which presents a surface of about thirty square feet. In each of the aforesaid pipes a blower and tuyere iron is inserted, such as are now used in ordinary smith's forges. The air will be conducted to the pipes through the hollow dead plates, grate bars, and split bridge. The blow pipes may be made either of fire clay, cast-iron, or other material that will stand the action of the fire thereon, and may be placed either horizontal or perpendicular to the pipes either before or behind them. The patentees separate the opening in the dead plates and split bridge in two parts, so as to be able to blow through the aforesaid fire-clay pipes either on the hot or cold side of the fire, either by mechanical means, or the action of the air itself. Another form of fire bricks or pipes to be used in combination with the pipes, I, lastly above described, is exhibited at J, showing one of the above mentioned bricks at the top of the split bridge. These bricks, E, are formed in the shape of a hollow triangle, and placed in front of the pipes, I, and disposed about four inches asunder. A slit or opening is formed on each side for the air to pass out of, and meet the flame which passes through the four-inch slits or spaces between the bricks.

Fig. 2.



The mode of operating is as follows:—When the furnace is to be fired one or both of the doors of the ash-pit is closed, according to the state of cleanliness of the fire, and the furnace door or doors in front of the grate bars are opened, thereby allowing the air to pass through the dead plates, grate bars, split bridge, and fire bricks, J, as also to the blow-pipe, tuyere, and fire-clay pipes, I, by which time the air is assumed to have acquired a temperature of about 600 degrees of Fahrenheit, being a temperature at which it is supposed to become ignited by the flame from the fire, and should any smoke remain after passing the bridge, the heated air and smoke having to pass through the red-hot fire-clay pipes will thus be consumed. By the ash-pit being closed, the fire will be found as good at the end of ten minutes, and possess as much heating power as when it was newly fired.

Manchester Association for the Prevention of Steam Boiler Explosions.—The report of this excellent society for last month states that there are now under inspection 574 mills and other works, and 1609 boilers, being an increase since the 22d ultimo of 3 mills and 6 boilers. The inspectors have made 284 visits, and examined 728 boilers and 544 engines. Of these 5 visits have been "special," and 7 boilers "specially," 19 "thoroughly," 15 internally examined. 272 diagrams have been taken from 155 cylinders; of these 7 cylinders and 15 diagrams have been "additional." The following are some of the principal defects met with, viz.:—Corrosion, 11 (2 dangerous); fracture, 5 (1 dangerous); safety valves out of order, 35 (2 spindles through stuffing boxes, and 1 "Salter's balance" screwed fast); pressure gauges out of order, 16; water gauges out of order, 31; feed apparatus out of order, 1; blow off cocks out of order, 24; flues and furnaces out of shape, 9 (1 dangerous); total, 132, (4 dangerous); 6 boilers were without "glass water gauges"; 7 boilers without "blow off cocks"; 56 boilers without back pressure valves, 1 boiler without pressure gauge. The reports of the sub-inspectors continue to furnish instances of damage to boilers arising from "watchmen" being entrusted with the duty of attending to them during the night. The inspector also draws attention to another instance of a "Salter's balance" being screwed down fast, so that the "safety valve" could not possibly act. The other defects met with are such as are usually observed by the inspectors, and though, in many respects, improvements are being daily made in the details of boiler fittings, and other matters pertaining thereto, and whilst numerous establishments readily avail themselves of the recognised advantages which the adoption of such improvements offer, yet very much remains to be done to bring about a more satisfactory state of things than exists at present. The inspector remarks that many of the derangements noticed, such as "blistered plates," "split rivet-holes," "leaky seams," and "bad joints," are greatly to be attributed to trade competition, in making boilers at so low a profit, that no margin is really left for the exercise of that care and thoughtfulness which should prevail in such constructions, to say nothing of second rate material and the entire avoidance of improvements which would in any way entail an additional outlay. He is persuaded that in such matters it would be better economy to secure the best of everything, although at an increase in the first cost, rather than incur the risk of ultimate failure and vexatious outlays, which are almost certain to ensue from a non-compliance with this principle. Members would also find it to their advantage to be more attentive to the necessity of "clothing in" the engine cylinder's steam pipes, and indeed all these parts of high temperature which are exposed to the common atmosphere, and often besides to the cooling action of machinery in rapid motion and in close proximity; the loss of heat under such circumstances is very great, and the effect on the machinery most injurious. The high pressure at which boilers generally are now worked, compared to what they were formerly, and for which they were originally designed, renders it necessary to be cautious in such instances, where "additional staying" has not been resorted to, and where the forms and dispositions are not such as are calculated to resist extraordinary strains. One of the most defective in this respect is the "old butterly" form of boiler, still in use in some places, although now fast disappearing, eclipsed by other arrangements better suited to modern requirements.

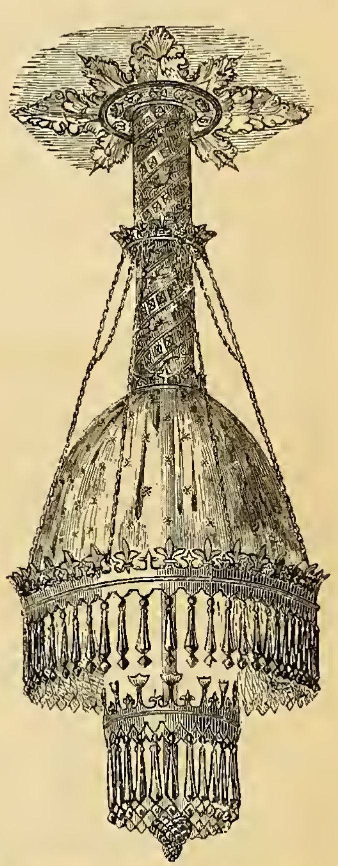
Combined Iron and Copper Cylinders for Calico Printing.—Mr. Robert Whittaker, a millwright of Campsie, near Glasgow, has lately introduced a plan—the rollers or cylinders used in calico printing—capable of steadily withstanding the severe lateral strain of the printing action, whilst a smaller quantity of copper is used in them, and they are extremely manageable and easily changed and adjusted when in use. The mandrel or central arbour, on which the actual printing cylinder is carried, and by which it is used, is of wrought iron, in two lengths, capable of connection by a screwed junction. The external end of each piece of the mandrel is formed with a conical shoulder piece, the larger end of each cone being disposed outwards. The central portion of the mandrel has fitted upon it a short cast-iron cylinder, turned inside and out, and grooved externally to receive a fixed feather in the interior of the actual copper printing cylinder which is fitted on over it. Each end of the mandrel has a similar wrought or cast-iron cylinder fitted on over it; wrought iron being preferred, as being better capable of resisting the setting up or adjusting strain. At the driving end of the mandrel a key or feather is employed to connect the mandrel with the interposed wrought-iron cylinder, and the latter is similarly connected by a feather with the copper printing cylinder. In this way the actual printing cylinder, which may be made of very thin copper, is supported upon three interposed cylinders or tubular pieces of metal, and the setting up of the whole, into a solid working cylinder, is effected by the screwing together of the two sections of the mandrel, the cones upon which—corresponding to internal cones in the outer ends of the two interposed end cylinders—produce the necessary jamming or supporting set up for work. Printing cylinders fitted up in this way are stiff, and capable of resisting a great amount of lateral pressure, as the comparatively thin copper is well supported from within, so as to preserve a dead, even, printing line; whilst they present superior facilities for adjustment and removal.

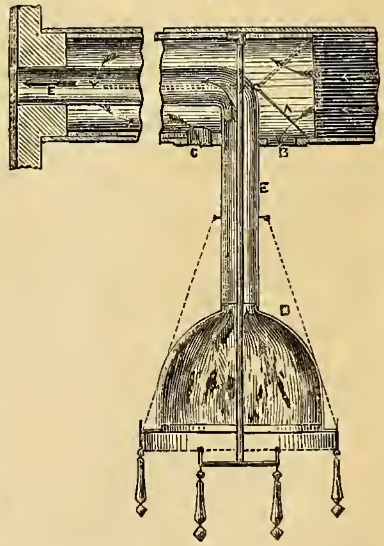
Railways, Steam, and Electric Telegraphs.—Of all the improvements in modern times, the introduction of railways is perhaps the one which has done most for the prosperity of this country, and, I may say, of all countries in which they have been established. If we look at the wonderful augmentation which has taken place in this country within the last twenty years, it must strike us that it has sprung, in a great measure, from the multiplication of the means of communication. In business we all know that time is worth money, and if it be true with regard to money, that a penny saved is a penny got, the days and weeks saved by the introduction of railway accommodation, must be worth, to the manufacturing and commercial interests, vast annual sums of money. One of the most remarkable features of the polity of England is, the manner in which private enterprise accomplishes works which, in other countries, require the aid and assistance of Government. We admire the remains of the works of the Romans, but I venture to assert that no works remain as memorials of the greatness and capacity of that nation which can for a moment compare with the works erected by private enterprise in different parts of this country for commercial purposes. Long may that spirit of enterprise animate the people of this country, and long may it not only manifest the amount of wealth possessed by this country, but also lay the foundation for the rapid increase of that wealth, and the augmentation of our national prosperity. I cannot say, speaking from general impression, what may be the amount of capital now invested in railway enterprise. We all know that the capital represented by the national debt—though it has been very lightly described not long ago by one who is well able to judge of the proportion between the resources and the wants of the country—would have been deemed two centuries ago as a fabulous sum, to be equalled only by the stories in the *Arabian Nights;* but I believe I should not be far wrong if I were to say that the amount of private capital invested in the different railways, cannot be much short of half the amount of the national debt—a singular and remarkable proof of the progressively increasing resources of the country, and of the spirit of enterprise by which individuals have been animated to undertake works which conduce not only to their own immediate interests, but lay the foundation really of great national advantage. We are told by those who instruct us in moral and religious teaching, that the calamities and misfortunes which sometimes befall nations or men, are intended for our permanent advantage, and, if duly used and reflected on, ought to be felt to be only administrations of that moral government by which Providence regulates the affairs of mankind. But there is also a like truth in regard to the laws which regulate the material globe. A careful attention to those laws, and a scientific application of them, tend as much to the permanent improvement of mankind, as a submission to the moral ordinances contributes to welfare of a different nature. And so it has been with the civilisation of the age in which we live. That expansive and explosive force which, in its unregulated operation, lays waste districts by the overflowing of a volcano, or spreads desolation over cities and towns by an earthquake, when governed and regulated by the scientific appliances of man, has been converted into your obedient slave, transports you from place to place by land throughout the whole continent of Europe, and, applied to your navigation, carries you safely and rapidly from one end of the globe to the other. So it is also with the thunderbolt, that natural element which inspires terror in the ignorant—which, when acting simply by the casual application of the laws of nature, is productive of death and destruction; yet guided and mastered by the science of the present time, becomes your servant, carries your ideas instantaneously from point to point, establishes rapid conversational communication between all the different parts of the globe, and now we hope in a very short time—before many months, indeed, have elapsed—that we shall communicate as rapidly between London and Calcutta, as we have hitherto communicated between one end of the smallest village and the other. We ought, then, to be proud of the age in which we live—we ought to be proud to think that the human intellect has arrived at that amount of scientific attainment, that we are able to understand those great laws which regulate the material world, and that by the proper application of that which in its original operation may appear to be simply an element of destruction, we have managed to convert into purposes most useful in the daily life of mankind, powers which Providence has created, not for purposes of destruction, but in order that the mind of man, by the progressive development of science, might adapt them to the uses of civilised life.—*Lord Palmerston.*

Advance of Science.—No sooner has the successful exercise of the powers of man accomplished any considerable simplification or improvement of processes, subservient to his use or comfort, than his faculties are again on the stretch to extend the limits of his newly acquired power; and having once experienced the advantages which are to be gathered by availing himself of some of the powers of nature to accomplish his ends, he is led thenceforward to regard them all as a treasure placed at his disposal, if he have only the art, the industry, or the good fortune to penetrate those recesses which conceal them from immediate view. Having once learned to look on knowledge as power, and to avail himself of it as such, he is no longer content to limit his enterprises to the beaten track of former usage, but is constantly led onwards to contemplate objects which, in a previous stage of his progress, he could have regarded as unattainable and visionary, had he ever thought of them at all. It is here that the investigation of the hidden powers of nature becomes a mine, every vein of which is pregnant with inexhaustible wealth, and whose ramifications appear to extend in all directions wherever human wants or curiosity may lead us to explore.—*Sir John Herschell.*

New Horticultural Garden at Kensington Gore.—A model showing how the ground will be laid out in terraces for the garden of the Horticultural Society, has just been placed in the South Kensington Museum, at the north end, near the entrance to the Ornamental Art Rooms. Between the Kensington road and Cromwell road the ground falls about 40 feet, and using this fact in aid of a general effect, the ground has been divided into three principal levels. The entrance to the gardens will be on the lower level, in Exhibition and Prince Albert Roads, and the central pathway, upwards of 75 feet wide, ascending through terraces to the third great level, will lead to the Winter garden. The whole garden will be surrounded by Italian arcades, each of the three levels having arcades of a different character. The upper or north arcade where the boundary is semicircular in form, will be a modification of the Arcades of the Villa Albani at Rome. The central arcade will be almost wholly of Milanese brickwork, interspersed with Terra Cotta, Majolica, &c., whilst the design for the south arcade has been adapted from the beautiful Cloisters of St. John Lateran at Rome. None of these arcades will be less than 20 feet wide and 25 feet high, and they will give a promenade sheltered from all weathers more than three quarters of a mile in length. The arcades and earthworks will be executed by the Commissioners for the Exhibition of 1851, at a cost of £50,000, whilst the laying out of the gardens and construction of the conservatory or Winter garden, will be executed by the Horticultural Society, and will cost about the same sum, the greater part of which has been already raised.

Ventilating Drawing Room Gasalier. — Mr. T. C. Hine, of Nottingham, architect, has recently introduced an improved gasalier, arranged to carry of the vitiated air and products off combustion from the apartment, as well as to introduce a current of pure warm or cold air. Our illustrative engravings represent an elevation and vertical section of one of Mr. Hine's extremely elegant and highly ornamental designs for a drawing room gasalier. The circular gas burner is attached to the lower end of a pendent gas pipe, which passes through the ceiling, and is secured to the underside flooring above. The circular tube in which the gas jets are fixed is surrounded by cut glass drops or lustres, above these is another and larger circle of drops pendant from the decorated brass corona, which partly supports the ornamental dome or shade, D. The heated air and products of the gaseous combustion pass up the tube, E, and are carried away by the horizontal continuation into the chimney of the apartment. A tubular or other passage is formed between the ceiling and the floor, for the introduction of a stream of pure air, which is admitted thereto from the exterior of the building. The cold air flows into the apartment through the apertures, B, made for the purpose in the ornamental patera which surrounds the tube, E. If it is desired to admit warm air in place of cold, the valve A, is lowered, so that the air before entering the room, is caused to pass round the heated combustion tube, E, as indicated by the arrows, in this way its temperature may be raised to 60 or or 70 degrees of heat. As the smoke, vapour, and carbonic acid evolved in the burning of gas are by this means completely removed, the pictures and decorations of the apartment remain uninjured, while the inmates may enjoy the luxury of sitting at any season in a perfectly lighted room, surrounded by a pure and refreshing atmosphere.





Recent Agricultural Shows: — Kent Show at Ashford.—This show in the "garden of England," is necessarily very attractive. The collection of implements was very good — another practical trial of reaping machines, as usual, attracted much attention. Messrs. Burgess and Key's grass mower, as worked by Mr. Aveling, of Rochester, performed very satisfactorily upon a heavy field of somewhat laid clover. Mr. Aveling also showed good work with his steam plough, but it must be very much simplified before he can persuade Kentish farmers to use it. Mr. F. Tindale, of Preston, Faversham, sho ed a good corn dressing machine, the peculiarity of which is, that it has a double shaking screen, so as to separate the grain from the seeds in a superior way. Major Munn, of Throwley, also showed his new rotatory horse hoe, for thinning young crops and clearing them from caterpillars:—It is worked by one horse as a steerage hoe, and will thin out one or two rows of turnips; on moving forward, the two spindles under the swing steerage carry the knives and brushes, and are made to revolve; and the latter, passing over the young plants, brush off the insects that may be upon them into the hollow space between the two rows, and revolving knives are used to cut out and thin the plants from four inches and a-half apart to any space required, and wherever the plants are thin, the driver can instantly, by holding a handle, prevent the knives acting, and then letting them down only where the crop is again thick in the row or rows. A roller follows between the rows, which assists to crush the insects, and the hoes following, completely bury the insects alive or dead. The whole lifts out at the endings or turns, like a common horse hoe, when the man raises the two handles. Messrs. Picksley, Sims, and Co., of the Bedford Foundry, Leigh, Lancashire, showed, amongst a great number of other articles, an ingeniously made root-grater, which cuts turnips, mangold-wurzel, and other bulbous roots, into thin strips for mixing with hay or straw chaff, the clean slices are carried by the shoot into the basket, and the dirt falls in a separate heap under the machine. The machine may be turned easily by one man; it has twelve gouge-shaped steel knives. Mr. James Boyd, of Lewisham, exhibited a patent chaff-cutter of very simple and novel construction. The principal advantage of this chaff-cutter over others consists in the capability of cutting two lengths of chaff with a stop feed, while the knife is cutting; this is all done by one wheel, and without any alteration in the gearing or derangement of the machine. The following is the prize list:—

Steam plough, or implement for cultivating the soil, Mr. Thomas Aveling, Rochester—£50.
Reaping Machine, (Burgess and Key's), Mr. Thomas Aveling—£10.
Hand cleaning machine, Mr. Bohy, Bury St. Edmonds—£3.
Collection of implements for steam or horse power, Mr. Thomas Aveling—£5.
Ditto, for hand use, Mr. G. Foord—£5.
General set of hand tools, Mr. George Foord—£3.

Jute and Hemp Softening Machine.—Mr. C. B. Blythe, of Dundee, has recently introduced a new machine for the preparatory treatment of jute and hemp, so as to soften the fibres in a very rapid and economical way. Softening is the first process through which jute is usually put. In the old softening machine, the material to be treated is fed through a machine of two tiers of rollers, and generally of nine rollers in length, and returned through another separate machine, and so on until sufficiently softened. The constant entering and receiving of the material from the machines are dangerous operations, and these are done away with in the new machine. Instead of two rollers mounted one above the other, Mr. Blyth mounts three, feeding the material between the top and middle rollers, and returning it between the middle and bottom rollers. The returning of the material is effected very neatly and efficiently by a flexible revolving sheet, having wood projections on the surface guiding the material downwards, where it is caught and returned by the middle and bottom rollers, and thus delivered in a softened state to the delivery table. This machine does not require any levers or weights for holding down the rollers, as in the old machine, the weight being obtained from the extra roller, and from their being about one half broader—all breakage of levers and studs being thus avoided. The machine can be made in lengths of nine or eighteen rollers to suit the work required; but a long machine has the advantage of being easily converted into any shorter length by taking out any tier of rollers and inserting the returning sheet in their place, so as to suit the quality of material. The first cost and work performed also contrast very favourably with the old plan—a pair on the old plan costing £175 and doing about 125 bales of jute per week, or about 19 tons, and a single machine on the new plan, occupying no more floor space, and costing £260, doing more than four times the work.

Hopes for the Humble.—We are at this moment advanced further in speculative than in practical knowledge. Our theoretical knowledge in electricity, in chemistry, and in many other deparments of science, is in advance of our power of applying those sciences to the arts of civilized life. What a hope does this hold out, that in the various callings in which artisans are employed, study and education, combined with genius to a certain extent, may, at any moment, give to working men or to any other men, discoveries almost as brilliant as those which rewarded the genius of Watt.—*Duke of Argyle.*

Hydrochloric Acid for Watering Streets.—A curious experiment is now being tried at Lyons for laying the dust in public promenades, and has so far been attended with success. A chymist of that city having accidentally spilt some hydrochloric acid on a terrace of his, found that it hardened the spot on which it had fallen, and maintained it in a state of permanent moisture. This led him to think that by watering the streets with this acid, the dust on large macadamized roads might be laid, or rather prevented from rising. Experiments were first made on the Cours Napoleon, between the Rhone and the Perrache station. The success was complete, and has also proved durable—the carriage way having now been several months free from dust; and another experiment is now being made on the Place Bellecour. During the hottest part of the day, the ground, although dry and gravelly, has the appearance of being as consistent and damp as if it had been watered half an hour before. But as evening approaches the moisture becomes more and more perceptible. Every morning the ground is stiffer and more comfortable to walk on. This may be easily accounted for—the acid decomposing the gravel or stone, forms one or several deliquescent salts, which therefore attract the moisture of the air. The question as to whether the roads thus watered are likely to last as long as they ought, can only be decided by time. Looking at the action of the acid, we should decidedly say that they will not.

Human Industry.—Having given thee, O man! art and intelligence, nature has filled the whole globe with materials to employ these talents. Hearken to her voice, which so plainly tells thee that thou shouldst also be the object of thy industry, and that by art and attention alone thou canst acquire that ability which will raise thee to thy proper station in the universe. Behold this artisan who converts a rude and shapeless stone into a noble metal; and moulding that metal by his cunning hands, creates, as it were by magic, every weapon for his defence, and every utensil for his convenience. He has not this skill from nature; use and practice have taught it him; and if thou wouldst emulate his success thou must follow his laborious footsteps.—*David Hume.*

The "Velani" Fruit in Turkey Red Dyeing.—Mr. Duncan Proudfoot, of Glasgow, has recently suggested the use of the fruit or produce of the "velani" tree or Turkish oak in the preparing and dyeing of cotton cloth and yarns, according to the Turkey red process. The new article is employed in all cases where galls and sumach are used with alum and other salts of alumina, and the result is, that it makes the colour more fast than at present, whilst it effects very great economy in the cost of the process. This new application is especially intended for use in Turkey red dyeing, but it is also available in the production of other colours.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When city or town is not mentioned, London is to be understood.

Recorded July 12.

1654. Thomas Wright, 9 George Yard, Lombard Street—Improvements in the permanent way of railways, and in the means of preventing railway accidents thereon.

Recorded July 30.

1768. Anton B. Seithen, 6 Alpha Place, Caledonian Road—Improvements in cases or boxes, and in casings, hampers, baskets, and wrappers for holding bottles, jars, and other articles.
1770. Henry J. Newcome, Shenley, near Barnet, Hertshire—An apparatus for heating or warming buildings.

Recorded August 1.

1778. Elizabeth Merrell, Little George Street, Minories—Improvements in apparatus for washing and dressing.
1782. Eugene de Bassano, Brussels, Belgium—Improvements in the manufacture of artificial fuel, commonly called patent fuel.

Recorded August 4.

1800. Edward J. Cordner, Derramore, Down, Ireland—Improvements in the application of kites to the saving of life and property from shipwreck, and to other purposes.

Recorded August 5.

1802. Benjamin Tweedy, Utrecht, Netherlands—An improved mode of, and apparatus for, consuming smoke in locomotive and other engine furnaces, whereby coal can be used instead of coke.
1806. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—A system of columns or monuments to be employed as sentry boxes, branch post and other offices, telegraph and fire-engine stations.—(Communication from Irenee Leys, Amsterdam, Holland.)
1808. Robert T. Pattison, Daldorch, Ayrshire—Improvements in dyeing certain woven fabrics.

Recorded August 6.

1812. William R. Drake, 46 Parliament Street, Westminster—An apparatus for conducting electricity in the sea, and for telegraphing and sounding in deep water.—(Communication from Emile Schneider, St. Petersburgh, Russia.)

Recorded August 8.

1822. John Cunningham, Paisley, Renfrewshire—Improvements in and connected with Jacquard apparatus for weaving.
1824. Richard A. Brooman, 166 Fleet Street—Improved means of preventing incrustations in steam boilers.—(Communication from Louis Serbat, St. Saulve, France.)
1826. Louis B. Ollivier, 29 Boulevart St. Martin, Paris—Improvements in closing or stoppering bottles, jars, and other receptacles.
1827. Benjamin Bauch, Bradford Street, Birmingham, Warwickshire—Certain improvements in the mode and apparatus for partially forming, and finishing the edges of certain description of vessels formed or raised from sheet iron or other metal.
1828. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—An improved signal light, and in the apparatus employed in the production thereof.—(Communication from Messrs. Silas and Pegot Ogier, Paris.)
1830. George T. Bousfield, Loughborough Park, Brixton, Surrey—Improvements in revivifying the scarlet colour of woollen cloth, lace, and embroidery, in use for military and other garments and furniture.—(Communication from Messrs. Andres Burdel and Chicard, Paris.)
1832. John B. Babcock, 35 Milk Street, Boston, U. S.—Improvements in umbrellas and parasols.—(Communication from Anthony G. Davies, Waterton, Litchfield, Connecticut.)

Recorded August 9.

1834. Nelson Kenward, Sutton, Surrey—Improvements in constructing tubular steam boilers.
1835. Thomas Dunn, Manchester—Improvements in machinery and apparatus for elevating and regulating the level and flow of liquids, part of which is applicable for propelling vessels.
1836. John Cannon, Billiter Street—Improvements in washing machines.—(Communication from Abiel Odell, Bournmanville, Durham, Canada.)
1837. Pierre F. Rolland, Hensies, Hainaut, Belgium—A new electric telegraph.
1838. Charles L. J. Diericks, the Mint, Paris—A new system of scales, to be used principally in the fabrication of coins.

1839. Isaac Mitchel and Samuel Lister, Bradford, Yorkshire—An improvement in apparatus applicable to machinery for spinning fibrous materials.
1840. George T. Bousfield, Loughborough Park, Brixton, Surrey—A new and useful method of manufacturing the vulcanised compounds of vulcanisable gums.—(Communication from John Murphy, New York.)
1841. John B. Babcock, 35 Milk Street, Boston, U. S.—Improvements in bustles and skirts.—(Communication from Handle N. Daggett, Attleboro', Massachusetts, U. S.)
1843. John D. Bryant, Rock, Cornwall—Improved superphosphate of lime.
1844. Welburn Williamson, High Holborn—An improved machine or tool for drilling holes.
1845. Benjamin Browne, 52 King William Street—Improvements in the manufacture of paints and pigments.—(Communication from Francis G. Spilsbury, Louvain, Belgium.)
1846. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in destroying noxious exhalations.—(Communication from Messrs. Silas and Pegot Ogier, Paris.)
1847. Walter M'Lellan, Glasgow—Improvements in parts of the permanent way of railways.—(Communication from John Gregory, Lisbon, Portugal.)
1848. Joseph Waite, Cheltenham, Gloucestershire—Improvements in making infusions for pharmaceutical purposes, which improvements are also applicable to other purposes of a similar nature.

Recorded August 10.

1849. William Muir, Manchester—Improvements in machinery for communicating motion to foot lathes and other machines to be worked by treadles.
1850. Thomas A. Temperton, Manchester—Improvements in pipes for smoking tobacco.
1851. William K. Westly, Leeds, Yorkshire—Improved machinery for combing, heckling, and preparing to be spun, flax and other fibrous substances.
1852. George Capper, Bidborough Street, New Road—Improvements in the permanent way of railways.
1853. Alexander Shaw, Grantham, Lincolnshire—Certain modes or methods of preparing sheep or other skins or pelts, or the linings thereof, and for raising nap on the same, and also for preparing the said skins for kid leather, and for enamelling and japanning the same.
1854. John J. Speed, the younger, Detroit, U. S.—Improvements in the manufacture of pipes, tubes, and hollow cylinders.

Recorded August 11.

1855. Ralph Heaton, the younger, and George Heaton, Birmingham—Improvements in coining machinery.
1856. William White, 34 North Audley Street, Grosvenor Square—A four wheeled safety sociable carriage.
1857. John T. Pitman, 67 Gracechurch Street—A composition applicable to the lubrication of machinery and to various other uses.—(Communication from Horace Vaughan, Providence, Rhode Island, U. S.)
1858. William Bouch, Shildon, Durham—Improvements in breaks, in buffers, and in couplings to be used on railways.
1859. David Hulett, 55 and 56 High Holborn, and George Prudden, Shefford, Beds—Improvements in apparatus for the manufacture and distribution of gas, and in apparatus applicable for internal or external illumination.
1860. Warren de la Rue and Dr. Hugo Muller, 110 Bunhill Row—Improvements in treating Japan and other vegetable wax.

Recorded August 12.

1862. William Clark, 53 Chancery Lane—Certain improvements in oscillating engines.—(Communication from Messrs. Mark Runkel, New York, and Frederick Franch, San Francisco, California.)
1863. Auguste Evaux, 206 Regent Street—Artificial marbles.
1864. William H. Tooth, 3 Spring Terrace, Wandsworth Road, Surrey—Improvements in the mode of cleaning or laying the dust of pavements, roads, or other surfaces.
1865. James Philp, Camden Town—An improved hobby-horse or child's exerciser.

Recorded August 13.

1867. Dugald Campbell, 7 Quality Court, Chancery Lane—Improvements in the preparation of oils for medicinal and other purposes.
1868. James Brown, 8 Exeter Place, Walham Green—Improving false shirt fronts.
1869. Robert D. Clegg and Thomas Sanders, Islington—Improvements in locks.
1870. William Green, Kidderminster, William Fawcett, and Francis B. Fawcett, Wolverley, Worcestershire—Improvements in the manufacture of rugs.
1871. Robert Clegg, Islington, and Richard Fell, Limehouse—Apparatus for obtaining aerated fresh water from salt water.
1872. John Stuart and William Stuart, Musselburgh, Mid-Lothian—Improvements in nets for fishing, and for other purposes.
1873. Karl Buhring, 45 St. Paul's Road, Camden Town—An improvement in obtaining spring power, and in its application to various purposes.
1874. Richard I. Watts, John Offord, and John R. Thomas, Plymouth, Devonshire—A method of condensing and consuming smoke, and other products of coals, ores, and similar substances, and reducing them to useful materials.
1875. Henry T. Lambert, America Square—Improved apparatus to be adapted to ships' tackle or boats, for the purpose of facilitating the disengaging of ships' boats when lowered into the water.—(Communication from Captain George H. Carleton, Camden, Maine, U. S.)
1876. Elias Sloman, Upper East Smithfield—An improved feed water and heating apparatus.—(Communication from Gottfreyd May, Magdeburch, Prussia.)
1877. James R. Rostron, Edenfield, Lancashire—Improvements in locomotive furnaces.
1878. Colin Mather, Salford, Lancashire—Improvements in machinery for stretching, drying, and finishing fabrics.

Recorded August 15.

1879. Samuel Harrison, 52 Stanhope Street, Clare Market, St. Clement Danes—Broiling of chops or any other kind of meat.
1880. John Jeyes, Northampton—An improvement in the manufacture of boots and shoes.
1881. Charles Kisky, King Street, Camden Town, and William Jones, Howland Street, Fitzroy Square—Improvements in the construction of sideboards.
1882. Charles Glassborow, Girard Avenue, Philadelphia, U. S.—Improvements in pianos.
1883. John Chanter, Bow Road, and David Annan, Bow—Improvements in apparatus for supplying air to furnaces.
1884. Edward Stone, 46 Lime Street—Improvements in machinery for cutting veneers.—(Communication from John Ahsbohs, New York, U. S.)
1885. John Poupard, Stratford, Essex—A certain plastic combination to be used for black leading stoves and other ironwork.

Recorded August 16.

1887. Henry Batchelor, Newport, Monmouthshire—Improvements in steam and other motive power engines.
1888. John H. G. Rex, Regent's Quadrant—Improvements in the construction of dwelling houses or other buildings, for the purpose of facilitating the escape of the inmates in case of fire.
1889. William Gossage, Widnes, Lancashire—Improvements in the treatment of certain offensive liquids, and of noxious gases liberated from such liquids.
1890. John C. Haddan, Bessborough Gardens, Pimlico—Improvements in wads for projectiles, and in projectiles to be used therewith.
1891. John C. Haddan, Bessborough Gardens, Pimlico—Improvements in machinery or apparatus for rifling cannon.

Recorded August 17.

1892. James Sidebottom, Waterside, Derbyshire—Certain improvements in power looms for weaving.
1893. Henry Medlock, 15 and 20 Great Marlborough Street, Westminster—Improvements in Portland and Roman cement, lime, and other similar kilns or furnaces.
1895. Richard A. Brooman, 166 Fleet Street—Improvements in locks and keys.—(Communication from Jules E. Petit, Paris.)
1896. Septimus Beardmore, 27 Albion Street, Hyde Park—Improvements in electric batteries.
1897. Auguste Yockney, Pockeredge, near Chippenham, Wiltshire—Improvements in refining and compounding oils or fatty matters with other substances for lubricating and other purposes.

Recorded August 18.

1898. Weston Grimshaw, Lower Broughton, near Manchester, and Samuel Mason, jun., Manchester—Improvements in machinery and apparatus employed in washing, bowking, bleaching, and preparing flax and other substances.
1899. James Drabble, Orchard Works, Orchard Lane, Sheffield, Yorkshire—An improvement in sewing machines.
1900. Adolpho J. Canu, Paris—Improvements in machines for breaking or crushing stones, minerals, or other similar materials.
1901. Hyam J. Hyams, Holywell Street, Westminster—Improvements in the construction of wet gas meters.
1903. William Wilson, Glasgow—Improvements in the manufacture or production of bricks, tiles, and other articles of earthenware, and in the machinery or apparatus employed therein.

Recorded August 19.

1904. Peter Salmon, Glasgow—Improvements in locomotives, and in apparatus for warming trains of carriages connected thereto.
1905. William T. Henley, St. John Street Road, Clerkenwell—Improvements in machinery for the manufacture of ropes and cables, and for paying out and picking up submarine telegraph cables.
1906. Swinton Boult, Liverpool—Improvements in the means of, or apparatus for retarding railway carriages.
1907. John Jackson and Joseph Thorley, Worsley, Lancashire—Improvements in hoists for raising and lowering weights.
1908. John Fowler, jun., Robert Burton, and David Greig, jun., Cornhill, Edward E. Allen, Park Side, Knightsbridge, and William Worby, Ipswich—Improvements in ploughs, cultivators, or tilling implements, and in machinery for giving motion to the same by steam power.
1909. Henry W. Harman, Manchester—Improvements in steam boilers, and in working the same, and in safety valves and apparatus connected therewith.

Recorded August 22.

1911. Edwin Hardon, Stockport, Chestershire—Certain improvements in looms for weaving.
1912. William Finegan, Belfast, Antrim, Ireland—Improvements in apparatus for lubricating machinery.
1913. David Grant, Edinburgh—Improvements in wet gas meters.
1914. George W. Petter and Thomas D. Galpin, Belle Sauvage Yard, Ludgate Hill—Improvements in printing presses.
1915. William A. Verel, Macduff, Banff—Improvements in the preparation of hones for manure.
1916. Richard A. Brooman, 166 Fleet Street—Improvements in apparatus for preparing and spinning fibrous materials.—(Communication from Felix E. Lemaire, Paris.)
1917. Joseph J. O. Taylor, Mark Lane—An improvement in the separation of silex and silicious matter from iron.
1918. Henry Spratt, Royal Marine Barracks, Plymouth, Devonshire—Improvements in revolving pistols and other fire-arms.
1919. Honourable William Talbot, Army and Navy Club, Pall Mall—An improved cigar lighter.
1920. Henry Parkes, Birmingham, Warwickshire—Improvements in the manufacture of cylinders, and tubular or hollow bodies of copper, and alloys of copper or other ductile metals.
1921. Edward Abbott, Brunswick Square—Improvements in ordnance and fire-arms.
1922. Oliver Maggs, Burton, Dorsetshire—Improvements in taps, cocks, and valves.
1923. Richard S. Harvey, Lincoln—Improvements in apparatus for dusting vines, hops, and other plants and trees with sulphur and other powder.

Recorded August 23.

1925. Paolino F. C. de la Salle, Nice, Italy—A new method of arranging the keys on the finger-boards of pianos, organs, and other similar instruments.
1926. William H. Hill, Birmingham, Warwickshire—An improvement in the manufacture of boxes or cases, and in fastenings for the same.
1927. Thomas Fry, Liverpool—The application of enamelled slate to the new purpose of lining, panelling, or otherwise facing the internal or external walls of houses, public buildings, and edifices generally.
1928. William Hollins and Frederick Hyde, Glossop, Derbyshire—Improvements in power looms for weaving, part of which improvements is also applicable to other machines driven by power.
1929. Oliver Maggs, Burton, Dorsetshire—Improvements in apparatus for weaving straw, rushes, and other materials into fabrics.
1930. Thomas Richardson, New Bridge Street, Newcastle-on-Tyne—Improvements in treating copper ores.

Recorded August 24.

1931. George Pearson, Lancashire — Improved machinery for manufacturing boots and shoes.
1933. Joseph Henry, Bury, and James E. H. Andrew, Audenshaw, Lancashire—Improvements in looms for weaving.
1934. John Blake, Accrington, Lancashire—Improvements in steam and vacuum gauges.
1935. Daniel Russell, 1 Grove Cottage, Southampton Street, Camberwell, and Jonathan Russell, 6 Devonshire Terrace, Queen's Road, Peckham, Surrey—Improving the means of docking and lifting ships out of water, for the purpose of examining and cleaning their bottoms, effecting any necessary repairs, fixing new screw propeller, rudder, raising sunken vessels, or anything else for which it is desirable to get at any portion of a vessel generally under water.
1936. Thomas Briggs, Richmond Hill Works, Salford, Lancashire—Improvements in the manufacture of tarpauling.
1937. James Murray, Knight, Dublin—Improvements in the preparation and bottling or preserving of carbonated cod liver oil and other ærated liquids.
1938. Charles T. Judkins, 22 Ludgate Street—Improvements in sewing machines.

Recorded August 25.

1939. Henry Smith and Thomas W. Ashby, Stamford, Lincolnshire—An improved construction of harrow.—(Communication from Messrs. J. Pintus and Co., Berlin, Prussia.)
1940. Loftus Perkins, Francis Street, Gray's Inn Road—Improvements in mills.—(Communication from James Bogardus, Duane Street, New York.)
1941. Amos P. Chamberlain, London—Improvements in machinery or apparatus for cutting cork, part of which improvements is also applicable to cutting paper, caoutchouc, and other substances.

Recorded August 26.

1942. Martin Billing, High Holborn—An improved mode of ornamenting and finishing certain articles of hardware.
1943. James Furrell, 5 Upper Phillimore Place, Kensington—Lock protector, consisting of an adhesive shield or cover to be placed over the keyhole of a lock for the purpose of insuring that any access to the interior of the lock shall be readily detected.
1944. Michael J. Stark, Norwich—Producing a new chemical or artificial manure from bones, and all such animal and fatty matters.
1945. Thomas Bird, Manchester—Improvements in castors.
1946. John M. Hetherington, Manchester—Improvements in machinery or apparatus for carding cotton, wool, and other fibrous materials.
1947. Hermann Grundt, America Square—Improvements in life boats.
1948. Walter M'Lellan, Glasgow—Improvements in rolling or shaping iron for railway spikes and other purposes.
1949. Charles T. Boutet, 12 Chenies Street, Tottenham Court Road—A new mechanical mill proper for milling every sort of grains, dried or torrefied, such as coffee and cocoa.

Recorded August 27.

1950. Charles Hanson, Huddersfield, Yorkshire—An improvement in the chronometer escapement of a watch.
1951. Francis Wrigley, Manchester—Certain improvements in the construction of the permanent way of railways.
1952. James B. Rostron, Edenfield, Lancashire—Improvements in furnace bars.
1953. William H. Balmain, St. Helens, Lancashire—Improvements in the manufacture of glass and other vitrified substances.
1954. Thomas Craven, Scarborough, Yorkshire—Improvements in ball cocks or valves.
1955. George Bell, South Inch Michael, Perth, North Britain—Improvements in reaping and mowing machines.
1956. John Heckethorn, 32 Stanmore Street, Caledonian Road—Improvements in candles and wicks, also in lamps or candlesticks for using with the same.
1958. Emil Rettig, New Cross, Kent—Improvements in the form and construction of anchors.—(Communication from Ferdinand Martin, Marseilles, France.)

Recorded August 29.

1960. Thomas Meriton, 39 Pinnasberg, St. Pauli, Hamburg—Improvements in governors for regulating the speed of marine and other engines and machinery.
1961. Charles Kerman, Vulcan Iron Works, Millbrook, near Southampton—An apparatus to prevent the sinking of vessels through leakage, for lifting and floating vessels off when stranded, and for raising and floating sunken vessels.
1962. Jesse R. Howarth, Manchester—Certain improvements in machinery or apparatus for calendering and finishing textile fabrics or other surfaces.
1963. William Clark, 53 Chancery Lane—Certain improvements in sewing and stitching by machinery.—(Communication from Kasimir Vogel, Chelsea, Suffolk, Massachusetts.)
1965. David Todd, Bridge-of-Weir, Renfrewshire—Improvements in machinery or apparatus for carding and treating or preparing fibrous materials.
1966. Benjamin Bauch, Salt's Patent Enamel Works, Bradford Street, Birmingham, Warwickshire — Certain improved machinery or mechanical arrangements for raising or giving form to articles formed of sheet metal, such as knobs, thimbles, ferules, and parts of umbrella and parasol furniture, button shells, and other such like small articles.
1967. Gilbert S. Fleming, 498 New Oxford Street—A head-rest, suitable for keeping the head in a comfortable position in travelling, sitting, or lying down.

Recorded August 30.

1969. John B. Barnes, Summer Lane, and John Loach, Caroline Street, Birmingham, Warwickshire—Certain improvements in oars for impelling boats, as also in the row-locks in which they work.
1971. James Hare, Hamstead Road, Handsworth, near Birmingham—Improvements in piano-fortes.
1975. Charles Chambers and James Chambers, Archer Street, Westbourne Grove—Improvements in apparatus for sawing staves and other forms of wood.
1977. Robert F. Drury and Ensor Drury, Don Tool Works, Sheffield, Yorkshire—Improvements in vices.

Recorded August 31.

1979. James Nutall, Todmorden, Yorkshire—Certain improvements in and applicable to machinery used in preparing and spinning cotton and other fibrous materials.
1981. Robert Beverley, Leeds, Yorkshire—Improvements in wet gas meters.
1983. Samuel Middleton, Blackfriars Road, Surrey—Improvements in the mode or method of uniting and otherwise manufacturing articles of leather and such like materials, and in the apparatus and machinery connected therewith.
1985. Augustus Smith, Brentwood, Essex—Improvements in machinery for the preparation of cocoa nut fibre.
1991. John Chatterton, Devonshire Street, Islington—Improvements in the manufacture of tubes of gutta percha, and other substances capable of being moulded in a similar manner when in a plastic state, and also in coating wire and other cores with such substances.

Recorded September 1.

1993. John A. Simpson, Liverpool—Improvements applicable to hats and other coverings for the head.
1995. Thomas Aveling, Rochester, Kent—Improvements in locomotive engines.
1997. Robert H. Collyer, 8 Alpha Road, Regent's Park—Improvements in preparing material for the manufacture of paper.

Recorded September 2.

1999. Julian Bernard, Albany, Piccadilly — Improvements in the manufacture or production of boots and shoes, in the machinery, apparatus, and means employed in such manufacture.
2001. William Brown, the younger, and Simeon Bathgate, Selkirk—Improvements in machinery or apparatus for grinding or sharpening the card teeth of carding engines for carding fibrous materials.
2003. William Fearn, British Pail Company, Leeds, Yorkshire—An improved construction of buoys.
2005. Strangman D. Goff, Henry Davis, Samuel Strangman, and Edward Strangman, Waterford, Ireland—An improved method of, and apparatus for, drying malt, corn, and other articles.
2007. Edwin Button, Smith's Terrace, Chelsea—Improved apparatus for raising sunken vessels.

Recorded September 3.

2011. Joseph Friou, 74 Newman Street, Oxford Street—Detaching instantly the locomotives from railway carriages, and also for detaching instantly the harness from horses that run away when attached to any carriage.
2013. Henry R. L. Schramm, Brieslau, Prussia—A new process for pressing and separating simultaneously the fibres and pellicles contained in the constituent matters of the beet-root, sugar, beer, grains, alcohol, potatoes, beets, and other similar substances.
2015. Walter Neilson, Glasgow—Improvements in steam hammers.
2017. James C. Nixon, Nottingham—Improvements in kitchen ranges, with combined steamer and hot closets, for cooking, warming, drying, or other purposes.
2019. Christian Schiele, North Moor Foundry, Oldham, Lancashire—Improvements in weighing machines.
2021. Bernard Lauth, Manchester — Improvements in the manufacture of rollers or cylinders for calico printers, and of tubes of copper and brass, or mixtures of those metals.

Recorded September 5.

2023. William Bush, Dulwich, Surrey—Manufacturing granulated seidleitz powder.
2025. John W. P. Field, 233 High Holborn—Improvements in breech loading fire-arms.
2027. Victor Tomell, 294 King's Road, Chelsea—Improvements in the manufacture of yeast.
2029. Alfred V. Newton, 66 Chancery Lane—Improvements in weighing machines.—(Communication from John Howe, jun., and Frank E. Howe, New York, and Francis M. Strong and Thomas Ross, Brandon, Rutland, Vermont, U. S.)

Recorded September 6.

2031. Richard K. Oeldard, Plymouth, Devonshire—Improvements in the method of, and and apparatus for making pharmaceutical or other infusions.
2032. John J. Sieber, 5 Baring Street, New North Road—Improvements in power looms.—(Communication from Henry Honegger, Thiengen, Grand Duchy of Baden.)
2033. François J. Manceaux, Paris—Improvements in cartridges.
2035. James Stewart, 66 Tottenham Court Road—Improvements in piano-forte action.

Recorded September 7.

2037. James J. Lyons, London—Improvements in the manufacture of sugar.
2039. George Lawrence, York Road, Battersea, Surrey—Improvements in the construction of wheeled vehicles.
2041. William J. J. Varillatt, Rouen, France—An apparatus indicating the level of water in steam caldrons or boilers.
2043. James P. Joule, Manchester—Improvements in apparatus for refrigerating and condensing steam or other vapours, which said improvements are applicable to refrigerating or heating liquids.
2045. Alfred V. Newton, 66 Chancery Lane — Improvements in the manufacture of ladies' hooped skirts.—(Communication from William S. Thomson, New York, U. S.)
2947. Edward T. Hughes, 123 Chancery Lane—Improvements in machinery or apparatus for forging metals.—(Communication from Ernest Danis, 7 Rue des Moulins, Paris.)

Recorded September 12.

2072. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved arrangement of piston packing, principally applicable to hydraulic apparatus.—(Communication from Casimer and Celestin Dabbine, Verduno, Sardinian States.)
2073. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—Improvements in the construction of hydraulic pumps.—(Communication from Louis L. Bequemie, Paris.)

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 7th July to 17th August, 1859.

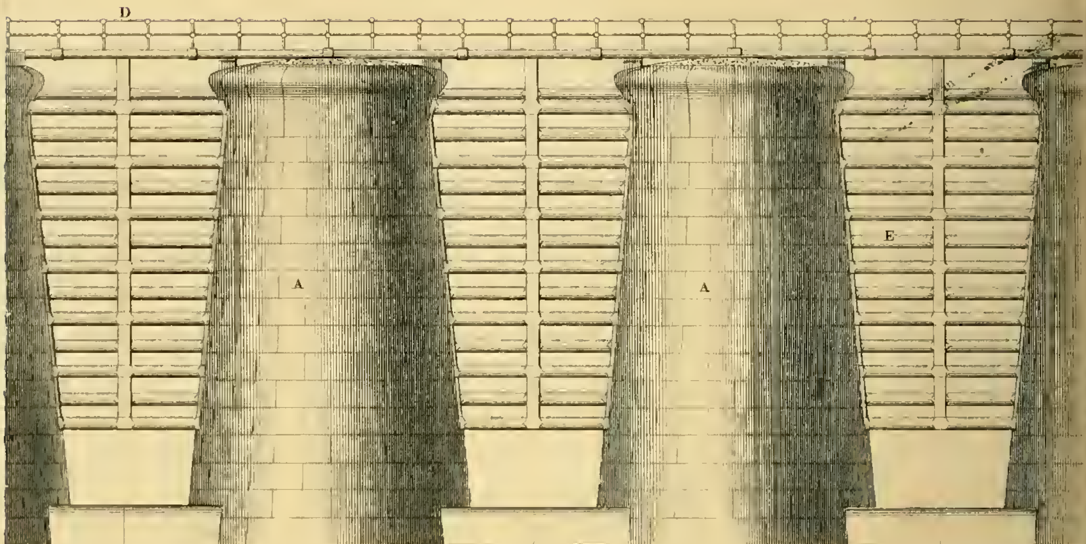
July 7th, 4189 John Adams, 76 King William Street, E. C.—"Tool for filling cartridges and closing the ends thereof."
18th, 4190 Joseph Chesterton, Leicester—"Appendage to ordnance and fire arms."
29th, 4191 James Chandler, Creek Road, Deptford, Kent—"Glass water-gauge, for steam, water, or other boilers where liquid may be used."
30th, 4192 John Dockree, 30 Robinson's Row, Kingsland—"Funnel valve."
Aug. 1st, 4193 Williams and Biven, Reading—"Valve for heating pipes."
17th, 4194 Cooper and Smith, Ashbourne, Derbyshire—"Corset fastener."

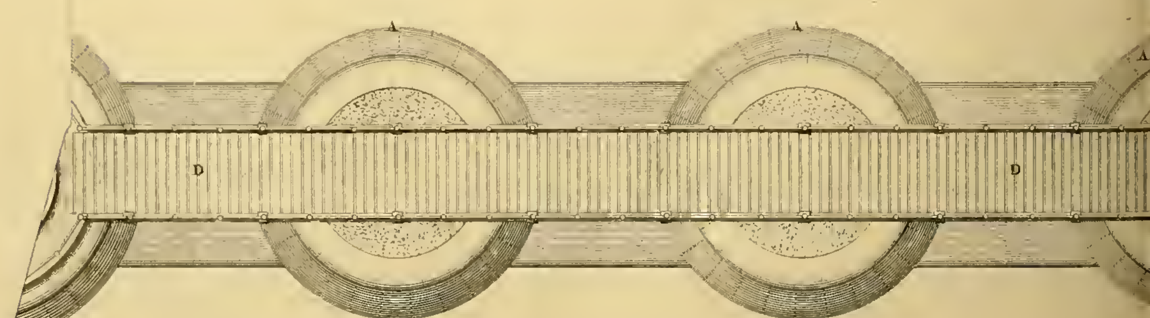
HARBOUR

T. RICHARDSON &

HARTLEPOOL

PAT





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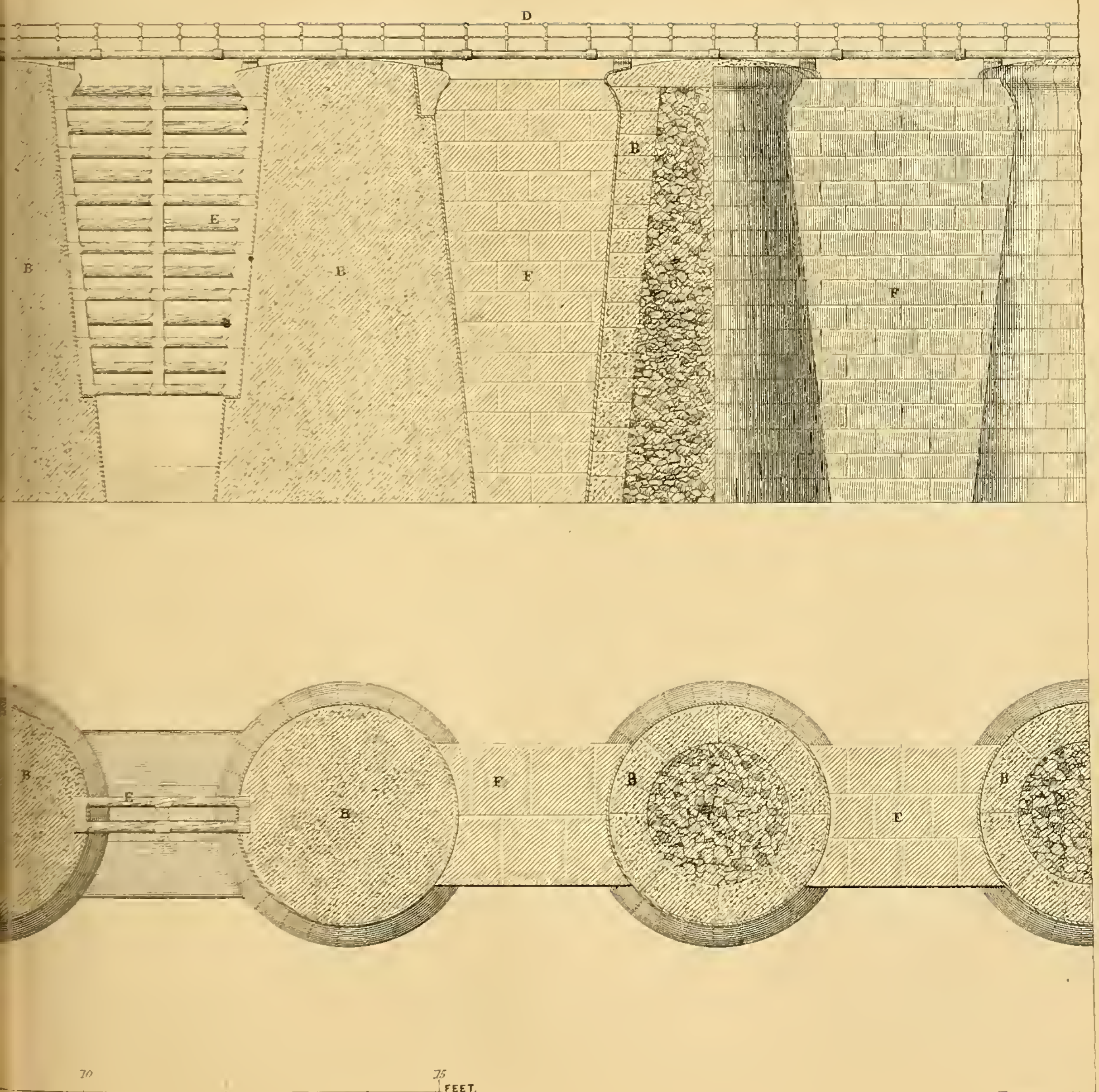
INS. 12 6 0 1 2 3 4 5

REFUGE,

N. JAFFREY.

KS. DURHAM.

ES.



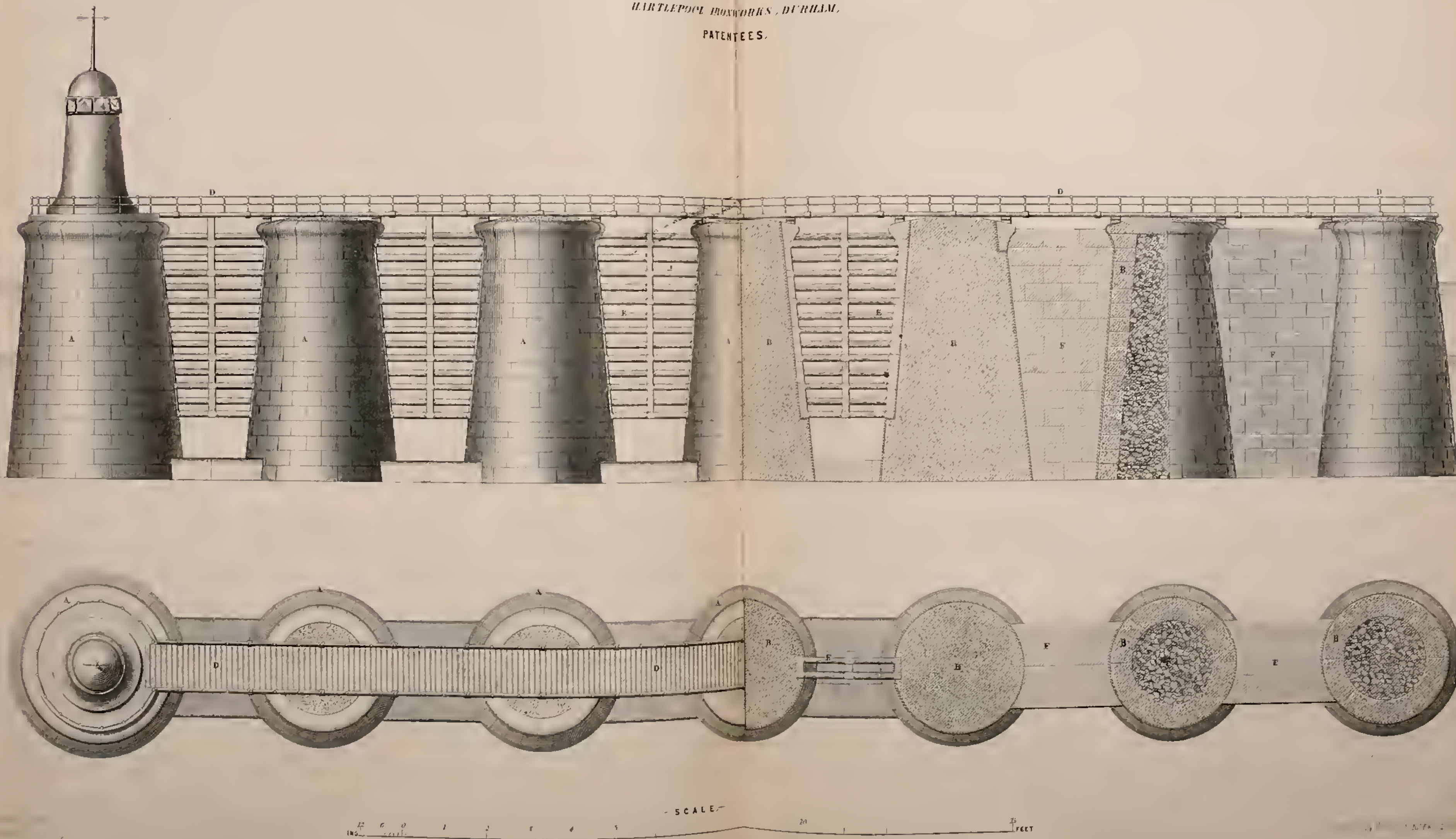
Printed by

HARBOUR OF REFUGE,

T. RICHARDSON & G. W. JAFFREY,

HARTLEPOOL IRONWORKS, DURHAM,

PATENTEES.



HARBOUR OF REFUGE.

By T. Richardson *and* G. W. Jaffrey, *Hartlepool Iron Works, Durham.*

Illustrated by Plate 247.

In our island country, and with the rugged coasts which we possess, few subjects can be more interesting and practically important than that of harbour works. The gigantic structures of the kind, which we have erected in so many situations along our shores, show that the matter has received a large amount of consideration; but a very little thought over them suffices to impress us with the opinion that little, indeed, has been really accomplished, in comparison with the vast sums of money which the country has paid for sea defences. This result has arisen from various causes; but the most prominent of them has always been the strong tendency of engineers to lay down enormous masses of expensive masonry, trusting rather to the mass of weighty material as a defence against the tremendous power of the waves, than to superiority of design. The natural consequence has always been, that whilst we have paid so dearly for works of the kind, we have expended years in their construction, when months might really have measured their time of construction. The plate which illustrates this article, however, shows that practical men have been thinking over the point in a practical way, and they have ended in giving us a design for such structures, which we are satisfied will meet most of the difficulties formerly experienced. We refer to the joint invention of Mr. Richardson and Mr. Jaffrey, of the Hartlepool Iron Works.

Messrs. Richardson and Jaffrey's invention embodies defensive and protective sea works of various kinds, such as harbours of refuge, breakwaters, sea-walls, barriers, and other sea-board structures or contrivances, intended either for the defence of the coast, against the action of the wind and waves, or for protecting shipping. The details employed in carrying out this invention in actual practice, consist mainly of a row, line, or series of tapered towers, cylindrical in transverse section, and made either of cast or wrought-iron, or of stone, each tower having a clear intermediate distance or space between each at the top, equal to its diameter. These spaces are in each case filled in with balks of timber, cast-iron pipes, or malleable iron tubes, or other suitable material, so arranged as to form a species of vertical lattice or screen to break the oscillation of the waves. This lattice or intermediate barrier work, also serves the purpose of preventing the inner sides of harbours from silting up, as they allow the tides to flow freely in and out right through them, which effect is impossible of accomplishment in close or impermeable sea-wall harbours. Harbours or sea barriers may be constructed according to this plan, in a very short time as compared with that required in the case of ordinary works. All the towers can be made and finished on shore, and then taken out to sea by derricks and sunk on the exact spots necessary. Hollow metal towers of this class may be pumped dry, after being sunk, so that the stone or other blocks used for the central filling up mass, may all be made on shore, to moulds, and then laid in their places with as much ease as on dry land. The cement for the interior mass is thus kept free from the wash of the waves, and if "beton" is used in its rough state, the metal tower answers as a mould to form a solid block or tower of beton deposited inside it, and which is capable of standing securely even if the external metal casing is destroyed. The lattice or screen frames can also be made on shore, and dropped into vertical grooves made in the contiguous sides of the towers by the derrick. The filling-up material of the towers may be stone or other massive matter, solid beton or concrete, or beton filled in with a central mass of slag. A permanent gangway is fitted up along the tops of the line of towers, which, besides serving the purpose of a permanent passage, answers also the temporary one of enabling the contractor to execute his work without the aid of the usual gangway and scaffolding plant. In these structures nothing is wasted, as each block or detail performs its allotted and intended purpose, whilst within the guarded line, the enclosed water space is safe and deep water for ships, which may come safely alongside the line of structure. Each tower has a totally independent stability of its own, equal to that of a continuous solid wall. Indeed, the spaces between the towers may be filled in with solid masonry, defended by lattice work or bars of any suitable kind, so as to form a continuous solid line. But this solid or impermeable barrier is not so useful or appropriate for the purpose as the permeable or open line or wall, hereinbefore described. The towers may either be solid throughout or hollow, and merely lined with the filling-up or strengthening material.

In carrying out this invention in the arrangement and construction of a harbour of refuge for ships, the inventors, in the first place, construct a number or series of iron towers, A, so that when these towers are deposited in the sea, at the predetermined distance asunder, they extend outwards, and partially enclose the required extent of sea room. The towers are by preference made of a circular figure in transverse section, wide at the base and tapering towards the upper part, sweeping inwards from the base with a curve, or rising upwards with straight sides of a gradually tapering or conical figure. These towers are by preference constructed of cast-iron or malleable iron, or partly of both kinds of metal; but in lieu of these materials they may be constructed of stone or timber, and made solid in the manner hereinafter described. In constructing the towers of metal, a framing of perpendicular and transverse circular or cylindrical ribs is bolted together, so as to form a skeleton figure of the predetermined shape; this framing is then covered with sheets of cast or wrought-iron, which are riveted or otherwise secured to the internal framing. The height and size of these towers must depend, to a great extent, upon the depth of water, and the position of the work; we may, however, give as an example of a useful size for these towers — diameter at the base, thirty-five feet, tapering to a diameter of twenty-seven feet at the upper part. The open bottom towers, constructed in this manner, are taken out to sea in succession, upon a powerful derrick or pontoon, or other suitable floating apparatus, and are then sunk upon the spot required; the towers are arranged in a straight or curved line, at such a distance apart as to leave between each an intermediate space equal at the upper part to the smaller diameter of the tower, or thereabouts. The towers being disposed in this manner, the water contained within each is then pumped out, and the interior of the tower is filled in with masonry, the blocks of stone being previously cut to the required shape on shore, in this manner the work may be carried on with great rapidity, the cement used in the building operations being meanwhile wholly protected from the wash of the sea-water. Instead of using stone as the material for filling in the towers, concrete, beton, or other hard-drying plastic cement, may be moulded into blocks of the required figure on shore and dried; these blocks when fitted into their proper places within the tower, are to be cemented together with a thin mixture of the cement or plastic material used for moulding the blocks. In some cases we should give the preference to another mode of procedure, namely, to fill the whole of the interior of each tower with beton or hydraulic cement, as shewn at B, which cement solidifying within the tower, the whole forms a compact and solid mass, capable of withstanding the waves of the sea after the removal or wearing away of the external plates of metal. In lieu of this solid mass of beton, a filling in may be used composed of beton, having a central mass or core of slag, as at C, the interstices of which may be filled up with the liquid, so as to form the whole into a solid mass. The operation of filling up the towers with masonry or with plastic materials, is materially facilitated by the convenience which the summits of the towers afford for at once laying down a permanent gangway or road, D, from one tower to another, along which gangway materials and implements can be conveyed with nearly the same facility as on shore. In this manner the expensive and costly plant required in harbour and coast works of the ordinary kind are wholly dispensed with, and the work is done at far less cost than can be accomplished with the usual structures. In place of constructing the towers of iron, they may be built wholly of stone; a suitable caisson being sunk over the spot where the tower is to be erected, the water having been pumped out of the caisson, the work may be carried on with great rapidity, if the several blocks of stone have been previously cut to the required shape on shore. The open spaces between the contiguous towers are filled in with open vertical frames, E, which serve to break up and divide the waves as they roll in, the water passing through the open screens without hinderance, and yet in a comparatively smooth and untroubled state, and so as to render the position of the shipping in the harbour perfectly secure. These lattice screens are constructed of balks of timber strongly bolted together, open rectangular spaces being left between the continuous vertical and transverse beams of timbers. These lattice screens are by preference constructed on shore, and in the opposite faces of each contiguous pair of towers a deep vertical groove is formed, either by bolting pieces of angle iron to the face of the tower back, or by securing pieces of timber thereto in a similar manner. These lattice screens are taken out in succession on the derrick, they are raised thereby to a sufficient height to admit of their being lowered down into the grooves made for their reception on the contiguous faces of the towers. Another mode of constructing these screens is to form them of cast-iron pipes, or of malleable iron tubes, the vertical tubes are connected together so as to form a frame or lattice, by means of transverse bars of metal at the upper and lower parts, and if necessary, at intermediate distances. These screens are fitted into the adjacent grooves in the towers, in the same manner as described in reference to those composed of timber. In addition to the protective action of these screens, there is another and highly important advantage attending the use of them in harbour and other similar sea works, which is, that from their open construction they prevent the silting up or accumulation of the sand inside the harbour, as the tide has free access and egress through the open screen, so that the original depth of water is maintained, and a prolific source of expense in the maintenance of dredging apparatus is avoided. The construction of harbours, piers, or quays, upon this plan, admits of vessels approaching close up to the towers, thus avoiding the waste of room and inconvenience attending long sloping sea walls of the ordinary construction. Even in situations where a rigid or impermeable sea wall would not be objectionable, this system offers considerable advantage in point of strength, economy of first cost, and facility of construction. In such situations the towers are constructed and disposed as hereinbefore described, but the intermediate spaces between the towers are filled in, either with a wall of masonry, as at F, or one formed of blocks of "beton" or concrete cemented together, and defended or not on the outer or seaward side by a lattice work of timber or metal. For these structures the towers may either be the simple iron tower sunk into its proper place, or it may be partially or wholly filled up with masonry, "beton," or other suitable material. According to this system of constructing harbours, breakwaters, sea-walks, and other similar exposed works, it is impossible to carry out such works in a manner more economical, for, if properly conducted, no portion of the materials employed need be wasted, which is far from being the case in structures of the ordinary kind, however careful the constructors may be in the disposal of their materials. Hartlepool itself offers an excellent opportunity of testing such a plan of sea wall as this; and next month we shall give a large plate showing fully, how well the design might be there carried out, and the advantages which it offers over all previous suggestions for the purpose.

HISTORY OF THE SEWING MACHINE.

ARTICLE XX.

The third part of Mr. Hughes' specification describes another form of single thread stitch, produced by means of a hooked needle and discoidal, or circular spool or thread case. The needle descends through the cloth to receive the thread, which it carries upwards in the form of a loop, as shown in fig. 143; the cloth being shifted the extent of a stitch, the needle again descends, carrying with it the loop, as in fig. 144, which loop is then taken from the hook of the needle by a hook on the side of the thread case, and is carried partly round the case, whilst the needle without the thread rises out of the cloth, which is then fed along sufficiently far for another stitch, as shown in fig. 145. The loop is now carried round the spool case, and the needle descends to receive the thread, which is guided therein by the thread guide, *a*, fig. 146, and is carried upwards through the cloth in the form of a loop, as in fig. 143. The cloth is again fed along the length of another stitch, and the needle descends as before with the loop. It is proposed to vary this stitch, a diagram of which we give at fig. 147, by imparting a lateral movement to the needle carrier, whereby a zig-zag or species of herring bone stitch may be produced. Under the fourth head of the invention, two needles are used, having each an eye near the point, with two threads and two hooks or catches, so as to form a stitch by the needles passing each thread from the opposite sides of the fabric or material in diagonal directions, each needle thus passing its thread through a loop formed by the other. The diagrams, Nos. 1, 2, 3, and 4, represent the instruments employed, and their various positions whilst forming a stitch. A and B are the two needles passing diagonally, or at a slight angle through the cloth from its upper and under sides; and C, D, are two hooks placed one above and the other below the cloth, and worked by slots in the needle slides, in which slots an anti-friction roller, carried by the stem of each hook, is engaged; consequently, the sliding motion of the needle slides or carriers impart an oscillating or vibratory motion to the hooks, so as to cause them to enter a loop, or to be disengaged therefrom as required. Each needle is supplied with a separate thread of its own, and the stitch is produced in the following manner:—The needle, A, having carried its thread up through the cloth, as in diagram No. 1, the hook, C, passes into the loop, which is opened by a slight withdrawal of the needle, and the needle is then drawn back entirely out of the cloth, leaving its loop round the hook, C, as in No. 2. The cloth is now fed forward the extent of a stitch, when the needle, B, carries its thread through the previously formed loop, and through the cloth downwards, as shown in No. 3, the hook, D, catching the loop of the needle, B, beneath the fabric. The needle, B, then withdraws, as in No. 4, leaving its thread round the lower hook, D, and drawing the previous stitch tight, the hook, C, having been already withdrawn out of the previous loop. The needle, A, again rises and passes its thread through the loop on the hook, D, and through the cloth, as in No. 1, and its thread is caught as before by the hook, C. A repetition of these movements produces the double thread chain stitch, shown in fig. 148. The last part of Mr. Hughes' specification describes a mode of sewing two parallel seams at the same time by one machine, which he proposes to accomplish by causing two needles, carried by a common slide or carrier, to pass the thread or threads for each seam through the material simultaneously, and securing the loops and guiding the threads in such a manner that the movements necessary for forming one seam may be made available for producing two seams at the same time. The needles by which the threads are passed through the material are hooked, and work in combination with two piercers or awls, provided for the purpose of piercing leather or other strong material at the points where the hooked needles are to pass through.

Fig. 143.

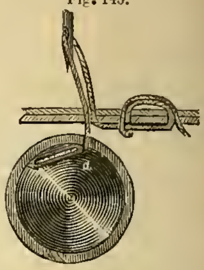


Fig. 144.

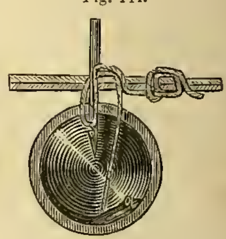


Fig. 145.

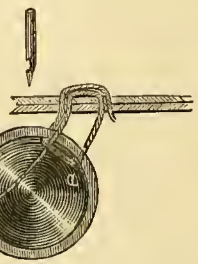


Fig. 146.

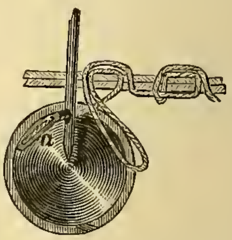
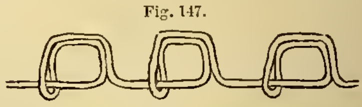
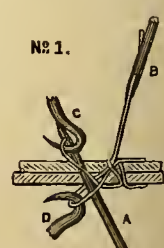


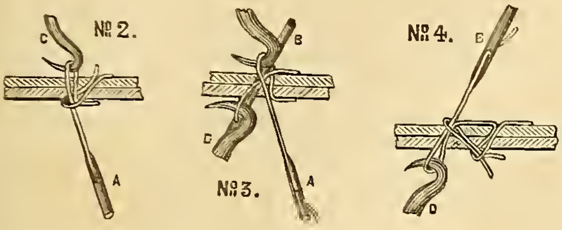
Fig. 147.



No. 1.



Otis Averry obtained a patent on the 6th of July, 1854, in the specification of which he describes a mode of making a tambour, locked, embroidery, or chain stitch, in cloth or leather, with a single thread, by the action of two needles, one of which has an eye near the point, the



other being a split or loop-holding needle; the latter needle works on the underside of the fabric, and moves in the same vertical plane, but at an obtuse angle to the upper or eye pointed needle. The eye pointed needle first carries the thread through the fabric or material, then the split needle passes between the eye pointed needle and its thread, to or through the fabric, and holds the loop close to the cloth until the eye pointed needle has been withdrawn and again passed through the cloth, and through the loop held by the split needle, when the latter is in its turn withdrawn. Our readers will see that this is a very similar arrangement to Mr. Hughes' plan of stitching with diagonal needles, with this difference, however, that only one thread is here employed, in place of two threads, as in Hughes' arrangement.

Fig. 148.

Samuel Szoutagh's patent, dated the 11th of September, 1854, relates to sewing machines, in which a shuttle is employed, in combination with a needle for performing the operation of sewing, and consists in making the needle, used for sewing leather, into a flat and broad point, and in placing this needle in such a position that the broad and flat part thereof makes an angle of about 45°, with the line of thread which passes through the eye, for the purpose of preventing the holes formed by the needle from cutting the thread of the last made stitch. Another part of the invention consists in applying a magnet to the shuttle box of sewing machines, for keeping the shuttle in close contact with that part of the shuttle box against which it slides, and thus ensuring more perfect contact than by the use of springs as commonly practised. We beg to refer Mr. Szoutagh to Newton's patent of April 1st, 1854, and noticed by us in our eighteenth article. He will there find he has been forestalled in the application of magnetic attraction, to the purpose referred to.

Mr. Bellford obtained a communication patent on the 20th September, 1854, the specification of which is very lengthy, and the mechanism of a highly complex order; but we gather, however, that the invention relates to the needle and shuttle machines, and consists in giving a lateral movement to the needle or fabric, in addition to the ordinary feed traverse, whereby button holes, whips, and herring bone stitches can be produced. This Mr. Bernard had previously done, as will be seen on referring to our notice of his patent of December 31st, 1853, in our sixteenth article. Another improvement consists in the use of a curved needle to enter each loop formed at the edge of the button hole, and retain the same during the next interlacing of the threads in the cloth, and until the sewing needle enters it in its next movement past the edge, so that every loop formed at the edge may be clasped by its predecessor.

Mr. Bellford also describes an arrangement of feed mechanism, whereby the fabric is moved in the direction of the line of sewing, once for every two operations of the needle and shuttle when working the button-hole stich, by which means the visible parts of the threads are laid parallel to each other, and the zigzag appearance that would be produced by feeding after each single operation is avoided. An ingenious arrangement is also described for causing the instantaneous stoppage of the feed motion, when the needle thread breaks or the loop is otherwise prevented from being formed or drawn tight. Another feature in the invention is the drawing of the shuttle and needle threads in opposition to each other when tightening the stitch, so that the interlacing of the threads may take place as nearly as possible in the centre of the cloth, and the shuttle thread be prevented from drawing through to the upper surface of the cloth. Another feature is the longitudinal adjustment of the shuttle, which enables the shuttle to receive just sufficient motion to carry it through and clear of the loops, and no more.

Walter Sneath obtained a patent on the 29th of September, 1854, but we are at a loss to discover the novelty of a sewing machine, wherein a single thread and eye pointed needle are used in combination with a hook, which catches the loop of the needle thread and holds it until at the next descent of the needle the needle passes through the fabric and through the loop so held, thereby producing the all but exploded chain or tambour stitch. This plan, however, forms the base of Mr. Sneath's invention.

Julian Bernard, Esq., obtained provisional protection on the 21st of October, 1854, for various improvements relating generally to the balancing the arm slide or lever which actuates the needle of sewing machines—the imparting a lateral motion to the arm which actuates the needle—attaching one or both the jaw pressers for feeding the fabric to the needle actuating arm—a mode of imparting motion to the feeder—moving or travelling sewing machines upwards or laterally in the case or stand which may contain them—use of a fly-wheel for sewing machines so constructed and arranged as to enable the operator to work the machine either by hand or power at discretion—roughing or making a number of circumferential grooves in the bed plate of the machine, or that part on which the material is pressed—also, indenting circumferential grooves in the jaws of the pressers or travellers.

NEW BAROMETER.

A compact and simple form of barometer has been invented by M. Blondeau. Its principle consists essentially in taking a volume of air, of the pressure which it is desired to measure, and expanding this air to double its original volume. This air not possessing more elasticity than will balance a demi-atmosphere, the difference of the heights of the columns of mercury contained in the communicating tube, which constitutes the apparatus, shows immediately the amount of the demi-atmospheric pressure, and, therefore, that of the atmosphere at the time of making the observation.

This barometer is composed of a bent tube, both branches communicating with the atmosphere. One of these branches is provided with a cock, and is furnished with two marks or indications, *a b*, corresponding to two columns of air, the one of which is double that of the other, and measured from the stop cock. When it is desired to measure the pressure of the air, the cock is opened and mercury is introduced by the other branch until its level reaches the mark, *a*. This cock is then closed, and by the aid of a second cock placed in the lower portion of the apparatus, the mercury is run off, until its level in the closed branch reaches the mark, *b*, or, in other words, until the air enclosed in the apparatus occupies a volume double that which it previously occupied; it is then sufficient to measure exactly the difference of level of the two columns, to arrive at the true demi-atmospheric pressure.

The inventor has also modified his apparatus in such a manner that the atmospheric pressure may be determined by compressing the air, in place of expanding it. After having traced upon the tube—which is capable of being closed by a stop cock—two marks, the one, *a*, corresponding to a volume taken for unity below the ordinary atmospheric pressure, the other, *b*, corresponding to 4·5ths of this volume. The observation is commenced by opening the cock, and introducing mercury until the liquid reaches the level, *a*; the cock is then closed, and by the open branch mercury is added until its level reaches the point, *b*, in the closed branch. As in this case the volume of air occupies only 4·5ths of its normal bulk, the pressure is equal to 5·4ths of the atmospheric pressure; that is to say, that the small column situated in the open branch above the mark, *b*, is equal to 1·4th of the barometric column, and consequently serves to indicate the height of the column of mercury which will balance the pressure of the atmosphere. This second arrangement reduces the weight and size of the apparatus, and therefore renders it extremely portable, and capable of being carried about without fear of derangement.

NEEDLE AND PIN POINTING MACHINE.

The simple and minute articles, needles and pins, are often adduced as instances of the wonderful division of labour which has been brought to bear upon trivialities. The most complex machinery and engines are not treated in so refined a manner on this head, as an ordinary sempstress's needle, which passes through the hands of 120 operatives before it finally takes its place in the neat flat little packages which we discover in domestic work-boxes. The routine of manufacture of this little article has been often most interestingly described, and observing readers will have remarked that one of the most important processes in the long list of manipulations is, the apparently simple one of pointing. According to the existing British practice, the double needle lengths to be afterwards severed in the centre, are held in small bundles between the thumb and finger of the pointer, who, with a piece of leather in his other hand spreads the ends out flat upon a rapidly revolving stone, and turns them individually round so as to point the whole equally. This is a slow process, and M. Schleicher, a Belgian inventor, has now given us a good practical improvement upon it, in the shape of a self-acting pointing machine of rapid and effective action.

Fig. 1 of the accompanying illustrations represents a front elevation of the machine in question, and fig. 2 is a corresponding elevation of the same, looking at right angles to fig. 1. Between the two standards or supports, A, is fitted a grindstone, B, the periphery of which is of a hollow or curved transverse section. At C, are adjusting screws for raising or lowering the stone, B, as required; and D, is an iron table or plate which is capable of being raised or lowered by the lever handle shewn in fig. 1. This plate carries two brackets, E, fitted with centre screws, F, upon the points of which the spindle of the pulley, G, rotates. This pulley is covered on its circumference by a band of India-rubber, H, and it is further adjusted by the upper set screws, I. Beneath the periphery of the roller, G, is a concave curved metal support, K, corresponding exactly with the periphery of the roller which rotates within it,

Fig. 1.

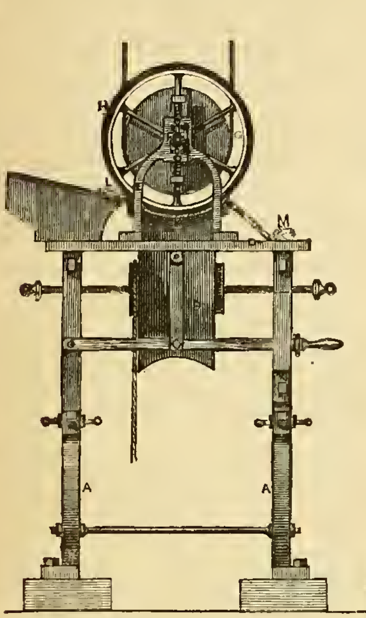
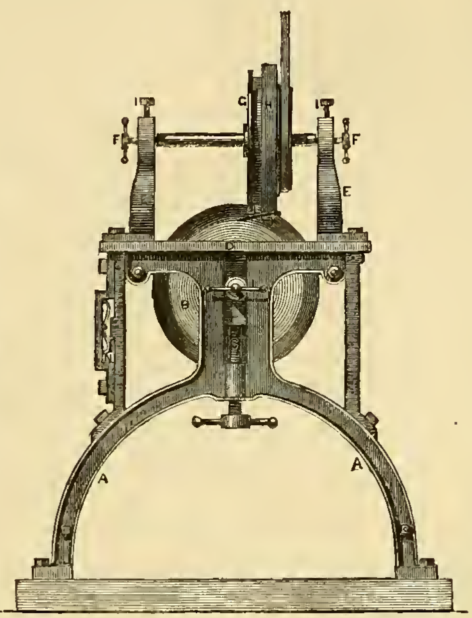


Fig. 2



and this curved support is also covered on its surface next the pulley with a band or strip of India-rubber. It is between these two contiguous surfaces of India-rubber that the lengths of steel, iron, copper, or other wire, to be pointed, are held in a direction at right angles to the axis of the grinding stone beneath, by means of the cam handles before referred to. The machine may be thrown out of work at any moment, as the raising of the plate, D, will necessarily lift the lengths of wire out of contact with the periphery of the stone; the driving straps of the pulley, G, will be slackened, and its rotation consequently stopped, whilst the grindstone continues constantly running. The part, L, of the machine is for supplying the needles to be pointed, a number of which are shown as entering between the pulley and the curved support. This part, L, consists of an incline composed of two rods, on which are fitted two plates of sheet metal, which may be widened to suit the length of the needles to be operated upon. So soon as the machine is put in motion, the pulley rolls the several needles one by one in a row, transversely over the periphery of the stone, upon which their protruding ends are pressed in order to be pointed. A pulley is fitted on to each side of the stone, to be used when heavy work is being done. The driving bands are below the stone, which run at the rate of about 1,500 rotations per minute. The pulley, G, makes one turn a minute by the strap above it; the movements of the stone and pulley, G, are not quite at right angles to each other, so that the points may commence at the tips in entering between the India-rubber surfaces, and finish at the after part on leaving the machine at M. This machine will point 500 needles of medium size per minute, 30,000 per hour, or 300,000 per day of ten hours. One workman can attend to two machines, and thus do the work of twenty men by hand labour. Suitable ventilation is applied to carry off the noxious grinding dust arising from the operation, by which means not only is the great point of health secured to the workman, but the machine is thereby rendered far more efficient than it otherwise would be.

THE VICTORIA (ST. LAWRENCE) BRIDGE.

The present autumn will witness the completion of, perhaps, the greatest engineering work of our time: of that great bridge across the river St. Lawrence, of which the Britannia Bridge over the Menai Straits proves to have been but the precursor, as to Americans it will hereafter seem but as the shadow. The Canadians, as may well be conceived, are intensely excited at the prospect of finding their country distinguished by so great a work of science; and throughout the United States, the completion of the Victoria Bridge is regarded as an important event in the history of that New World, which, since its discovery, has been marked by such rapidity of progress.

It may not be uninteresting, at such a time, to recall the circumstances under which this work was undertaken, and to record briefly, the history of its construction. There are many, indeed, who will gaze with wonder on the lofty piers and the stupendous tubes of this structure, to whom its peculiar features may scarcely suggest themselves; yet the greatness of the conception of this design consists, in reality, less in the size and character of the structure itself than in the objects, political, commercial, and scientific, which it is capable of effecting.

The primary necessity of a new country is a road. The better the line of communication, the more certain the new country of success. The greatest boon, therefore, that could be conferred upon Canada, was the construction of a railroad; and those who devised and carried out the project of the Grand Trunk Railway, connecting the different dependencies of the British crown in North America, and passing through the richest parts both of Upper and Lower Canada, for a distance of 1200 miles, must be regarded as great benefactors to the country.

Yet, grand as was the conception of the Canadian Railway, its original design was imperfect. It was not a road through the province alone which Canada required. It needed, imperatively, a facile communication between the north and south shores of the St. Lawrence; railway connection, free from the inconveniences of transhipment, with the United States; and, above all, direct communication with the seaboard of the Atlantic.

A very little consideration of the circumstances of the country will show the imperative character of these requirements. The broad and rapid river St. Lawrence, whilst during the summer months of the year it opens out the whole of Canada to the ocean, for the five winter months, completely isolates the province. Canada, lying to the north of the river thus frozen up throughout its course, is itself commercially as well as physically congealed. During that protracted season no ships can leave or can reach Quebec. With the United States, the communication is, in every sense, of the most frigid character. Up to a very recent period, even intercommunication between different localities of Canada itself was, during winter, maintained with difficulty. To sleigh for 180 miles, as from Quebec to Montreal, was a task attended with no little trouble and with very considerable cost. Of course the transport of goods was impossible. Commercial markets, therefore, were comparatively useless. In fact, the want of means of communication with the outer world, prevented by the frozen state of the great river boundary and highway of the province, deprived the Canadian of nearly one-half of his active existence.

To the Grand Trunk Railway, a direct and uninterrupted communication between the north and south shores of the St. Lawrence was also of vital consequence. Inasmuch as a bridge across the St. Lawrence was the key to the whole province, so, in possession of that key, the Grand Trunk Railway would command the whole external intercourse of Canada; whilst, without it, it must remain a mere provincial line. The tide of immigration sets very much into Canada from and through the United States. The whole of that traffic, so important to the Grand Trunk Railway, would have been lost without the connecting link between Canada and the United States. In the winter season, also, the Grand Trunk Railway kept open, despite snow and frost, by various arrangements and appliances, would command the trade of the province without having to contend with any steamboat competition. To show, by one illustration, the importance of a bridge to the Grand Trunk Railway, it may be mentioned that the Canadian government contribute the large sum of £50,000 a year to the steam-ship company, upon the condition of its opening and maintaining the best direct steam communication between Liverpool and Canada. In the summer months the route can be directed from Quebec; but in the winter that is impossible.

Without crossing the St. Lawrence, therefore, the route for which this handsome subsidy is paid, could not be maintained, and the Grand Trunk Railway Company and the Canadian community would alike sacrifice the advantages of direct communication between Canada and Europe.

These considerations naturally weighed with increased strength upon the Canadian people and the directors of the Grand Trunk Railway as that line approached completion. A bridge they saw that they must have; but the question was, could such a bridge be made?

"The rapid river ran deep and wide;"

and there were not a few who thought that to span it by a bridge would be little better than a temptation of Providence.

The difficulties, indeed, of crossing the St. Lawrence were far from inconsiderable. Its width, even at the most available point, is very formidable: its current is very rapid; its depth not insignificant. Besides this, the navigation of the river, not merely by steamboats and other vessels, but by enormous timber rafts, had to be provided for; so that unusual elevation and unusual width between the piers were both required. There was another obstacle, more formidable—far more formidable—than all. In the winter season the river St. Lawrence presents a field of ice from three to five feet thick. Whilst it is thus frozen, the river rises sometimes as much as twenty feet above its summer level. This rise of water might be provided for; but how was accident to be avoided, at the annually-recurring period when "the breaking up of the ice" exhibits, in North America, one of the most wonderful operations of nature on that continent?

This "breaking up of the ice" in North America, though welcomed as the harbinger of returning summer, is an event which carries with it no inconsiderable amount of apprehension to the mind of the Canadian. From the extreme thickness of the ice in the middle of the river, little or no effect is immediately produced upon it by the action of the sun. But the banks of the river, imbibing the heat, melt away the thinner portion of the ice which touches them, thereby depriving the main body of the support it receives from its contact with the land. Then, when a small line of blue water intervenes between the shore and the river ice, the ice begins to move, first slowly, then more rapidly, until the velocity and power of the current, rapidly increased by the melting of the snow, wrenches the ice upwards, and breaks and tears it into fragments, which, larger or smaller, go floating down the river in masses, bearing before them almost everything which they encounter.

Dismal tales are rife in Canada of the fatal disasters which have occurred to life and property by "the breaking up of the ice." The city of Montreal has especially suffered from these fatalities. Before now, the ice has burst into that city and been found sliding down its streets. It has broken into the second-floor windows of dwelling-houses after blocking up the front doors for weeks. It has forced down river terraces and spoilt public and private gardens. Large warehouses, erected without due protection on the banks of the river, have been pushed over by the great moving sheets of river ice, as if they were mere houses of cards. At sudden bends of the river, where the ice meets with obstruction, it piles itself, sometimes, into huge icebergs, from fifty to eighty feet in height. At length, when the river rises, these icebergs get again into its current, and go rolling and sweeping down the St. Lawrence, carrying danger and destruction all before them.

Could any bridge be devised to withstand these formidable difficulties? If possible, how was such a bridge to be constructed? The directors of the Grand Trunk Railway, to whom these questions were so vitally important, took a course which will probably be thought to redound greatly to their enterprise and sagacity: they determined to take the opinion of the most eminent engineer whose advice and counsel they could obtain.

The Britannia Bridge across the Menai Straits was opened in 1849; and it was not, therefore, unnatural that in 1852 the directors should look to Mr. Robert Stephenson as the engineer most competent to advise them. Mr. Stephenson considered the subject of so much interest and importance, that he determined to go out to Canada, personally, for the purpose of dealing with it. He accordingly repaired there at the end of the summer of 1853, and, after examining into the facts, made a public declaration of his opinion, that a bridge across the St. Lawrence was practicable. On the 2d of May following, Mr. Stephenson addressed to the Grand Trunk Railway directors a report, in which he considered the whole question in three branches: first, as to the description of bridge best calculated to prove efficient and permanent; second, as to the proper site; and, thirdly, as to the necessity for such a structure. Upon the first point he did not hesitate at once to recommend the adoption of a tubular bridge, as the description of bridge best fitted for a permanent, safe, and substantial structure in such a situation; on the second point, he was not a little influenced by considerations affecting the flow of the river and "those almost irresistible forces" consequent upon the breaking up of the ice in spring.

As Mr. Stephenson's view of the nature of these forces, and the best mode of encountering them, has not yet, that we are aware of, received publicity, it may be interesting to place them upon record, especially as we are enabled to do so *with authority*. Mr. Stephenson, on his arrival in Canada, met with numerous alarmists, who could graphically describe to him the effect of the ice, but he met with no one who had in any way measured or calculated the amount of its pressure. In considering the question whether a bridge could be constructed to withstand that pressure, it appeared to Mr. Stephenson to be of primary importance to ascertain really and precisely what that pressure was. This was a question of calculation; though, in the absence of any data, the difficulty was how to calculate it. And here, before the reader proceeds further, he may, perhaps, not without advantage, pause for a moment to ponder on the way to solve the problem—what is the amount of the pressure of ice four or five feet thick in a running stream of a certain inclination, velocity, and breadth?

This problem puzzled Mr. Stephenson himself at first; but it was not long before he hit on an expedient. He first got at the inclination of the river; next at its velocity. He then assumed that the ice upon that river was what they told him it usually was, from four to five feet thick. He then inquired into the condition of the river, and he found that, about nine miles above Montreal, there was a fall called the Fall of Lachine, which, of course, separated the body of ice above the fall from the body of ice below it. Taking these data, he calculated what would be the pressure of nine miles of ice, from four to five feet thick, lying on a plane of a given inclination, and pressing against the piers of a bridge across the channel. The result of that calculation in figures it would be unnecessary, even if it were possible, to state; but, whatever were the figures, they enabled Mr. Stephenson at once to realize one all-important fact. He arrived at the conclusion that "the almost irresistible force" of this mass of ice would crush or sweep away any ordinary bridge, and that all the suggestions previously made for encountering the difficulty were only likely to result in disaster if carried into effect.

For, up to the period of Mr. Stephenson's report, great difference of opinion existed in Canada and elsewhere as to the probable effect of the ice pressure. One party held that no bridge whatever could stand against it; another, whilst admitting the difficulty to be formidable, thought timber casings or fenders, such as those in use on the small rivers of Norway and elsewhere, would be an efficient protection for the piers. The proposal most forcibly impressed on Mr. Stephenson was to protect his piers by what is called a "crib-work;" that is to say, by large masses of timber in front of the piers, crossed and weighted, and as thick or thicker than the ice itself. It was evident, from the first, that this extensive crib-work must be an additional obstacle and impediment to the free navigation of the river, and to the passage of the ice. But, beyond this, Mr. Stephenson's calculations convinced him that such a work would be entirely inadequate to protect such a structure as he contemplated, in such a river as the river St. Lawrence; and that, even if the crib-work stood, it would be subject to such abrasion and wear and tear, from its conflicts with the ice, that it would require to be reinstated at least every two or three years. It was more than doubtful to his mind if such an arrangement would be capable of resisting the ice at all; and if it did not, the capital of the company would be wasted. Mr. Stephenson, therefore, at once determined that such a work was undesirable; and that such enormous stakes as those at issue could not be left dependent upon the uncertainty of such an expedient.

The abstract methods he had taken to ascertain if any bridge would withstand the almost irresistible pressure of the ice, had not alone convinced Mr. Stephenson that no such projects would avail as those proposed in Canada. They had equally satisfied his mind as to the amount of resistance requisite to encounter the pressure against which it was needful to provide. Knowing what timber would not resist, he equally knew what resistance could be afforded by substantial masonry. "Cribs" he felt were useless; but there were methods by which the pressure could be resisted independently of "cribs." Mr. Stephenson decided on the adoption of stone piers, to carry the tubes at wide intervals, each pier having, on the side opposed to the course of the stream, large cut-waters of solid stone work, inclined against the current, up which, as it were, the ice would creep, and break itself to pieces by its own weight and pressure. He arranged that these wedge-shaped cut-waters should present angles to the ice sufficient to separate and fracture it as it rose up upon the piers, but at the same time so obtuse as not to be liable themselves to fracture. These piers, therefore, were devised to answer the double purpose of piers and ice-breakers. They exhibit, as now constructed, every indication of massiveness and power to resist pressure as well as of stability to support the superstructure. Experience, indeed, has proved the piers suited for all the purposes for which they were designed. During the four years the structure has been in progress, it has entirely fulfilled all the conditions its originator anticipated; and it has withstood, in the most satisfactory manner, the most violent pressures which have followed the break-up of the ice.

Whilst these piers of the bridge are thus peculiar in their design, in order to meet the peculiar circumstances of the country and climate of Canada, the superstructure, which creates in America so much surprise, is an elongated repetition only of the design for the Britannia Bridge.

The Victoria Bridge is indeed remarkable for its extreme length, but its several tubes are not so long as those of the Britannia Bridge, and are only otherwise distinguishable inasmuch as that they are the longest tubes yet constructed without the adaptation of the cellular principle. It deserves notice, however, that these tubes, in all their details, were designed, plate by plate and rivet by rivet, in the office of Mr. Stephenson, aud were calculated for every strength and strain, and prepared and arranged in all their details, under the sole superintendence and supervision of his relative, Mr. George Robert Stephenson. With such nicety were all the arrangements respecting these plates conducted in this country that, under the directions of that gentleman, every plate and piece of iron was punched in England before it was sent out to Canada; and elaborate and detailed drawings and instructions were sent by the same hand to show the method of connection. On the arrival, therefore, of each separate cargo of iron in Canada, little remained to those upon the spot but to fasten together the various pieces, and place them in their order and position as directed.

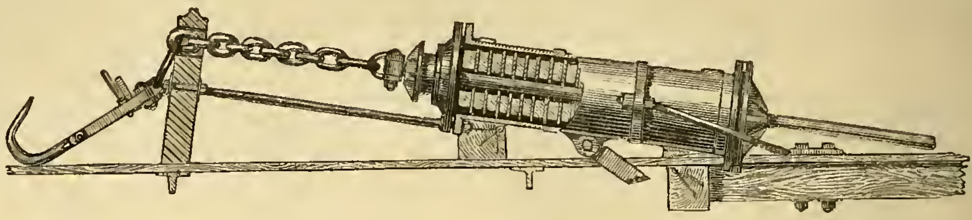
So entirely, indeed, have the details respecting the tubes been conducted on this side, that it has not only devolved on Mr. G. R. Stephenson to examine the quality of the iron at the iron-works, but to superintend the construction of the plates at the manufactory, and to issue instructions for putting the pieces together. Upon him has devolved the duty of seeing to the shipment of each tube as it was completed, and of signing the certificates for payments, not alone to the contractors, but also to the resident engineers and other officials in Canada, who were employed and paid under Mr. Robert Stephenson's directions. It is most gratifying that, from first to last, the design has been carried out harmoniously and efficiently by all concerned. Great credit is due to Mr. Alex M. Ross, who was appointed the resident engineer to superintend the bridgeworks in Canada, and who has especially devoted himself to the erection of the masonry; and to Mr. Hodges, who, from the commencement, has most efficiently and honourably represented Messrs. Peto, Betts, and Brassey, the contractors, and on whom has devolved the principal responsibility in the execution of the works, as well as to Mr. Stockman, who in the early part of the present year, went to Canada, accompanied by Mr. S. P. Bidder, to make a full inspection and detailed report upon the works — a duty which was performed in a manner eminently calculated to satisfy the miuds of the engineers and of the public.

It is not the object of the present preliminary paper to enter into the fuller statement, which will hereafter be given, of the dimensions of the bridge, of its quantities, and of the various details connected with its construction. The present object is rather to exhibit the theory upon which it was commenced and carried forward. One remark, therefore, in conclusion, is alone necessary. Canada owes this bridge to one mind —the mind of Robert Stephenson. Had that eminent engineer expressed the smallest doubt or apprehension, the directors of the Grand Trunk Railway would have shrunk from involving their company in an expenditure of a million and a-half of money to carry a bridge across the St. Lawrence. Until Mr. Stephenson had satisfied the Grand Trunk Company, they would not entertain the idea of constructing such a bridge, and unquestionably, Mr. Stephenson would never have satisfied the company unless he had thoroughly satisfied himself. It was the reliance of the company on Mr. Stephenson's experience and professional reputation, that induced them to commence the bridge; and having pledged that experience and reputation, Mr. Stephenson, who would have been responsible for failure, is entitled to the full meed of honour and of fame which must hereafter attach to the successful execution of so great a work. He has indelibly inscribed his name on the structure which resists the ice of the St. Lawrence.

Great preparations are now being made for the opening of this splendid structure on a grand scale. Who can either hear of, or witness this, without deploring deeply that Mr. Stephenson is not alive to take part and rejoice in it.

DRAW SPRING FOR SHIPS' CABLES AND TOW-LINES, AS APPLIED TO THE "*AJAX*" TUG BOAT.

The object of this invention, which has been extremely well carried out in practice by Messrs. Fletcher, Jennings, & Co., of the Lowca Engine Works, Whitehaven, is to counteract the sudden shocks and jerks to which ships' tow-lines are subjected, especially in stormy weather, where instances are of frequent occurrence in which vessels are lost through the breakage of the tow-rope. It is also applicable with a similar view to the cables of vessels riding at anchor. The engraving represents the apparatus as applied to the *Ajax* steam tug, a vessel belonging to the trustees of Whitehaven harbour. Our engraving represents the arrangement partly in section through the main cylinder and guide bracket, to show the elastic details, and the arrangement for



guiding the chain. It consists in this instance of a cast-iron cylinder, four feet six inches long, and twelve inches diameter, containing a number of discs of India-rubber, with a plate of iron between each; these alternated discs being acted upon by a piston, which is connected by means of a rod and chain to the hook to which the tow-rope is attached. This chain is guided by an inclined cast-iron bracket, bolted down on the deck; the main cylinder is also bolted down upon suitable beams on deck, and it is further secured by means of a stay, which passes downwards in an angular direction to the keelson. There are two end disc pieces of India-rubber to receive the back lash, in case the spring be from any cause suddenly released from its tension. Other modes of connecting the tow-line with the spring have suggested themselves in place of the chain, but this has not been found objectionable in practice, as the links are made very short to enable them to work freely through the guide. The identical spring from which our drawings were made has now been at work for four months on board the tug *Ajax*, of Whitehaven, and its operation has been found most satisfactory. The scale of our engraving is three-eighths of an inch to the foot.

THE LAW AS TO PATENTS FOR INVENTIONS IN BRAZIL.

The following is an abstract of the Brazilian Patent Law, to which we may direct the considerate attention of inventors and patentees:—

Article I. The law assures to the discoverer or inventor of any useful industry the proprietary and exclusive use of his discovery or inventio .

II. He who will improve a discovery or invention has, in the improvement, the right of a discoverer or inventor.

III. To the introducer of a foreign industry will be granted a reward proportioned to the utility and difficulty of the introducti n.

IV. The right of the discoverer or inventor will be confirmed by a patent allowed gratis, payment only to be made for the seal and workmanship; and to obtain it—

1. He will show, by a writing, that the industry to which it refers is of his own invention and discovery.

5. He will deposit in the public archives an exact and certain exposition of the means and process he has employed, with plans or delineations, drawings and models, to explain it, without which the subject cannot be exactly elucidated.

V. The patents will be granted according to the qualities of the discovery or invention, for a term of five to twenty years, a special law being required for a longer time.

VI. If the Government will buy the secret of the invention or discovery, he will order it to be published; but in case of only having granted a patent, the secret will be concealed till the expiration of the term allowed to the patent.

VII. The infringer or transgressor of a patent will lose the instruments and products; and will, besides, pay a fine equal to the tenth part of the value of the products manufactured, the costs being always subjected to the indemnification of loss and damages. The tools, instruments, products, and fine, will be given up to the owner of the patent.

VIII. He who possesses a patent may dispose of it as he likes, using it himself, or pass it to one or several persons

IX. In case of there being two or more applicants for a patent (interested in the same inveution) it will be granted to them collectively.

X. All patents will be finished and without effect, upon—

1. Being proved that the possessor has not been faithful and true in what he has said, or has been short or abridged, concealing any essential matter in the exposition or explanation made to obtain the patent.

2 Being proved not to be the original inventor or discoverer.

3. If the invention or discovery is not put into operation withiu two years after the granting of the patent.

4. If the inventor or discoverer has already obtained a patent in any foreign country; but in such a case, he will obtain, as an introducer, the right of the reward established in Art. III.

5. If the goods or objects made or manufactured are proved to be prejudicial to the public good or contrary to the laws.

6. Making public or using the invention before the patent is obtained.

XI. The Government is authorised to order the patents to be passed according to the provisions of the present law, the King's attorney being always heard on it, &c.

XII. All the laws and provisions to the contrary are revoked.

NEW PLASTIC METALLIC ALLOY.

This metallic alloy, which has been discovered by M. Gersheim, not only adheres forcibly to other substances or compositions, such as glass and porcelain, but serves also to unite them in the same way as mastic. After ten or twelve hours, this plastic alloy attains a hardness which renders it capable of bearing a high polish, similar to silver or brass.

In preparing this alloy, oxide of copper is reduced by means of hydrogen, or sulphate of copper is precipitated with zinc parings. By this means a pure copper is obtained, twenty, thirty, or thirty-six parts of which are taken according to the hardness desired—the more copper in the alloy the greater being the hardness thereof. This is moistened in a cast-iron or porcelain mortar with concentrated sulphuric acid, of a density of 1·85. To this species of metallic paste are added seventy parts by weight of mercury—the mass being kept continually stirred or agitated. When the copper is completely amalgamated, the composition is washed with boiling water to remove the sulphuric acid; it may then be left to cool, and ten or twelve hours will be sufficient to render it hard enough to bear an excellent polish, and to scratch tin and bone. It is not acted upon either by weak acids, alcohol, ether, or boiling water; and its density remains the same whether it is plastic or hard. When required as a mastic, it may at any time be reduced to a soft and plastic condition by submitting it to a heat of about 375° Centigrade, and working it in an iron mortar, heated to about 125° Centigrade, until it has attained the malleability and consistency of wax. If in this state it is placed between two metallic surfaces well freed from oxidation, it will unite them so perfectly that in ten or twelve hours afterwards they may be submitted to any usage. This composition, in a soft state, may also be poured into hollows, into which it will adhere forcibly after it has hardened, as it is found that it does not shrink in changing its condition.

The peculiar properties of this alloy admit of its application to a great variety of uses, but it is especially useful in the uniting of metallic surfaces where it would be inconvenient to employ heat for soldering or brazing the parts. Whilst on this subject, we may mention that Professor Pettenkofer, of Munich, discovered a sure method of preparing the amalgam of copper, which is now employed by dentists in stopping teeth, as far back as 1845.

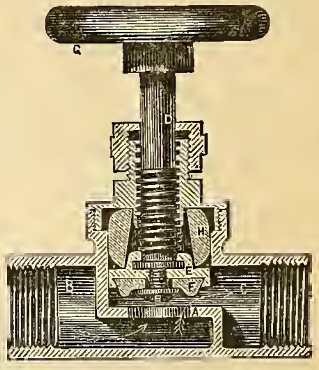
RECENT PATENTS.

COCKS AND VALVES.

Henry Brecknell *and* John Dyer, *Bristol.—Patent dated January* 25, 1859.

According to this invention, the passage of the cock or valve is closed by a vulcanised India-rubber washer or disc, having an annular lip or projection moulded thereon, which lip or projection forms the actual contact surface of the washer when the cock or valve is closed. The India-rubber washer or disc is bevelled at its circumference, to fit into a corresponding dove-tailed recess, formed in the under face of a metal disc or holder, and is further retained therein by a central screw. This disc or holder is attached so as to turn freely on one end of a screw spindle, passing through a stuffing-box in the screwed cap of the body or valve chamber of the cock, or in the place of an ordinary stuffing-box, a ring of vulcanised India-rubber may be introduced inside the chamber of the cock or valve above the disc or holder, and surrounding the screw spindle, which ring bears against the underside of the cover. This ring of India-rubber serves also as a protector to the thread of the screw spindle, which is thus preserved from the deteriorating action of the steam or fluid passing the cock or valve. In the case of steam valves the ordinary stuffing-box is used in combination with this ring

The entrance to the body of the cock or valve is at the centre of the base of the valve chamber, which part is composed of or coated with block tin, to prevent the rubber from adhering to the metal surface. The exit or discharge is from the side of the body or valve chamber, but the positions of the exit and entrance orifices may obviously be reversed. The cock or valve is opened and closed by simply turning the spindle, which has the effect of raising the washer from, or depressing it down upon, the valve seat in the base of the valve chamber, thereby uncovering or covering the inlet orifice.

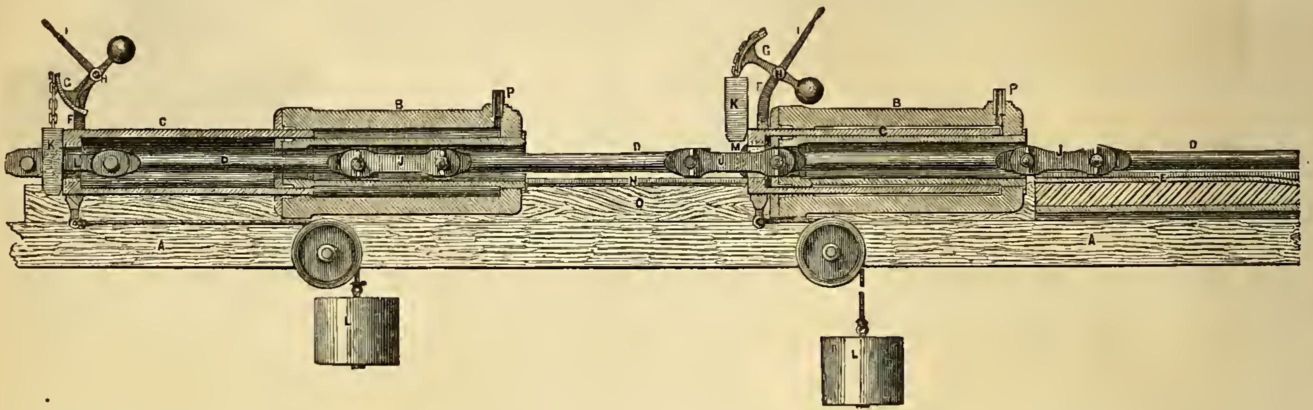


Our engraving represents a longitudinal vertical section of a steam valve constructed according to this invention. A, is the seat of the valve, of which B, is the inlet, and C, the outlet pipe. A screw spindle, D, passed through a stuffing-box, has fitted loosely on to its lower end the metal disc or holder, E, which has a dove-tailed circular recess formed on its lower face, for the reception of the correspondingly shaped or bevel-edged vulcanised India-rubber washer, F. This washer, which fits the recess in the disc, E, and is tightened and retained therein by a central screw and washer as shewn, the screwing up of which expands the India-rubber, and causes it to fit tightly in the disc. A projecting annular lip or rim is formed on the face of the washer, which lip forms the contact surface of the valve, and when screwed down by the spindle, D, rests upon the valve seat, A. The upper end of the screw spindle, D, carries a hand-wheel, G, for the purpose of opening and closing the valve. In order to preserve the screw thread of the spindle, D, from the destructive action of steam or liquids, and to prevent leakage, the lower portion of the spindle is enclosed within a ring, H, of vulcanised India-rubber, which fits between the upper surface of the metal disc, E, and the underside of the screwed cap or cover of the valve cock. In some cases this ring, H, will be found to answer as a substitute for a stuffing-box, but in the case of steam valves, we prefer to use the stuffing-box in addition to the ring. The valve seat, A, or the part upon which the India-rubber washer, F, rests, is composed of, or coated with, block tin, to prevent the adhesion of the rubber with the metal. It is obvious, that in place of using a vulcanised India-rubber valve, in conjunction with a tin or tinned seat, the seat itself may be composed of India rubber, as described in reference to the valve, and the valve composed of tin or a disc of tinned metal, or both the seat and valve may be composed of vulcanised rubber.

HYDROSTATIC APPARATUS FOR RAISING AND LOWERING SHIPS.

Thomas White *and* George Jenkins, *Portsmouth.—Patent dated February* 12, 1859.

The patentees' improvements relate to a peculiar construction and arrangement of hydrostatic apparatus, whereby a continuous heaving and lowering action is obtained in raising or lowering ships from or into the water along an inclined slip. According to one mode of carrying out this invention, it is proposed to employ two or more hydrostatic cylinders placed in the same longitudinal axial line, and furnished each with a tubular ram or trunk, through the centre of which passes the traction rods or chains. Each ram or trunk is furnished at one end with a stopper, connected with a weighted lever, and so arranged that it is free to be entered into the joints of the traction rods or chains when the ram is to act thereon, and to be raised or released therefrom when the ram is no longer required to act, or is making its return or back stroke. The several cylinders and rams are so worked that one comes into action just before the other has completed its stroke, so that the hauling or lowering motion of the traction rods or chains will be continuous. As each ram arrives at the end of its forward stroke, it presses upon a catch which opens an escape valve for the escape of the water behind it, whilst it is run back by the action of a separate small cylinder, worked by the force pumps or by a counter weight. In lowering a ship the water is allowed to escape slowly from the cylinders through a small adjustable aperture made for that purpose in each cylinder. The subjoined engraving represents a longitudinal vertical section of two of the hydrostatic cylinders and rams, with a length of traction rod in complete working order. A, is a strong timber foundation or way, upon which are securely bolted two or more horizontal hydrostatic cylinders, B. These cylinders are made with an annular water space, so as to receive the hollow or tubular rams, C, through the interior of which pass the traction rods, D. These rods are supported upon the central guide rail, E, and pass down the inclined slip to the cradle which supports the vessel. On the head of each of the rams is fitted an upright bracket or standard, F, which carries a weighted segment lever, G, working on the spindles, H, to which latter are keyed the hand levers, I. To the upper portion of the segment is suspended by a chain the stopper, K, which is so formed and placed as to be capable of dropping into the space contained between the short links, J, which occur at regular intervals in the traction rods, D. These stoppers should be sufficiently strong to stand the strain of the ship when on the cradle, and of a length sufficient to extend diametrically across the mouths of the rams as shewn in the left hand cylinder of the engraving, where the stopper, K, is represented as down in its place across the ram, and between the links of the traction rod, the head of the long link and the joint pin sustaining the entire strain upon the rod when in the position shewn. The stoppers and weighted levers are so constructed, that the lever elevates the stoppers when no strain is upon it, as shewn in the right hand cylinder, where the stopper is elevated, and is about to be lowered by turning the hand-lever, I, the joint in the traction rod being in a suitable position to receive it. L, is a heavy counterweight connected by a chain or rope, passing over a guide pulley



to the head of each ram, C, so as to run back the rams on the completion of the stroke. In order to prevent undue straining of the rams, and to guide and support them as they are gradually forced out of the cylinders, a stud bracket is fixed on each side of the head of each ram, to carry a pair of antifriction and supporting rollers or pulleys, M, which run along guide rails, N, laid for that purpose on the timber, O; or metal slides may also be used as guides in place of these wheels and rails. P, is the inlet pipe of each of the cylinders, the water escapes through the same pipe for a short distance, and the supply cock is a three way cock or slide, which will either open the water supply and close the discharge, or *vice versa*, according to the position of the plug or slide of the cock or valve. By having these pipes placed at the top side of the cylinders, the cylinders will always remain charged and ready for action. In raising a ship up an inclined slip by means of this apparatus, the traction rod, D, having been properly secured to the cradle, is coupled by means of the stopper, K, to one or more of the rams of the series. Water is now pumped into the cylinder or cylinders of the ram or rams, which immediately commence to exert a powerful tractive strain upon the cradle, and raise the ship along the slip. Just before the first ram or set of rams has completed the outward stroke or traverse, the second ram or set of rams is coupled as before with the traction rod and begins to operate, continuing to exert a tractive force upon the rod during the time that the first ram or set of rams is being run back by the action of the counterweights, L, the outlet orifice having been opened by a self-acting catch on the arrival of the ram head at the end of its stroke. Or in lieu of counterweights, each cylinder may be combined with a smaller or reversing cylinder, the ram of which is connected with the main or lifting ram, so that on forcing water in the reversing cylinder the main ram will be carried back again inside its cylinder, the water escaping freely therefrom through an outlet for that purpose. Immediately a ram commences to make its back or return stroke, the consequent release of its stopper, K, will allow of its being elevated out of the way by the weighted lever, G. When the ram is run home, and the traction rod has arrived at a suitable position, the attendant, by turning the lever handle, I, brings the stopper, K, down into its place again, and the ram is ready for its next stroke or lift. It is thus obvious that the heaving action will be exerted in a constant and unvarying manner upon the ship, there being no stoppages as heretofore in the action of the apparatus, which is one of the most important advantages obtained by the use of this arrangement, since it is well known that in the case of large ships, the sudden jerks and strains attendant upon an intermittent method of traction, operate most seriously upon the ship, by subjecting her to violent straining and shaking each time, the *vis inertiæ* of the mass has to be overcome. Another advantage coupled with the last, is the great saving of time effected in the operation, as the haulage is constant, and no time is lost in readjusting the parts. The operation of lowering a ship is the same as that for raising it, but simply reversed. In this case also, the outlet orifices in the cylinders are adjusted by suitable cocks or valves, so as to regulate the escape of the water from the cylinders, according to the speed at which it is considered safe to allow the ship to descend, which will, of course, depend upon its size. Whilst one ram is descending and slowly letting down the ship, another is being forced out in readiness to be coupled with the traction rod by the time the other has got home, the second ram then begins to lower, and the first rises to be in readiness for another hold upon the rod. Thus the lowering action is equally continuous and steady with the raising action. In place of using annular cylinders and tubular rams, a series of ordinary cylinders and rams may be employed, arranged in pairs, and having the traction rod working between the cylinders. In this case the rod is connected to a crosshead, which extends across from one ram head to the other in each pair.

In the drawings appended to their specification the patentees show another form of cylinder and ram, applicable to flat gradients or levels, and capable of working in both directions, or double-acting. The ram in this modification consists of a trunk, open throughout, and having a piston turned thereon, which fits accurately into the bored cylinder, and fitted with leather packing. A tight fitting cover is bolted on to each end of the cylinder, and each end of the ram is provided with a stopper and weighted segment lever, similar to those delineated in our illustrative figure. In this arrangement the traction rod passes through the centre of the ram as before, but is capable of engagement therewith at either end, thus affording facility for working in both directions, as may, in some cases, be found requisite. According to another arrangement, a set of ordinary cylinders and solid rams may be used in conjunction with two sets or lines of traction rods, the one on one side of the cylinder, and the other on the opposite side, suitable cross bars connecting the two sets of rods and enabling them to be coupled with the rams.

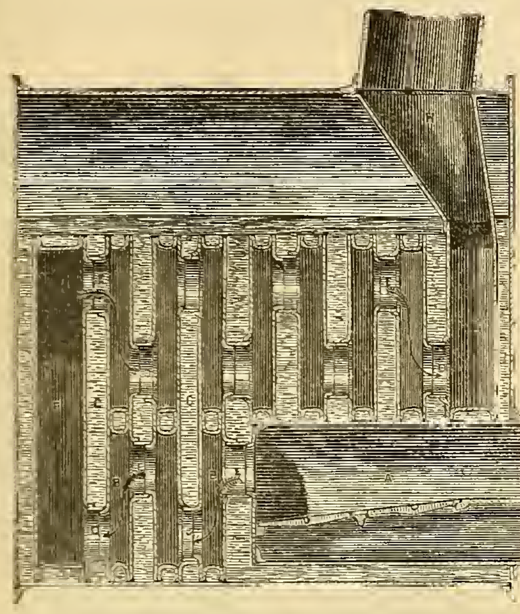
STEAM BOILERS.

Thomas Hunt, *Crewe.—Patent dated February* 14, 1859.

These improvements consist, firstly, in the application and use of transverse flue spaces or chambers, having one or more openings made through each, but so arranged, that the openings in one chamber are not exactly opposite to those of the next chamber, the whole being placed in the barrel or circular portion of the boiler of a locomotive engine, or in that portion of a multitubular boiler usually occupied by the tubes and flues. In a circular, cornish, or marine boiler, with one or more flues through, the partitions commence at the bridge end of the flue and extend then along the entire, or a portion of, the length of the flue or flues. Secondly, in the combination of the above described transverse chambers with tubes, the latter being fixed at the end of the boiler or flues, or transverse chambers next the chimney. Third, in arranging the transverse flue spaces or chambers in boilers having two or more furnaces or flues, in such manner, that one set of transverse chambers may be used in common to all the furnaces, or have a separate series of chambers to each as may be deemed necessary. Fourth, in the constructing the fire-boxes of multitubular or locomotive boilers with a water space or midfeather attached to the tube plate and to the crown plate, such water space projecting a portion of the distance towards the opposite side of the fire-box, by which the direct current of the gases is diverted from the entrance to the transverse partitions or flues, and thrown towards the fire door plate, through which, or the side-plates, atmospheric air is admitted so as to ensure the prevention or combustion of smoke.

The accompanying figure represents a longitudinal vertical section of a marine boiler, provided with several series of transverse divisions or flue spaces, and arranged according to the patentee's improvements. Each of the boiler furnaces, A, opens into a separate series of transverse flue spaces or chambers, B, disposed inside the outer shell of the boiler in such a manner as to leave a water space, C, between each chamber.

The several chambers in each series are connected by passages, D, arranged so that no two consecutive passages come opposite each other, by which means the flame and products of combination are caused to make a zigzag course, and to traverse the length of each individual flue space or chamber. The passage or openings, E, connect the first or front chamber of each series with its respective furnace, the lower portion of



such passage or opening forming the fire-bridge. The last of each of the lower series of chambers, B, opens into the lower portion of the transverse chamber, F, which may, if required, be common to all the chambers, or otherwise. The upper portion of this transverse chamber communicates with the several series of transverse flue spaces or chambers, which are placed above and rest upon the lower series, B. The upper series of chambers, are of precisely the same construction and arrangement as the lower ones, and finally terminate in the up-take, G, leading to the chimney, H, the up-take being common to all the furnaces and series of flue spaces.

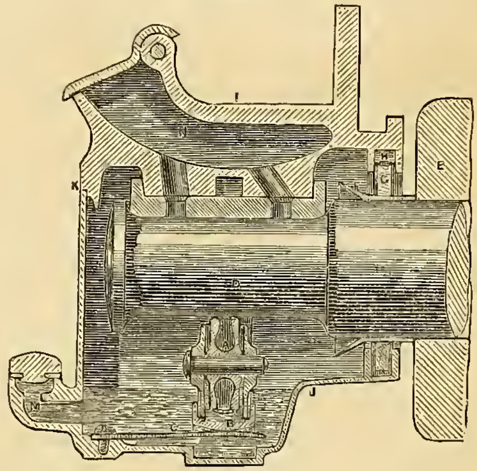
AXLE BOXES AND BEARINGS.

J. H. Johnson, *London and Glasgow* (J. Vallot, *Paris*)—*Patent dated March* 2, 1859.

These improvements relate to a peculiar construction and arrangement of the gear boxes of railway carriages and waggons, and of bearings generally, so as to obtain a better lubrication of the working parts of the axle or shaft, whilst the escape of the lubricating material is avoided, and the entrance of dust or other foreign matters into the bearings effectually prevented. In applying these improvements to railway axle boxes, the junction between the upper and lower halves of the box, (when made in two parts,) should be always placed above the level of the rubbing surfaces, so as to effectually preclude the escape of the lubricant at the point of junction of the two portions of the box. A constant and regular supply of oil is obtained by using a pulley or roller, the periphery of which is slightly recessed and filled with felt or other suitable absorbent material, whilst its interior (if made hollow,) may be filled with cotton waste. This pulley rotates within a trough, which may be either supported by a blade spring or by a weighted lever, so as to bear it up constantly, and thereby press the periphery of the pulley against the underside of the axle journal, which by its rotation imparts a rotatory motion to the pulley. At the bottom of the trough, which rests upon a saddle piece on the spring above referred to, there is a strainer of wire gauze or other suitable material, and when the lower portion of the axle-box is supplied with oil, the bottom of the trough and lower portion of the pulley enclosed within it will be immersed therein, the oil straining itself from impurities, by rising up through the strainer in order to enter the trough. By enclosing the pulley in a trough as described, the oil is not wasted by being scattered or thrown by the rotation of the pulley over the interior sides of the axle-box. In order to prevent the oil escaping at the part where the axle enters the back of the box, a trumpet mouth or metallic cone is fitted upon the shoulder of the journal, the mouth piece of the cone projecting inside the axle-box, so that any oil carried along the journal towards the back of the box will be arrested by the cone, and will drop down into the oil reservoir below, to be again strained and applied to the journal. A wooden shield divided vertically down the centre, and having its two halves held together by a spring, is fitted on to the shoulder of the axle at the back of the box, and is maintained in position by being let into recesses or grooves formed in the sides of the back part of the axle-box. By this means the entrance of dust is effectually prevented. When applied to ordinary bearings the lower brass should have an opening made therein, to allow the lubricating pulley to bear upon the under surface of the journal.

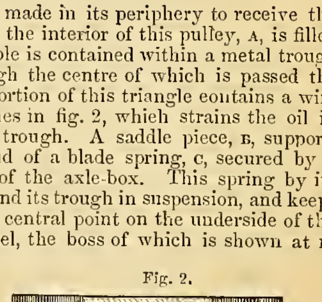
Fig. 1 of the subjoined engravings represents a longitudinal vertical section of a railway axle-box, constructed according to this invention, Fig. 2 is a transverse vertical section of the box. A, is a roller or pulley, which may be made either hollow, as shown, or solid, and composed of any suitable metal. This pulley is covered by a band of felt or other

Fig. 1.



absorbent material, a groove being made in its periphery to receive the felt, which is countersunk therein; the interior of this pulley, A, is filled with cotton and waste, and the whole is contained within a metal trough or reservoir, shown in fig. 2, through the centre of which is passed the spindle of the pulley. The lower portion of this triangle contains a wire gauze strainer, shewn in dotted lines in fig. 2, which strains the oil in which the pulley, A, rotates in the trough. A saddle piece, B, supporting the triangle, rests upon the end of a blade spring, C, secured by a screw to the bottom of the shell of the axle-box. This spring by its elasticity maintains the pulley, A, and its trough in suspension, and keeps the former in constant contact at a central point on the underside of the journal, D, of the axle of the wheel, the boss of which is shown at E. A cone or trumpet mouth, F, is fitted tightly on to the shoulder of the journal, its function being to catch any oil which may tend to escape towards the boss of the wheel, and to return it again to the main oil chamber in the axle-box, to be again strained through the strainer before entering the trough carrying the pulley, A. The cylindrical portion of the cone, F, which clasps the axle, is embraced by a wooden collar, G, made in two parts, being divided through the centre in a vertical direction. This collar fits accurately, but with slight friction round the cylindrical portion of the cone. The two halves of the collar are kept in constant contact along the junction line, by the

Fig. 2.



pressure of a blade-spring, H, secured to the top edge of the collar. Two cheeks serve to maintain the collar in its vertical position during the running of the axle. This arrangement effectually prevents any foreign body from entering the back of the axle-box, which the inventor proposes to construct in two portions, namely, an upper portion, I, and a lower portion, J, connected by a perfectly dry joint at K, and held together by two bolts passing vertically through the two snugs, L. By thus forming the junction of the two parts of the box above the rubbing surfaces, it obviates all loss from the escaping of the oil, and enables any one to examine the state of the journals without the necessity for raising the locomotive or carriage for that purpose. In front of the lower portion, J, of the axle-box, is a cup, M, fitted with a stopper or cone packed with leather, through which the oil is supplied to the axle-box, and the proper level maintained therein. It is proposed to retain in the upper portion, I, of the axle-box, the ordinary grease box, N, which may be used should circumstances require it, or the oil in the lower portion run short. In place of fitting the lubricating pulley and trough with a spring, as hereinbefore described, they may be carried with the strainer on the end of a lever, O, (shewn in dotted lines in fig. 2,) having its fulcrum carried on the lower part of the box, above the level of the oil at its outer extremity; the inner end of the lever being attached to the pin of the pulley, carries a counterweight, P, which keeps the pulley in constant contact with the journal. The edges of the bearing brasses are chamfered at Q, by which means the oil applied to the centre portion of the journal by the pulley, A, is spread or directed evenly over the entire surface of the journal. In applying this system of lubricating to fixed bearings or plummer blocks, an oil reservoir is connected to the plummer block, in a similar manner to that adopted for connecting the lower with the upper portion of the axle-box, as before described, and the lower brass should be made with an opening therein, for the purpose of admitting of the lubricating pulley bearing against the underside of the journal.

MANUFACTURE OF CAPSULES.

William Betts, *City Road, London.—Patent dated January* 15, 1859.

The ordinary metallic capsules are made of a flexible compound metal, namely, lead coated with tin, and when placed over the top of a bottle they can be pressed by a cord into the unevenness of the neck of the bottle, and cannot readily be removed without destruction. The improved capsules are made of the same material, but considerably stouter or thicker than ordinary capsules, perhaps of twice the substance of the thickest capsules usually manufactured, and they are raised by stamping in the ordinary manner. A mandrel having on it an external screw of the same size as a screw formed on the neck of a bottle, to which it is intended to apply the improved capsule, is then taken, and the capsule being placed on the screw mandrel, the mandrel and capsule are then caused to rotate by suitable means, and at the same time, by the action of the screw they are moved in a lateral direction. A small disc is then pressed against the capsule, which forces it into the indentations of the screw mandrel, and at the same time embosses the raised portions of the screw, and a stiff screw capsule is then formed. This improved capsule can be applied to the mouth of the bottle, having a screw on its neck, and removed from such bottle by unscrewing the same without destroying it. In some cases when it is desired to make a perfectly air-tight joint, the top of the capsule is lined with cork or other suitable material.

Fig. 1 of the subjoined figures represents a longitudinal elevation of the apparatus which the patentee employs in the manufacture of capsules, according to the improved process, and fig. 2 is an end view of the same. A, is a metal frame resembling a lathe head-stock, which carries two bearings, B, furnished with brasses, C. These bearings carry a horizontal mandrel, D, capable of rotating and also of sliding longitudinally for a short distance within them. At one end of this mandrel is fitted the crank handle, E, and at the other end is formed a screw thread, F, cut to correspond to that which it is desired to form on the capsule. An arm or horizontal handle, G, working on a centre at H, has fixed to it by a binding screw, I, the tool, J, which carries at its end by a pin the revolving disc, K. This disc is made in two parts, which can turn independently the one of the other. A bar, L, capable of revolving partially round the centre, M, carries a slide, N, which is pressed forward by a spiral spring, O. The apparatus is worked in the following manner:—the bar, L, is turned to one side, and the capsule to be screwed is placed over the end of the mandrel, D; the slide, N, on the bar, L, is then drawn back, and the bar returned to its proper position again, so that the end of the slide, N, (when released,) presses the capsule firmly against the end of the mandrel. The bar, L, is kept in its place during the operation by the retaining spring, P. By means of the handle, G, the tool, J, is brought against the capsule, which is thus indented, that portion of the disc which is of the larger diameter entering the indentations of the screw, whilst the other part which is milled on its surface rests on the top of the thread. By turning the crank handle, E, every portion of the periphery of the capsule is then brought under the action of the tool, the mandrel being caused to traverse longitudinally at the same time by a wooden block, Q, having a portion of a screw thread cut in it, in which the screw on the mandrel works. When the capsule is completely formed, the handle, G, is released, and the slide, N, is turned out of the way; the workman then takes hold of the capsule and turns the handle, G, in a reverse direction, thereby unscrewing the capsule off the end of the mandrel. A stop, R, is employed, which by coming in contact with a projection on the mandrel, stops its further movement and prevents injury to the wooden block, Q.

Fig. 1.

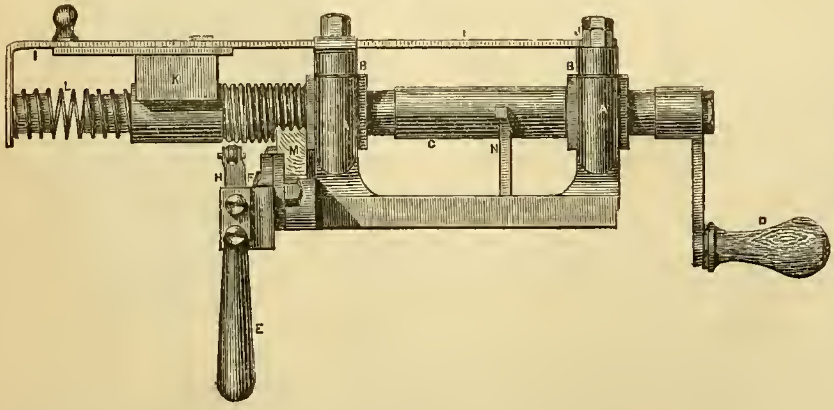
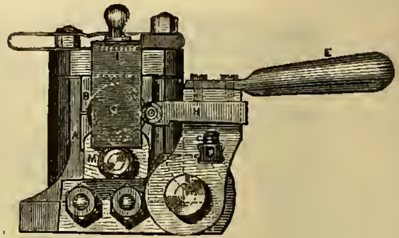


Fig. 2.



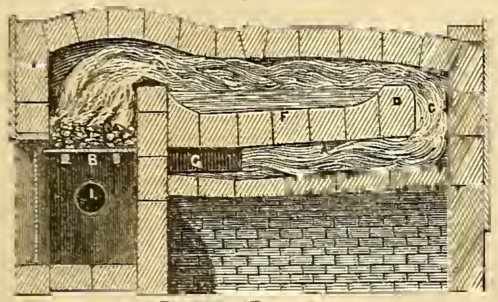
PRODUCTION AND CASTING OF STEEL.

J. H. Johnson, *London and Glasgow* (M. Sudre).—*Patent dated December* 31, 1858.

The object of these improvements is the production of steel in sufficient abundance for casting articles of extreme size, such as large ordnance. By this invention also, the employment of the ordinary melting pots or crucibles is dispensed with; and consequently, the expense and trouble attendant upon their use is obviated, whilst a considerable economy of fuel is effected. The essential features of this invention are:—1st, The application and use in the manufacture and melting of steel, of a reverberatory furnace in which the cast-iron and the iron ore or ores, or any mixture capable of forming steel, are introduced in any convenient manner, the one acting upon the other by reaction, so as to produce steel, which steel is protected from the action of the flame and smoke by a supernatant layer of neutral or basic scoria previously or subsequently fused. The protective material, which is most suitable, is the scoria resulting from the working of blast furnaces supplied with wood or coke fuel, such scoria being employed either alone or in combination with other matters. 2d, A new process for the manufacture of cast steel, by placing steel produced either by cementation or otherwise, upon the hearth of a reverberatory furnace, the same being covered with a protective layer of scoria or slag, in a state of fusion as herein-before described. 3d, The use of a reverberatory furnace, having the floor or hearth heated from the underside by a suitably disposed flue, so that the heat and flame may circulate freely beneath the hearth, and admit of an inferior fuel being employed. 4th, The employment of the combustible gases arising from blast furnaces, or from special gas generators for heating furnaces for manufacturing and fusing steel by the process above referred to. 5th, The use of a large vessel or receiver heated to a high temperature, to serve as an intermediate receptacle for the melted steel from the ordinary melting pots or crucibles used in the old process when casting large articles. 6th, The application and use in the casting of large articles of a reverberatory furnace, with a protective layer of scoria or slag, or of a large receptacle provided or not with a discharge aperture; and in general, any large receiver heated to a high temperature for receiving and collecting the steel from the ordinary crucibles, when employed, before running it into the moulds. 7th, The special application and use of neutral or basic scoria as a protective layer on the surface of the steel, during the process of its manufacture or fusion, and particularly the use of the scoria or slag from blast furnaces supplied with wood, coal, or coke fuel, also glass debris free from lead and the neutral or basic fusible silicates of earthy bases, all such materials or substances being employed either alone or combined together in any required proportions.

Fig. 1 of the illustrative figures is a longitudinal vertical section of an arrangement of furnace adapted for carrying out this invention. Fig. 2 is a horizontal section of the furnace corresponding to fig. 1. The return of the flame intended for heating the under surface of the sole or hearth is effected by a large flue, A, which joins the passage, C, placed at the end of the hearth opposite to the furnace bars, B; this flue, C, descends

Fig. 1.



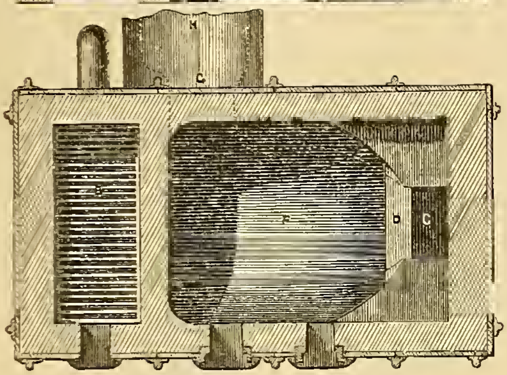


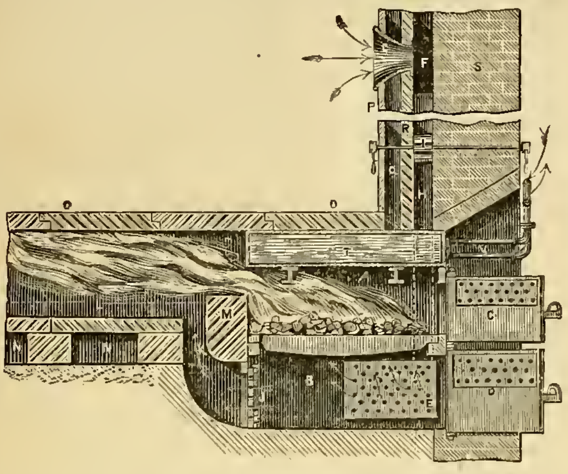
Fig. 2.

vertically behind the small bridge, D, which terminates the hearth at this point. The large flue, A, is nearly horizontal, and is so arranged as to heat the lowest portion of the hearth, F, which is the most liable to be cooled. This flue is composed at its upper part of an arch constructed of sandstone grit, or of fire-clay bricks of the best quality. It is upon the extrados or upper surface of this arch that the hearth or sole, F, is supported. The flue, A, extends up to the wall of the main fire bridge, C, at which point it joins at right angles the horizontal flue or passage, G, through which the flame escapes; this passage, G, conducts the flame directly to the supplemental furnace, H, built at right angles to the main reverberatory furnace, and enclosing the muffle intended for heating the cast-iron, and steel, and slags, and also for heating the air to support and facilitate the combustion in the main furnace. This hot air is introduced to the body of the furnace either by means of a number of tuyers in the bridge, or by a passage, I, opening into the ash-pit, which is closed by a door. When tuyers are used, the bed of the furnace is made solid, and composed of fire-clay, having a slight inclination from the fire door downwards; a suitable aperture is made in the wall of the furnace, in front of the fire door at the level of the furnace bed, for the efflux of the slag arising from the fuel. To cause the fusion of the slag, a convenient quantity of lime or sand is added to it, according to the nature of the slag; or the slag which has been employed in the melting of steel, or the scoria from iron works may be used. This latter substance should only be used with great caution and in small quantities, so as not to injure the sides of the furnace. It is advisable to construct the hearth of blocks of refractory grit, carefully shaped, and having the joints pointed or filled in with fire-clay or fine sand, or large fire-clay lumps of the best quality, and baked at the highest temperature, may be employed. When a return flue is used, as shown, it is necessary to make a draught hole and a discharge aperture for the collection of the steel which might escape should the hearth get damaged. These furnaces may be supplied by the carbonic oxide gas, arising either from blast furnaces or from special generators where low priced fuel is burnt. The arrangements requisite for burning this gas are well known, and need not therefore be described here. By using the hot blast and a suitable apparatus for mixing the jets of gas and air, a sufficiently high temperature may always be obtained to melt the most refractory steel. It may in some cases be found desirable (as in the case of special and peculiar qualities of steel being used), to effect the melting of the same in the crucible, as in the ordinary system; but when large steel castings are to be run and melted, serious difficulties arise, for the contents of each crucible, successively falling into the mould, cause the entrance therein of slag or dross, which remains agglomerated in one mass. This running or pouring in of small quantities of metal at a time, further produces bubbles or flaws, and tends greatly to impair the homogeneity of the casting. The application of the reverberatory furnace and protective layer, hereinbefore referred to, as an intermediate means, remedies these inconveniences. In carrying out this portion of the invention, a suitable reverberatory furnace is heated to a high temperature for some time previous to the emptying of the crucibles, and the hearth is covered with a layer of melted scoria a few inches in depth. A hole is then made in the roof of the furnace over the deepest part of the hearth. Through this opening the melted metal is successively poured from the crucibles into the hearth below, the flowing being either direct into the furnace or through a fire-clay conduit, which serves to protect the metal from the action of the flames during its entrance into the furnace. The molten steel, on reaching the hearth, descend sat once to the bottom thereof, through the hearth or layer of scoria, where may be accumulated any desired amount of cast-steel, according to the size of the hearth. The molten metal should be well stirred to render it homogeneous; the scoria, which the crucibles may have contained, collecting on the surface. The moulds being brought near to the furnace, the tap hole is opened and the steel run direct into the moulds at one operation. By this means perfectly sound castings are obtained, especially where a siphon is employed; the passage or duct of the siphon may itself form the mould of some article capable of being turned to account. The idea of employing an intermediate receptacle, previously heated for the production of large steel castings, may also be carried out by using a large crucible similar to a glass house crucible, heated externally and provided at its lower part with a discharge hole and duct. This crucible, placed inside a cylindrical or conical chamber, closed by a moveable lid or cover, may be heated by coals or coke fuel. A quantity of slag or scoria, should be introduced into the crucible and melted therein to form the protective layer over the steel. The steel is then poured in through an opening above the crucible, and the metal, after being well stirred, is run off through the tap hole formed in the lower portion of the crucible. The iron resulting from what is known as the "Bessemer" process may be advantageously submitted to this method of melting, with the addition of a certain quantity of rich ore, and the patentee, therefore, reserves to himself the exclusive right of applying this process to the metal produced by the Bessemer process.

HEATING BUILDINGS.

Richard Barter, M.D., *Cork.—Patent dated January* 22, 1859.

The patentee's improvements are applicable generally to the heating of public or private buildings, but more particularly to baths and other similar establishments. The accompanying figure represents a vertical section of a part of the floor and one wall of an apartment constructed and heated according to the patentee's invention. A, is the heating furnace, and B, the ash-pit, both of which are respectively closed by the perforated doors, C and D. The ash pit door, D, is made to fit air-tight, or nearly so, and the sides of the ash-pit are chambered or recessed out beneath the fire-bars, such chambers being provided with metal plates, E, having a number of small holes perforated thereon, which perforations lead from the termination of a flue, F, constructed within the four walls of the apartment near the ceiling, and communicating with the hot rooms by small bell-shaped openings or mouths, one of which is shown at G. The communication between the flue, F, and the chambers in the sides of the ash pit is effected by two perpendicular flues or passages, one of which is shewn at H. A damper or regulator, I, of any convenient construction is fitted within each of the descending flues or passages, H, for the purpose of regulating the supply of air to the furnace. By this arrangement all the foul air of the apartment is drawn through the perforated plates, E, and into the fire when the room is in use, but when not in use the damper is closed entirely, when the furnace will be supplied with air through perforations in the ash-pit door, D. For the purpose of regulating this latter supply, the ash-pit door is provided with a perforated slide shewn in dotted lines on the door, by sliding which more or less the perforations in the door may be entirely or partially closed. A perforated door, J, is also fitted at the back end of the ash-pit, opening into a passage, K, which leads directly into the main heating flue, L, immediately behind the bridge, M. This passage and perforated door, J, serve to admit air behind the bridge, for the purpose of burning the inflammable gases, whilst they afford facility also for removing any cinders or ashes which may be carrried over the bridge. The furnace door, C, is also perforated for the purpose of admitting air on to the surface of the fuel, so as effectually to burn the gases. This supply of air is regulated by a perforated slide or damper plate, shewn in dotted lines in the engraving, or by any other convenient air supply regulator, so as to suit the varied requirements of the fuel employed. The floor of the room or apartment is traversed by a number of heating flues, L, which are insulated from the walls by suitable air chambers to prevent loss of heat by radiation. For the same purpose, these flues, L, are built over air chambers, N, which are themselves constructed on a bed or foundation of charcoal, or other good non-conductor of heat. The flues, L, are covered with fire tiles, O O, over which may be laid in cement an ornamental floor of Mosaic tiling of any suitable design or shape. The heating flue, L, having traversed the floor of the apartment, enters a chimney erected at a suitable and convenient distance from the building, a damper being placed in the flue at the junction with the chimney. The interior of the walls and ceiling of the apartment is made of lath and cement, or plaster, as at P, immediately behind which is formed an air space, Q, behind which again is a lining of peat or brick, R, and lastly, the main brickwork, S, of the wall itself. When intended for a bath-room, the apartment is lighted from above by double glass with an air space between the glasses, and fresh air is admitted under the marble seats and couches, and allowed to escape into the room through perforated tiles, and a circuitous heated passage beneath the heated tiles. This supply of fresh air is also controlled by dampers, which are shut down when the room is not in use. Moore's patent ventilators are also fitted high up in the walls, whereby a nice regulation of temperature is readily effected. The doors are padded with wool, or other non-conductor, and covered with cloth, so that a high and regular temperature may be maintained, with a thorough absence of disagreeable draughts. In bathing establishments where hot water is constantly required, the patentee proposes to place a boiler, T, over the furnace, and to connect the same by circulating pipes, V V, with all requisite parts of the establishment.

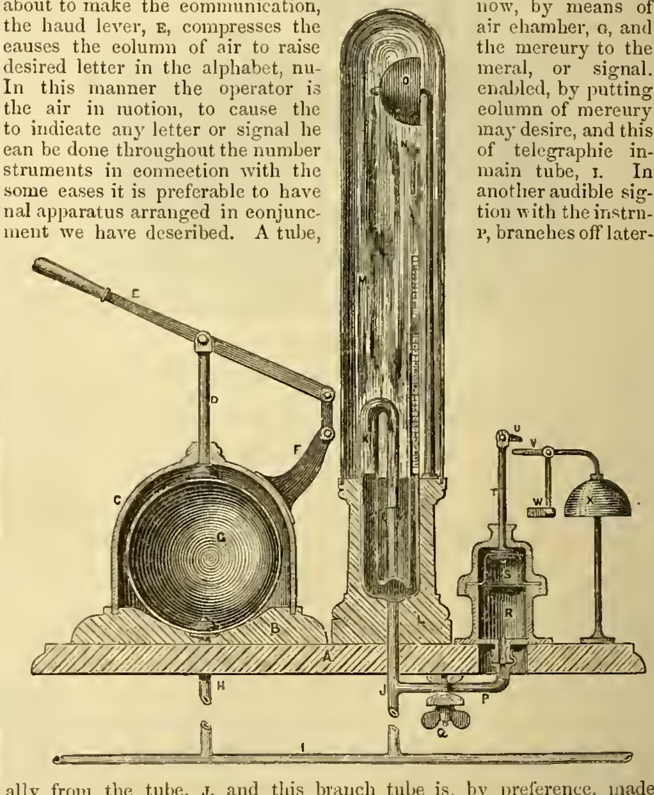


TELEGRAPHIC APPARATUS.

James M'Nab, *Linlithgow.—Patent dated March* 12, 1859.

The patentee's improvements relate to the working of telegraphic apparatus of various kinds, and thereby transmitting signals by means of a line or lines of atmospheric or hydrostatic tubes, such line of tubing or pipes being the actual means of communication between the distant points, to and from which telegraphic signals are to be sent and received. The end of the line of tubes, or the portion whence signals are to be sent, is fitted with a cylinder and piston, or a flexible chamber or other apparatus, by the agency of which, the requisite forcing pressure can be communicated to the fluid contents of the line of pipes; whilst at the receiving stations on the line, there is a recording, and, if necessary, a printing apparatus, through which the action of the fluid movement or pressure is communicated and delivered in the form of signals.

The accompanying engraving is a partially sectional elevation of one modification of the patentee's improved atmospheric telegraphing apparatus, in which the alphabetical or numerical signals are arranged and shown in a vertical column. The apparatus consists of the table or platform, A, on which is fixed the circular base, B; this base has fitted thereto the cylindrical cover or guard, C, which may be of brass or other suitable metal. The cover, C, has a tubular aperture made in the upper part, through which the rod or presser, D, works; the upper end of the rod is jointed to the hand lever, E, one extremity of which works on a pin carried in the forked end of the arm, F. The lower extremity of the presser, D, forms a concave or convex disc, which presses on the upper part of the elastic air holder or chamber, G; the air chamber in this modification consists of a hollow ball of vulcanised India-rubber, or other similar flexible material may be used in lieu thereof. The lower part of the air chamber, G, rests on the concave surface of the base, B, and at this part it is connected with the pipe, H, which enters the main tube, I. This tube consists of ordinary iron gas tubing, and it extends from station to station, or from one point to another throughout the line or distance it is desired to convey the signals. Immediately contiguous to the tube, H, is an outlet tube, J, which communicates with the mercurial syphon, K, the upwardly directed column of which is made of smaller diameter than the parallel leg. This is done in order that the depression of the mercury in the larger tube may raise the column through twice the distance or more in the smaller tube. The syphon, K, is fitted in the base, L, and its upper part is enclosed by the glass shade, M. The exterior of the smaller tube of the syphon, K, has upon it, or arranged parallel thereto, the letters of the alphabet, numerals, words, or a code of signals. The open end of the syphon tube has fitted within it a small plunger, N; this is a cylindrical piece of wood, tipped with brass at the upper end. When the mercury is forced to a sufficient height, the column raises the plunger, and it comes in contact with the bell, O, which is suspended above. An instrument corresponding to the one here described, is fitted at each station or place to which the communication is to be made, and upon the operator or attendant at either station depressing the hand lever, E, the air contained within the air chamber, G, is forced out of the same and along the main tube, I. The impulse thus given to the air causes the mercury in the syphons, K, to be depressed in the larger tubes and ascend in the smaller, and give the audible signals, so as to draw the attention of the several attendants to the communication which is to be made. The telegraph clerk, who is about to make the communication, now, by means of the hand lever, E, compresses the air chamber, G, and causes the column of air to raise the mercury to the desired letter in the alphabet, numeral, or signal. In this manner the operator is enabled, by putting the air in motion, to cause the column of mercury to indicate any letter or signal he may desire, and this can be done throughout the number of telegraphic instruments in connection with the main tube, I. In some cases it is preferable to have another audible signal apparatus arranged in conjunction with the instrument we have described. A tube, P, branches off laterally from the tube, J, and this branch tube is, by preference, made of an elastic substance, so that it may be readily collapsed by turning the thumb screws, Q, which brings the discs, through which the spindle passes, towards each other. The pressure of the lower disc collapses the tube, P, and shuts off the communication. The patentee prefers this arrangement to the ordinary stop cocks. The tube, P, opens into the cylinder, R, which is made in two parts that are screwed together, the lower part being fast to the table, A. Between the upper and lower parts of the cylinder, R, is interposed the edge of a circular piece of thin sheet vulcanised India-rubber, or other easily yielding material, S, forming a flexible diaphragm, which divides the cylinder, R, into an upper and lower chamber. The upper part of the cylinder, R, is made with an aperture, through which the rod, T, passes; the lower end of this rod carries two discs, which are arranged on each side of the diaphragm, S, and secured thereto by a nut. To the upper end of the rod, T, is jointed a small catch, U, which is limited in its motion about the centre. When air is forced through the tube, P, the diaphragm, S, is raised, which causes the catch, U, to strike the bell crank lever, V, that carries at its lower



end the clapper, w, which strikes against the bell, x, and thus gives the signal. By means of this signal the attendant at a station may be warned of a communication about to be made to his station, or the number struck on the bell may indicate that he is to shut the tube, P, in order that a message may be sent to a particular station and not to the others. By using two or three bells in conjunction, a complete code of signals may be arranged, so as to be useful under other circumstances than in connection with the mercurial syphonic telegraph.

In arranging the telegraphic apparatus, sufficient space is left between the surface of the mercury and the lowest letter or signal, to allow for the variation of the atmospheric pressure on the mercury. These instruments may also be arranged to be worked by means of water or other liquid, in lieu of air and mercury. In this modification the same general principle is carried out, but using a cylinder for containing the water, which cylinder is connected to the main tube; the water is depressed in the cylinder by means of a piston, actuated by a hand lever, in manner similar to the arrangement shown in the subjoined figure. The telegraphic instrument may also be actuated by air alone, without the use of mercury or other fluid. It consists of a cylinder made in two parts, and screwed together at the centre, the junction serving to retain a flexible diaphragm, which is secured at the central part to a light tubular piston. The upper end of this piston works out through the cylinder, and carries an index, which moves across the divisions of the vertical column of letters or signals. The lower part of the piston or plunger is connected to a thin tube, which slides freely within the tubular extremity of the cylinder. The tubular part of the cyliuder is connected to the air tube, which corresponds to the branch tube, J; when the air chamber of the apparatus is compressed, the air presses upon the under side of the diaphragm, which yields to the pressure and lifts the piston and the index points to the required letter or signal. By a slight modification this pneumatic apparatus may be caused to indicate the signals upon a circular disc, instead of a vertical column. This pneumatic telegraphic apparatus is also adapted for marking or impressing the signals or cyphers upon a moving band or strip of paper. The air is forced into a cylinder which raises a diaphragm and rod, which are connected by a link to a weighted lever. This lever is centred upon a stud projecting from a standard; the longer arm of the lever has a catch jointed to it, which strikes a bell when an audible signal is required. The free extremity of the lever has attached to it a style or marking instrument for impressing or marking the paper. The band of paper is wound upon a reel, the spindle of which is carried in standards; the paper passes under a tensional pulley, and over a cushion or pad, which is arranged below the style, and thence is wound upon a reel, which is carried in the standards of the instrument. The paper is wound upon the reel by means of a clock-work movement. When the audible signal is given to intimate that a message is about to be sent, the attendant in charge of the receiving instrument sets the pendulum of the movement going, the paper moves on at a uniform velocity, and as the lever is actuated by the movement of the diaphragm in the cylinder, the dots or lines representing letters or words are marked or impressed on the moving band of paper. The instrument which the patentee prefers to use for marking the paper, consists of a small tube bent to the form of a siphon, the extremity of the longer leg being drawn out to a fine point, having a capillary aperture. The shorter leg of this siphon is immersed in a holder or reservoir of marking fluid, which holder is attached to the free end of the actuating lever before referred to. As the paper moves beneath this marking instrument, the ink is deposited upon its surface in dots or lines, at the will of the operator who is sending the message.

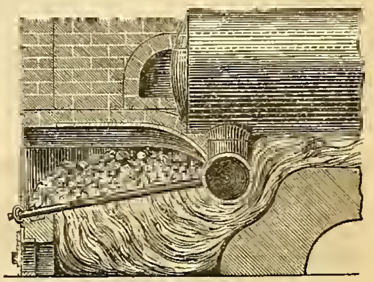
The patentee has also shown and described a simple arrangement of pneumatic apparatus for ringing bells or giving audible signals in public, or other buildings or on shipboard. The apparatus consists of a flexible air chamber, which is fixed to a vertical stand or base plate, and communicates with an air tube, that either branches off or forms a continuation of the main air tube. The apparatus is concealed behind a wall or partition, from which a handle projects, this handle is connected by a rod to a frame which encircles the air chamber. At the backward part of the frame is a spherical projection, which compresses the air chamber, G, when the handle is drawn outwards; the compressed air is driven along the tube into the cylinder, the diaphragm of which is raised, and causes the catch to strike against a projecting nib and so ring a bell. The various modifications of the improved pneumatic and hydrostatic telegraphic apparatus may be applied to all the purposes for which the electric telegraph is used, and is also well adapted as a means of giving signals in commercial, manufacturing, and domestic establishments, as well for conveying orders or signals on board steam-ships and other vessels, or for the like purposes in garrisons or fortifications.

FURNACES FOR BOILERS.

FERDINAND JOSSA, *Durham.—Patent dated December* 14, 1858.

THIS invention consists in so constructing furnaces, that the fire burns in a direction contrary to ordinary furnaces; that is to say, instead of burning from the bottom upwards, it burns with the heat and flame passing downwards—it thus consumes the smoke, and the stoker has simply to heap on coals, to keep the upper part of the fire black.

The subjoined eugraving is a central longitudinal vertical section of the fire-place or furnace, with part of the boiler, and as much of the brick setting as is necessary to illustrate the inventiou. The body of the boiler has attached to it a short trunk, and connected thereto is a cylindrical or or other formed chamber, constituting a water space in open communication with the boiler. This chamber extends the breadth of the furnace, and is firmly set iu the brickwork, or it may be otherwise supported in position. From this cross chamber are extended a number of tubes, which form the furnace bars, and into which the water of the boiler enters. The tubes rest at the front end on the dead plate; and the brick-work or other support, is an arch thrown over and constituting the upper part of the fire-place, resting and abutting on the brick-work at either side, and on the transverse chamber at the back, so as to perfectly enclose the whole of the upper part of the fire-place; thus uo passage between the fire-place and the flues exists, except down between the fire-bars. The ashpit is enclosed by doors, to prevent the admission of air; the fire-place may, however, be without doors, but if applied, they may be used for modifying the draught, by regulating the admission of air to the fire-place, or may have a number of holes made in them for the admission of air. The fire being lighted on the bars, coals are heaped on it to nearly fill the arch fire-place; the draught from the furnace so arranged is down between the bars, which direction the heat and flame takes, and sweeping under the chamber, passes thence to the flues, which it traverses in the usual manner. Thus the fire burns continually downwards, and the stoker has simply to heap on coals on the top of the fire as they subside by consumption from below, which fire may therefore appear black on the top, although buruing with great fierceness from below. By this means, the fresh coals are at all times kept on the top, and the incandescent fire below, whereby the smoke and gases generated from the fresh coals are constrained to pass down through the incandescent mass below; the entire combustible part being thereby consumed. By keeping the bars filled with water, clinkers or slags are prevented adhering thereto, which, with solid bars, might take place, and so stop the draught to a considerable extent.



BOILERS AND SUPERHEATING STEAM.

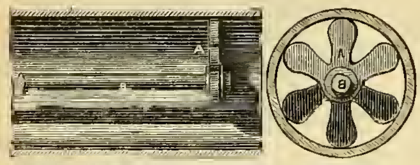
J. E. M'CONNEL, *Wolverton.—Patent dated February* 9, 1859.

IN fitting up the tubes of locomotive or marine boilers, according to this invention, a series of annular, or partially annular discs, or flattened rings, are fitted at intervals within the tubes, so that as the currents pass along, they come in contact with these internally projecting surfaces or edges, and are thus deflected, and to a certaiu extent retarded, and made to exercise a superior heating effect. Instead of using complete disc rings, it is preferred to use rings of a horse-shoe form, that is, open on one side. These horse-shoe discs or partial rings, are made with a deep crown portion, narrowed off towards each end at the opening, the opening being next the bottom side of the tube, whilst the crown bears against and supports the crowu or upper side of the tube. These discs or partial rings are passed into the tubes before the ferrules are put into the ends, and they are made of such a size as to have a considerable spring or elastic bearing against the interior of the tube, so that they are easily put in and taken out. The ferrules themselves may also be made in a similar way. They may be either of cast-iron, wrought-iron, or other metal. A thin central rod is also passed along the centre of each tube, for the purpose of carrying a series of crossed or laterally disposed arms, or deflecting pieces of metal, which split up and break the gaseous current, and thus aid still further in causing the heat to operate effectively upon the tubes. These details may be used either separately or in combination.

This invention relates also to a system or mode of superheating steam, so as to obtain a superior working effect from it. In the smoke box of locomotive and other engines, there is disposed a tubular or cellular steam heating chamber, through which the steam from the boiler is passed on its way to the working cylinders. The regulator or steam valve is disposed between the heating chamber and the cylinders, so that the working steam on its way to the cylinders receives the full effect of the heat of the smoke box. The harrel or main body of the boiler has also fitted within it a flue tube, running from the fire box tube plate to the smoke box tube plate. This flue tube is surrounded by another tube, leaving a narrow annular steam space between the two. A pipe passes from this annular space to a regulator or valve in the steam chamber or receiver. This also affords the means of drying and superheating the steam. The steam is admitted from the main body of the boiler to this annular space by any suitable arrangement of valve worked either by hand or automatically. If automatically arranged, an internal valve would answer for the admission of the steam, as it would operate in opening and closing, in accordance with the difference between the pressure of the steam in the body of the boiler, and in the annular superheating space. The steam from this annular space may be taken either directly to the working cylinders, or passed through the cellular or other superheater, in the up-take or smoke box.

Fig. 1 of the accompanying engravings represents in longitudinal and transverse vertical sections one arrangement of the tubes, which are fitted internally with a series of arms, A, fitted on to the rod, B, for the purpose of retarding, to a certain extent, the draught, and of effectually commingling the gaseous products of combustion passing through the tubes. Fig. 2 represents an arrangement of annular or partially annular discs, or flattened rings or arms, C, fitted on the rod in lieu of the arms, A, fig. 1. In place of rings arms may be used, the arms forming quadrants of a circle, the internal diameter of which corresponds to the internal diameter or bow of the tubes. When arms are employed, the patentee prefers to dispose them in different circumferential positions round the central rod, so that the course of the gases may be as much broken as possible.

Fig. 1.



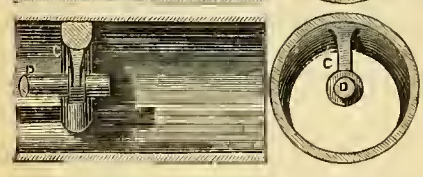


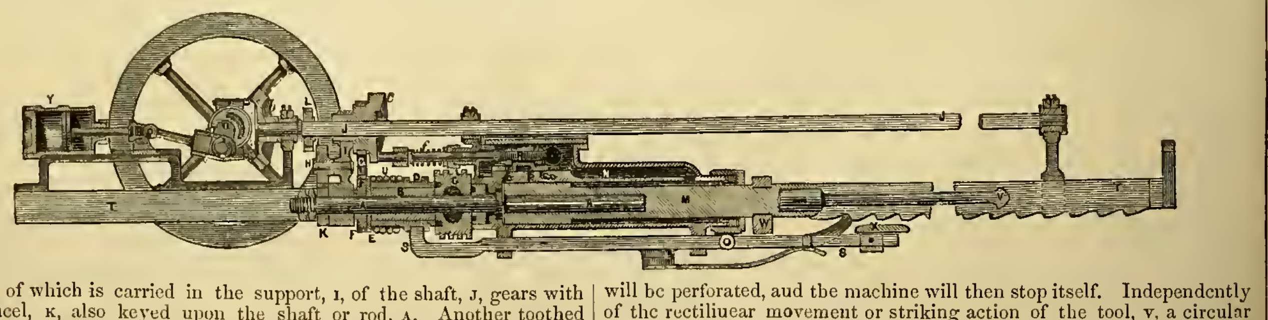
Fig 2.

APPARATUS FOR BORING OR WORKING STONE.

J. H. Johnson, *London and Glasgow* (M. Sommeiller, *Turin*).—*Patent dated January* 6, 1859.

This invention relates to a peculiar arrangement of self acting mechanism, for boring the blasting holes in rocks, and applicable also, by slight modifications, to the dressing or working of stone, or as a power hammer generally.

The subjoined illustrative figure represents a longitudinal vertical section of the boring apparatus. On the central rod, A, is keyed the collar, B, and on the one side of this collar is mounted the screw, C, with which gears at pleasure the clutch, D, keyed upon the said collar, B. On the other side of this collar, and separating the washer, E, is keyed the ratchet wheel, F, actuated by the pawl, G, for the purpose of imparting a rotatory motion to the rod, A. An intermediate toothed wheel, H, the spindle of which is carried in the support, I, of the shaft, J, gears with the wheel, K, also keyed upon the shaft or rod, A. Another toothed wheel, L, carried by the shaft, J, is engageable with the wheel, H, for reversing the movements, as will be hereinafter described. The various parts are held against the actuating cylinder by jam nuts on the end of the spindle, A. The reciprocating motion of the striking piston, M, is derived either from the force of compressed air, water, or other suitable fluid, which acts intermittently upon the back of the piston, whilst it exerts a constant pressure against the front of the piston. This constant pressure is produced through the passage, N, which establishes a constant communication between the front of the cylinder and the valve chest. In this condition, if the fluid be admitted by the port, O, upon the back end of the piston, M, the latter will be forced forward with considerable power, according to the pressure of the fluid, and to the difference between the areas of the front and back of the piston. If this valve is now moved over the escape ports, P and Q, the fluid which has forced the piston forward, will escape into the atmosphere, and the constant pressure exerted upon the face of the piston, will force back the same to its original position, when a fresh stroke will be made by again moving the valve into the position indicated in the engraving. Thus, by imparting a reciprocatory motion to the slide valve, R, a similar motion will be imparted to the piston, M. The stroke or travel of the piston is regulated at will between a state of rest and a maximum course equal to the space between the point of the piston and the end of the cylinder within which it works. The general working of the machine is easily understood. By means of the ratchet, F, and pawl, G, worked by an eccentric on the shaft, J, motion is imparted to the bar, M, which carries round the collar, B, and clutch, D. Each time that the catch, S, disengages from the teeth of the rack underneath the beams, T, and forming the side frames of the machine, it permits the spring, U, to push the clutch into gear with the screw, C; this latter is carried round with the rest, and gearing into the internal teeth or partial screw threads formed on the inner sides of the beams, T, causes the whole tool or bearing apparatus to advance. To effect the retrograde movement of the machine, the pawl, G, is disengaged, and the wheel, L, slid forward so as to gear with the wheel, H, when the tool holder will thus return, having a continuous rotatory motion imparted to it. During this return, the catch, S, following the backward motion of the apparatus and the clutch, D, gears constantly with the screw, C, which consequently turns in the reverse direction, whilst the shaft, J, rotates always in the same direction. Supposing it is intended to work the machine with a traverse or stroke, the piston, M, being then at the beginning of its stroke, the machine is so adjusted as to have the end, V, of the boring tool at a distance somewhat less than the stroke of the piston, M, from the surface of the rock. The machine is then put in operation, and the tool, V, will pierce a hole or cavity in the rock; its traverse increases in proportion to its entrance in to the rock, and when this is equal to the length of one tooth of the rack, on the under side of the frames, T, the tappet, W, on the front end of the piston rod, M, strikes the stop, X, of the catch, S, and disengages its pawl from the rack; the helical spring, U, surrounding the clutch, D, then pushes forward the clutch, and causes it to gear with the screw, C; the ratchet, F, which receives its movement from the shaft, J, causes the screw, C, to rotate, which imparts to the whole of the travelling portion of the machine a forward movement, by gearing with the teeth or threads inside the beams, T. This advance is much more rapid than that of the tool in the rock, whilst the stroke of the piston, which was equal to the first stroke of the piston, or distance from the rock, plus the length of one tooth of the rack, diminishes again one tooth until the pawl of the catch, S, encountering the next tooth of the rack, again pushes back the catch, D, and throws it out of gear with the screw, C, which then ceases to turn and to move forward the moveable part of the machine. The piston will increase its stroke again as the boring proceeds, until it disengages the catch, S, again from the rack, when the movements above described recommence. This movement will be repeated the oftener, the quicker the tool enters the rock, so that the hardness of the rock will regulate the advance of the tool quite independently of the workman. The machine may also be regulated by means of a tappet, which will close the admission of the fluid into the cylinder, whereby a hole of a given depth will be perforated, and the machine will then stop itself. Independently of the rectilinear movement or striking action of the tool, V, a circular motion is imparted to it by the ratchet, F, and pawl, G, which slides along the shaft, J, and accompanies the moving part of the machine during its advance. As the ratchet, F, is keyed on the central bar, A, at each stroke of the tool, S, it will be caused to turn to the extent of one tooth of the ratchet. The parts above particularly described, constitute the moving or travelling portion of the machine; but we shall now proceed to describe the fixed or stationary part thereof.—The actuating cylinder, Y, of the prime mover, fixed upon the beams, T, drives the crank shaft, *a*, and by



means of the bevel gearing, *b*, actuates the shaft, J. Upon this shaft, J, which is of a square section, an eccentric, *c*, slides, which imparts to the slide valve, R, its rectilinear motion in one direction, the reverse movement being derived from a helical spring, *f*. The pawl, G, which drives the ratchet, F, is worked by another eccentric, forming part of the eccentric, *c*, which also slides along the shaft, J. These eccentrics are drawn along the shaft, J, by straps fixed to the travelling portion of the machine. The fixed portion of the machine may be combined with the moving part. By placing the cylinder of the prime mover upon or at the side of, or in front or behind the striking cylinder, and dispensing with the shaft, J, a new arrangement of machine will be obtained without changing the principle. The constant pressure which effects the return of the striking piston might also serve, by combining another piston with the striking piston, to force it forward, the intermittent counter pressure then serving to move it back. Or the compressed air or other fluid might be caused to operate upon the striking piston by an alternate admission and omission upon both sides of the piston without changing the motion of the machine. By dispensing with the prime moving cylinder, Y, the beams, T, and shaft, J, making the striking cylinder of suitable form, and substituting for the cylinder, Y, a crank handle for working the slide, R, and giving to the striking piston a rotatory motion, a much lighter and more portable machine will be obtained, based upon the same principles as the former, with this difference, that the advance of the cylinder will be at intervals, and effected by hand; but this advance may be dispensed with, by allowing to the piston a convenient length of stroke. This modification may be mounted upon pivots or upon a frame, so as to work in all directions. By substituting a suitable tool for the borer, V, the machine may be applied to the various operations of stone cutting, now effected by manual labour. Lastly, by substituting a hammer head for the tool, V, and suitably arranging the machine accordingly, it might be so modified as to form a hammer for the working of metals, and applicable in general to all purposes where percussion is required.

LAW REPORTS OF PATENT CASES.

FIGURED FABRICS: KNOX *v.* PATERSON.—This was a case in the Scotch Appeal Court, before Lord Deas, on the following issues—Andrew Lawson Knox, manufacturer, Glasgow, being the suspender and pursuer, and Robert Paterson, manufacturer there, is respondent and defender—were sent to a jury:—

1. Whether the pursuer, in or about the month of November, 1852, obtained Letters Patent under the Great Seal of the United Kingdom, granting to him the sole privilege of making, using, exercising, and vending his invention of improvements in the manufacture or production of ornamental fabrics, within the United Kingdom of Great Britain and Ireland, the Channel Islands, and the Isle of Man, and did duly file in the Great Seal Patent Office a specification particularly describing and ascertaining the nature of the said invention, and in what manner the same is to be performed; and did on or about the 19th January, 1856, pursuant to the Act 5 and 6 William IV., entituled an Act to Amend the Law touching Letters Patent for Inventions, as modified by subsequent Acts, file in the Great Seal Patent Office a memorandum of alteration on the said specification, stating the alterations proposed to be made, and setting forth the specification as the same will be after the said alteration?

2. Whether, during that part of the month of January, 1856, subsequent to the said 19th day thereof, the defender did wrongfully, in contravention of the said Letters Patent, use the invention described in the said Letters Patent and amended specification, in the manufacture for sale of ornamental fabrics of the nature described in the said Letters Patent?

3. Whether, during that part of the month of January, 1856, subsequent to the said 19th day thereof, the defender did wrongfully, in contravention of the said Letters Patent, vend ornamental fabrics manufactured, or caused to be manufactured by him, by the use of the invention described in the said Letters Patent and amended specification? Or,

1. Whether the alleged invention described in the said Letters Patent and specification and relative memorandum of alteration is not the original invention of the pursuer, the said Andrew Lawson Knox?

2. Whether the alleged invention described in the said Letters Patent and specification and relative memorandum of alteration, was known and publicly used within the United Kingdom prior to the date of the said Letters Patent?

3. Whether the description contained in the said alleged specification and relative memorandum of alteration, is not such as to enable workmen of ordinary skill to use the alleged invention, so as to produce the effects set forth in the said Letters Patent and specification, and relative memorandum of alteration?

The trial on the above issues was not gone into, counsel for both parties having arranged that a verdict for the pursuer, in all the issues, should be returned.

REGISTERED DESIGNS.

OBLONG DOUBLE NUT FOR BEDSTEADS.

GEORGE TILLET, *of 55 Alfred Street, Islington, Proprietor.*

THE purpose of this design, which has been provisionally registered, is the obtainment of a more firm and lasting joint for connecting the various parts of bedsteads. Fig. 1 of the annexed engravings is a side elevation of the oblong double nut, and fig. 2 is a longitudinal section of the same. A, is the body of the nut, which is made of wrought iron or other metal; it is of an oblong form, and is provided with two tapped bolt holes, B, for the reception of two tightening bolts or bed screws.

Fig. 1.

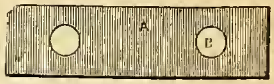
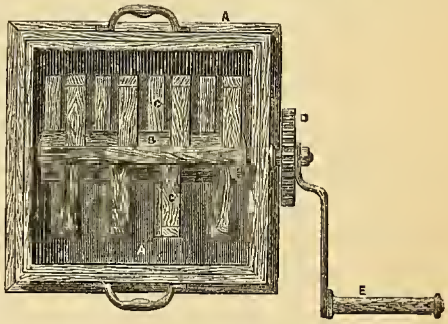


Fig. 2.

ROTATING DASHER CHURN.

Registered for MR. HENRY WILKINSON, *of Alston Moor, Cumberland.*

PROVISIONAL protection, under the Registration Act, has been obtained for the churn represented in our engraving: the object of the improvement is the obtaining of a more efficient agitation of the milk or cream, than by the churns of the ordinary kind, so as to expedite the operation. The accompanying engraving illustrates a plan of the churn, with the lid or cover removed for the purpose of showing the essential feature of novelty therein. A, is the body of the churn or receptacle for the milk or cream, and B is the dasher or agitator, which is of a peculiar construction. This dasher consists of a central barrel or axis, B, fitted with a number of radiating arms, C, which are set in a spiral direction round the central axis, so as to form a screw from end to end of the axis, which screw, when the dasher is rotated by the gearing, D, and handle, E, has such an agitating effect upon the milk or cream, as to effectually bring out the butter in a less space of time than has hitherto been found practicable.



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REVIEWS OF NEW BOOKS.

Handbook of Geological Terms and Geology. By David Page, F.G.S 8vo. Pp. 416. Edinburgh and London: W. Blackwood and Sons. 1859.

There is no more earnest living practical worker in geology than Mr. David Page. To his excellent "Introductory Text-book of Geology," and his "Advanced Text-book of Geology, Descriptive and Industrial," he has now added an admirable system of geological terms, with ample and clearly written explanatory notices, such as all geological observers, whether they are able professors and distinguished lecturers, or mere enquirers upon the threshold of the science, must find to be of the highest value. The author himself says in his preface:—

Go where you will—to the popular platform, the public lecture-room, or the private parlour—and you hear immense interest professed in the science of Geology; but the profession, for the most part, accompanied by the regret that its "hard words and forbidden technicalities" should render it so difficult of acquirement. Now, while deprecating, in the strongest manner, the introduction of unnecessary terms, it is quite evident that every science must have its own technicalities and modes of expression: new objects require new names, and new facts new phrases to express their relations. There is no avoiding this necessity in any progressive branch of human knowledge, and the only thing that can be done to lessen the difficulty—next to the rigid exclusion of whatever seems superfluous—is to explain these terms in brief and simple language. This I have endeavoured to do, chiefly with a view to the requirements of the general reader, at the same time appending such details as might render the volume an acceptable handbook of reference to the student and professed geologist. Thus the ordinary reader will generally find the information he requires in the first and second sentences of a definition; what follows is addressed more especially to the professional inquirer—to the student, miner, engineer, architect, agriculturist, and others, who may have occasion to deal with geological facts, and yet who might not be inclined to turn up half-a-dozen volumes, or go through a course of geological readings, for an explanation of the term in question.

This is well put, and we freely and fully endorse Mr. Page's observations. His volume is divided into—1st, Tabular schemes of the chemical, mineral, lithological, and vital aspects of the globe; 2d, Dictionary of terms and technicalities employed by British and American geologists; and 3d, Explanation of specific apellations made use of by British and foreign palæontologists. These schemes at once lead the student into a proper dissection of his subject, so that he at once takes a broad grasp of the constituents of that great reservoir of matter—the earth—which he is about to take into geological consideration. But however necessary this arrangement may be—and we fully admit its great value—it is, of course, merely introductory to the "Dictionary of general terms and technicalities," which immediately succeeds it, and forms the real marrow of the book. Each subject head is set off distinctly and clearly at the side of the definitive and explanatory text, which is written in short, pithy, and well chosen language. We shall, however, best show both the manner and the matter of the author's workmanship by extracting a portion of this division in the very type, or nearly so, as that in which it originally appears:—

Amber (Arabic).—A well-known fossil gum or gum-resin, usually found in connection with tertiary lignites. It is hard, rather brittle, easily cut, of various shades of yellow, and semi-transparent. It is very light, is highly electric, and burns, like other hydro-carbons, with much smoke and flame. It consists of about 70 carbon, 12 hydrogen, and 8 oxygen; and frequently encloses chips of leaves, insects, and the like—showing that it must once have been in the state of a gummy or viscious exudation. It occurs in irregular nodules, from the size of a hazel-nut to that of a man's head, the latter size, however, being very rare. It is found in Sicily, Poland, Saxony, Siberia, and Greenland, in tertiary clays; on the Yorkshire coast of our own country; but in particular on the Baltic coast of East Prussia, where it is thrown up after storms, and strewn like pebbles along the shore. It is also, but very seldom, obtained by digging down to the looser beds of the tertiary lignites in Northern Germany; and there it appears in connection with coniferous trunks and branches. These forests of Amber Pines *(Pinus succinifer)* seem to have been situated in the south-eastern part of what is now the bed of the Baltic (about 55° N. Lat., and 37° to 38° E. Long.), and were probably destroyed at the commencement of the Drift period.

Amianthus (Gr. *a*, priv., and *miaino*, to soil).—This term, though often used as synonymous with *asbestos*, properly includes only the varieties which occur in delicate and regular silky fibres. The name is said to be derived from the incombustible nature of the mineral, which, when woven into cloth, admits of being cleansed by being thrown into the fire. That small fancy fabrics can be manufactured of amianthus is well known: it was occasionally so employed by the ancients, and is still used for that purpose in Siberia, Italy, and the Pyrenees. It is also employed as incombustible lamp-wicks; for filling gas-grates—the fibres remaining red-hot without being consumed; and attempts have been made to manufacture it into an incombustible paper. Amianthus is found abundantly in many countries, particularly in primitive districts; and occurs in veins in which the filaments or fibres are perpendicular to the surfaces of the vein, and of various lengths, according to the thickness of the vein, which is sometimes, though rarely, a foot. Like the Hornblendes, to which it belongs, it consists chiefly of silica (58), magnesia (25), lime (12), with traces of alumina, iron, manganese, and water.—See Asbestos.

Coal (Ger. *kohle;* Fr. *houille*).—In mineralogical systems the Coals constitute a limited, but very distinct and highly important family, which embraces such species as *graphite*, *anthracite*, *common coal*, *brown coal* or *lignite*, and *peat*. Chemically, their chief constituent is carbon, in combination with varying proportions of hydrogen, oxygen, and nitrogen; and in all there exists a greater or less amount of earthy impurities, which being incombustible, remain, after burning, as ashes. From their composition, which only differs from vegetable or woody matter in the diminished amount of its gaseous and volatile elements; from their internal structure, which, for the most part, exhibits to the naked eye, and almost always to the microscope, abundance of vegetable tissue; and from their lithological and other characteristics, there can be no doubt of their vegetable origin—whether occurring as peat and lignite, in which the ligneous structure is still apparent, or as common coal and anthracite, in which, for the most part, mineralisation is so perfect as to have obliterated every external trace of their organic origin. We have thus the most satisfactory evidence that Coal, in all its species, is merely mineralised vegetation—vegetation which, in part, grew and was submerged *in situ* as peat mosses, cypress swamps, jungles, and forest-growths, and in part was *drifted* by rivers into the seas of deposit, whose varied strata of sandstones, limestones, shales, mudstones, coals, and ironstone, now constitute our available Coal-Fields. Of course, as the operations of nature are uniform and incessant, we have Coals of all periods—graphites and anthracites of the Silurian and Devonian, bituminous coals of the Carboniferous and Jurassic, lignites of the Tertiary, and peats of the current epoch—the products differing in quality according to the amount of mineralisation and subsequent metamorphism to which they may have been subjected. The available coal of Great Britain is no doubt of *carboniferous* age, but many excellent coal-fields in India, America, and other countries, belong to the Jurassic or Oolitic period, while anthracites and graphites may belong to any epoch, just as the original bituminous coal may have been subjected to heat and other metamorphic processes. Like all mixed rocks, common coal presents many varieties—and these, according to their structure, texture, and qualities, have received various names, as *caking coal*, which is soft or "tender" in the mass, like that of Newcastle, and swells and cakes together in burning; *splint* or *slate coal*, which burns free and open, and is hard and slaty in texture; *cannel*, which is compact and jet-like in texture, and burns with a clear candle-like flame, and, from its composition, is chiefly used in gas manufacture; and *coarse*, *foliated* or *cubic coal*, which is more or less soft, breaks up into large fragments, and contains in general a large per-centage of earthy impurities. Between these there is, of course, every gradation—coals so pure as to leave only one or two per cent. of ash, others so mixed as to yield from ten to thirty per cent., and many so impure as to be unfit for fuel, and so to pass into *shales* more or less bituminous. The following analysis exhibits proximately these gradations, but mainly that varying proportion of gaseous elements which marks the passage of wood into peat, peat into coal, and coal into anthracite and graphite:—

(At 212°.)	*Carbon.*	*Hydrogen.*	*Oxygen.*	*Nitrogen.*	*Inorganic Ash.*
Wood	48—54	6—10	35—45	...	...
Peat,............	56—66	5— 9	18—33	2—4	1— 6
Lignite,........	56—70	3— 7	13—27	1—0	1—13
Coal,...........	70—92	2— 6	1— 8	0—2	3—14
Anthracite,...	74—93	1— 4	0— 3	trace	1— 7
Graphite,.....	80—98	...	...	...	1— 7

Iron (Gr. *sideros;* Lat. *ferrum;* Fr. *eisen*).—One of the best-known, and, economically speaking, by far the most important of the metals. Though readily tarnished, rusted, or oxidised by exposure to air and moisture, it has in the fresh fracture a peculiar grey colour, known as "iron-grey," or "steel-grey," and, when polished, possesses much lustre. It is not very malleable, but extremely ductile and very tenacious. At common temperatures it is hard and unyielding, but at a red heat it is soft and pliable, and at a high red-heat two pieces may be inseparably united by hammering, or *welded*, as it is technically termed, into one mass. It is very difficult of fusion, requiring for that purpose the highest heat of the blast-furnace. In this state it can be run into moulds, and is then known as *cast-iron*, which is hard, brittle, and of a granular texture. Subjected to repeated heating and hammering (*puddled*, as it is termed), it becomes less fusible, assumes a fibrous texture, gets tough and malleable, and is then known as *forged* or *wrought iron*. The average specific gravity of cast-iron is 7.27, that of forged 7.78. Iron is attracted by the magnet, and is itself susceptible of being rendered magnetic—a property possessed by no other metal except nickel. It is capable of forming alloys with several of the metals, though in this state little used; and with a small-proportion of combined carbon it forms *steel*, a substance of incalculable importance to all the industrial arts and manufactures.

Unlike many of the other metals, iron is rarely found in a *native* state, and this in scarcely appreciable quantities, in stones and masses of meteoric origin. This *meteoric iron*, as it has been termed, contains nickel, along with cobalt and other metals; and what is known as *telluric iron* occurs in minute grains and scales in other mineral veins, and contains carbon, graphite, or occasionally some other metal, but not nickel. On the whole, *native iron* is a very rare and doubtful substance; and all the iron of commerce is derived from *ores* (oxides, carbonates, &c.), either pure or in combination with various earthy ingredients, forming *ironstones*. These ores and ironstones occur in rocks of all ages—the ores chiefly in veins and abnormal masses among metamorphic schists, the ironstones in bands and layers among the strata of the Carboniferous, Oolitic, and other later formations. The ores are usually regarded as belonging to two families—1*st*, the Sparry Iron Ores, the most important member of which is *siderite*, *spathose iron*, or *carbonate of iron*, and which includes the *clay ironstones*, or the "clay-bands" and "black-bands" of the coal and other formations; and 2*d*, the Oxidised Iron Ores, embracing such well-known species as *magnetite* or magnetic iron, *hæmatite* or specular iron, *limonite* or brown iron-ore, and the like. In nature, iron enters largely into the composition of many rocks and rocky compounds; and also forms many chemical combinations, as oxides, carbonates, chromates, phosphates, sulphurets, and sulphates. Its presence in water is readily detected by the tincture of galls, or by the ferro-cyanate of potash—the former turning weak solutions purple or dark-blue, and forming a black precipitate where the metal is more abundant—the latter producing Prussian blue under similar circumstances.—See tabulations, "Mineral Scheme."

Nickel (Ger.).—One of the metals; white, ductile, malleable, attracted by the magnet, and, like iron, capable of being rendered magnetic. Its specific gravity, when hammered, is about 9. It is rather more fusible than pure iron; is not altered by exposure to the air and moisture at ordinary temperatures, but is slowly oxidised at a red heat. It is found in all meteoric iron; but its principal ore is a copper-coloured mineral found in Germany, and called *nickeline* or *kupfer nickel*—"nickel" being a term of detraction used by the miners, who expected from the colour of the ore that it would contain copper. Since the manufacture of German silver or *argentane*, nickel has, however, become an object of considerable importance, and is extracted from several ores, as from *Gersdorffite* or nickel-glance, *Nickeline* or copper-nickel, and the like. These are usually compounds (*speise*) of nickel, cobalt, antimony, arsenic, sulphur or iron, and belong to the family Pyrites. The salts of nickel are mostly of a grass-green colour, and the ammoniacal solution of its oxide is deep blue, like that of copper.

Nothing can be better than this as a ready book of reference for real working purposes. In the concluding portion, "specific" apellations, we have the same acute and handy arrangement. The list contains the greater portion of those terms employed by palæontologists to distinguish their so-called *species* of fossil plants and animals. Most of them are Latin, or Latinised forms, and refer chiefly to external aspect; not unfrequently to the name of the discoverer, or other individual eminent in the branch of natural history to which the object belongs; and in many instances to the locality where it was first detected, or in which it is exclusively found. Thus, *Pecten quinquecostatus*, the five-ribbed pecten; *P. Woodwardii*, after S. P. Woodward, the eminent conchologist; and *P. Purbeckensis*, a species apparently peculiar to the Purbeck beds of the Oolite. Whatever their origin (and it is greatly to be desired that describers would in every instance endeavour to adopt such terms as refer to some palpable characteristic), these designations follow the usual inflexion of Latin words—*rotundus*, *rotunda*, *rotundum*—*pulcher*, *pulchra*, *pulchrum*, or *brevis*, *brevis*, *breve* being respectively applied just as the generic word to which they refer may be masculine, feminine, or neuter; while the names of discoverers, &c., are thrown into the possessive case, as *Lyellii*, *Murchisoni*; and those of the localities converted into adjectives, as *Hibernicus*, *Purbeckensis*, and the like, but this, it must be confessed, not always.

We can recommend the book to all who have felt the want of a ready book of reference, and they are many indeed. If we are to find fault with any part of the arrangement, it must be with the paging at the bottom instead of the top. This is a fault; but, owing to the nature of the book, not so grave a one as it might be in some other works.

The Carriage Builders' and Harness Makers' Art Journal. Large 4to. Plates and Woodcuts. Monthly Parts at 2s. 6d. Parts I. to IV. London: Tallis & Co. 1859.

Since Mr. Bridges Adams' well known book on wheeled carriages, we believe we have had no public instructor in this class of manufacture; and although Mr. Adams understood his subject perhaps as well as any man living, and wrote about it in that masterly style which has since been more fully developed in various branches of the literary art, there is no doubt that there was plenty of room for something of a more advanced kind, and which should bring up the history and practice of the great art of carriage building, to somewhere near our own times. We are sorry however to find that the *Carriage Builders' and Harness Makers' Art Journal*, so far as it has already run, gives but little earnest of accomplishing these points. Its very title, in black and red, makes us distrust its contents before we turn the cover. That voluminous, or at least many-lined page tells us that it "contains practical directions in all branches of coach building, with working drawings and coloured illustrations, forming a beautiful show-book of carriage architecture, of the most approved designs and patterns of all descriptions of pleasure, domestic, public, railway, government, and agricultural carriages, introducing and explaining, from time to time, all new patents and improvements in springs, wheels, axles, and lamps; designs in metal chasings, steel and iron work, silk and lace, carriage furniture, heraldry, &c., &c.; with an inquiry into the combination of paints and varnishes, and the contrasts of colours, including working drawings and designs in harness making and saddlery." Here is a prodigious announcement. We almost think we know all about the art of constructing vehicles and harness from reading it, it promises so much, and leads over so wide a field of research in this elegant art.

The first author who comes forward in part I., after the editor's own preliminary trumpet, is Mr. James Rock, jun., of Hastings, who tells us something upon "Carriage building considered as an art," and very well he tells it, for to a large experience as a carriage builder, Mr. Rock adds a strong love for his profession, and an observant eye for constructive defects and their remedies. He says:—

The art of coach building holds a somewhat anomalous position in the world of industry. Essentially and of necessity for its practical purposes, a *mechanical* art, it nevertheless includes so much of what is termed "art" *par excellence*, that it may justly claim to be considered more than a mere industrial manufacture, producing only things of mere utility, and to rank along with goldsmiths' work, and the higher efforts of the potter, as an "art of manufacture." A few remaks may serve to justify this claim to the non-professional reader, and not be without use to the instructed manufacturer.

To produce a well shaped "body," which is the principal part of a carriage—that part, indeed, to which all the other parts are but accessories—requires no small amount of artistic taste, proficiency in drawing, and knowledge of perspective. There must be, firstly, a good outline, composed of easy flowing curves, so adjusted as to harmonise with each other, while they follow the general directions which the uses of the thing necessitate; and, secondly, there must be a symmetrical rounding of the surfaces of the body: a mere outline on the flat would neither satisfy the eye, nor give sufficient room in the vehicle without making it unnecessarily large and heavy.

In order to combine the outline with the rounding, the carriage designer is obliged to lay down his lines of construction with due consideration as to the position of each part of the finished body—to employ, in fact, the rules of perspective, and allow for the effects of fore-shortening and distance,—so that the curves drawn upon a flat surface in the outline drawing may be reproduced without distortion upon the rounded surfaces of the body. For want of due attention to this, it frequently happens that two manufacturers, working from the same design, produce carriages which, when finished, have scarcely a single point of resemblance.

Many carriage bodies are shaped as if they were portions of a gracefully moulded vase or tazza, and may compare, not unequally, with the best forms thrown from the potters' wheel, while the coach maker has this difficulty which the ceramic artist has not, that his "vase" is made up of many parts, each of which must be formed separately before it takes its place in the skeleton of frame work, which, when covered with panelling, constitutes the body of a carriage. He has also this further difficulty, that, in laying down his lines, he must foresee the ultimate form of the body; if his lines are faulty, the body will be faulty; for he cannot correct his lines as the construction goes on. He can only observe from time to time, and correct in his future productions the faults which he observes in the results of his earlier attempts. In this he is frequently baffled by the rapid changes of fashion: and unless he can discover and learn to apply the principles of those fundamental forms which underlie all things of plastic design, his constructions will always be faulty and displeasing to the instructed eye.

It may be remarked, *en passant*, that the curved surfaces of carriage-bodies should be treated as parts of those solid natural objects which the eye of man universally admits to be symmetrical and pleasing, as, for instance, the egg, the fir cone, and various spheroidal bodies. Various as are the shapes of modern pleasure carriages, a little observation will serve to shew that their outlines are referrible to two broadly defined styles of drawing—one of which is easy, flowing and natural: the other stiff, quaint, and conventional. The outlines of the former style are derived chiefly from the circle and ellipse, of the latter from the hyperbola and the parabola. In both styles good effect is produced by contrasting the curved lines with straight lines, horizontal, perpendicular, and oblique.

But the body is not the only part of a carriage which requires the exercise of artistic skill in its design and arrangement. The under-carriage and its iron work and the various appendages should be so designed as to harmonise with the style of the body, and constitute with it a work which may be judged by the laws of plastic art, and present to the eye from every point of view none but pleasing and harmonious outlines, and gracefully swelling or hollow surfaces.

In bringing about this result the coach smith is an important auxiliary. It is not absolutely necessary that he should be a "Quentin Matsys," but he must possess something of his spirit, and have the eye of an artist to guide his plastic hammer in moulding the heated iron, and his "wrench" in twisting it into graceful curves. The draughtsman may give him outlines for some parts of his work, but no drawing on a plane surface can dispense with the necessity of a good eye for form in the practical smith.

Now this is all very good, and we wish that more of our carriage builders would think and act in some such spirit as this.

In the same part, Mr. Starey, of Nottingham, treats us to a dissertation on "Purity of taste, as applied to carriage building," in which he says:—

The design, construction, and decoration of CARRIAGES OF LUXURY differ in various countries, according to their individual national characters; for instance, while our neighbours the French admire display and elaborate ornamentation, our cousins across the Atlantic pay chief attention to mechanical construction. The happy "mean" appears to be with the English builders, who, while devoting much attention to effective construction and simple elegance of outline, make all ornament subservient to general utility. Avoiding details, it would appear that in the design, construction, colours, and appointments of carriages, certain fundamental rules may be laid down.

In every case, *Fitness*, or adaptability of the carriage to the purpose to which it is required, should be the first consideration: without this, whatever may be its beauties of form or harmony of colours, it must result in a failure.

Simplicity of construction, with thorough effectiveness and quiet elegance of outline, is the next great point.

Individuality of character is most important, not only in the *tout ensemble*, but in all matters of detail: "*Quisquid in suo genere satis effectum est—valet.*" —*Quint* xii. 9.

Due proportions, free from exaggeration, and independent of any passing style or mannerism, are most essential.

The employment of material, however plain and simple, *the best of its kind*, carefully selected and adapted by its peculiar quality for the particular requirements of the case; this, as a matter of course, must be united to excellence of workmanship.

Except in carriages built expressly for display, a *subdued style of painting* is most permanently pleasing, and the avoidance of anything *outré* in all decorations and appointments should be studied: thus forming a certain harmonious combination which, without attracting attention to any one part, pleases, and gives satisfaction as a whole.

Mr. Starey is another eminent builder, who has well earned a right to write upon the subject he has chosen, and we are glad to meet him here.

An article, "On the application of machinery to carriage building," is another contribution of value, for carriage builders have always been much behind in availing themselves of mechanical aids in their work.

Each part contains two coloured plates of carriages, set off with all the graces of the art of the professional carriage draughtsman and colorist, and two outline plates giving constructive details. This arrangement is very well conceived, but if such erroneous drawings as that of Mr. Oxley's fore carriage are given, we are afraid the elementary work will not be of much value. In this case, the principle of the conical wheel has apparently been quite misunderstood, for the angles of the axle bearings, and the corresponding inclination of the wheels, do not at all accord with the disc of the wheels, and the consequence is, that the set of the wheels is as wrong as wrong can be, and the outside edges alone of the tyres would wear.

The subsequent parts contain some useful articles; but in part III. we are treated to something more on conical, as compared with flat or disc wheels, on which we shall not remark further than to say, that like the other chapters on the subject, it contains many absurdities; and in one of the sketches of the wheels the lower part of the wheel is shown as at right angles to the axis, whilst the upper part is disced off.

Mr. Cooper's drawings of finished carriages are, as they always are, very beautiful and accurate; but in some of the other drawings we find the old and very improper fashion of making the wheel spokes like hair lines. There is ample room and verge enough for a good work on carriage building. The present *Journal* is certainly the most ambitious attempt which has been made in this way, and we shall rejoice very much if it should eventually turn to good results.

THEORY OF COMPOUND INTEREST AND ANNUITIES, WITH LOGARITHMIC TABLES. By Fedor Thoman. 8vo. Pp. 190. Tables. London: Lockwood & Co. 1859.

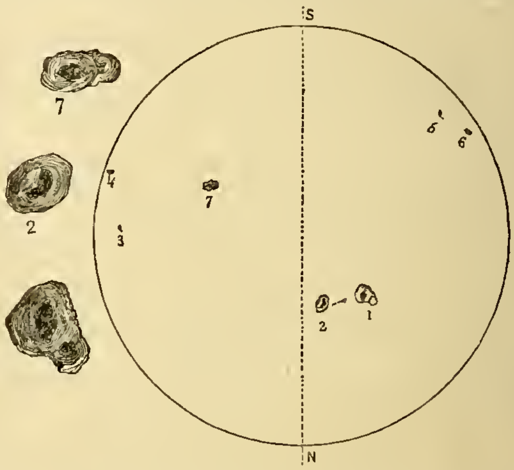
M. FEDOR THOMAN is "of the Société Crédit Mobilier of Paris," and like a true Frenchman he dedicates his book to H.R.H. Prince de Joinville. Whether or not His Royal Highness knows much of logarithmic calculations we are ignorant; but, M. Thoman has given us a good practical book on this subject—such a book, indeed, as must be of real value in the ordinary calculations of every-day life; without being either too discursive or too niggardly concise, it seems to reach as near as may be, to the average wants of the day.

It is divided into five parts, which are: On the amount of any sum at compound interest; On the present value of any sum due at a future time; On immediate annuities; On deferred annuities—reversions; and On annuities with entrance. The author has been long engaged in advising one of the largest foreign financial companies, and he has of course gathered a great amount of experience in laborious computations, and has long ago found out, in a practical manner, how much time can be saved by the use of logarithms in the bulk of extended calculations of various kinds, and by how much the chances of error can thus be diminished. All the heads of the subject matter which we have enumerated, are well worked out with practical examples, and to them are added a complete set of logarithmic tables of compound interest and annuities, and other matters to which the calculator can at once turn for concise statements of the numbers which he may require, and be at the same time certain that his progress in calculation is perfectly correct. We shall be glad to see the book come into general use.

CORRESPONDENCE.

MACULÆ OR DARK SPOTS ON THE SUN.

THE accompanying diagram sketch shows the relative position of the maculæ or dark spots on the sun, as that luminary appeared on the 25th of September last, at 3·30 P.M. The drawing was carefully made from the image formed on a plain surface at the eye end of a telescope, with



power 50. The enlarged view of the maculæ which I have drawn alongside the sun's circle, with numbered references to their position on the sun's disc, was similarly drawn with a telescopic power of 108. The scale of the sun is taken at 1,000,000 miles, = 2·480 inches. The scale of the detached maculæ is taken at 1,000,000 miles, = 9·920 inches.

No faculæ, or bright spots, of importance were discernible. A series of views, if taken in hand by observers who have leisure at command, would enable us to trace the progress of the solar maculæ in a very interesting manner.

W. H. WALENN, C.E.

19 *Talbot Road, Holloway, London, Sept.*, 1859.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

MEETING OF THE BRITISH ASSOCIATION AT ABERDEEN, 1859.

THE following is a condensed report of the proceedings:—

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

"On the necessity for incessant recording, and for simultaneous observations in different localities, to investigate atmospheric electricity," by Professor W. Thomson.

The necessity for incessantly recording the electric condition of the atmosphere, was illustrated by reference to observations recently made by the author in the island of Arran, by which it appeared that even under a cloudless sky, without any sensible wind, the negative electrification of the surface of the earth, always found during severe weather, is constantly varying in degree. He had found it impossible, at any time, to leave the electrometer without losing remarkable features of the phenomenon. The author pointed out certain simple and easily executed modifications of working electrometers which were on the table before him, to render them self-recording. He also explained a new collecting apparatus for atmospheric electricity, consisting of an insulated vessel of water, discharging its contents in a fine stream from a pointed tube. This stream carries away electricity as long as any exists on its surface, where it breaks into drops. The immediate object of this arrangement is to maintain the whole insulated conductor, including the portion of the electrometer connected with it and the connecting wire, in the condition of no absolute charge; that is to say, with as much positive electricity on one side of a neutral line as of negative on the other. Hence the position of the discharging nozzle must be such that the point where the stream breaks into drops is in what would be the neutral line of the conductor, if first perfectly discharged under temporary cover, and then exposed in its permanent open position, in which it will become inductively electrified by the aërial electromotive force. If the insulation is maintained in perfection, the dropping will not be called on for any electrical effect, and sudden or slow atmospheric changes will all instantaneously and perfectly induce their corresponding variations in the conductor, and give their appropriate indications to the electrometer. The necessary imperfection of the actual insulation, which tends to bring the neutral line downwards or inwards, or the contrary effects of aërial convection, which, when the insulation is good, generally preponderate, and which, in some conditions of the atmosphere, especially during heavy wind and rain, are often very large, are corrected by the tendency of the dropping to maintain the neutral line in the one definite position. The objects to be attained by simultaneous observations in different localities alluded to were—1. To fix the constant for any observatory, by which its observations are reduced to absolute measure of electromotive force per foot of air. 2. To investigate the distribution of electricity in the air itself (whether in visible clouds or in clear air) by a species of electrical trigonometry, of which the general principles were slightly indicated. A portable electrometer, adapted for balloon and mountain observations, with a burning match, regulated by a spring so as to give a cone of fire in the open air, in a definite position with reference to the instrument, was exhibited. It is easily carried, with or without the aid of a shoulder strap, and can be used by the observer standing up, and simply holding the entire apparatus in his hands, without a stand or rest of any kind. Its indications distinguish positive from negative, and are reducible to absolute measure on the spot. The author gave the result of a determination which he had made with the assistance of Mr. Joule, on the Links, a piece of level ground near the sea, beside the city of Aberdeen, about 8 a.m., on the preceding day, (September 14), under a cloudless sky, and with a light north-west wind blowing, with the insulating stand of the collecting part of the apparatus buried in the ground, and the electrometer removed to a distance of five or six yards, and connected by a fine wire with the collecting conductor. The height of the match was three feet above the ground, and the observer at the electrometer lay on the ground to render the electrical influence of his own body on the match insensible. The result showed a difference of potentials between the earth (negative) and the air (positive) at the match equal to that of 115 elements of Daniel's battery, and, therefore, at that time and place, the aërial electromotive force per foot amounted to that of thirty-eight Daniel's cells.

"Report on luminous meteors for 1858-9," by Professor Baden Powell.

"Provisional report on the progress in the solution of certain special problems in dynamics," by Mr. A. Cayley.

"Report on the changes of deviation of the compass on board iron ships, by 'heeling,' with experiments on board the *City of Baltimore*, *Aphrodite*, *Simla*, and *Sleeve Donard*," by Mr. John T. Towson.

The author explained that these were matters of consideration which the compass committee deemed incomplete; the one was the change which took place in iron ships in proceeding to the opposite hemisphere; the other, the change that was produced by what is technically denominated "heeling," that is, when the deck of a vessel leaned over through the action of the wind or otherwise; if, when looking towards the bow, it slanted downwards to the right, it is said to heel starboard, if to the left, to heel port. The first question was undertaken by the late respected Rev. Dr. Scoresby, who proceeded to Australia in the *Royal Charter*, and whose exertions in the pursuit of this branch of the inquiry shortened a most valuable life. The second question was the subject of the author's present report. Having described the principles on which the graphic illustration was constructed, he pointed out the unexpected amount of deviation which this source of disturbance (heeling) brought about, amounting in most instances, when the ship's head was in the position to produce the maximum effect, to two or three points in the standard compass, and after to a greater amount as far as the steering compass is concerned. He remarked on several particulars connected with this investigation. Generally the north end of the compass was drawn to the upper side of the ship,—the case with seven out of nine compasses on board the *City of Baltimore*, but in the two steering compasses, the needles were drawn in an opposite direction. The author explained that this disturbance arose, partly from subpolar magnetism below the compass, and partly from the disturbance of the inductive magnetism of the ships. In such ships as those under consideration, the following empirical rule held good with respect to compasses favourably placed. When the vertical force, as determined either by vibrating experiments or torsion on board the ship, maintained the ratio, as compared with the vertical force on shore, in the proportion of nine to fourteen, little or no effect was produced by heeling, and in the case of the *Simla* this plan of predicting the amount of error was adopted—a moveable upright magnet was applied so as to produce the before-named vertical force, when it was found "with magnet in," no error was produced, although "with magnet out," it amounted to 24 degrees from changing a heel of 10 degrees starboard, to 10 degrees port. Another remarkable result appears to exist. He believed that when a ship was built with her head south-east or south-west, little if any effect would be produced by heeling. When examining the magnetic condition of a particular vessel, they are surprised to find that the vertical was very nearly that which would give no effect from heeling. Their secretary immediately suggested that her head could not have been east when building, which had been taken for granted; and on inquiry it was found that on account of her great length, she had been built diagonally, with her head south-east nearly. Although the author believed that for practical purposes sufficient information had been obtained, yet there were anomalies in their observations that rendered the theories deduced, unsatisfactory. This he believed arose from the rapidity with which they were obliged to carry on their experiments, on account of the passing in and out of ships through the docks, from which cause the inductive influence of the earth had not sufficient time to complete its effect. It had been proposed to request the aid of the Admiralty in allowing the committee to experiment on one of her Majesty's iron ships in some convenient place for an unlimited time. In conclusion he requested that the Astronomer Royal would favour the society with his remarks.

The President remarked that he himself had made some observations on the deviation of the compass on board an iron ship which he possessed. After trying magnetic compensation, the magnets were taken away, and a table of errors adopted. He believed that magnetic compensation rendered the compass sluggish.

The Astronomer Royal, in reply to the noble President, stated that magnetic adjustment rendered the directive force exercised on the needle equal with the ship's head on all points of the compass. Without compensation, with the ship's head on some point, the directive force was frequently neutralised by the ship's magnetic force. He had been prepared to find that the compasses on board iron ships were affected by heeling, but was surprised at the amount, yet convinced of the practicability of compensating this source of error. He considered that the Compass Committee should not conclude their labours without further experiments, and thought that the Admiralty should place an iron ship at their disposal.

Professor W. Thomson wished, so far as his opinion could have any weight, to recommend that the necessity for constant determinations of the error of the compass, should be enforced on masters of ships generally, but most strongly on all masters of iron ships. It appeared to him that the only way to use the compass safely, *is never to trust to it*, that is to say, to take azimuths astronomically as often as weather permits, and only to use the compass as a convenience for steering by according to these azimuths, and as a means of keeping as nearly as possible the desired course in the intervals between the azimuthal determinations. When these intervals amount, as they often do, to several days or weeks, no confidence ought to be felt in the dead reckoning within a wide margin of possible error in the course, and the established precautions on approaching land ought to include a large allowance for this uncertainty. No such security can possibly be had for the determination of direction by the compass, as the comparison of two, or three, or more chronometers always gives, in a well-approved ship, for determining absolute time. Professor Thomson referred to the sound and thorough mathematical theory which had been given by Mr. Archibald Smith, and the thoroughly practical manner in which he had applied it, and brought it into form for practical use, in the real circumstances of sea going ships, by which Professor Thomson believes much has been done to give security to modern navigation. Professor Thomson referred to the case of the wreck of the *Tayleur*, which the late Dr. Scoresby, whose loss was so much felt by this Section, had attributed to a change in the magnetism of the ship (a new iron ship), produced in consequence of being tossed about in the Channel in a gale within a few hours after leaving Liverpool; and remarked that it appeared strongly to corroborate the opinion now expressed by the Astronomer Royal, that new iron ships are liable to sudden and great changes of magnetism on being knocked about in rough weather at sea.

Mr. Towson considered that iron ships were as safe as wooden ships, and remarked that they were insured at the same premium as class A 1 at Lloyd's, which would not be the case if they incurred more risk. He believed that when the evils of the compass were got over, they would be by far the safer class of ships.

"On the rapidity of signalling through long submarine telegraphs," by Mr. F. Jenkins.

This paper detailed certain experiments undertaken at the establishment of Messrs. R. S. Newall & Co., Birkenhead, with a view to verify the theory of retardation, and to supply certain constants required. This theory has been well developed by Professor Thomson, and is confirmed by the results of these experiments, which have indeed only been rendered possible by the peculiar construction of Professor Thomson's marine galvanometer. In this instrument, momentum and inertia are almost wholly avoided by the use of a needle weighing only one and a-half grain, combined with a mirror reflecting a ray of light which indicates deflections with great accuracy. By these means a gradually increasing or decreasing current is at each instant indicated at its due strength: thus, when this galvanometer is placed as the receiving instrument at the end of a long submarine cable, the movement of the spot of light, consequent on the completion of a circuit through the battery, cable, and earth, can be so observed as to furnish a curve representing very accurately the arrival of an electric current. Lines representing successive signals at various speeds can also be obtained, and by means of a metronome, dots, dashes, successive A's, &c., can be sent with nearly perfect regularity by an ordinary Morse key, and the corresponding changes in the current at the receiving end of the cable, accurately observed. The strength of the battery employed was found to have no influence on the results; curves given by batteries of different strengths, could be made to coincide by simply drawing them to scales proportionate to the strengths of the two currents. It was also found that the same curve represented the gradual increase of intensity due to the arrival of a current, and the gradual decrease due to the ceasing of that current. The curves of arrival obtained for lengths of from 1000 to more than 2000 nauts, were found to agree very closely in general appearance with those given by Professor Thomson's theory. In the curves representing dots and dashes sent at high speeds, successive dashes appear in quite a different part of the scale from that occupied by dots. It is in these cases obvious that no delicacy of relay will enable us to indicate both of these signals at a constant adjustment, nor does any increasing strength of battery help us—for though the variations of intensity are absolutely increased, the relative position of such changes to one another on the scale remains unaltered. The magnitude of the first appearance of a current at the far end of a cable may, however, be increased by the use of powerful batteries, and delicate instruments would permit the faintest appearance to be observed. By these means one isolated signal might be sent with great rapidity. Returning to the consideration of successive signals, when speed of transmission is diminished, the oscillations of the spot increase in size, those for dots and dashes overlap one another, and would give legible Morse signals by means of a relay. The amplitudes of oscillation representing any letter or letters, were found to be proportional to the amplitude representing dots. The speed of signalling possible can therefore be measured by that amplitude as soon as in one case it is determined what speed of dot signalling is compatible with the reception of all other combinations, dots, dashes, and spaces. This amplitude is modified by the nature of the receiving instrument, by the nature of the signal, by the skill of the manipulator, &c. The possible speed of signalling was found to be very nearly proportional to the squares of the lengths spoken through; thus, a speed which gave 15 dots per minute, in a length of 2191 nauts, reproduced all the effects given by a speed of 30 dots in a length of 1500 nauts. At these speeds, with ordinary Morse signals, speaking would be barely possible. In the Red Sea, a speed of from 7 to 8 words per minute was obtained in a length of 750 nauts. This result agrees very closely with the deduction from the experiments at Birkenhead, and apparently shows that the influence of electro-magnetic induction, due to the disposition of the cable in coils, does not very materially retard the possible speed of signalling. The amplitudes of oscillation representing dots, can be thrown into a curve which will be the same for all lengths. By this curve, we can determine from one single observation, on any cable, the amplitude of oscillation due to any speed, and, consequently, the possible speed of signalling on that cable. This method, however, of determining the possible speed of signalling, presupposes that a considerable length of the cable shall have been manufactured. Mechanical senders, and attention to the proportion of the various contact, would materially increase the speed at which signals of any kind could be transmitted. The best trained hand can not equal the accuracy of mechanism, and the slightest irregularity causes the current to rise or fall quite beyond the limits required for distinct signals. No important difference was observed between signals sent by alternate reverse currents, and those sent by the more usual method. The amplitude of oscillation, and consequent distinctness of signalling, was quite the same in the two cases. An advantage in the first signals sent is, however, obtained by the use of Messrs. Siemen's & Halshe's submarine key, by which the cable is put to earth, immediately on signalling being interrupted, and the wire thus kept at a potential half-way between the potentials of the poles of two counter-acting batteries employed, and the first signals become legible, which, with the ordinary key, would be employed in charging the wire.

This paper was accompanied by illustrative diagrams, by means of which the results referred to were exhibited to the section.

"Remarks on the discharge of a coiled electric cable," by Prof. W. Thomson.

Mr. Jenkin had communicated to the author last February, March, and April, a number of experimental results regarding currents, through several different electric cables coiled in the factory of Messrs. R. S. Newall & Co., at Birkenhead. Among these results were some in which a key, connected with one end of a cable, of which the other end was kept connected with the earth, was removed from a battery by which a current had been kept flowing through the cable, and instantly pressed to contact with one end of the coil of a tangent galvanometer, of which the other end was kept connected with the earth. The author remarked that the deflections recorded in these experiments were in the contrary direction to that which the true discharge of the cable would give, and at his request Mr. Jenkin repeated the experiments, watching carefully for indications of reverse currents to those which had been previously noted. It was thus found that the first effect of pressing down the key was to give the galvanometer a deflection in the direction corresponding to the true discharged current, and that this was quickly followed by a reverse deflection generally greater in degree, which latter deflection corresponded to a current in the same direction as that of the original flow through the cable. Professor Thomson explained this second current, or false discharge, as it has since been sometimes called, by attributing it to mutual electro-magnetic induction between different portions of the coil, and anticipated that no such reversal could ever be found in a submerged cable. The effect of this induction is to produce in those parts of the coil, first influenced by the motion of the key, a tendency for electricity to flow in the same direction as that of the decreasing current flowing on through the remoter parts of the coil. Thus, after the first violence of the back flow, through the key and galvanometer, the remote parts of the cable begin, by their electro-magnetic induction on the near parts, to draw electricity back from the earth through the galvanometer into the cable again, and the current is once more in one and the same direction throughout the cable. The mathematical theory of this action, which is necessarily very complex, is reserved by the author for a more full communication, which he hopes before long to lay before the Royal Society.

"On an application of quarternions to the geometry of Fresnel's wave surface," by Sir W. Rowan Hamilton.

The author had a lithographic sheet of paper, which he distributed to the mathematical members of the Section, and which contained the application in question. He briefly explained the terms "vector" and "scaler," drawing attention to the fact that in this system the vector not only marked magnitude but direction. He then explained how, in a few simple formulæ, the same result was arrived at as by the very abstruse and difficult method of Fresnel, a method involving such intricate and voluminous calculations that its author had for years suppressed it, merely publishing the results. Sir W. Hamilton also showed that the method of quaternions was strictly impartial, as you arrived at the true result whether you started from the hypothesis adopted by Fresnel or that of M'Cullagh.

"On the aqueous vapour of the atmosphere," by Admiral Fitzroy.

"On a new species of double refraction," by Sir. D. Brewster.

The author exhibited to the Section a number of beautiful double slips of glass, with small pieces of decomposed glass, which he had obtained from the Marquis Champana in Rome, interposed, which showed all the varied tints of Newton's thin plates, and then explained to the Section how, by the polarization in two different planes of the transmitted light, and the interference of those which were retarded by internal reflection at the surfaces of these very thin films, none of them the two-thousandth of an inch thick, the varied tints were produced. He also explained minutely their optical properties when examined by the polariscope.

The Rev. Dr. Lloyd could not agree with Sir David Brewster that this was a new species of double refraction, but explained how it was to be viewed as an instance of interference of the two beams of light polarized in opposite planes.

Professor Forbes drew the attention of the Section to the similarity of the properties of these films to those he had many years exhibited to the Section, which he had obtained by heating plates of mica, and which he had used in his experiments on polarized heat.

"On the transmission of electricity through water," by Mr. J. B. Lindsay.

The author has been engaged in experimenting on the subject, and in lecturing on it in Edinburgh, Glasgow, and other places, since 1831. He has succeeded in transmitting signals across the Tay and other sheets of water, by the aid of the water alone, as a means of joining the stations. His method is to immerse two large plates connected by wires at each side of the sheet of water, and as nearly opposite to each other as possible. The wire on the side from which the message is to be sent is to include the galvanic battery and the commutator, or other apparatus for giving the signal. The wire connecting the two plates at the receiving station is to include an induction coil or other apparatus for increasing the intensity and the recording apparatus. The distance between these plates he distinguished by the term "lateral distance." He found that there was always some fractional part of the power from the battery sent across the water. There were four elements on which he found the strength of the transmitted current to depend; first, the battery power; second, the extent of surface of the immersed metal sheets: third, the "lateral distance" of the immersed sheets; and, fourth, in an inverse proportion the transverse distance or distance through the water. As far as his experiments led him to a conclusion, doubling any one of the former three doubled the distance of transmission. If, then, doubling all would increase the intensity of the transmitted current eight fold, he entered into calculations to show that two stations in Britain, one in Cornwall and the other in Scotland, and corresponding stations well chosen in America would enable us to transmit messages across the Atlantic.

The President, the Earl of Rosse, said he was aware that some years since experiments were made on the subject treated of by Mr. Lindsay, and messages sent across the Serpentine, but as nothing further appeared to have come from them, he supposed there were found to be practical difficulties which proved insuperable.

Sir D. Brewster said he was a member of the committee entrusted with the making the experiments alluded to by Lord Rosse during the Great Exhibition. The results were, messages were sent across in the usual manner: the wire was then broken; with a gap of six feet the messages still went, and when the distance was increased to sixteen feet and twenty feet, they still went across.

"On the Phonautograph, an instrument for registering simple and compound sounds," by the Abbé Moigno.

The phonautograph is an instrument which consists of a large chamber or drum, of a spheroidal form, with a diaphragm or drum-head at one end, which, by a system of levers, works the pen which records the sounds which the form of the chamber causes it to concentrate on the tympanum. The Abbé exhibited a drawing to the section, which explained the construction of the instrument, and then exhibited drawings showing the actual markings of the pen over a sheet of paper carried past it by clockwork, 1st, when tuning-forks sounding various notes were vibrated in presence of the instrument; 2d, when several notes were sounded on a diapason pipe; and 3d, when a person spoke before it. In the first two cases the recording pen drew such regular curves, that the number of vibrations corresponding to the note as seconds could be counted, and, as the Astronomer Royal observed, they were obviously the curves of sines. In the case of the human voice the words spoken were written below the corresponding tracings of the pen; and although these were very irregular, yet a marked correspondence could be traced, especially where the words contained r's, g's, and other well-marked low or guttural sounds.

"Supplement to Newton's method of resolving equations," by the Abbé Moigno.

"Portable apparatus for analyzing light," invented by M. Porro.

This instrument was a telescope, at the side of which the light to be analyzed could be introduced by a slit, and being then reflected down, met a prism of flint glass, with its remote side silvered, and placed perpendicularly to the axis of the observing or telescopic part, the light then reflected back is dispersed as if by a prism of double the refracting angle of the prism of the instrument, and the dispersion then measured by a micrometer placed at the focns of the eye-piece.

"Report of the Balloon Committee," by Col. Sykes.

"On some properties of the powers of numhers," by Mr. J. Pope Hennessy.

The first part of this paper contained an extension of the discovery announced at the Leeds meeting of the Association. The properties which were then shown to exist in the powers of any number of the ordinary or decimal scale of notation were now traced in all scales of notation whatever.

"On the stereoscopic angle," by Mr. A. Claudet.

"On the focns of object glasses," by Mr. A. Claudet.

The researches on this qnestion tended to show the relation between the distances and sizes of objects with the focal distances and sizes of their images, and to find the two points, one before the lens and the other behind, from which the distance of objects and the focal distances mnst be measnred, and from which all proportions are in an exact ratio, for it is found that measuring from the object glass on both sides, double distance of object does not prodnce one-half of the focal distance, and *vice versâ*. These two points are, first, the point before the lens which prodnces an image infinitely larger at infinite distance, and behind the lens the point which is the focus for an object at infinite distance, giving an image infinitely small, it is obvions that these two points are on each side the zero of the scale of measnre, and it remained to fix the position of another point before the lens, which prodnces behind the lens an image as large as natnre. The two spaces between these two points, one in front and the other behind the lens, are perfectly eqnal, and they are each the nnit by which all distances of objects and all focal distances are to be measnred. Donble the nnit in front will give a focus one-half of the unit behind the lens, and one-half of the unit in front will give a focal distance donble of the unit behind the lens, and all the other distances in the same proportion, so that knowing either the distance in front of the lens, or the focal distance, the other distance can be fonnd withont having to examine the focns on the gronnd-glass; the only thing to do being to divide the scale called "the nnit of focal distances," in any number of parts corresponding in an inverted ratio with the progression of distances in front of the glass.

"On the stereomonoscope," hy Mr. A. Clandet.

"On a changing diaphragm for donhle achromatic combinations," hy Mr. A. Clandet.

Mr. Clandet explained the construction of his contrivance, intended to rednce or increase the apertnre of a double achromatic lens without having to nnscrew one of the lenses and without any slit on the tube. This is done by two rings revolving on one another, like the top and bottom part of a snuff-box, and each carrying a number of India-rubber stripes, the other end of which was fixed on the opposite ring, so that making the ring not fixed in the tnbe to revolve by an external pinion, the India-rubber stripes were drawn intermixing each other nntil each of them was extending on the diameter of the tube, on which disposition the whole aperture was shnt.

"On the angular measurement of the picture in painting," hy Mr. H. R. Twining.

This is a small instrument nsed to enable the stndent to fix the distance of objects as represented in a pictnre withont having reconrse to linear perspective.

"On the affections of polarized light reflected from and transmitted by thin plates," by the Rev. H. Lloyd.

"On a curious landscape inclosed in a specimen of calcedony, belonging to a lady," exhibited by Sir. D. Brewster, and explained by him.

"On the present state and history of the qnestion respecting the acceleration of the moon's motion," by the Astronomer Royal.

"On atmospheric waves," hy Admiral Fitzroy.

"On a new electro-medical apparatns," hy M. Rhumkorff, exhibited and explained by the Abbé Moigno.

The Abbé briefly described Daniel's and Grove's and Bunsen's galvanic batteries, the chief objection to the two latter being the evolntion of nitric acid fumes. The peculiarity of the instrument he exhibited was, that snlphate of mercury in solution contained in two neat little cups of carbon was nsed to excite the zinc; a small battery of two cells, aided hy a Rhumkorff's coil, packed np in a small box, constitnted the apparatus.

"On Becquerel's phosphoroscope," hy the Abbé Moigno.

"On tbe stratified electrical discharge as affected hy a moveable glass bell," by Mr. J. P. Gassiot.

"On friction in air," by Mr. J. P. Joule.

"On radiant heat," by Mr. B. Stewart.

"On mixtnre of colonrs of the spectium," by Prof. Maxwell.

"Note on the propagation of waves," hy Mr. G. J. Stoney.

"On chromatic dispersion," and "On the wave lengths of different rays," by Mr. M. Panton.

"On an iris seen in water," by Mr. J. J. Walker.

"On proportional compasses," by Colonel Shortrede.

"On calculating lunars," by Colonel Shortrede.

"On a new photographic lens," by Mr. T. Sutton.

By placing a donble concave small lens between two large plane concave lenses, and taking care to adjust their respective distances, attending also to the centering of them, the anthor asserted that he had succeeded in prodncing a lens entirely free from distortion

"On the canse of colonrs," by Mr. J. Smith.

The anthor exhibited to the section two little instruments, fitted to prodnce rapid whirling motion; by placing in these caids a pure white, so cut ont as to give at several distances from the centre various proportions of the white parts remaining, and placing the instrument on an intensely black gıound, (a piece of black velvet), he succeeded in producing vivid impressions on the eye of several colours, viz., bright red, dusky reds and browns, deep greens, light greens, yellows of various degrees of purity, orange violets, and other colours; and asserted that, by apportioning the spaces which alternately produced in rapid succession impressions of light and of darkness, he could at pleasure cause any colour he desired to be seen while the rapid motion was continued.

"Repoıt on the theory of numbers," by Mr. H. A. S. Smith.

"Report on thunderstorms," by Mr. G. J. Symons.

"On the establishment of thermometric stations on Mont Blanc," by Prof. Tyndall.

"On the connection between the solar spots and magnetic disturbance," communicated hy Sir D. Brewster.

"On the calculus of variations," hy Professor Lindelöf.

"On celestial photography," hy Mr. W. de la Rue.

"On the submergence of telegraph cables," by Mr. H. Cox.

"On electrical 'frequency,'" by Professor W. Thomson.

Becarria found that a conductor insulated in the open air becomes charged sometimes with greater and sometimes with less rapidity, and he gave the name of "frequency," to express the atmospheric quality on which the rapidity of charging depends. It might seem natural to attribute this quality to electrification of the air itself round the conductor or to electrified particles in the air impinging upon it; but the author gave reasons for believing that the observed effects are entirely due to particles flying away from the surface of the conductor, in consequence of the impact of *non-electrified* particles against it. He had shown in a previous communication that when no electricity of separation (or, as it is more generally called, "frictional electricity," or "contact electricity,") is called into play, the tendency of particles continually flying off from a conductor is to destroy all electrification at the part of its surface from which they break away. Hence, a conductor insulated in the open air, and exposed to mist or rain, with wind, will tend rapidly to the same electric potential as that of the air, beside that part of its surface from which there is the most frequent dropping, or flying away of aqueous particles. The *rapid charging*, indicated by the electrometer under cover, after putting it for an instant in connexion with the earth, is therefore, in reality, due to a *rapid discharging* of the exposed parts of the conductor. The author had been led to these views by remarking the extreme rapidity with which an electrometer, connected by a fine wire with a conductor insulated above the roof of his temporary electric observatory in the island of Arran became charged, reaching its full indications in a few seconds, and sometimes in a fraction of a second, after being touched by the hand, during a gale of wind and rain. The conductor, a vertical cylinder about ten inches long and four inches diameter, with its upper end flat and corner slightly rounded off, stood only eight feet above the roof, or in all, twenty feet above the ground, and was nearly surrounded by buildings rising to a higher level. Even with so moderate an exposure as this, sparks were frequently produced between an insulated and an uninsulated piece of metal, which may have been about 1-40th of an inch apart, within the electrometer. and more than once a continuous line of fire was observed in the instrument during nearly a minute at a time, while rain was falling in torrents outside.

"On gutta percha as an insulator at various temperatures," by Mr. F. Jenkin.

"On Sir Christopher Wren's cipher, containing tbree methods of finding the longitude," by Sir D. Brewster.

"On methods of finding the position of a fault in a submerged cable," by Mr. C. F. Varley.

"On lunar influence on temperature," by Mr. J. Park Harrison.

"On the transparency of the atmosphere," hy Mr. A. Cruiksbank.

"Meteorological observations made at Huggate, Yorkshire," hy the Rev. T. Rankin.

"On three variable stars, R and S Ursæ Majoris, and U Geminorum, as observed consecutively for six years hy Mr. Pogson," communicated by Dr. Lee.

"On an improvement in the heliometer," hy Mr. N. Pogson.

"On recent theories and experiments on ice at its melting point," by Prof. J. Thomson.

"On the mid-day illumination of three lunar craters," hy Mr. W. R. Birt.

"On Chinese astronomy," hy Mr. J. B. Lindsay.

"On the decomposed glass found at Nineveh and other places," hy Sir D. Brewster.

He described the general appearance of glass in an extreme state of decomposition, when the decomposed part was so rotten as to break easily between the fingers, a piece of nndecomposed glass being generally found in the middle of the plate. He then explained how, in other specimens, the decomposition took place around one, two, or more points, forming hemispherical cups, which exhibit the black cross and the tints of polarized light. In illustration of this decomposition, he showed to the Meeting three specimens, in one of which there was no colour, but which consisted of innumerable circular cavities with the black cross, these cavities giving it the appearance of ground-glass. In another specimen the film was specular and of great beauty, showing the complementary colours by reflection of transmitted light. In a third variety the films were filled with circular cavities exhibiting the most beautiful colours, both in common and polarized light. Various other remarkable properties of these films were described by the author.

"On the fall of rain at several places in Forfarshire," hy Mr. A. Brown.

"On the climate of Orkney," hy the Rev. J. C. Clouston.

"On the meteorology of British Guiana," by Mr. P. Sandeman, Colonial Observer, British Guiana.

"On mild winters in the British isles," by Professor Hennessy.

"On the figure of an imperfectly elastic fluid," by Professor Hennessy.

It appears that the shape of a mass of such a fluid is dependent on its volume in such a way that any abstraction from it will in general be attended with a change of figure. This proposition, when applied to the case of a mass in rotation, shows that if the earth has gradually passed into its present state from one of complete fluidity, the figure of the inner surface of the consolidated crust must be less elliptical than the stratum of fluid out of which it was formed.

"On the annual variation of the barometer," by Mr. A. Brown.
"On the theory of light," by Mr. G. F. Harrington.
"On the cause of magnetism," by Mr. G. V. Fowler.
"On the diurnal variation of the barometer," by Mr. T. Davies.
"On the angles of dock-gates and the cells of bees," by Mr. C. Willich.

This ingenious paper, which was illustrated with models admirably calculated to make this abstruse subject intelligible, gave a very interesting history of the speculations of mathematicians in their successive attempts to discover the angle which gave the greatest strength to support pressure with the greatest economy of materials. It showed that, though some of the mathematicians had fallen into error, the bees, by a peculiar instinct, had always used the mathematically-correct angles. The models showed exactly the manner in which the surfaces were arranged so as to produce the desired effect.

"On an expression for the probability of a given deviation from a mean result," by Mr. R. Campbell.
"On a system of moving bodies," by Mr. A. S. S. Wilson.

The author attempted to prove, from the well-known dynamical theorem, that the centre of gravity of an entire system of bodies is either at rest or moves uniformly in a straight line, and that the phenomena of weight and the fall of projectiles on the surface of the planets are caused not by forces inherent in these systems, but by their motions in space.

"On the longitude," by Sir. C. Grey.
"On the relations of a circle inscribed in a square," by Mr. J. Smith.
"On the reduction of Professor Forbes's observations of underground temperatures," by Professor W. Thomson.
"On the same subject, with its application to monthly mean-temperatures," by Professor J. D. Everett.
"On the indication of the planetary orbits," by Mr. J. P. Hennessy.
"On an instrument for exhibiting the motions of a ring of satellites," by Professor C. Maxwell.
"On the dynamical theory of gases," by Professor C. Maxwell.

The phenomena of the expansion of gases by heat, and their compression by pressure, have been explained by Joule, Clausens, Herepath, &c., by the theory of their particles being in a state of rapid motion, the velocity depending on the temperature. These particles must not only strike against the sides of the vessel, but against each other, and the calculation of their motions is therefore complicated. The author has established the following results :—1. The velocities of the particles are not uniform, but vary so, that they deviate from the mean value by a law well-known in the "method of least squares." 2. Two different sets of particles will distribute their velocities, so that their *vires vivæ* will be equal ; and this leads to the chemical law, that the equivalents of gases are proportional to the specific gravities. 3. From Professor Stokes's experiments on friction in air, it appears that the distancee travelled by a particle between consecutive collisions is about 1-447000th of an inch, the mean velocity being about 1,505 feet per second; and therefore each particle makes 8,077,200,000 collisions per second. 4. The laws of the diffusion of gases, as established by the Master of the Mint, are deduced from this theory, and the absolute rate of diffusion through an opening can be calculated.—The author intends to apply his mathematical methods to the explanation on this hypothesis of the propagation of sound, and expects some light on the mysterious question of the absolute number of such particles in a given mass.

"On a new photometer," by the Abbé Moigno.
"On a proposal for a general mechanical theory of physics," by Mr. J. S. S. Glennie.
"On the distribution of heat over the sun's surface," by Mr. J. J. Murphy.
"On the philosophy of physics," by Dr. Macvicar.
"On the relation between refractive index and volume," by the Rev. T. Dale and Dr. Gladstone.

The authors referred to a previous paper, in which they had shown, among other things, that the *sensitiveness* of a subject is not directly proportional to the change of density produced by an alteration of temperature. The theoretical formulæ relating to the dispersion of light afford little assistance in determining what this relation is, but a series of careful observations had been made with a view of arriving at some empirical formula. It was found that the product of the volume, reckoned as 1,000 at the boiling point, and the refractive index for the line A of the prismatic spectrum less unity, gave numbers which were nearly constant. In the case of water, alcohol, pure wood spirit, and bisulphide of carbon, however, the volume increases a little faster in proportion than the refractive index less unity diminishes, while with ether the reverse is the case. The regularity of the numbers shows that this is not due to errors of experiment. The authors propose examining the subject more closely.

The Section passed a vote of thanks to the President, Lord Rosse.

Section B.—Chemical Science.

"On the stages which led to the invention of the modern air-pump," by Professor G. Wilson.
"On the fluorescence and phosphorescence of some diamonds," by Dr. J. H. Gladstone.
"On the comparative value of certain salts for rendering fibrous substances non inflammable," by Messrs. Versmann and Oppenheim.
Dr. S. Macadam followed with a paper "On the analysis and valuation of manures."
"New process of preserving milk perfectly pure in the natural state, without any chemical agent," by the Abbé Moigno.
"On a symmetrical arrangement of oxides and salts on a common type," by Dr. Lyon Playfair.
"On the molecular movements of fluids," by the Master of the Mint.
"On the ageing of mordants in calico printing," by Mr. W. Crum.
"Laboratory memoranda," by Mr. Brazier.—Mr. Brazier's laboratory memoranda fell under the following heads:—"On the quantitative estimation of the soluble combustible contents of water;" "A method for obtaining pure distilled water;" and "On the action of concentrated sulphuric acid on cubebin, in relation to the test for strychnine, by bi-chromate of potash and sulphuric acid."
"On the formation of rosolate of lime on cotton fabrics in hot climates," by Mr. C. Calvert.
"On the density or alloys," by Mr. C. Calvert.
"On stib-ethyl," by Mr. G. B. Buckton.
"Report on the chemical characters of the photographic image," by Prof. Maskelyne.
"To exhibit a photograph of fluorescent substances," by Dr. Gladstone.
"To exhibit two photo-chemical experiments," by M. Niepce de St. Victor, and a "Collection of photographs in charcoal and metallic powder, and photographic enamels," by the Abbé Moigno.
"On a new mode of generating illuminating gas by means of super-heated steam and any hydro-carbon," by MM. Isoard.

This new process is carried out without the use of coal, but with the use of some resinous substance, such as tar. The mode is so economical that a machine of three horse-power would be able to light the city of Aberdeen, and the price is considerably cheaper than the gas in ordinary use.

"On the composition of a recently formed rock on the coast of Flanders," by Dr. Phipson, of Paris.
"On the composition of the shell of *cardium edule*, (common cockle,) by Dr. Phipson, of Paris.
"Preliminary report on the solubility of salts," by Dr. Sullivan.
"First report on mechanico-chemical analysis of rocks," by M. A. Gages.
"On gold nuggets from South Australia," by Prof. Tennant.
"On the action of air on alkaline arsenites," by Mr. J. M'Donnell.
"On the supply and purification of water," by Mr. T. Spencer.
"On a new mode of bread-making," by Dr. Odling.

By this process the carbonic acid is produced independently of, and superadded to, the flour, which consequently undergoes no modification whatever. The carbonic acid gas is stored in an ordinary gas-holder, and is pumped therefrom into a cylindrical vessel of water, whereby the water becomes charged with gas. This soda-water is mixed under pressure with the flour, and the resulting dough becomes vesicular on removing the pressure. It is then divided into loaves and baked. This process is so rapid that in an hour and a half from the first wetting of the flour, a sack of flour is made into two-pound loaves. The advantages of this new mode are—its cleanliness ; from the beginning to the end of the operation, neither the flour nor the water is touched by the human feet ; it conduces to the health of the work-people ; it is a very rapid process ; it is certain and uniform ; and it prevents any deterioration of the flour, so that by this process you can use flour which would require alum in the ordinary process.

"On the composition of Thames water," by Drs. Odling and Dupre.
"Report on the recent progress and present state of organic chemistry," by Mr. G. C. Foster.
"Notice of Dugong oil."
"On the solubility of bone-earth from various sources in solutions of chloride of ammonium and common salt," by Mr. Binney.
"Report on field experiments on the essential manuring constituents of cultivated crops," by Prof. Voelcker.
"On soluble silicates, and some of their applications," by Mr. F. Ransome.

The writer gave a history of the discovery of the soluble silicates, and of the various researches and experiments of Dr. Fuchs of Munich, and of Prof. Kullmann of Lille, and of the several applications of these silicates to stereochromy, to the various branches of manufacture, and of the effects of their combination with lime, whether carbonate, sulphate, phosphate, or caustic; but described more in detail the value of their application in the manufacture of artificial stone, and in the preservation of natural stone, &c., from decay.

"Notes on the current methods for estimating cellulose, or 'woody fibre,' in vegetable foodstuffs," by Mr. T. Segelcke.
"On the effects of different manures on the composition of the mixed herbage of meadow land," by Messrs. Lawes and Gilbert.
"On the organic elements and their relations to each other and to the medium of light, illustrated by models according to the author's theory of the forms and structures of the molecules of bodies," by Dr. Macvicar.
"On crystallised bi chromate of strontia," by Dr. Dalzell.
"On the economical preparation of pure chromic acid," by Dr. Dalzell.
"On Corne and Demeaux's disinfecting and deodorising powder," by the Abbé Moigno.
"On matches without phosphorus or poison," by the Abbé Moigno.
"To exhibit a nephogene, capable of being adapted to many chemical, therapeutic, and hygienic purposes," by the Abbé Moigno.
"On the equivalent of bromine," by Dr. Wallace.

"On proposed improvements in the manufacture of kelp," by Dr. Wallace.

The chief defects of the present system were pointed out, and, by way of remedy, it was proposed that sheds should be erected for the desiccation of the weeds and their preservation from rain, and that the weeds should be burned or charred at a low temperature into a loose ash, instead of being strongly ignited and subjected to fusion as now practised. By this process the loss of iodine that appears at present to occur, and the production of sulphur compound, which cause an enormous consumption of vitriol in their decomposition, would be entirely avoided. Dr. Wallace described the varieties of weeds used by the kelpers, and described the results of a series of experiments, conducted with the object of estimating the quantities of iodine and potash in the ashes of the various weeds when prepared by the improved process. From these it appeared that the ashes of the deep sea tangle contained 28 lb., that of the black wreck, 9 lb., and that of the yellow or bladder wreck, 6 lb. of iodine per ton of 22½ cwt. Dr. Wallace concluded by calling upon the proprietors of the kelp-bearing shores to interest themselves more than they have hitherto done in this important manufacture, and to expend some capital in the erection of sheds, and purchase of such simple apparatus as the islanders are capable of using with advantage. By doing so, they would confer an important benefit upon their poor tenants, and insure greatly augmented returns from their estates.

Dr. Daubeny exhibited specimens of several varieties of volcanic tufa, from the neighbourhood of Rome and Naples.

"Reports from the laboratory at Marburg," by Dr. Guthrie.

"New process of etching glass in relief by hydrofluoric acid," by Mr. Napier.

"On combination of earthy phosphates with alkalies," by Prof. Voelcker.

"On Marsh's test for arsenic," by Dr. Odling.

"Quantitative estimation of tannin in some tanning materials," by Messrs. Mulligan and Dowling.

Mr. C. J. Burnet exhibited some Photographs toned with a solution of bichloride of platinum, rendered strongly adhesive by carbonate of soda, the previous addition of a little tartaric acid also being apparently a further improvement. Platinum-toning had been introduced in France some years ago, but, as far as Mr. Burnett could find out, did not seem there or here to have been found generally satisfactory, apparently from chemical reasons which Mr. Burnett mentioned. The addition of carbonate of soda, as made by Mr. Burnett, was an attempt to remove some of those objections and render platinum more available.

"On the different points of fusion to be observed in the constituents of granite," by Mr. M. F. Bialloblotzky.

"On some new cases of phosphorence by heat," by Dr. Phipson.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

October 4, 1859.

This was the opening of the session, when Mr. Fairbairn, the President, delivered the usual address. Afterwards the following papers were read:—"Researches on several organic colouring matters," by Mr. Arnaudon, of Turin, presented by Dr. C. Calvert.

The most remarkable of these researches is one concerning nine different species of wood, termed by the author, collectively, *bois d'amarante* (and one of which is known in England under the name of purple heart), on account of their containing a peculiar colourless principle capable of being transformed into a substance of fine purple colour by the action of light, heat, and acids. Oxygen is unnecessary to this transformation, as it takes place equally in an atmosphere of hydrogen or in vacuo. A solution of the colourless principle exposed to the action of air during several years, in a dark place, remained perfectly unaltered.

The purple colouring matter differs entirely from the colourless principle from which it is obtained, not only by its colour, but also by other physico-chemical properties; thus, for instance, it is less soluble in water and in ether, more volatile, and contains a greater proportion of carbon, than the colourless principle. It may be reduced in the same manner as indigo blue.

Amongst the many interesting experiments which may be performed with this colouring matter, and of which several were repeated during the evening, we may mention the following:—A quantity of the colourless solution is introduced into a glass tube, from which the air is then expelled, and the tube hermetically closed. If the tube be now exposed to the direct rays of the sun, the solution assumes a purple colour, and red flakes of colouring matter are deposited. When acidulated with hydrochloric acid, the colourless solution acquires a purple hue when heated up to 80° C. If the colourless principle in the dry state be enclosed in a tube containing hydrogen, or devoid of air, and exposed to a temperature of 160° C., in the dark, the purple colour is at once produced.

The wood and its decoction show the same phenomenon, but with less intensity. Woollen, silk, and cotton stuffs, with or without mordant, steeped in this decoction, have only a brown or greyish hue, as long as the original substance has not been modified. But when so prepared they are exposed to the action of light and heat, or immersed in a bath of acidulated water, they are at once dyed of a purple hue.

The colour thus produced withstands perfectly the action of acids, it is rendered slightly more blue by alkalis, and resists light better than archil purples and aniline.

A second research is on the Bois de Taigu, from Paraguay (or Ebène soufré), from which the author has separated an acid principle, which crystallises in beautiful yellow prisms, and yields crystallisable salts of a scarlet colour.

Then follows a notice on the Quebracho wood of South America, from which Mr. Arnaudon has produced a fine yellow on wool.

Violet Palisander wood (Madagascar), contains a violet colouring matter which differs from that of the bois d'amarante, and may be fixed in the same manner as the colouring matter of logwood.

In a last notice on the colouration of the solution of guaiac resin, the author shows by experiments that it is produced only by the action of oxygen.

From general considerations deducted from comparative experiments set down by him in tabular form, Mr. Arnaudon concludes that, with our present chemical knowledge, general laws for the production of organic colouring matters cannot be laid down.

"On the cause of colour and the theory of light," by Mr. John Smith, M.A.

The author, in attempting to explain certain natural phenomena, could not satisfy himself by applying the principles of either theory or light, and said that many natural phenomena indicated beats or vibrations in the luminous ether very different from what science taught. That is, that there were greater intervals between them than Newton had demonstrated and scientific men believed. He therefore endeavoured to contrive experiments by which he would be able to make as many revolutions or beats in a second as he considered the effective vibrations of light were repeated in a second of time, and argued that by certain contrivances to produce light and shade in alternate vibrations he should produce colour. A series of experiments was subsequently undertaken, which led to the conclusion that varieties of colour are produced by pulsations of light and intervals of shadow in definite proportions for each shade of colour. That is, supposing white light to consist of the motion of an ether, blackness to consist of an entire absence of motion, then a certain colour, blue, red, or yellow, will be produced by the alternate action of the light and the shadow. The author used shadow in the positive sense as the sensation was positive.

On pursuing the inquiry, he first caused a small parallelogram, cut in card board, to revolve over a black surface with a rapidity which he considered equal to the vibration of light. By this motion he obtained a distinct blue, while at another time, in different weather, he obtained a purple. He then made a disc with several concentric rings, which he painted respectively $\frac{1}{3}$, $\frac{3}{4}$, $\frac{2}{3}$, and $\frac{1}{2}$ black, leaving the remainder white; and on making this disc revolve, the rings became completely coloured. There was no appearance of any black or white. In a bright day, with white clouds in the sky, the rings were coloured respectively a light yellowish green, two different shades of purple, and a pink. By using discs of a great variety of shapes and different proportions of white and black, the author said that he produced successively or together all the colours of the rainbow, although he had not yet arrived at the exact arithmetical determination of the amount of light and shade needful for each.

These experiments were made before the Society by the light of a paraffin oil lamp with a reflector. The author said that they were much more brilliant by sunlight.

There was another set of experiments which the author considered as very effective, and especially as being easily made and described, but requiring strong sunshine to show them. These were made by casting a shadow of a particular figure on a white wall or on a sheet of paper, so as to produce alternate beats of light and shadow when put in revolution. The figure became coloured of different shades, and because these could be seen on the wall, like the spectrum from the prism, he called them spectra by reflection.

He mentioned also that the colours may be produced by making a black disc, with figures cut out of it, revolve before a white cloud or white screen. There were many others which he had not time to enumerate, much less to describe; but he described some of the figures which produce the phenomena which are perceived when looking through transparent solids.

The author considered that his theory gave an entirely new and simple explanation of the phenomena of refraction through the prism, and summed up as follows:—

The experiments prove the homogeneity of the ether. They prove the undulatory hypothesis, but oppose the undulatory theory. They enable us to dispense with the different refrangibilities of the rays of light, as taught by Newton. They help to explain many of the phenomena of what is called the polarisation of light. They give a new explanation of prismatic refraction, and explain, in a plain and simple manner, many very interesting natural phenomena.

Startling, he said, as these conclusions are to those who are conversant with the subject of light, he thought he was perfectly warranted in drawing them from his experiments. The general process of reasoning could not, however, be given in a short abstract.

AMERICAN PHOTOGRAPHIC SOCIETY.

August 8, 1859.

"On photo-phosphorescence," by Mr. S. D. Tillmann.

The luminous appearance which many substances exhibit at ordinary temperatures in the dark, cannot be traced to a common origin. In some, phosphorescence is apparently spontaneous and from internal sources; in others, it results from external influences. Spontaneous light depends often on vitality, as in the various species of fire-fly, glow-worm, and marine animals; and often on the decomposition of organized bodies, as in the putrified fish, or the eremacausis of vegetable matter. In all these instances, light is probably the result of chemical action. The other class of substances affected solely by external forces, seem to undergo no chemical changes. In them phosphorescence is the direct result of electricity, friction, heat, or of light itself. Those influenced solely by the luminous rays producing phenomena which we may distinguish as photo-phorescence are of especial interest to the photographer.

Many years ago Dessaigners, Brewster, and others presented a vast number of phenomena relating to phosphorescence, but no deductions were drawn tending to clearer views of the subject. In the meantime the phenomenon of fluorescence has excited some attention. It is exhibited when uranium glass, a solution of the sulphate of quinine, or a decoction of horse-chesnut bark are exposed to diffused daylight and removed into the dark. A peculiar glow is seen limited to the parts where the light first entered. Hydrogen gas and other feeble flames may be affected in a similar manner. We are indebted to the late investigations of Becquerel, as reported in the *Annales de Chimie et de Physique*, 1859, vol. 55, for valuable acquisitions in relation to these subjects.

In his series of experiments, Becquerel used chiefly the sulphurets of strontia, baryta and lime, which are among the most powerful phospori. They were prepared and arranged in seven glass tubes, so as produce when exposed to ordinary sunlight or the electric light, and placed in the dark, the seven colours of the spectrum. The results of his investigations may be stated as follows:—

1st. The phosphorescent rays were found to be less refrangible than those which produced them.

2d. The same preparation, raised to different temperatures, gave out rays of different colours which reappeared in reverse order on its cooling.

3d. Time was necessary in raising the preparation to the phosphorescent state, but the time could be shortened by the use of heat, which gave increased brilliancy to the phosphorescence.

4th. Special relations of different phosphori were shown to the different rays of the spectrum.

5th. At lines corresponding with the dark bands of the spectrum known as the lines of Fräunhofer, little effect was perceptible.

6th. Some of the phosphori were highly fluorescent; and after the light had become invisible, if held in the dark rays of the violet end of the spectrum—the luminousness was again produced, but instantly disappeared on intercepting the dark rays.

7th. The same body being both phosphorescent and fluorescent, Becquerel was led to believe that the two luminous conditions differed only in the time during which the state, excited by exposure to the light, was continued. This position he proved by the phosphoroscope.

This new instrument, the invention of Becquerel, consists either of a disc or of a cylinder about an inch in diameter, and six or seven inches long, so arranged that a portion of its surface shall be enclosed within a tight box containing an electric light, and about three-fourths of the surface exposed to the view of a spectator in a dark chamber. The spaces between the box and cylinder, on either side, being carefully covered with black velvet so as to prevent the passage of light. The cylinder covered with the substance to be examined is then made to revolve about three hundred times in a second, and as a twentieth part of a revolution would be sufficient to bring a portion of the cylinder from the inside to the outside, it is evident that a phosphorescent effect, lasting only one sixteen-hundredth part of a second, would become visible. With such an instrument, Faraday lately repeated these experiments before the Royal Institution in London, using the phosphori sent to him by Becquerel. Separate cylinders covered with a solution of the crystals of nitrate of uranium, with the sulphate of quinine, and with æsculin, the active principle in horse-chesnut bark, were severally brought into use.

On the slow revolution of the cylinder no effect was seen, but on increasing the velocity, light was beautifully displayed. It was found that fluorescence occupied the time of a full revolution, and therefore was easily made to assume the characteristic of phosphorescence.

It may not be deemed improper here to offer a short explanation of these phenomena, which will harmonize with the undulatory theory of light. Phosphorescence must, in accordance with the theory, also be the result of undulations. Time being introduced as an element, precludes the possibility of connecting these effects with those of reflection or refraction. We must regard these luminous appearances as secondary, or inductive, and resulting from the vibratory motion of the atoms composing the phosphori communicated to them by the original rays. Do not elastic fluids always thus act? The pulsations of air producing sound will cause a sympathetic vibration of certain strings and reeds; these will continue to vibrate after the original sound has ceased. Let a series of strings or reeds be properly attuned and arranged longitudinally around a cylinder, made to revolve in the partition which separates two rooms, sounds made in one room will, by means of the rotating strings or reeds, be heard in the other. Often new vibrations and tones may be produced, always, however, having harmonic relation to the original sound. These correspond to the chromatic effects of light. The phosphori hold the same relation to the original earth-waves that the strings or reeds have to the primary air-waves. The secondary propagations of light and sound also correspond. If the views here briefly stated are correct, we must regard photo-phosphorescence as the effect of secondary undulations, which beautifully illustrate phenomena of physical reproduction.

The paper was followed by a long and animated discussion, affording a great many suggestions on this most interesting subject.

ASSOCIATION OF FOREMEN ENGINEERS.

October 1, 1859.

This was the ordinary monthly meeting at the rooms of the Association in the city of London. The attendance of members on the occasion was not so numerous as might have been expected, from the fact, that Mr. C. F. Hayes, of the Small Arms Factory, Enfield, had promised a resumption of his series of papers on the rifle musket. Those who were present, however, had reason to congratulate themselves, as Mr. Hayes gave a very clear description of the processes necessary to the formation of the *Bayonet* and *Locking ring* of an improved long Enfield rifle, such as is now being distributed by the Government to the various' patriotic rifle corps. The machines used at the Small Arms Factory in developing these implements of war were also described, whilst the paper was made yet more instructive and interesting from the fact, that Colonel W. M. Dixon, R.A., had, with the best possible feeling towards the society, forwarded from the stores at Enfield a remarkably well finished musket complete, to assist Mr. Hayes's explanation. The great number of operations through which the stripes of iron and steel for conversion into bayonets pass before sending out into active service astonished almost every one, and Mr. Hayes concluded his paper amid much applause. A vote of thanks to Mr. Hayes and to Colonel Dixon, followed a rather conversational discussion of the paper, and concluded the meeting. Mr. Newton filled the chair.

MONTHLY NOTES.

MARINE MEMORANDA.

The directors of the London and North-Western Railway have just shown how they appreciate the value of the *Great Eastern* project, by giving a grand banquet, at Holyhead, in honour of the coming there of the big ship. The Marquis of Chandos was in the chair, which was well supported by a large number of our leading engineers, and other notabilities of the time, and in proposing "Success to the Great Ship Company," he remarked that all around him were aware of the skill, ingenuity, and perseverance which had been displayed in many of those works over which they must have passed in coming to that corner of the island. It was by such triumphs of engineering skill that this country had acquired a reputation of progress among the nations of the earth. The gentlemen connected with the London and North-Western Railway could not look back to the past without remembering that they had no longer associated with them a Stephenson, whose ingenuity devised the passage of the Straits of Menai, carrying galleries through the air and across the rocks of Wales, which, before the days of Telford, had long defied the engineering skill of the country. Those who had known Mr. Stephenson had lost a friend, and the whole country had lost an engineer who had sprung from a family of humble origin to a position, not only of British, but of world-wide reputation. Not alone had Stephenson passed from among them lately, but another engineer of great celebrity, long known throughout England as well as the Continent, had been also taken from among them; and while alluding to this great man, could he longer postpone, in any English assembly, wishing success to that last undertaking—that magnificent conception of Brunel which had now reached completion? They lived in an age of progress. His own days had been few compared with many around that table. His connection with the progressive interests of the country had been but short compared with many of those whom he saw around him, but, notwithstanding this, he had long since realised the age of progress in which we lived, and learned to appreciate the skill which not only Stephenson and Brunel, but all who had risen in that particular school, had exhibited. The development of trade, commerce, and industry was one of the strongest guarantees for the peace of Europe; and this country ought always to have at its command the largest and swiftest ships. Time was when the idea of sending the tons of goods and numbers of passengers that now travelled from Lancashire to London would have been considered visionary; time was—and that, too, within his own recollection—when scientific men protested that it was impossible to cross the Atlantic by steam. Think of the success of the *Great Western*, of the *Great Britain*, and other large vessels, which now with a certainty, and with the regularity of railways, perform monthly trips across the ocean in various directions. Why, he asked, was the *Great Eastern* not to succeed, supplanting, as she did, that first class of ships? Why was she not to succeed, as railways had succeeded, in supplanting other modes of communication in the country?

Mr Campbell, the chairman of the *Great Eastern* Company, said that the great aim of the Company was to do for India, China, and Australia, what a lamented friend had done for America twenty years ago, when he connected that country with this by steam communication without stoppage; and the Chancellor of the Exchequer recurred to what Pope had written in an early work, "Windsor Forest," which really might have been taken as a prophetic foresight on his part of the repeal and fundamental change of our system of navigation.

"The time shall come when free as waves or wind,
Unbounded Thames shall flow for all mankind,
Where nations enter on each swelling tide,
And seas but join the nations they divide;
Earth's distant ends our glory shall behold,
And the New World run forth to seek the Old."

The speakers all went very much to the point, and all expressed great hopes and anticipations, that in the *Great Eastern* a really grand result had been achieved.

The *Delta*, built by the Thames Iron Ship-Building Company, for the Peninsular and Oriental Company, and fitted with Mr. Penn's engines, taken from the *Valetta*, has just showed very good results. The following is her performance when tried over the Stokes-bay Mile:—1st run (to eastward, against tide), 4 min. 11 sec., 14·342 knots per hour; 2d run (to westward, slack tide), 4 min., 15·000 knots per hour; 3d run (to eastward, slack tide), 4 min. 4 sec., 14·754 knots per hour; 4th run (to westward, against little tide), 4 min. 11 sec., 14·342 knots per hour. Average of the four runs, 14·609 knots, equal to 16·830 geographical miles. 1st run, 20lb. pressure of steam, 25½ revolutions, 25 vacuum; 2d run, 20lb. pressure of steam, 25½ revolutions, 24½ vacuum; 3d run, 20½lb. pressure of steam, 25¾ revolutions, 24½ vacuum; 4th run, 20¾lb. pressure of steam, 25¾ revolutions, 24½ vacuum; mean, 20¼lb. pressure of steam, 24¾ vacuum. Draught of water, 14 feet 11 inches, both fore and aft. Weight of coal on board, 300 tons; water, 30 tons. Indicated horse-power of engines, 1,612·96; nominal horse-power, 400. The average speed is the highest ever attained on the measured mile, namely, 14·609 knots, the three nearest to her being the *Shannon*, 14·412; the *Malta*, 14·134; and the *Paramatta*, 14·092.

It is impossible to read the details of the start of the *Great Eastern* down the river, the run to Portland, the sad explosion, and the subsequent legal inquiry, without feeling how deplorably everything was mismanaged. Instead of having a high steam pressure in the funnel casing, and thus actually converting the lower end of the comparatively fragile funnel into a steam boiler, not one atom of steam ought to have been produced there. The annular chamber was a feed water heater, and not a steam generator; and was never intended to usurp the place of the boilers proper. Now any one, excepting the most incompetent engineers and attendants, would have at once detected the existence of steam where no steam ought to be, and would have seen to its liberation. But here was a chamber absolutely hermetically sealed on one side by the mysterious stop-cock, of which no one professes to accept the responsibility; and on the other, by the shutting of the valve upon the feed-water thoroughfare to the boiler, and yet with all the intense heat of the uptakes constantly kept upon the water thus shut up. The whole affair is most scandalous; and the attempts of the officials to pitch responsibility back and forward between one another were equally so; whilst the finding of the coroner's jury was an outrage upon public feeling. If ever a dreadful act of manslaughter was committed, surely it was in this case.

The shipbuilding trade up the Clyde, at the old burgh of Rutherglen, seems to progress with spirit, and Mr. Seath, the builder there, has lately launched a 110 feet boat on the shallow waters at his command. She is named the *Cromwell*, and is of 120 tons burden, and to have engines of 30 horse power. She is for the coasting trade.

Mr. Miller, of Liverpool, is now building two gun-boats, to be called the *Pelican* and *Steady*, which it is expected will be ready for launching in December. They will be fitted with engines of 80 horse-power by Napier, of Glasgow, and are intended to carry one 95 cwt. pivot gun and four 24 lb. carronades. From the fineness of their lines great speed is expected from them.

Scotland is still behind hand in her part of our life-boat system. It is along the Scotch coast that a large portion of our trade with the Baltic, Greenland, Archangel, Davis's Strait, and much of that of the Canadian and United States trade is carried on. In addition to this traffic the Scotch coast is remarkable for its great herring fishery. Peterhead has its 250 fishing boats; Fraserburgh and Buckie more than 400 sail; while further north, off the coast of Caithness, more than 1,200 fishing boats, manned by 6,000 persons, nightly pursue their calling during the season, exposed to the proverbial suddenness of a north-east gale. May we not hope that with these facts before them, the people of Scotland will at last come forward to do for their coast what has been so well done in the south.

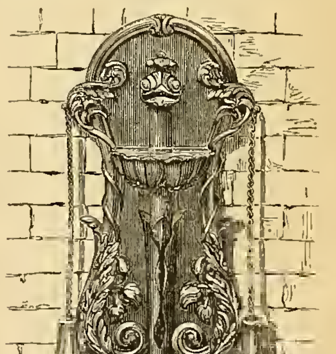
The great "steam rams" so often talked of as in contemplation by the Government are now fairly under way. The first is now in hand at the yard of the Thames Iron Shipbuilding Company, and the second has been contracted for by the old Glasgow firm of Robert Napier & Sons. These rams are 380 feet long, by 58 feet beam, thus being 20 feet longer, and 15 feet broader than the celebrated *Persia* of the Cunard line. They are to be built amidships with ponderous armour plates, with the view of offering satisfactory resistance to modern guns. The burden is 6,000 tons, and the engines 1,250 horse-power. We are not aware of the precise armament to be carried, further than that the guns are to be giants indeed. The total cost of each ram is calculated at £300,000.

The object of the construction of the Canadian Grand Trunk Line is to open Canada, winter and summer, from end to end, by a continuous railway for country and foreign traffic, and to superadd a large portion of that between the eastern and western states, with Chicago and Milwaukie, the intercepting port being Sarnia, at the entrance of Lake Huron—500 miles distant by water from Chicago and 340 by rail—at which port, in the year 1855, the number and tonnage of vessels arriving in nine months was 6610 vessels, registering 1,608,845 tons; in the same year the sailing and steam vessels entered at Liverpool from coasting voyages, was, ships, 8434, tonnage, 1,336,106. The intercepting ports of foreign traffic are Quebec and Portland; this is denominated foreign through traffic, which has been conveyed by water in propellers requiring great power to stem the rapid currents of the St. Lawrence, which in places runs at the rate of eight miles an hour. The navigation of the Upper Lakes is open for 9 months of the year, and on the St. Lawrence and New York canals only about six months. At Sarnia the Grand Trunk connects with the Great Junction Railway 57 miles to Detroit, and thence by the Michigan Central to Chicago, Galena, Ohio, Illinois, etc. By the completion of the Victoria Bridge there will be no transhipments required, which is the great drawback to the successful competition of the New York railways with water carriers for heavy goods. Another advantage the Grand Trunk will possess is the direct access to the shipping wharves at Sarnia, Portland, and Quebec, by which the heavy expense of cartage will be avoided. All but the wharvage at Quebec will be completed this year; this wharfage at Quebec, however, is as necessary as the Victoria Bridge.

A third vessel of the set of shallow steamers now being built by Messrs. Mitchell, at the Low Walker Iron Shipbuilding Yard, Newcastle, for India, has just been tried. Two have already been sent out to Calcutta. They have been —and the remainder that are to follow will be—sent to their destination in pieces, packed like ordinary merchandise, and will be fitted together at Calcutta. It appears that the contractors undertook to furnish vessels which would tow a barge each at the rate of 10 miles an hour, and in order that the speed and capabilities of the vessels might be ascertained the trial was instituted; because, as the steamers will be almost fac-similes of each other, the performances of one can be taken as certain indications of what can be done by the rest. The peculiarity in the construction of this flotilla is, that the vessels comprising it are almost flat-bottomed. Each has a steering apparatus at each end; and each steamer is fitted up with a couple of derricks on deck for the purpose of hoisting in and discharging the cargo. A very great portion of the vessel is of steel; the whole of the outside plates and much of the inner departments are of that metal. Steel, in fact, has been used wherever greater than the ordinary strength is required. The vessels are spoon-shaped both at stem and stern, and the steamers are paddle-wheeled, with feathering floats. Each vessel has top girders of steel; those in the steamers are fourteen feet deep in the centre, and taper towards the ends until they touch the deck, and by means of these girders the vessel is kept rigid. None of these vessels have accommodation below deck suitable for passenger traffic; but as she is almost exclusively designed for the use of the natives, an awning on deck will be provided. The following are the dimensions of each steamer—Length over all, 226 feet; breadth of beam, 30 feet; depth, 7 feet. When light each draws two feet, and each can be loaded to a depth of four feet. The barges are rather shorter than the steamers; they are 200 feet in length, and 30 feet wide. The barge tried on Tuesday had about 370 tons of coals on board, and with this cargo she drew four feet. The barges have also internal girders similar to those of the steamers, but the girders of the barges are only ten feet deep, this decreased depth being sufficient, in consequence of their having less weight to carry amidships than have the steamers. Messrs. Robert Stephenson & Co. will construct the whole of the engines for the eight steamers. The engines used in the trial trip were diagonal oscillating engines, and the two cylinders worked upon one crank pin, thus producing a very steady motion. The engines were of the nominal power of 170 horses, though they are capable of being worked up to 680 indicated horse-power, or an amount of indicated power four times that of the nominal. The size of the cylinder is 52 inches by 3 feet 6 inches stroke. The framings of the engines are entirely of wrought iron, thus securing very great strength compared with that obtained from cast-iron. The condensers are of an extraordinary large size, in order to suit the higher degree of temperature of the waters of the Ganges. The outsides of the boilers are entirely of steel plates, with steel rivets and angles. Two of the remaining engines which are being built will be furnished with four cylinders each, two to each wheel, so that the vessel will be able to turn in a space equal to no more than her own length, also giving great facility of steering. The steamer started on her trial trip from Messrs. Mitchell's quay at about a quarter before twelve. She went down the river making 40 revolutions of the wheel per minute. She was taken across the bar, and shortly afterwards the log was cast. On being taken in at Souter Point it showed that she had been going at the rate of $12\frac{1}{2}$ knots, or $14\frac{1}{3}$ miles an hour. She was brought round when off Souter Point, and turned in 70 seconds. Though not designed for the sea there was very little bending, and her great length kept her perfectly free from pitching. She was taken northwards as far as Whitley Point, and on returning to the Tyne took her barge in tow at Jarrow Quay. When towing the barge, loaded to four feet, in the river, her speed was $11\frac{1}{4}$ miles an hour; she therefore exceeded the rate of speed for which she was contracted to be built by a mile and a quarter per hour. At this rate of speed the dynamometer showed the average resistance of the barge to be 2 tons 2 cwt.

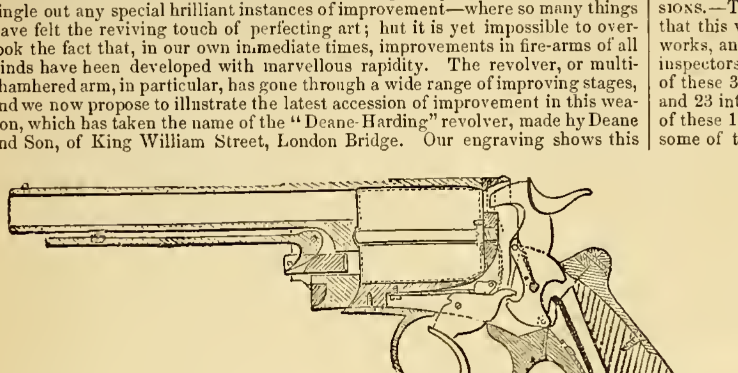
The Scotch Herring Fishery.—The number of boats engaged this year at the different Scottish ports, from Orkney to Northumberland, was 4780. The value of these, including nets, is about £400,000. The number of men engaged may be stated at 24,000, and the wages they have received £296,000. The result of the fishery altogether is 296,000 crans, the value of which will not be under £370,000. In 1858, the number of herrings caught was 393,000 crans, the deficiency this season being 99,000 crans, which would represent nearly £140,000. Even last year's returns were very unsatisfactory, so that the apparently large amount here shown for this year is anything but what it should be.

Ornamental Drinking Fountains.—The two very handsome designs for public drinking fountains presented below, were designed and executed by Mr.



E. O. Tindall, of the Scarborough Iron Works, Scarborough, Yorkshire. The first one is a pillar fountain, the pillar standing up from the centre of a circular dog trough forming the base of the design. The drinking basin near the apex of the pillar is ornamented florally, as are also the base of the pillar, and the bottom trough. Drinking horns are suspended by chains from the top of the pillar, thus adding very much to the grace of the whole. The other fountain is of the wall bracket kind, its ornamentation being chiefly scroll work. It has also a dog trough, and the drinking horns are suspended by chains from a part of the bracket pillar above the level of the drinking basin. The material is bronze, and the basins are enamelled. Both designs are exceedingly pretty, and as the public have at length found out the value of such fittings, we hope to see them soon scattered over the country.

The Deane-Harding Revolver.—In our age of progress, it is difficult to single out any special brilliant instances of improvement—where so many things have felt the reviving touch of perfecting art; but it is yet impossible to overlook the fact that, in our own immediate times, improvements in fire-arms of all kinds have been developed with marvellous rapidity. The revolver, or multi-chambered arm, in particular, has gone through a wide range of improving stages, and we now propose to illustrate the latest accession of improvement in this weapon, which has taken the name of the "Deane-Harding" revolver, made by Deane and Son, of King William Street, London Bridge. Our engraving shows this



weapon in longitudinal section. All the functions of the improved arm are performed by the cock and trigger; and, whilst it is not liable to get out of order, no mistake can be made in putting it together again, after having been taken in pieces. The barrel is removable for the purpose of being cleaned; and the readiness with which it can be detached, and its firmness and solidity when fixed to the body of the pistol, render the barrel and the frame, as it were, one piece —yet separable.

In order to remove the barrel, it is necessary to turn the pendant part, forming the bolt to the cylinder, from right to left, until it stands upright above the top of the barrel, when the pin which joins the fastening between the barrel and the body may be withdrawn, and the two parts be separated by pressing them downwards in opposite directions, as if breaking a stick, the stock being in the left hand, and the barrel in the right. To replace the barrel, all that is necessary is to insert the hook upon its lower limb in the slot in the body intended to receive it, and the projection on the top of the body in the slot of the top strap of the barrel, when the bolt-pin can be returned to its place. To take the action or lock to pieces, we take out the screws by which the stock is affixed, and remove the mainspring by placing the edge of a screw driver under its lower extremity and pressing it upward. The screws which hold the guard in its place are then taken out, afterwards unscrewing and removing the trigger-spring with the lifter. Then the cock and trigger may be taken out, by unscrewing their respective pins. When cleaned each part is to be returned to its place in reverse order.

The facilities with which this pistol may be loaded, by the use of the new lever ram rod, which is at once simple and powerful, acting vertically upon the bullet, is also another new feature in this pistol, which will commend itself to every one accustomed to the use of these weapons.

Naylor's Steam Hammer.—An enormous steam hammer, on Naylor's patent principle, for the Victorian Railway Company of Australia, has just been made by the Kirkstall Forge Company, Leeds, for manufacturing large forgings. The hammer is upon the double and single action principle, that is, it is not only lifted by the pressure of steam from below, but the natural effect of gravity of the falling hammer is assisted by the pressure of steam from above. By this means additional momentum is acquired, and a blow of most extraordinary force and rapidity is produced, which is particularly advantageous in the manipulation of iron forgings of magnitude requiring a great number of blows. The work is thus finished at one heat, saving both the fuel and time of second heats, also consequent deterioration and waste of iron. The effect of the blow of this immense hammer will be equal to the momentum acquired by sixteen tons making forty blows per minute. The hammer can be made to work double or single acting, instantaneously; and by the adjusting valve gearing the length of stroke and force of blow can be changed almost instantly. In all gravity hammers the effect of the blow is dependent on the weight of the hammer, multiplied by the height of its fall, and consequently the greater the distance it falls the greater the force of the blow, and the slower is the speed of working. In the double-action hammer thrice the force of blow can be given at double the speed. The principal dimensions and weights are—timber foundation, 26 feet by 24 feet 6 inches, depth 13 feet; cast-iron anvil block, base 11 feet 6 inches by 9 feet 6 inches, 30 tons weight; base plate to receive standards, 19 feet 6 inches by 15 feet 6 inches, 14 tons weight; standards 10 feet 6 inches apart, weight 15 tons; height from ground to top of steam cylinder, 21 feet 6 inches; weight of all about 75 tons. Steam to work this hammer is generated from the furnace in which the work to be operated upon is heated, the boiler, upon "Balmforth's patent vertical principle," forming the chimney, and the heat passing up four flues in the same, thus economising fuel and avoiding the expense of a brick chimney. The boiler is 6 feet 6 inches diameter, and 30 feet long,—weight 15 tons. The weight of the whole apparatus, including boiler and mountings, is about 100 tons. Our readers will at once see the details of this fine tool, by turning to our plate 242, in the *Practical Mechanic's Journal* for July last, where we have engraved two modifications of Mr. Naylor's hammer.

Manchester Association for the Prevention of Steam Boiler Explosions.—The last report of the chief inspector, Mr. H. W. Harman, C.E., shows that this very valuable society has now under inspection 574 mills and other works, and 1611 boilers, being an increase since the 26th ult. of 2 boilers. The inspectors have made 266 visits, and examined 765 boilers and 572 engines; of these 3 visits have been special; 4 boilers have been specially, 16 thoroughly, and 23 internally examined; 274 diagrams have been taken from 164 cylinders; of these 17 cylinders and 31 diagrams have been additional. The following are some of the principal defects, viz.:—corrosion, 12 (2 dangerous); fracture, 15 (3 dangerous); safety valves out of order, 38; pressure gauges, 13; water gauges, 18; feed apparatus, 5; blow-off cocks, 10 (3 dangerous); furnaces out of shape, 22; shortness of water, 4; 50 boilers were without glass water gauges; 31 without blow-off cocks; 65 without back pressure valves; 12 without pressure gauges; 4 with fusible plugs placed wrong and corroded with scale. Many safety valves have their spindles passed through stuffing boxes, although not packed, and again have 2 of Salter's balances been found to be screwed down and inoperative. The other defects are of a general character; but Mr. Harman remarks upon the continued want of attention to the necessity of constructing all new boilers on those principles of safety that late investigations and experiments on the part of Mr. Fairbairn, the president, and others, have conclusively established as being really indispensable in the generality of boilers employed, in resisting the strains they have to undergo, especially as against collapse of internal flues. He noticed in many boilers lately inspected, that the rivet holes in the angle iron rings at the ends, have been punched so near to the outside edges, that little is left to withstand the tension to which they are subjected, and draws attention to the insecurity of many of the joints in pipes and mountings of boilers. In numerous instances they are not sufficiently bolted together, and if they do not break entirely, the bolts are so far apart that the iron yields between them, and so causes leakage and corrosion; it is very common also to find bolts short, or passing only half-way through their nuts, a very dangerous method of fixing, and one that may escape the eyes of those not specially instructed in such matters. Cases of this kind have occurred in engine bearings, where the whole power has been transmitted through them; and that a breakdown should be the result, is not be wondered at.

As regards smoke, the desire for its abatement, if not entire abolition, is apparent from the variety of schemes adopted pretty generally by the members of the society in the endeavour to attain that object. Many of them are, nevertheless, ill adapted, whilst others would succeed were they constructed in a bolder shape, and were not mere philosophical toys. Much may be done by simply getting rid of the present dead plates, some of which are one-third the length of the furnaces, and substituting a narrow perforated plate in its stead; or in a gridiron form, so as to admit a larger and constant supply of the atmosphere for the purposes of combustion. The expression, constant, is used emphatically, as in most of the two-flued circular boilers in use the firing is obliged to be constant also. Dead plates are useless appendages, except as a support for the fire-bar ends, and should be got rid of.

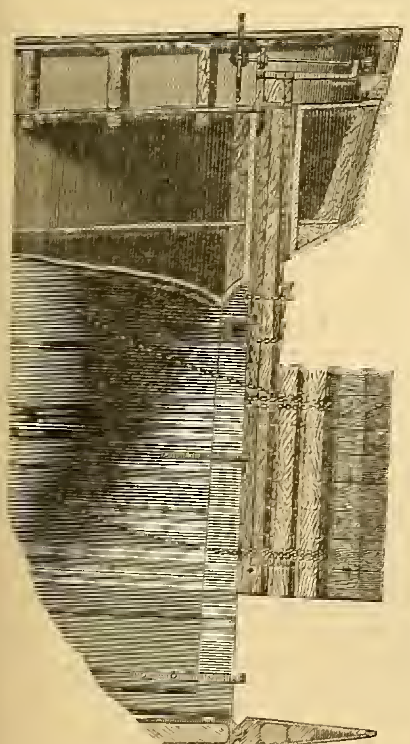
Robert Stephenson.—The details of the life of Mr. Robert Stephenson are really in the main already well-known to the world, partly from his father, George Stephenson's Memoirs, and partly from the eminently prominent professional position which he himself made and occupied for so long, in pursuits which are so necessary, and we may say, so congenial to the mass of the great Anglo-Saxon race. The son of one of the very humblest class of operatives, a mechanic, at a time when mechanics were really not divided off from ordinary labourers, Robert Stephenson was lucky indeed to find in his father such a self-denying, provident, and certainly far-seeing man, as the "father of railways" proved to be. Every school-boy of past days has felt his imagination aroused at the perusal of the school day examples of "the pursuit of knowledge under difficulties," but we doubt if history can furnish so magnificent an example of the great faculty of thus seeking learning, as is to be found in the early struggles of the colliery-labourer, George Stephenson, and in a lesser degree in those of his son, Robert. By dint of never-ending toil, both within and without the legitimate hours of labour, the workman father contrived to send his son to the Edinburgh University, where he gained the mathematical prize—this was in 1820-21. In 1822 Robert Stephenson was apprenticed to his father, who had by this time started his locomotive manufactory at Newcastle; but his health giving way after a couple of year's exertion, he accepted a commission to examine the gold and silver mines of South America. The change of air and scene contributed to the restoration of his health, and, after having founded the Silver Mining Company of Columbia, he returned to England in December, 1827, by way of the United States and Canada, in time to assist his father in the arrangements of the Liverpool and Manchester Railway, by placing himself at the head of the factory at Newcastle. About this time, indeed, he seems to have almost exclusively devoted his attention to the study of the locomotive engine, the working of which he explained jointly with Mr. Locke, in a report replying to that of Messrs. Walker and Rastrick, who advocated stationary engines. How well he succeeded in carrying out the ideas of his father was afterwards seen when he obtained the prize of £500 offered by the directors of the Liverpool and Manchester Railway for the best locomotive. He himself gave the entire credit of the invention to his father and Mr. Booth, although we believe that the "Rocket," which was the designation of the prize-winning machine, was entered in the name of Robert Stephenson. Even this locomotive, however, was far from perfect, and was not destined to be the future model. The young engineer saw where the machine was defective, and designed the "Planet," which, with its multitubular boiler, with cylinders in the smoke-box, with its cranked axle-tree, and with its external framework, forms, in spite of some modifications, the type of the locomotive engines employed up to the present day. About the same time he designed for the United States an engine specially adapted to the curves of American railways, and named it the "Bogie," after a kind of low waggon used on the quay at Newcastle. To Robert Stephenson we are accordingly indebted for the type of the locomotive engines used in both hemispheres. Then came his great work, the London and Birmingham Railway, and from that time forward he continued rising, until he reached the very summit of professional power. He died startlingly close upon his contemporary, Brunel, and in his death we are forcibly reminded of the recent rapid lopping off of the older heads of the engineering profession—Rendel, Brunel, and Stephenson. Three great practical authorities have disappeared in close proximity to each other, and we are thus told that the old school is quickly giving way to the new. May the latter be able to show at least some examples fit to be compared to Robert Stephenson. Thomas Hood was thought by the mass to be a mere humourist—a sort of literary joker, until his "Song of the Shirt" aroused the world of readers to a deeper and calmer perusal of that rich feeling which is everywhere to be found in his writings. Let us accord a somewhat similar tribute to our living contemporary, "*Punch.*" We find the following in his last issue. It will be read with great interest, we are assured, for it possesses grace, feeling, and deep pathos. It is but yesterday that we recorded the death of Brunel, and now Robert Stephenson reposes in Westminster Abbey. Here is a fitting tribute to the memory of both, and it loses none of its expressiveness by coming to us whence it did.

BRUNEL, died September, 1859.
STEPHENSON, died October, 1859.

A Nation's Pioneers—they rest. To mock
Renown like theirs with sculptured tomb were shame;
Where the bridged chasm, or where the pierced rock
Attests mind's victory, read each hero-name.

Yet in an epitaph their names shall live,
That Silence, there, may pay one noble due:
They died Untitled. Of what Courts can give,
No jot, O knaves and fools, they grudged to you.

Pottinger's Jury Rudder.—How to rig a jury rudder, as the mariner technically terms a temporary steering apparatus, put up when the original rudder fails or is lost at sea, is one of the most important pieces of knowledge which the ship carpenter can possess. Many a goodly ship has been lost for want of a practical man on board, who could do this as it ought to be, and we therefore cannot make too widely known any cases of successful practice of the kind. The sketch of a jury rudder which we now give, in elevation and sectional plan, was designed and fitted to the ship *Bounty Hall*, of Liverpool, by Mr. Christopher Pottinger, now a shipbuilder at Anstruther, in Fifeshire. When it was fitted, Mr. Pottinger was carpenter on board the craft, when on her return voyage from the Brazils, when in latitude 40 N., longitude 39 W., and running before a gale of wind, a heavy sea struck the vessel on the quarter, she immediately broached to, the rudder broke close to the counter, and was swept clean away. With the gale still blowing, and the vessel unmanageable, in two days he constructed and shipped another rudder, which the captain described as having steered the ship almost as well, and with the same labour as the original; and without any improvement made upon it after the day it was shipped, brought the vessel safely into Liverpool. The materials of which the rudder is constructed can be found in every ship; the mufflidite spar or spare topmast, from 50 to 100 feet (according to the size of the vessel) of rough plank from $1\frac{1}{2}$ to 3 inches in thickness, a kedge anchor stock, the stream chain, and one topsail-sheet chain. In the case of the *Bounty Hall*, the main piece of the temporary rudder was made out of the mufflidite spar; two lengths of twelve feet each of



it were bolted thereto, and planked over with rough planking to form the rudder. It was then fixed to the stern post by two gudgeons, made out of the kedge anchor stock, fitted in such a manner that the shoulder of the anchor stock bore the weight, and the forelock served as a woodlock for the rudder. The stream chain was used as the third gudgeon and brace, the brace having been carried off the sternpost; it had a round turn around the rudder stock, crossed over the stern post, and was set up to the forechains by runner and tackle. The topsail-sheet chain was fixed round the rudder with a clove hitch on the after part, to be used as a pinnet to steady the rudder in case it should be found necessary to heave-to the vessel in stress of weather. When finished, this rudder resembles the rudder of a flat or canal boat; it is broader than the original rudder of the vessel, but does not go so far down, and it is placed exactly where—according to the water lines of the vessel—the action of the rudder is most felt. This rudder created quite an excitement amongst shipmasters at the time, both in Liverpool and at foreign ports where it was exhibited; and well it might, for it brought home a good ship which perhaps, without it, would have come to sore grief.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When city or town is not mentioned, London is to be understood.

Recorded June 20.

1478. Loring D. Dewey, 4 Southampton Buildings, Chancery Lane—Improvements in spring seats for chairs, sofas, couches, carriages, and other similar articles.—(Communication from Charles Robinson, Massachusetts, U. S.)

Recorded July 4.

1589. Henry C. Howells, 120 Duane Street, New York, and Joseph C. Howells, Madison, Wisconsin, U. S.—Improvements in the mode of registering the number of persons entering or leaving public conveyances or places of public resort, and of determining the value of the entry or fare.

Recorded July 26.

1739. Deidamia B. Hala, New York, U. S.—A new and useful garment for ladies' wear, being a combined waist or body and a skirt supporter and bustle.—(Communication from Albert W. Hale, New York, U. S.

Recorded August 6.

1814. Charles C. R. Goudenove and Adolphe Feret, 60 Rue Neuve St. Augustin, Paris—An improvement in gas burners.—(Communication from Marie P. A. Coquet, 39 Rue des Trois Cornes, Paris.)

Recorded August 16.

1886. William Leatham, Leeds, Yorkshire—An improved double acting superlative screw throttle valve.

Recorded August 22.

1910. John Gregory, Barreiro, Portugal—Improvements in locomotive and other steam engines.

Recorded August 27.

1957. James Philp, Camden Town—Improvements in the manufacture of soap.—(Communication from Professor Packer, Newark, U. S.)

Recorded August 29.

1959. Joseph Whitworth, Manchester—Improvements in ordnance, fire-arms, and ammunition.

1964. John Edwards, 77 Aldermanbury—Improvements in the manufacture of buttons.

Recorded August 30.

1970. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in the construction of steam generators, applicable also to the construction of condensers, the heating of water generally, and to the warming of buildings.—(Communication from Joseph Harrison, the younger, Philadelphia, Pennsylvania, U. S.)

1972. George Collier, 23 Elizabeth Street, Eaton Square—Improvements in chairs and couches.

1974. Joshua Field, Lambeth, Surrey—Improvements in apparatus for superheating steam.

1976. Henry Hutton, Palace Road, Lambeth, Surrey—An improved lubricator.

Recorded August 31.

1978. James Cowgill and John Stocks, Bradford, Yorkshire—Improvements in caps for spinning fibrous substances, and in the means or method of manufacturing the same.

1980. Wilhelm A. V. Kanig, Hardinge Street, Islington—Improvements in the manufacture of starch and compounds of starch, and in extracting gum dextrine and grape sugar therefrom.

1984. James Mackenzie and Stephen T. Wentworth, St. Martin's-le-Grand—Improvements in breech-loading fire-arms.

1986. James Samuel, Great George Street, Westminster—Improvements in railway sleepers.

1987. Henry Higgin, Bow—Improvements in machinery for cutting and preparing match splints.

1988. Louis Berge, Newgate Street—An improved method of fastening or securing porte-monnaies, bags, and other like articles with frames.

1989. Richard A. Brooman, 166 Fleet Street—Improvements in treating auriferous and argentiferous ores and substances.—(Communication from Dr. Raoul Destrem, Paris.)

1990. Edwin Ellis, St. Ann's Well Road, Nottingham—Improvements in finishing silk fabrics made on bobbin net and warp frames.

Recorded September 1.

1992. James Brine, Maidstone, Kent—Improvements in the mode of preparing, arranging, and combining the leaves of books to be used for producing simultaneously one or more fac-simile copies of letters, accounts, or other such similar documents or writings.
1996. James Borrington, Derby—Improvements in pumps.

Recorded September 2.

1998. Peter Wright, Dudley, Worcestershire—An improvement or improvements in the manufacture of anvils.
2002. John K. Watson, Edinburgh—Improvements in gas meters and exhausters, washers, and purifiers.
2004. William Clough, Wigan, Lancashire—Certain improvements in machinery or apparatus for propelling vessels on water.
2006. William A. Turner, Manchester, and Henry L. Lilley, Stand Lane, Manchester—Improvements in the manufacture of starch.
2008. Jean F. F. Leroux, 29 Boulevart St. Martin, Paris—A new or improved apparatus to be employed for taking money on the counters.
2009. Thomas Hedgcock, Ivy Cottage, Great Church Lane, Hammersmith—An improvement in quadrants.
2010. John Spurgin, Great Cumberland Street—Improvements in ordnance and projectiles.

Recorded September 3.

2014. William Suffield, Birmingham, Warwickshire—Improvements in the manufacture of artificial teeth, and in machinery to be employed in the said manufacture.
2016. George Davies, 1 Serle Street, Lincoln's Inn, and 28 St. Enoch Square, Glasgow—Improvements in printing, and in apparatus connected therewith.—(Communication from M. Alois Auer, Vienna.)
2018. George Parsons, Martock, Somertsetshire—Improvements in wheels.
2020. Henry Swan, Bishopsgate Street Without—Improvements in stereoscopes and stereoscopic pictures.

Recorded September 5.

2022. Frederick C. Bakewell, 6 Haverstock Terrace, Hampstead—Improvements in the manufacture of caustic alkalies.—(Communication from Henry Pemberton, East Tarentum, U. S.)
2024. Jean B. H. H. R. Barre, and Jean B. M. E. Barre, 27 Rue de Penthievre, Paris—Improvements in cutting out or engraving metals and their alloys.
2026. William L. Earle, Alfred Place, Bedford Square—Improvements in apparatus for promoting the combustion of smoke and gases arising from fuel.
2028. Alfred V. Newton, 66 Chancery Lane—Improvements in sewing machines.—(Communication from Henry W. Hayden, Waterbury, Connecticut, U. S.)

Recorded September 6.

2030. George Lowry, Salford, Lancashire—Improvements in machinery for heckling flax and other fibrous materials.
2034. Alfred V. Newton, 66 Chancery Lane—An improved fabric, applicable to the manufacture of hose or flexible pipes.—(Communication from Nehemiah Hunt, Boston, U. S.)
2036. Edward Blake, 61 Tachbrook Street, Pimlico—Improvements in apparatus for and in treating china-grass rhea fibre, mudar, and other similar vegetable fibres.

Recorded September 7.

2038. Edward R. Dann and Edward Goldschmidt, Nottingham—Improvements in the manufacture of bonnet fronts or lappets.
2040. Henry Jones, Birmingham, Warwickshire—Improvements in breech-loading fire-arms.
2042. John L. Jullion and Gordon Pirie, Stoneywood Works, Aberdeen—The manufacture of gelatine, and apparatus to be employed therein.
2044. Alfred V. Newton, 66 Chancery Lane—An improved manufacture of metallic strips, or bands applicable to ladies' skirts.—(Communication from William S. Thomson, New York, U. S.)
2048. William Rothwell and Thomas Watson, Carr House, Midgley, Halifax, Yorkshire—Improvements in screw gill-boxes.

Recorded September 8.

2049. Thomas Hooman, 490 Oxford Street—An improved stock, cravat, or neck muffler or wrapper.
2050. Thomas O. Small, Newcastle-upon-Tyne—Improvements in the stereoscope, by means of tinted media, and by the application of the pulley and lever, or spring, in changing the lights.
2051. Joseph Nicholson, Chaple House, Hensingham, Whitehaven, Cumberland—Improvements in horse rakes.
2052. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in cocks and valves.—(Communication from Jean B. P. Gire, Paris.)
2053. Joseph Thorley, Newgate Street—An improved preparation of food for cattle and horses.
2054. James Tandy, Cavendish Grove, Wandsworth Road, Surrey—Improvements in locomotive and other steam boilers.
2055. Thomas W. Allsopp, Castle Donington, Leicester—Improvements in portable gas apparatus.
2056. George Gowland, Liverpool—Improvements in nautical and surveying instruments for measuring angles.

Recorded September 9.

2057. William Roscoe, Croxteth Hall, West Derby, Lancashire—An improved agricultural implement or machine for distributing guano and other manures upon land.
2058. Matthew M. Jackson, Zurich, Switzerland—Improvements in generating steam for condensing engines.
2059. John G. N. Alleyne, Butterley Iron Works, Alfreton, Derbyshire—Improvements in the manufacture of wrought-iron beams.
2060. Samuel Worssam, Chelsea—Improvements in sawing machinery.
2061. Frederick Carpenter, Porter Street, Westminster—An improved apparatus for cutting tobacco.
2062. William E. Gedge, 4 Wellington Street, South, Strand—Improvements in the manufacture of nails.—(Communication from Bernard Roelandt and Co., Fontaine l'Eveque, Belgium.)
2063. Sigismund Cornely, Lime Street—An improvement in the permanent way of railways.—(Communication from Messrs. Lezairo and Pauwels, Valenciennes, France.)
2064. Alfred V. Newton, 66 Chancery Lane—Improvements in the process of, and machinery for, manufacturing hat bodies.—(Communication from Andrew Campbell, New York, U. S.)

Recorded September 10.

2065. Henry O. Robinson, Westminster—Improvements in machinery or apparatus for the manufacture of sugar.
2066. Andrew Smith, Mauchline, Ayrshire—Improvements in strengthening umbrella and walking stick handles, and other articles or details wherein the cross or transverse grain of the wood or other material is subject to strains.
2067. Joseph Pollock, Leeds, Yorkshire—Improvements in the manufacture of beds, couches, and invalid or other carriages.
2068. William Ross, Glasgow—Improved apparatus connected with the discharge of liquids.
2069. Edward J. Mallett, Florence, Italy—Improvements in axles.
2070. Thomas J. Perry, Bilston, Staffordshire—An improved construction of hot air oven.

Recorded September 12.

2071. Thomas G. Gutch, Southampton, Hantshire—The improvement of copying books, for order books, and letter books, and so forth, as the improvement can be applied.
2075. Floride Heindryckx, Brussels, Belgium—Improvements applicable to railways or tramways.
2076. John Eason, Oxford Street—Improvements in the manufacture of huff or losh and other oiled leathers.
2077. Frederick Versmann and Alphons Oppenheim, Bury Court, St. Mary Axe—Improvements in the treatment of various substances, so as to reuder the same non-inflammable.
2078. William H. Morrison, Nottingham—Improvements in the manufacture of bonnet and cap fronts, and in the means or apparatus employed therein.
2069. Frederick N. Gisborne and Lazarus S. Magnus, 3 Adelaide Place—Improvements in telegraph cables
2080. Josiah Mason, Birmingham—An improvement in boxes or cases and cards to contain or hold pens.
2081. Henry G. Collins, M'Lean's Buildings, New Street Square—Improvements in producing printing surfaces on stone, metal, and other materials capable of being employed in printing, in the manner of lithographic stones, also in the production of printing plates and surface printing blocks, and in transfer inks.
2082. William Elliott, Birmingham, Warwickshire—Improvements in the manufacture of African or Guinea rods.

Recorded September 13.

2085. George M. Levi, Val Benoit, Liege, Belgium—Improvements in washing and separating ores and substances of different specific gravities, and in apparatus for that purpose.
2086. Ernest A. F. Lebourgois, Suresnes, France—An improved machine for providing with pin points the blocks employed for surface printing on calico, paper, and other similar materials.
2087. John Granger, Birmingham, Warwicksbire—Improvements in breech-loading fire-arms, and in moulds for making projectiles.
2088. Alexander B. Freeland, Camden Road Villas—Improvements in preparing hay and clover for food for horses and other animals.
2089. William E. Newton, 66 Chancery Lane—Improved apparatus for drying paper and other fabrics.—(Communication from Edward L. Perkins, Roxbury, Norfolk, Massachusetts, U. S.)

Recorded September 14.

2091. Charles G. Gumpel, 2 Gordon Cottages, Holland Road, Brixton, Surrey—Improvements in the application of motive power to the propelling of vessels.
2092. John Marritt, Sutton, Yorkshire—An improved double-action rotating harrow.
2093. John P. Kennedy, Torrington Square—Improvements in steam boilers.
2094. Richard C. Rapier, Newcastle-upon-Tyne, Northumberland—Improvements in the construction of steam boilers.
2095. Charles Beslay, Rue St. Sebastian, Paris—Improvements in preparing and obtaining printing surfaces with designs sunk as also in relief.
2096. Nathan Defries, Fitzroy Square—Improvements in gas meters.
2097. John S. Slocum, Providence, Rhode Island, U. S.—Improvements in projectiles, suitable for ordnance.—(Communication from Charles T. James, Providence, Rhode Island, U. S.)
2098. Augustus Applegath, Dartford, Kent—Improvements in machinery for printing and for cutting printed paper into sheets.

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 19th August to 19th October, 1859.

Aug.	19,	4195	Joseph Caddick, Birmingham—"Candlestick."
	23,	4196	William Keates, High Street, Cheadle, Staffordshire—"A shoe or bootmaker's last stand."
	24,	4197	Thomas De la Rue and Co., Bunhill Row, E.C.—"A fastening for pocket books, purses, portmonnaies, and other similar articles."
	27,	4198	Henry Elliott, Birmingham—"Cartridge case drawer, for breech-loading fire-arms."
	30,	4199	Fenwick Brothers, 71 and 72 High Street, Gravesend—"The colonial belted trousers."
Sept.	26,	4200	Charles Wall, Newton Street, Birmingham—"Iron keg or cask, for packing paint or other merchandise."
	27,	4201	Armstrong and Hogg, 30 Lothian Road, Edinburgh—"Economising and purifying gas burner."
Oct.	3,	4202	Williams & Bate, Birmingham—"Glazed and covered show case."
	5,	4203	Thomas Ridge, 5 Norway Place, Hackney Road, N.E.—"Improved upper for boots and shoes."
	6,	4204	Loveridge and Shoolbred, Merridale Works, Wolverhampton—"Improved Persian coal scoop."
	19,	4205	Charles Sandford Windover, Huntingdon—"Dog-cart phaeton."

TO READERS AND CORRESPONDENTS.

W. S. Hayle.—See Fincham's "Outline of Shipbuilding," and Young's "Nautical Dictionary." The common rule for builders' tonnage, is to multiply tho length by the extreme breadth, and the product by half the extreme breadth, dividing the result by 94.

PORTABLE CANNEL COAL GAS APPARATUS,

GEORGE BOWER,

VULCAN FOUNDRY, ST NEOTS,

PATENTEE.

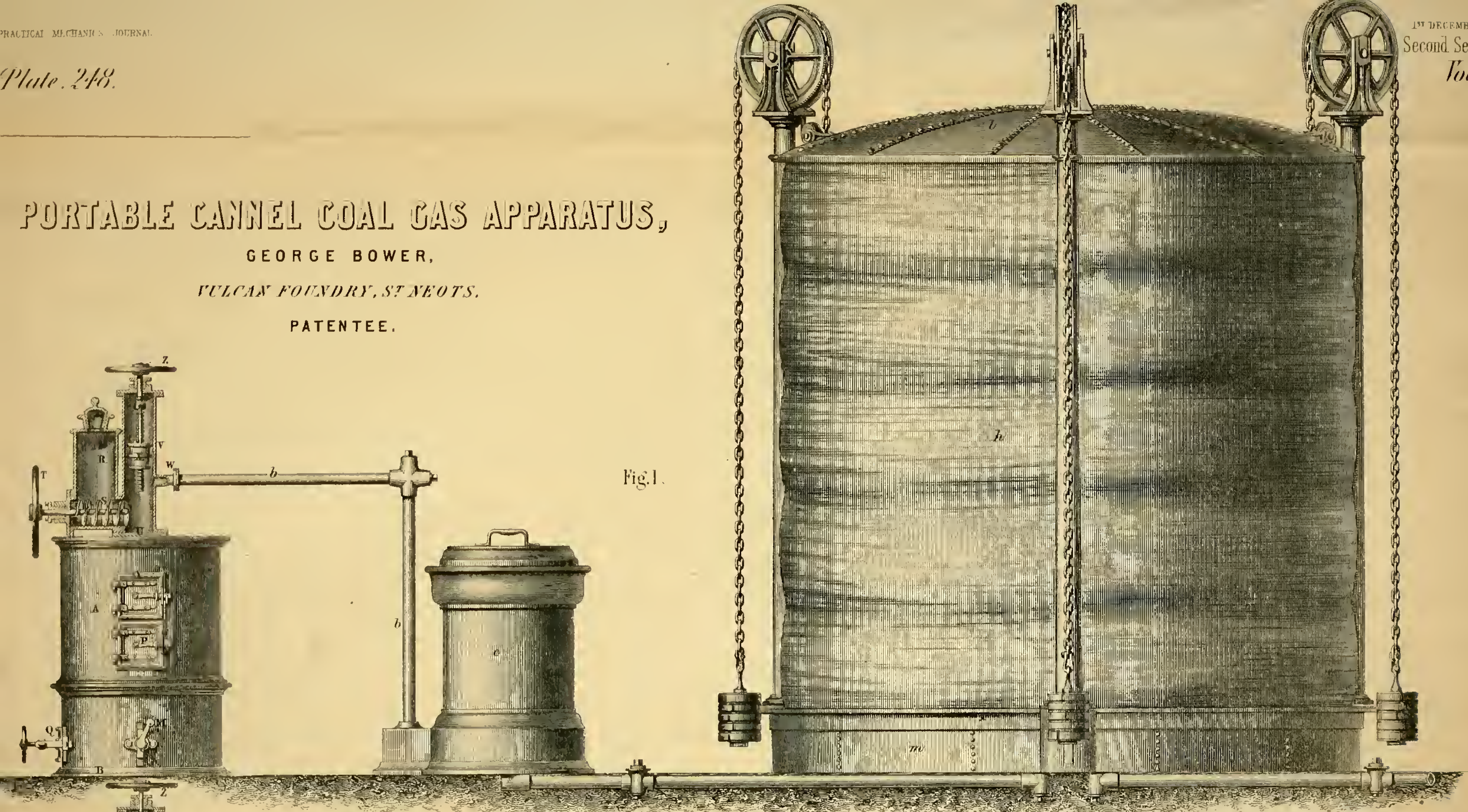


Fig. 1.

—SCALE.—

12 6 0 1 2 3 4 5 10 FEET.

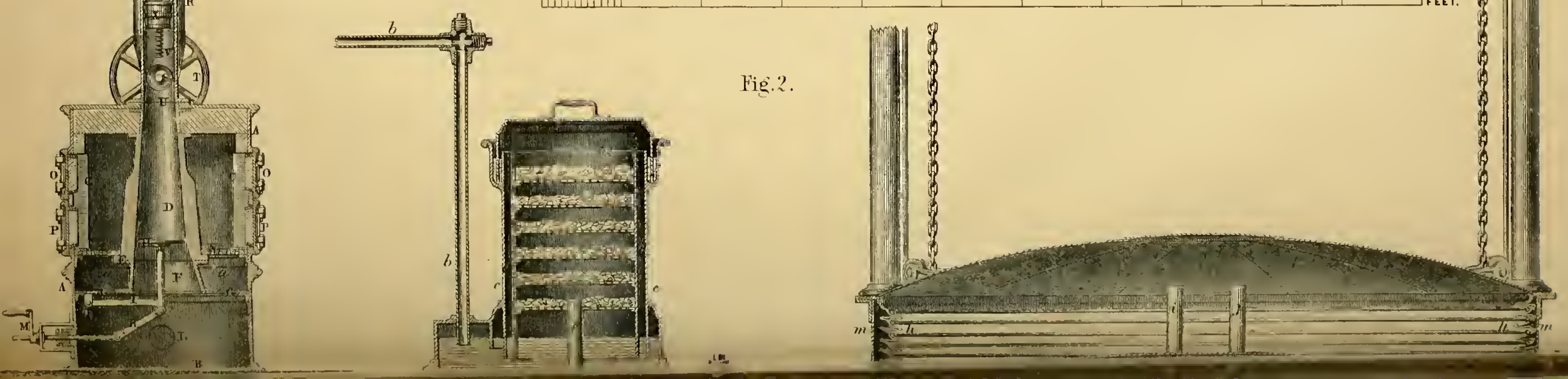


Fig. 2.

PORTABLE CANNEL-COAL GAS APPARATUS.

By Mr. George Bower, *Engineer, Vulcan Foundry, St. Neots, Huntingdonshire.*

(*Illustrated by Plate* 248.)

A manufacture which in Great Britain alone annually absorbs, as its mere raw material, above 10,000,000 tons of coal, and possesses within the same limits nearly 1,000 public working establishments, must necessarily occupy a high place in our list of nationally important industrial undertakings. Such is the position of the manufacture of coal gas—a manufacture which in its results has diffused blessings and benefits amongst us, inferior only, perhaps, to those which the printing press and the steam engine have unitedly conferred upon the wide world. Suppose the invention of typographical reproduction were to be blotted out of the knowledge of the human race, and where in a short time would be our learning, our literature, and our power of disseminating those truths of science, and those never-ending steps in practical improvement, without which, our ideas would become stagnant, and the world indeed might be said to cease to move. Fancy us deprived of the steam engine, and what would become of our great iron and textile manufactures, how should we get from place to place, how, indeed, would the over-grown family of the world be fed and clothed? So it would be with gas lighting. We tremble as we think of the straits to which we should be reduced if our other most inefficient sources of artificial light were the best which could be got. Hitherto, the great value of gas light has been felt only on the large scale, such as in town works, where one central establishment lights, by its ramifications of pipes, an extended area of country. But there is really no reason why gas light should not be used on all scales—even the smallest;—and if we do achieve this point, of bringing so brilliant a light within the reach of individual consumers, we shall have no one to thank more for such a consummation than Mr. Bower, of the Vulcan Foundry, St. Neots. We have already noticed Mr. Bower's previous efforts in this way,* and it will now perhaps suffice for us to say, that his latest patent has brought up the machinery of gas making to, as near as may be, the highest pitch of perfection which the users of gas light on a small scale can possible demand.

One modification of Mr. Bower's last improvements consists of a novel arrangement of gas generator, of a portable and peculiarly simple kind. The generator consists of a cylindrical base chamber or reservoir, having on each side of it an inclined shoot or laterally projecting open chamber, in full communication with the main central cylindrical chamber. The top of the latter carries a set of circular grate bars, for the fuel to be used in working the gas retort. Over this grate there is placed an upright cylindrical or slightly conical fuel chamber or furnace of metal, lined with fire-clay or bricks on the whole of its surface—the fuel is supplied to this furnace by a side fire door.

The retort is a conical vertical cast-iron tube, set in the centre of the furnace or fuel chamber, with its upper and narrower end projecting somewhat above the top cover of the furnace. Its lower end is trumpet-mouthed and quite open, and it is bolted to an annular supporting flange in the interior of the base reservoir, at the level of the water with which the latter is filled. This open lower end of the retort is filled in with a horizontal disc plate, capable of being set up within the trumpet-mouth, so as to entirely close the opening just where the trumpet portion joins the lower end of the main cone, and at, or slightly above, the level of the furnace bars. This disc plate is attached to the upper vertical end of a bent or bell-crank lever, which extends outwards through the opening in the base reservoir on that side, and passes into and through the laterally projecting chamber on that side, as already referred to, terminating in a vertical piece which is jointed to a stud centre, carried upon the top of the open laterally projecting chamber. At the bend where this latter vertical portion of the lever joins the main portion of the lever, there is a joint stud for connecting it by a loose revolving joint to the lower end of an inclined screw spindle, employed for actuating the closing disc of the retort at pleasure. This inclined screw passes through a stationary nut on the top of the open lateral chamber, and is fitted with a winch handle at its upper end. Thus, by turning this handle in either direction, the screw spindle urges the bent lever backward or forward, and thus fully opens or closes the open bottom of the retort as desired.

The upper end of the retort has cast upon it a ring flange for connection to the top of the fuel chamber, and it has also a flange at the top of the lower trumpet portion, for the support thereon of a conical tube or covering piece of fire-clay or brick, as a shield and collector of heat for the retort. In this way the fuel supplies to the chamber or furnace is entirely contained between brick burnings or coverings. The smoke from this fuel passes off by a lateral branch.

Upon the top of the retort there is bolted a coal charging chamber, and a gas discharging apparatus for the retort itself. This consists of a short horizontal chamber projecting to one side, and fitted with an archimedean screw, worked by a handle on the projecting end of the screw spindle, which is passed through a stuffing box. On the upper side of this screw chamber there is cast a vertical receiving chamber or hopper fitted with a plug on its top. The coal or other solid material to be used in the manufacture of gas is supplied to this chamber, and the periodical turning of the screw forces the coal from it into a small vertical chamber portion of the same casting, whence it falls directly into the upper end of the retort. This chamber is also fitted with a plug for allowing access to the retort to clear it out when necessary. From the same chamber a lateral branch pipe passes off to convey the gas and distilled matter away to the hydraulic main, and to the combined gas apparatus, and thence to the gas-holder; with this apparatus the gas generating process goes on continuously, as the simple occasional supply of coal to the receiving chamber, the turning of the screw to put the coal into the retort, and the opening and closing of the bottom plate of the retort to discharge the coke in the water reservoir in the case, answer all the conditions necessary for the working of the generator. Oil, resin, or other material may be used for making gas in this generator, by simply dropping the gas producing matter upon coke, brick, or other porous or permeable matter in the retort.

Fig. 1, on plate 248, is a front external elevation of Mr. Bower's improved gas apparatus complete, from the generator, which is in partial section, to the holder, which latter is of the collapsable kind. Fig. 2 is a corresponding sectional elevation of the apparatus, but with the gas-holder in its collapsed condition, the generator, too, being shown as at right angles to its position in fig 1. In this arrangement the gas generator, A, consists of a cylindrical metal chamber in one or more pieces as may be considered desirable. It is fitted with a metal bottom which rests upon the natural surface of the earth at B, without any sinking or any foundation, and it is lined internally all round and on its upper internal surface with fire-clay or fire-brick, C. The gas retort, D, standing concentrical within it, is of thick cast-iron, especially at the part where the greatest intensity of the furnace heat is to be apprehended. And it is not defended or covered by any fire-clay shield. It rests by a bottom flange, E, upon the flange of a conical or trumpet-mouthed casting, F, carried upon an internal flange, G, of the base of the main generator chamber. Its open bottom end is governed by a disc, H, on the upper end of a bent lever, I, set on a stud centre at J, to this cranked lever there is attached a connecting rod, K, which is jointed to the inner end of a screw spindle, passed through a stuffing box in the side of the base of the chamber or coke pit, L, of the generator. The outer end of this spindle is fitted with a nut attached to a winch handle, M, so that by turning this handle correspondingly, the disc, H, can be set up or down as may be required, for closing the retort for work, or for opening it for the discharge of the spent coke.

The annular arrangement of fire bars, N, rests upon a flange cast on the interior of the generated cylinder, and upon a flange cast upon the

* "Gas Retorts and Combined Gas Apparatus," plate 132, vol. vi., *Practical Mechanic's Journal*, 1853. "Gas Light Economical on a Small Scale," plate 201, vol. i., second series, 1857. "Gas Apparatus Economical, for Private Use," plate 219, vol. ii., second series, 1858.

retort. The fuel is supplied to the retort furnace by the two doors, O, P, so that ready access for all operating purposes is obtained; as either one or other of the doors can be used just as the upper or lower portion of the fuel chamber requires attention, the coke is withdrawn from the base chamber, L, by the side door, Q. The coal is supplied to the retort by the vertical chamber, R, governed by a plug at the top. This chamber conducts the coal down to the archimedean screw, S, worked by the winch wheel, T, whence it is forced into the upper section U, of the retort.

The gas passes off from the retort into the upper vertical chambers, V, bolted down upon a branch of the fuel supplying chamber, and flows away to the cleanser and holder, by the branch pipe, W; the top, or narrow throat of the retort is fitted with a perforated disc cap piece, X, through which the vertical screw, Y, works up, and in the interior of the chamber, V, the screw being actuated by the hand wheel, Z. By this means a few turns of the hand wheel at once starts the coke in the retort, and sends it down into the base chamber, L, whence it can be withdrawn by the side door, Q. The ashes from the retort furnace descend into the chamber, *a;* with this arrangement of coke clearing and gas discharging apparatus the retort can be cleared out very easily, without opening up any channel of escape, whilst the gas can flow off quite freely up into the chamber, V, through the perforations in the disc cup, X.

As the newly made gas flows off, it enters the descending pipe, *b*, to reach the hydraulic chamber, *c*, of the "combined gas apparatus," or washer and purifier; and from this base chamber it passes up the vertical internal pipe, *d*, to the top, *e*, of the purifying chamber, and then re-descends through the successive layers of lime or other purifying agent on the shelves, to the central base pipe, *f*, in communication with the horizontal pipe, *g*, leading to the gas-holder, *h;* from this pipe it ascends into the gas-holder by the vertical branch, *i*, and flows off to the service main down the other branch, *j*, and out by the horizontal pipe, *k*.

The gas-holder is composed of vulcanised caoutchouc distended to a cylindrical form by internal metal rings. It is fitted with a convex metal top, *l*, and is guided in the usual way by pulleys and vertical pillars. Its base is formed by a shallow metal tank, *m*, filled with water, so that when wholly collapsed it is entirely contained in this tank, and is therefore peculiarly portable, whilst the whole of the contained gas can be expelled from it. In this arrangement of apparatus, the generator, "combined" apparatus or purifier, and the gas-holder are all upon the same level, and as they are each and all independent in themselves, no foundation is necessary for any of them, and the whole can be at once removed with facility when necessary. Either of these arrangements of gas apparatus may be employed for the manufacture of gas from oil, resin, or other gas producing matter, by simply dropping the material into the retort, by the upper end opening as we have described it.

In this apparatus Mr. Bower possesses the most complete arrangement for the purpose which can possibly be desired, his patterns being suitable for working out the new plan for from 5 lights up to 2000. His factory is about the only one in this country where gas works, and gas works alone, are manufactured on anything like a systematic and extensive scale; and for this reason he can produce exactly what is wanted, for any special service, in the most perfect and economical manner.

The apparatus is now being made in six sizes—for 10, 20, 30, 50, 70, and 100 lights. The cost of the gas is thus stated as regards a 20 light apparatus, for one day's consumption, when cannel coal of the Lesmahagow quality is used:—

	S.	D.
Coke to heat the retort, 56 lbs., at 17s. per ton, ...	0	5
Lesmahagow cannel, 42 lbs., at 40s. per ton, ...	0	9
Cost of purification, ...	0	1
Occasional attendance of either man or boy, ...	0	8
Wear and tear and renewals, ...	0	3
Interest of capital, ...	0	2
Total, ...	2	4

The 42 lbs. of cannel produce 250 cubic feet of gas, making the cost 9s. 4d. per 1000 feet; but as the illuminating power is from three to four times greater than that of ordinary coal gas—where equal quantities are used—the cost of the *light* from gas of the quality made by this apparatus is equal to that of common coal gas at 3s. per 1000 cubic feet.

Mr. Bower's own lengthened experience with an apparatus of this kind, shows that the actual cost of the gas is even less than this; that in fact it does not exceed nine shillings per 1,000 feet; the gas, be it remembered, being of an illuminating power, four times higher than gas made from common Newcastle coal. These figures will, of course, vary considerably with the localities of manufacture, depending, as they must do, both upon the cost of cannel and the fuel required for heating the retorts.

Mr. Bower is about to put down an apparatus of this kind, for 100 lights, upon his own engineering premises, and he will thus see his way in the clearest manner to the giving of any necessary finishing touches to the development of a principle, the soundness of which has been long ago proved.

The vulcanised caoutchouc gas-holders, as shown in our plate, are mainly intended for use in apparatus for exportation; but they answer admirably in places where it would not be prudent to build a brick tank. In cases where a brick tank and metal gas-holder can be put down without any fear of having to leave them behind on the removal of the occupier, they are to be recommended in preference. Still, the extreme portability of the flexible holder is an admirable feature in the arrangement, whether for home or foreign use. Such a portable apparatus is peculiarly well suited for Indian and Australian use, where there must necessarily be splendid fields for the introduction of gas works, independently of the trammels of large companies. A widely-spread system of individual gas-making, on a plan like that of Mr. Bower, will quickly strike at the root of the great gas monopoly. We are at present at the mercy of our city companies, who charge the most exorbitant prices for very inferior gas. In London, in particular, this evil is excessive. Such a state of things, however, cannot last for ever; and if, as Mr. Bower shows, people begin to make their own gas on a principle which entails neither trouble nor nuisance, and at a rate of cost which leaves other plans far behind, we shall soon see an end of a most unreasonable monopoly.

IMPROVEMENTS IN SUGAR REFINING.

We have from time to time had occasion to introduce to our readers the improvements brought forward by Mr. Robert Nicol, of East Stewart Street, Greenock, a practical sugar refiner, whose efforts to render more perfect the apparatus used in the several departments of the sugar refinery, are entitled to high commendation. This gentleman has sent for our inspection an improved pin for stopping the lower end of the sugar mould, previously to its being filled with sugar from the scoops or basins. This pin is designed to do away with the old and clumsy practice of stopping the aperture with a plug of cloth, and it also possesses advantages over the iron pin, which formed the subject of letters patent granted to Mr. Steel, of Greenock, in 1855. Mr. Nicol has also made an improvement in connection with the vacuum pan, which we have also engraved.

Fig. 1 of the subjoined figures represents a partially sectional elevation of a sugar (lump) mould, A, fitted with one of the wooden pins, B; which pin is furnished with an India-rubber washer, fitting close at the neck of the pin. This pin, unlike the patent iron pins, is hollowed at the neck, in order to admit of the washers falling down into the curvature, immediately on the weight of the mould coming to bear upon it, and thus prevent the escape of the syrup or mother liquor, on the moulds being filled with sugar; the pressure thus exercised upon the washer, causing it to expand towards the outer edge, and so preserve the aperture in the tip of the mould proof against leakage. Another advantage in the use of this pin is its easy removal from the mould. In this case, when the weight of the mould is removed from the surface of the washer, the spring or elasticity of the latter causes it again to assume its former flat position, which it had previously to its being inserted in the aperture of the mould, leaving a vacuum under it as before, from the curvature round the neck of the pin; the latter, from the sudden spring of the washer to its former flat position, being forced to let go its hold, and is thus made to loosen or detach itself from the tip of the mould, the pin being thereafter easily removed with the hand. This is, however, not the case with the patent iron pins, the removal of which from the moulds is rendered extremely difficult from the shape or form of the head, which is square, thin, and flat; and round which (instead of an India-rubber washer) is placed a washer consisting of a double or even treble ply of old filter sheathing cloth, the pores of which being so wide and open, leakage of syrup from the mould follows as a consequence; the several plies of the cloth becoming incrusted with the sugar or granulated syrup, causes sometimes violent means to be resorted to in order to effect their removal; and this being frequently the case, much loss of time is experienced in the pull-up or hoisting of the moulds to an upper floor of the sugar-house. The last, though not the least, important feature of this wooden pin is its comparative cheapness and durability. Suppose an ordinary sized sugar-house having in stock 1,000 of the patent iron pins, the patent fees for the use of which being £50, is exactly 1s. for each pin made use of; and assuming the market price of the pins to be 2d. each, at the rate of 22s. per cwt., amounts in all to a total cost of 1s. 2d. each pin. Now, against this place the price of a wooden pin, with washer included, which is not more than 3d., when taken in a quantity similar to the above, it follows that an actual saving of about 90 per cent. is thus effected on the price, to say nothing of the advantages of pins of the above construction. The wooden pins will also be found more durable than those of iron, which are most liable to corrosion from the action of the saccharine acid upon the iron. In order to remedy this evil, and preserve the iron pins proof against these injurious effects, the galvanising process has been called into operation, but without anything like a favourable result. The utility of wooden pins of this description, over those of iron, has already been fully proved from experience, some of them having been tried in one or two sugar-houses in Greenock, where they have been in use for several weeks, with the most favourable results. These pins are manufactured from any hard wood capable of standing the heat of the sugar-house, and at the same time susceptible of a smooth surface being produced in the turning process.

Fig. 1.

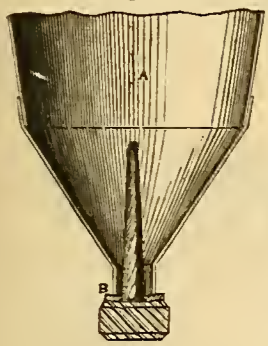
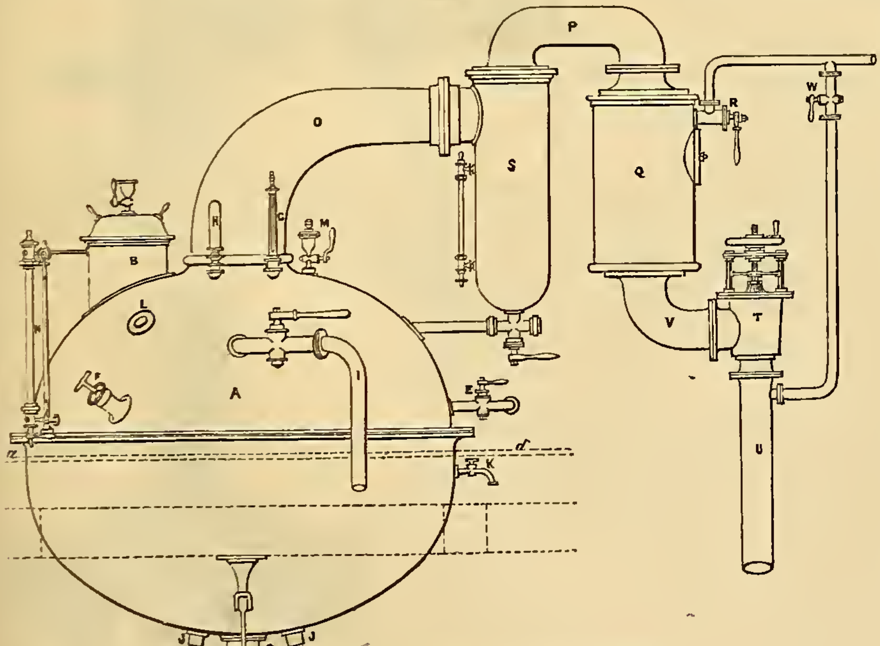


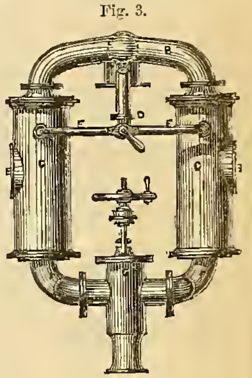
Fig. 2.



The second improvement has reference to the boiling department; it consists in the substitution of two condensers to the vacuum pan instead of one as now in use. This arrangement admits of the condensers being about half the usual diameter, and by its adoption the following advantages are secured, viz.: a saving of 20 per cent. in the consumption of injection water for condensing purposes, with the production of the same amount of vacuum; or, what is the same thing, the production of a superior vacuum with the same amount of injection water; whence it follows, that quicker boiling at lower temperatures, and a superior colour is produced in the refined product. The latter being the result of boiling at low temperatures, and quick boiling, with the view to the sugar's removal from the pan as quickly as possible, thus rendering the process of liquoring almost unnecessary. The injurious effects of excessive heat in the case of sugar boiling are well known; but it may be mentioned that it has the effect of darkening the colour in the pan during evaporation, as well as converting a considerable portion of the sugar into syrup or uncrystallizable matter; a remedy for which defects became the subject of a patent in 1812, by boiling in vacuo instead of the old common open pan system.

To extend this improvement still further, is the object of this invention, which, Mr. Nicol is confident, will have the desired effect—the attainment of which has been frequently the subject of lengthened discussion, in which the refiner and raw sugar manufacturer are alike deeply interested. Fig. 2 represents a vacuum sugar pan of the newest construction, with part of its subsidiary apparatus. Fig. 3 represents an elevation of the proposed arrangement of the condensers, with the vacuum pan and some of its fittings removed. In fig. 2, A, is the copper vacuum pan or vacuum spheroid, the lower half of which is encased in a cast-iron jacket set below the flooring, *a*, *d*, the space between the two being occupied by steam. B, is a manhole-door with a movable cover ground steam and air-tight into its collar. The cover is fitted with an air-cock for the admission of air when running off the contents of the pan by the slide valve, C, which is worked by the lever, D. The stop valves supplying steam to the pan for the purpose of boiling its contents, are not shown. E, is a cock supplying steam to the interior of the pan for cleansing purposes. F, is the proofstick for drawing out a sample of the sugar during the process of evaporation, without disturbing the vacuum within. G, is a thermometer for ascertaining the temperature at which the syrup within the pan is boiling; and H, a barometer or vacuum-gauge, for ascertaining the amount of pressure within the pan. The pan is charged with liquor or syrup by the main feed-pipe, I, communicating with the liquor or other cisterns below, by means of intermediate stop-cocks, &c., the liquor or syrup being conveyed to the vacuum pan by atmospheric pressure, on the same principle as water ascends a common pump. At J, are two pipes for carrying off the water of condensation from the steam-worm in the interior of the vacuum pan; the one serving a similar purpose for the steam jacket, not being shown. K, is a small air cock, inserted in the side of the steam jacket, for the due escape of the air on the admission of steam to the steam space surrounding the bottom part of the pan. L, is an eye-glass or lens through which the boiling action in the vacuum pan is seen by the operator; and M, a butter-cup with a stop-cock attached, by means of which a small piece of butter or grease is introduced into the pan, to modify the violent ebullition to which the coarser syrups and molasses are liable; N, being a glass tube or gauge communicating with the vacuum pan, which serves to show, by the height of the column, the quantity of syrup, &c., in the pan. The steam generated in the vacuum pan, escapes by the large pipe, O, usually termed the swan-neck, and thence, by the coupling pipe, P, into the condenser, Q, where cold water from the injection cock, R, condenses it as fast as it is formed. There is a manhole-door in the side of the condenser, for admission to the water-rose within. S, is a safe or overflow vessel, usually known as the tell-tale, for catching any little syrup, &c., that may chance to flow over from the pan from excessive ebullition, the amount of the overflow, if any, being indicated by a glass tube attached to the side of this vessel. The contents of the safe

Fig. 3.



are again returned to the pan by means of a pipe and cock at the bottom. The screw stop-valve, T, on the top of the pipe, U, serves to establish or cut off at pleasure the connection between the pan and the vacuum pump not shown, which latter both removes the air and generated vapour from the pan, and gets rid of the spent injection water and that produced by the condensing process, which water passes off from the condenser, Q, by the pipe, V, into the main pipe, U, leading to the vacuum pump beneath. The cock, W, is for supplying the vacuum pump with water during the disengagement of the vacuum pan.

In fig. 3 the coupling pipe, A, corresponding to the pipe, P, in fig. 2, has two branches, B, which connect it to the two condensers, C, which, as already remarked, are only about half the diameter of that referred to, in order to effect the desired object. This will at once appear obvious, as the heat in the two smaller condensers, C, being much less than that produced in the large one, Q, fig. 2, to which reference has just been made; the heat at the same time being more confined and within a smaller surface, the condensing or injection water will necessarily produce a superior effect in keeping the heat under, so producing a better vacuum in the pan, with boiling at a lower degree of temperature; for the diminution of temperature in this case produces a corresponding increase of vacuum, and consequently, boiling at lower temperatures and more rapid evaporation of the liquors, or with the same amount of vacuum a saving of injection water equal to at least 20 per cent. is effected. The injection water to both condensers, C, is supplied by the injection cock, D, which has a branch, E, to each condenser, which branches are of equal capacity, thus distributing an equal supply of injection water to each condenser. The spent injection water from the condensers, C, passes off by two separate pipes, F, into the screw stop valve, G, furnished with two branches for the purpose, or this may be effected by one pipe with separate branches to each condenser, C. If properly applied, this arrangement effects a saving of at least 25 per cent. on the general expenses connected with the boiling department of a sugar-house or sugar plantation where vacuum pans are used, and would, no doubt, have the preference to any other yet introduced; proving a great boon to the colonies or such places where the supply of water for injection or condensing purposes is limited. As this question is just now the subject of much discussion in Greenock, and creating a marked degree of interest between refiners and the Shaws Water Co., as to the rates charged for water, its immediate adoption should at once be decided upon, especially by those refiners who are unable to obtain injection water from the sea. We think we have now shown that Mr. Nicol's improvements are of sufficient importance to command the attention of all sugar refiners who desire to conduct their establishments upon principles of sound economy.

HISTORY OF THE SEWING MACHINE.

ARTICLE XXI.

MR. BELLFORD obtained a patent for an invention communicated to him from abroad, dated the 13th of December, 1854. This invention relates to that class of sewing machinery wherein two threads are employed to form the stitch, one thread being carried through the cloth and left protruding in the form of a loop so as to receive the second thread, thereby producing the "interlocked" or shuttle stitch. The improvements here consist principally in the substitution for the ordinary shuttle of a thread case so arranged relatively to the line of motion of the needle, that instead of requiring, like the shuttle, a movement of its own to carry the locking thread through the loop of the needle thread, this loop is drawn over it by the withdrawal of the needle, thus simplifying the construction of the machine.

Mr. Elmer Townsend obtained a patent on the 11th of January, 1855, for certain improvements communicated to him from abroad. The improvements in question relate to that class of sewing machines wherein a hooked needle ascends through a hole in the material previously punctured therein by an awl or punch, and catching the thread, which is properly presented to it by a guide or carrier, draws it in the form of a loop through the material and through the previously formed loop, which is thus released from the stem of the needle—each successive loop remaining on the stem until it is released by the needle descending in order to draw the loop through it. The chief improvements for which the patent was obtained, consist in certain peculiar arrangements of parts for feeding the material and holding the same during the operation of sewing; a grooved needle holder for communicating a vertical reciprocating motion to the needle, combined with a semi-rotatory or rotatory movement of the needle on its longitudinal axis; and of means for ensuring a proper and uniform tension of the thread when a waxed thread is employed.

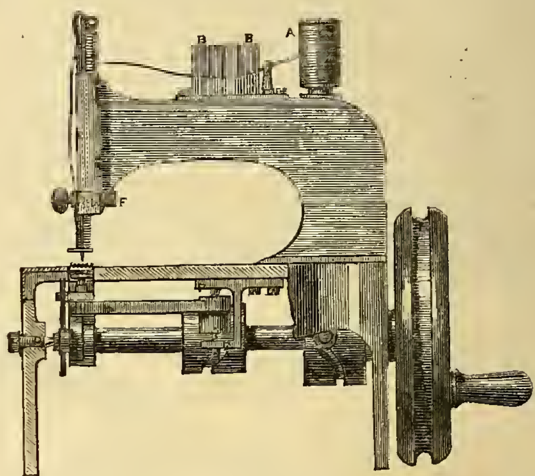
Joshua Kidd obtained a patent on the 21st of February, 1855, for constructing sewing machines in such a manner as to render the same capable of producing the ordinary "chain stitch" and the double or "cross chain stitch," by simply changing the needle or thread carrier. The principal operating parts consists of a straight needle (formed with an eye to receive the thread) descending at regular intervals through the fabric or material, and working in combination with a needle or thread carrier and appendages placed beneath the bed or table of the machine, and moving in a horizontal direction. In making the "cross chain stitch," the thread passed by the upper needle through the fabric is interlooped with a thread carried by the lower needle; but when a "single chain stitch" is required, the second thread is dispensed with, and the lower needle simply takes the loop formed by the descent of the upper needle, and places it in such a position that the upper needle, in its next descent, will carry a new loop through it. This invention also includes certain methods of feeding the fabric and thread and regulating the stitch, which, however, are not sufficiently important for detailed notice.

Charles Heaven obtained a patent on the 10th of March, 1855, for an embroidering machine, whereby an embroidery stitch, similar to the button-hole stitch, is produced, but as we do not see the applicability of this machine to sewing or uniting fabrics, we pass it over without further notice.

We now come to a more extensively known machine, and one which has been found in every respect to be a most efficient worker—we refer to the Foxwell sewing machine.

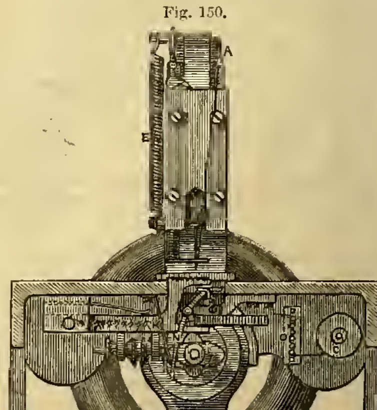
Mr. Daniel Foxwell obtained a patent for his invention on the 8th of May, 1855, since which period it has been extensively employed in the manufacturing establishments of Manchester and the neighbourhood. Mr. Foxwell's name is also well known through his protracted litigation

Fig. 149.



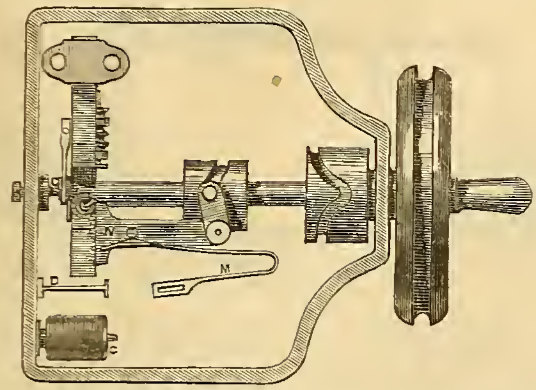
with Mr. Thomas. Mr. Foxwell has taken the Hughes or Grover and Baker sewing machine as his type, as our readers will see at a glance on comparing the illustrations annexed of the Foxwell machine with Mr. Hughes', given in article viii. Mr. Foxwell's invention appears from his claims to consist of certain mechanical improvements in, and additions to, the working details of what is known as the Grover and Baker machine. Fig. 149 represents a sectional elevation of a sewing machine with Mr. Foxwell's improvements attached. Fig. 150 is a partial transverse section of the same. Fig. 151 is a plan with the table or top plate removed. Fig. 152 is a side elevation of a portion of the needle slide, showing the socket for carrying the needle; and fig. 153 is a detached view of the arrangement, for insuring the formation of the loop on the proper side of the vertical needle.

Fig. 150.



The thread of the vertical needle is supplied from the bobbin, A, placed loosely upon a spindle without the adjuncts either of springs, nuts, or screws, for regulating the tension of the thread—this being effected by the series of rods or pins, B B, between which the thread is more or less passed according to its strength and the degree of tension or drag required. In lieu of these pins the patentee states that a perforated plate may be substituted, the thread being passed through a greater or lesser number of holes according to the tension required. C, is the bobbin for supplying the circular

Fig. 151.



needle, the thread of which is also passed round the series of pins, D D, for the purpose above referred to. E, is a helical spring, the object of which is to overcome the back lash of the bell-crank lever which works the vertical needle slide, one end of the spring being secured to the fixed bracket of the machine, and the other to the top of the needle slide. The needle, in place of being fitted directly into a socket formed in the bottom of the slide or carrier, is secured into the head of a pin or spindle, F, by a set screw, as shown in detail at fig. 152, which spindle is fitted horizontally into a long boss formed on the lower end of the slide, and is adjusted therein by a second set screw at G. By this arrangement, it is stated, greater facility is afforded for accurately adjusting the position of the needle in the machine. The arrangement for ensuring the formation of the loop on the proper side of the vertical needle, shown in detail at fig. 153, consists of a lever, H, centred at I, and provided at its upper

Fig. 152.

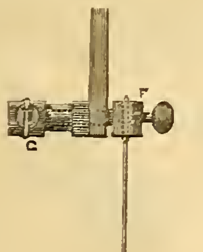
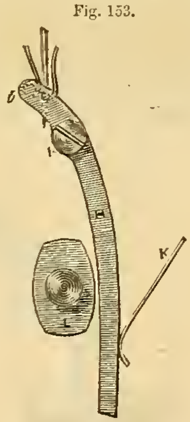


Fig. 153.



end with a pin, *i*, which is pressed against the thread on one side of the vertical needle by the spring, K. This pressure is released by the action of the cam, L, carried by the main shaft of the machine, which cam bears against the tail of the lever, H, and forces the pin, *i*, out of contact with the needle thread. M, is a blade spring, which bears against the segment lever, N, for actuating the circular needle, the object of this spring being to prevent back lash of the circular needle. The pointed centre, for the end of the main shaft to work upon, is shown at O, similar centres being also applied to the segment lever, N, as shown at P. Mr. Foxwell claims as his invention the use of perforated plates or rods for the threads to pass through; the use of a spring to overcome the back lash of the crank; fixing the vertical needle to the head of a pin or spindle working in a socket; the use of a lever, acted upon by a cam and spring, to press against the vertical needle; the use of a strong spring acting upon the cranked segment; the use of a pointed centre screw for the end of the main shaft to work on; and, lastly, the use of two adjustable pointed centres for the spindle of the segment lever to work on.

Mr. Edwin A. Forbush obtained a patent for an arrangement of mechanism for sewing leather, cloth, &c., on the 10th of May, 1855, wherein the work is held by a pair of clamps mounted on a carriage, which traverses across the machine on a pair of rails. On each side of such rails, and at right angles thereto, there is another pair of rails between or upon which a compound carriage travels. Each carriage is provided with a piercer and a needle, and their movements are so controlled as to cause the piercer to advance and puncture a hole in the fabric (held vertically between the two carriages), and then the needle is inserted in the punctured hole and drawn through the same by the aid of grippers on the opposite carriage, which then runs out to draw the thread. This is a most complex piece of mechanism, and we therefore refrain from giving anything more than the above general outline of its character, as our readers would only be mystified were we to attempt to describe it without an illustration, and we do not consider the arrangement of sufficient importance to warrant a wood-cut. Although the machine is intended to pass two threads through each hole in opposite directions at the same time, so as to produce the shoemaker's or saddler's stitch, it may also be used to sew with one needle and thread only.

Mr. Bellford obtained provisional protection on the 28th of May, 1855, for improvements in sewing machines, consisting of a peculiar kind of looper working in combination with a needle, to form a stitch with a single thread; a method of operating the needle in connection with the looper, so as to throw the thread over its point; a peculiar arrangement of mechanism for carrying out the operation last referred to; and a feed motion for moving the cloth in the line of the seam. The needle is of the ordinary construction used in sewing machines, with an eye near its point; it carries the thread downwards through the fabric in the form of a loop near the point of the "looper," which consists of a piece of metal, which is straight, except at one end, where it is slightly curved and pointed. This instrument is placed parallel to the line of motion of the needle, and below the bed of the machine, with its pointed end downwards. When the needle rises and leaves its thread slack, it also turns on its axis towards the point of the looper, and as it continues to ascend it draws the thread in the form of a loop over the looper, which latter instrument, without detaining the loop, merely keeps it open in position for the needle to pass through in its next descent. When the needle again descends, the loop is drawn over and off the "looper" by the consequent tension of the thread, the combined movements above described producing a single thread chain stitch.

William Meyerstein obtained provisional protection on the 3d of August, 1855, for a machine for sewing by means of a straight needle vibrated vertically by a lever arm, and acting in combination with a shuttle, which travels in a horizontal circular course, the straight needle and shuttle each carrying a separate thread. The material to be sewed is advanced between the successive movements of the needle by a suitable feeding apparatus capable of being adjusted, by turning a screw, so as to vary the length of the stitches at pleasure. We congratulate Mr. Meyerstein on his not having spent more money in *completing* the patent for this so-called invention; there may have been some brilliant idea or other in the *mind* of the inventor, but if so, the *provisional* certainly does not disclose it.

Alfred Heaven, on the 10th of August, obtained a patent for an arrangement of apparatus for piercing, puncturing, or cutting holes of various shapes in fabrics by means of stilettoes or punches applied to the ordinary embroidering machines, or by other means previous to performing the operation of embroidering or sewing by such machines, the object being to produce a clear outline in the design, and to make the embroidering or sewing as strong as that performed by hand.

MARINE PROPULSION: IMPROVEMENT IN THE FORM OF PROPELLING BLADES.

It is demonstrable by theory and practice that propelling blades of uniform width, as those of oars and steamers' wheels, are defective in principle, inefficient in practice, and wasteful of power; that the action of their several parts against the water is unequal and conflicting; and that the resistance they have to overcome is accumulated at or near their outer or further extremities, instead of being equally distributed over them.

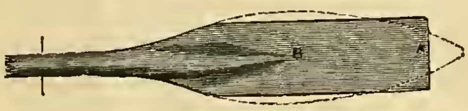
As every part of a blade has a different velocity, according to its distance from the fulcrum or axis of motion, there can be no equality of resistance against sections of equal areas; on the contrary, the principal part of the resistance is unavoidably met by the outer section, which sweeps through a greater space in the same time than the inner ones; and these, having equal volumes of water to overcome, and moving slower and slower (describing smaller and smaller curves) as they approach the fulcrum, not only give diminished results, but neither harmonise in their action with the swiftest section, nor with one another. It is indeed impossible for the various parts to act in unison, and with full effect, while the centre of resistance, instead of being at or near the centre of a blade, is thrown out towards its extremity.

Now, the required improvement consists in making propelling blades of such forms, that the resistance they have to overcome is distributed equally over their acting surfaces, and every part made to act in unison with the rest. With this view, I taper the blades from the widest parts outwards; and in such a ratio that if any section be taken, and its area multiplied by the square of its velocity, it will give the same resultant as any other section of the same width, though unequal in area. In other words, velocity is modified by surface and surface by velocity, so that every part performs its appropriate portion of the work; and the centre of resistance is brought in from near the end of the blade to its centre, and consequently a corresponding saving in the outlay of power obtained.

The following are exemplifications in oars, side wheels, and submerged propellers:—

Oars.—Fig. 1 represents a common oar-blade, and consequently having the centre of resistance at or near A. In the improved form, indicated by the dotted lines, the centre of resistance is drawn in toward the

Fig. 1.



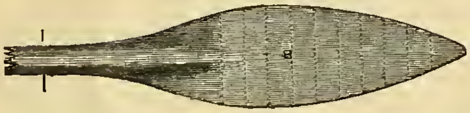
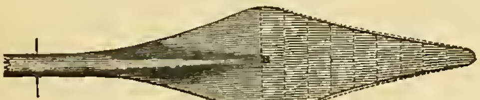


Fig. 2.

centre of the blade at B, and as shown also in fig. 2. The sections marked by the vertical lines in the last figure, while varying in their areas, produce equal effects on the principle already mentioned—diminished area being compensated by increased velocity or extended sweep, and *vice versa.* The advantages are, that all the parts of the blade act in harmony with each other; the centre of resistance is brought nearer the

Fig. 3.



fulcrum or centre of motion, and the work is done with a less outlay of power. By making the sides of the tapered part concave, as in fig. 3, or straight, as shown by the dotted lines, the centre of resistance may be drawn still nearer the fulcrum. The convex sides, as in fig. 2, may, however, be found preferable in practice.

Side Wheels.—It may be deemed presumptuous to find fault with so universal an instrument as the oar. Physical laws are, however, inexorable, yielding nothing to human opinions or prejudices, and according to them the popular hand propeller *is* defective in outline, and unmechanical in its action. But its defects are trifling compared to those of our paddle wheels. In the oar, the longitudinal axis of the blade properly coincides with that of the lever which moves it; whereas, in the wheel it is at right angles to the arms, length being substituted for width, and width for length. Fig. 4 represents a section of a steamer's hull, with the paddle-shaft extending across it. At one side is the ordinary plank paddle, at the other the proposed form of blade; the advantages of the latter are:—

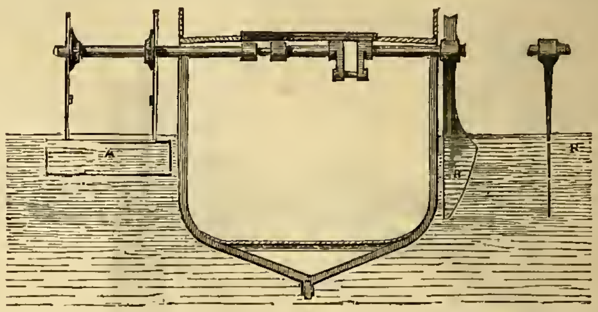
1. An equilibrium of pressure on the face of the blade, a property utterly incommunicable to the other, one that can only be attained by reducing the surface from the widest part outwards, so that the areas of the sections may be inversely as their velocities.

2. The width of the blade is reduced to one-third of the ordinary one, so that the shaft instead of extending from twelve to fifteen feet over the vessel's side, need not project over three, thus virtually adding to its strength by diminishing its length, and avoiding those enormous strains on both shaft and paddle, which occur when the vessel rolls, so as to bury one wheel in water while the other revolves in air. With the improved blades there can be no dangerous straining by a vessel's lurching, nor can a blade ever be thereby raised out of the water. There can be no contest between them and Neptune to determine which shall give way—the wave or the blade.

3. Though the width of the blade is so greatly reduced, its length is not proportionately increased. It is projected further into the resisting medium in accordance with what appears to be a general law, viz., that speed is increased, and only to be increased by lengthening the organs of propulsion—not by enlarging the surface, but by increasing the dip—a law that does not require, as some persons have supposed, a further protrusion of the centre of resistance, but the reverse. The centre of the improved blade at B, is nearer the shaft than the other at A.

4. The adoption of these blades requires the throwing overboard two-thirds or three-fourths of the number in use, with the same proportion of shafting, as not simply useless, but positively injurious. This cannot be done with the present blades, on account of the jarring caused by their violently slapping the water as they come down upon it. When few blades are used, the effects of this are seriously destructive; and

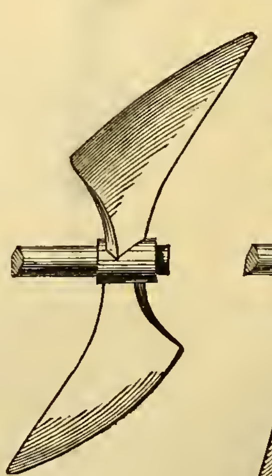
Fig. 4. Fig. 5.

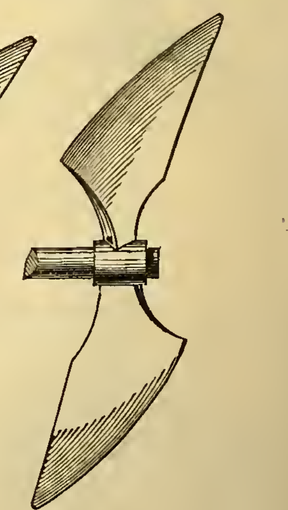


hence, to reduce the concussion the number is increased, on the principle of dividing a few large blows into many little ones. Some boats have had seventy-two blades on each wheel, some have now thirty-six. Thus, one error has called in another; for it was not perceived that as their number was multiplied, their efficacy was diminished.

5. The least amount of material is required in the proposed blades. They are not uniform in thickness, but are thinned away to their extremities. Besides economy of material, there are evolved from this simple feature, what very few would anticipate, some of the most essential attributes of a propeller. As the reduction in thickness of natural propellers, outwards, is a permanent feature under all circumstances, it might have been inferred from that fact, that the same trait might be indispensable to success in artificial propulsion. It has not been so inferred, and we are therefore led at once to inquire, why natural blades are reduced outwards, and to a mere film? Obviously, because length of stroke virtually *diminishes with thickness, and a waste of power keeps pace with it.* This is demonstrated in our paddle-wheels. It is an inexpugnable truth, that whatever may be the number of blades in a wheel, the sum of their thickness must be deducted in every revolution from their sweep through the water, in order to determine their propelling capacity, or the work they should perform. Taking the mean thickness and number of the massive planks that constitute the blades of ocean steamers, they lose from this cause from eight to ten feet of stroke in every turn of each wheel. Assuming 250,000 revolutions as the average number in a trip across the Atlantic, over 500 miles of stroke are thus lost in each

Fig. 6. Fig. 7.





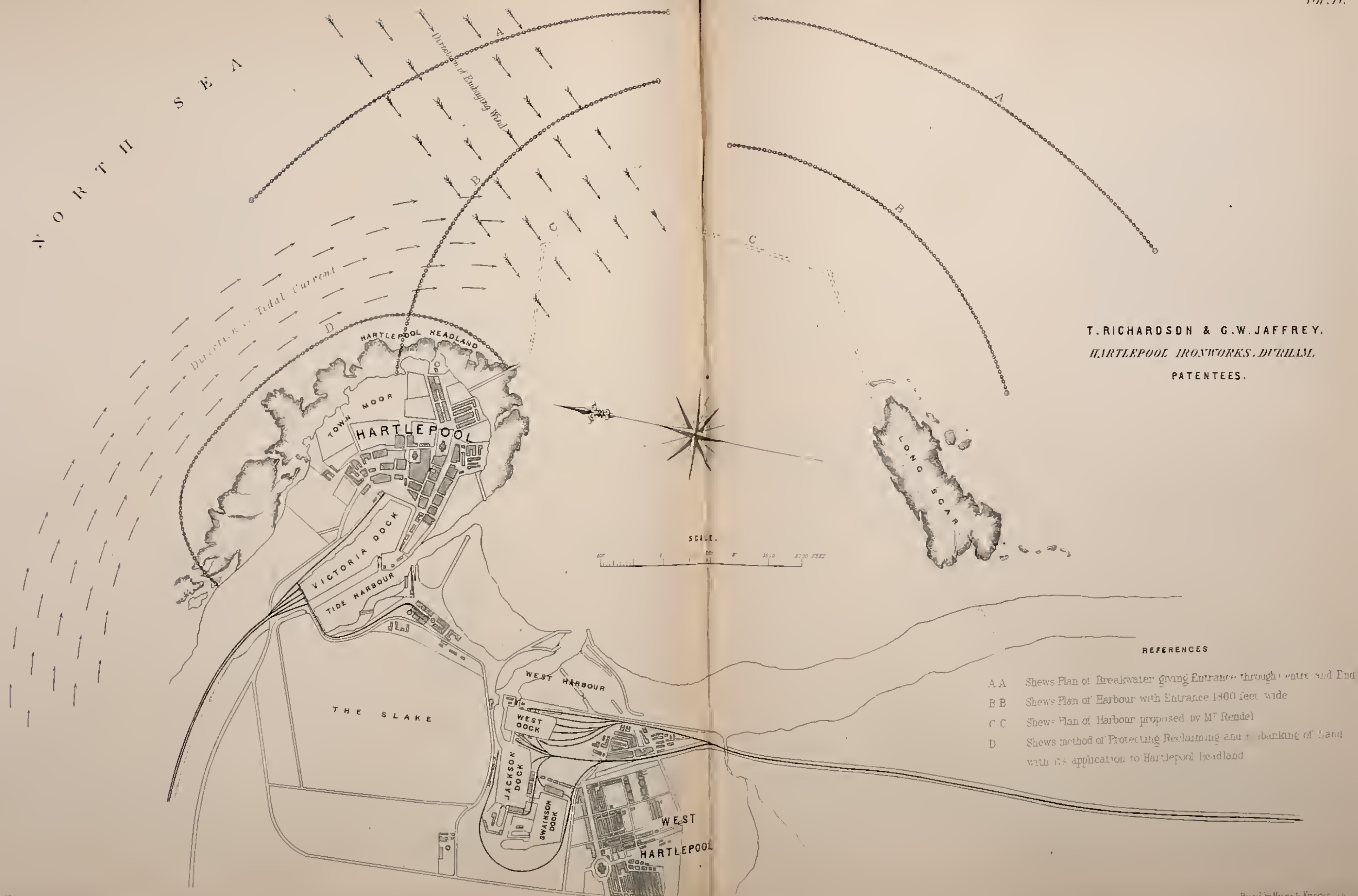
wheel, and 1100 in both; or, in other words, between 20,000 and 30,000 pounds of timber are whirled 1100 miles through air and water, and to no purpose but consuming power and wearing out the motive machinery.

The improved blades are made of metal, and of a degree of thinness impossible with the rectangular paddle planks; tenuity being inseparably allied to tapered forms. Instead of the united thickness at the extremities of the blades of a wheel amounting to eight or ten feet, it need not exceed half as many inches; and hence, from this feature alone, there would be 400 miles of stroke virtually gained in each wheel

PROPOSED HARBOUR OF

GE FOR HARTLEPOOL,

PROPOSED HARBOUR OF REFUGE FOR HARTLEPOOL,



on a trip across the Atlantic. This very important feature of thinness in blades, has escaped the notice of engineers. Its virtue was not suspected.

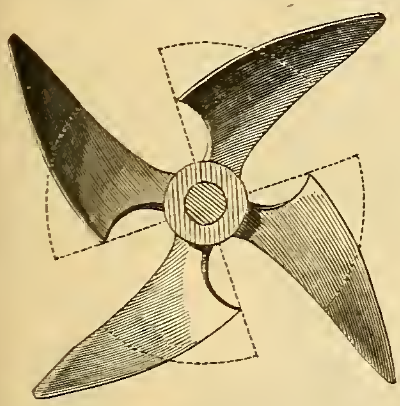
6. The quantity of "back water" is vastly diminished. Instead of eight to ten feet of plank, there is but a point at the extremity of each blade from which to discharge it. Such are some of the virtues of form, and such are the proofs that correct outline in propelling blades is everything: because every—the most essential of desiderata—flows from it. An objection has been made to an increase of dip, because of its adding to the diameter of wheels. Admitting this, the prime object is speed; and should the principle be sacrificed to an accessory? The finest of natural flyers move heavily with crippled wings, and we can have no swift skimmers with deformed or defective organs of motion. But in reality little, if any, increase of diameter would be required. The shafts of paddle wheels have been raised higher and higher, for the purpose of diminishing an evil inherent in their rectangular buckets, viz., the jar and waste of power consequent on a large proportion of their widely-extended surfaces striking the water. If the shafts were level with the water, the entire faces of the buckets would come down slap upon it at once, while in proportion as the shaft is raised this evil is lessened. Now, with tapered blades, the striking surface is a point, and for them the shafts might be lowered, so as to have wheels no larger in diameter, or but little larger, than those in use.

One thing is certain—the virtue of the common paddle wheel is exhausted. No additional speed can be got out of it. To attain this, increase of surface is not required, but simply an alteration in form. The meteor flight of the frigate bird could not be realised with propellers formed after those of an ostrich, nor can we ever make a steam frigate fly over the ocean with the undershot wheels of a grist mill.

Submerged Propellers.—Figs. 6, 7, and 8, are submerged propellers, in which the same principle of modifying velocity by surface and surface by velocity is retained, though not so obvious as in the preceding changes from rectangular forms.

In all blades proposed previous to the enunciation of the above principle the radical defect of paddle planks was adopted in submerged propellers, and is so yet, so far as I am informed, though it may very well be that it is more or less diminished by whim or accident in some of the multitudinous patterns proposed. Their chief acting surfaces are at their extremities. They contain the elements of, and most of them do not deviate from, a sector, as shown by the dotted lines in fig. 8. The difference between them and those proposed consists essentially in removing a portion of the sector, and adding it to the extremity, as represented in the same figure, by which equilibrium of pressure or resistance is attained, and the centre of resistance brought nearer to the fulcrum.

Fig. 8.



These blades are reduced in thickness to their edges, thereby virtually increasing the length of the stroke, though the amount of gain in this respect bears but a small proportion to that on the thick paddle planks of side wheels.

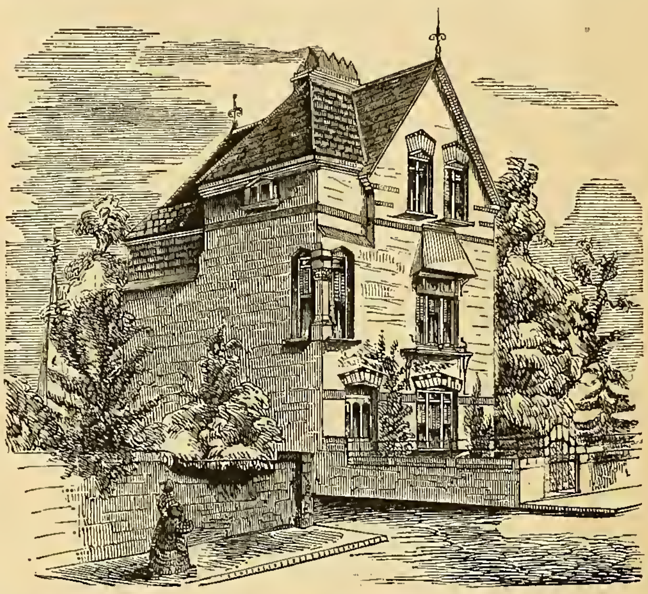
Besides the value of a series of experiments on the subject of form in propelling blades both to our national and commercial marine, it will be honourable to our government to take the lead in the solution of a problem of enduring interest to all maritime nations.

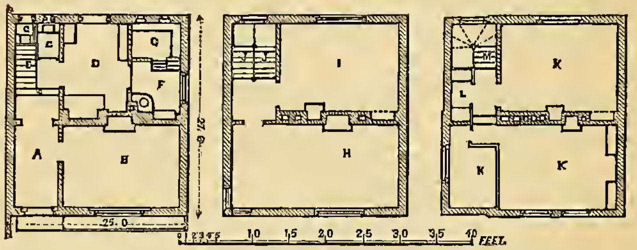
Thomas Ewbank.

THE HOME OF AN ARCHITECT.

An American author some time ago gave us a very pretty volume, illustrated by still prettier pictures of the delightful homes where rest in leisurely quiet, some of the poetical hearts of the United States. Probably some of these lovely places were somewhat poetically drawn, and perhaps they owed some of their beauties to the exercise of that license, in which, by acknowledged courtesy, the poet alone is allowed to indulge. But even with a fair allowance of such accessories, it must be admitted that many of the American homes of literature and poesy are intrinsically beautiful enough to provoke something of envy, and a great deal of admiration on the part of many of the writers of song and story, and the more prosaic followers of science here.

Now, although in the *Practical Mechanic's Journal* we cannot well show how British poets live, we may say something as to the substantial homes of architects, and we therefore now engrave the picturesque suburban home of Mr. G. Truefitt, the architect of Bloomsbury Square,





London, as designed by himself, and erected in the Middleton Road, Holloway. The diagrams beneath the perspective elevation, represent plans of the ground and two upper floors. In the ground plan, A, is the hall; B, dining-room; C, closets; D, kitchen; E, stairs; F, scullery; G, larder. In the drawing-room, or what is so erroneously called the "first floor" plan, H, is the drawing-room, extending along the entire front of the house; I, a bed-room; and J, the stairs. In the plan of the floor above, at K, are three bed-rooms; L, is a closet, and M, the stairs. The entire structure is of brick, with no stone but that in the angle window of the drawing-room, and there is a solid bed of concrete beneath the entire base. The roof and chimney tops are of slate, and the hall, hearths, and skirtings, are executed in Maw's tiles. No paint is used in the internal decorations, as the doors, shutters, and all the joinery are of yellow pine, varnished. The walls are plastered and coloured, plate glass is fitted in the windows of all the principal rooms, and the doors have oak finger plates and handles. The area occupied by the house is small, being only 28 by 25 feet. Our readers will judge for themselves as to the architectural pretensions of the house. To us, it certainly appears to be, on a moderate scale, a fitting dwelling for a man who has some title to be considered a master of his art.

PROPOSED HARBOUR OF REFUGE FOR HARTLEPOOL.

By T. Richardson *and* G. W. Jaffrey, *Hartlepool Iron Works, Durham.*

(Illustrated by Plates 247 *and* 249.)

The annual losses by shipwrecks on our coasts amount to at least £1,500,000. This is a loss in treasure and property merely—of which we can actually count the cost. But what of the valuable lives of men which are thus cut short by one of the most shocking deaths? and what of the poor wives who are thus suddenly made widows, and the children and babes who, under the vengeance of the same fell swoop, are suddenly and for ever made orphans? The goods of this world may be regained, or, at any rate, the weight of their loss may be lightened, but the poignance which ever attends the loss of our nearest and dearest can never be removed—it can only be dulled by the blunting effects of time. Even within the last few weeks—within a compass, indeed, of a very few days—between 400 and 500 wrecks have occurred upon British shores, and about 1000 human lives have been thereby sacrificed. The Royal National Life-Boat Institution has indeed enough to do in working its next best remedy for shipping disasters; but all which that admirable association can effect is the saving of lives when wrecks have actually occurred. We want something more than this. We want to prevent wrecks from happening. The foundering of ships in mid-ocean will, of course, occasionally occur in defiance of all precautionary measures, for there no human power can avail in the dread hour of danger; but when a labouring vessel is within sight of land, and that land an open, rugged, lee shore, on which the furious tempest threatens to drive it, what would the captain give for a haven into which to run his craft? In constructing works of this class, there are three great primary points to be taken into consideration. These are—first, a good design, which, when executed, will really afford the protection which a good breakwater or harbour of refuge should give; second, such economy in constructive cost as shall not altogether defeat the object aimed at; and, third, such a site or geographical position for the works as shall be best suited for the wants of the sailor; so that, under all circumstances of wind and weather, he will stand a good chance of always being able, when necessary, to reach one haven or other, when such asylums are created, as they must sooner or later be, all along our coasts. When we introduced Messrs. Richardson and Jaffrey's harbour of refuge in this *Journal* last month, we believe that we succeeded in satisfying most people as to the capabilities of their design for answering the two first conditions which we have named; we have therefore now to consider the third one, and we shall do this by a reference to the exposed bay and town of Hartlepool, which the designers propose to render a safe resting-place for ships, according to their particular plan, as laid down in our plate 249.

In looking at a scheme of this kind, benevolent and philanthropic considerations must obviously hold the first place—a place which we have ourselves assigned them. Then we have the naval and tactical points to look at. In the instance of the Hartlepool harbour, our fleet of steamers could go right inside it with the greatest safety, and load their complement of the best and cheapest coal in the world, and go out again in all states of the tide. This is a feature of the very highest importance, which, however it may have been forgotten on former occasions, will never again be overlooked in future cases.

Our plate also shows that there are already in existence at Hartlepool large and commodious docks, possessing a network of railways connected with the whole country. Ships going inside the sea barrier can directly discharge their cargoes into trucks upon the rails which fringe the harbour. There is no tortuous river navigation dangerous and tedious to get over, but, on the contrary, there is on the one side the open sea, and on the other a safe place for business and repose in immediate connection with it. The materials for the formation of such a structure are there ready to hand upon the shore, against which the surges dash. The Cleveland hills form one side of the bay, and they are almost a solid mass of ironstone—a fact in itself sufficient to induce mature consideration of the project; and as the town of Hartlepool is built upon a limestone formation, of which, indeed, the whole of the surrounding strata are composed, so that everything may be said to be arranged for the execution of the work.

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RECENT PATENTS.

WEAVING TEXTILE FABRICS.

William Robertson, *and* J. G. Orchar, *Dundee.—Patent dated March* 16, 1859.

Messrs. Robertson & Orchar's improvements consists in the better arrangement, contrivance, and action of what is technically known as the "take-up" motion, or the movement which winds the cloth upon its proper beam, in accordance with the rate of weaving. In this take-up motion, a "pike" roller or beam, studded with pointed projections or pins, is used as the actual agent in taking up the cloth—the "drag or quadrant" up-take being applied to, or fitted up in connection with, this pike or pin roller, which apparatus can be so adjusted as to give the exact number of weft shots in the cloth that are required; whilst at the same time, it provides that there shall be no take-up when the shuttle in action ceases to give off any weft. A separate and distinct roller is employed for receiving and taking on the woven cloth, so that as the pike or studded roller to which the quadrant is applied, always remains at its normal diameter, the quadrant can be trimmed or adjusted at the commencement of a piece of cloth, to work steadily and evenly to the end thereof. There are two or more arrangements by which this desirable end may be conveniently attained, the woven cloth being wound upon the second roller. In one of these arrangements, a pulley or disc is fitted on each end of the studded or pointed roller, or its spindle; and similar pulleys or discs on the corresponding portions of the actual cloth roller; the pulleys of the cloth roller being allowed to rest in frictional contact with the pulleys on the studded roller, so that the frictional effect rolls on the cloth.

In another arrangement there is a toothed spur-wheel on one end of the studded roller, and a corresponding wheel on the cloth roller, the two being in gear. The wheel on the cloth roller is frictionally connected to the roller or its spindle. This is very conveniently and effectively accomplished by the arrangement shown in fig. 1 of our engravings. The spindle, E, of the cloth beam has fitted to it the frictional disc, F, which is made with an elongated tubular boss to fit the spindle, and is fastened thereto by the set screw, G. The outer extremity of the tubular boss is made solid, and has a screw thread cut on it, to which is adapted the thumb nut, H. The spur wheel, J, is of the disc class, or made with a solid centre part; the wheel is slipped over the tubular boss up to the face of the disc, F, a layer of "plaiding," I, or other textile or frictional material being inserted between the contiguous faces, to increase the frictional contact. A second frictional disc, K, is, in like manner, arranged in contiguity to the outer side of the wheel, J, and by means of the thumb nut, H, the frictional surfaces may be tightened up so as to cause the cloth to be wound on the beam, more or less tightly, as required. In this way, just as the frictional contact is made feeble or strong, the cloth roller will wind up the fabric slack or tight. Fig. 2, of the accompanying engravings, is an elevation or side view of a portion of a loom sufficient to show the application of two other modifications of the improvements thereto. Fig. 3 is a front elevation corresponding to fig. 2. The framing, A, of the loom is of the ordinary kind, the rocking shaft, B, to which the swords, C, of the slay are attached, extends out beyond

Fig. 1.

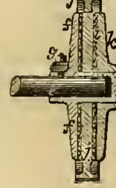
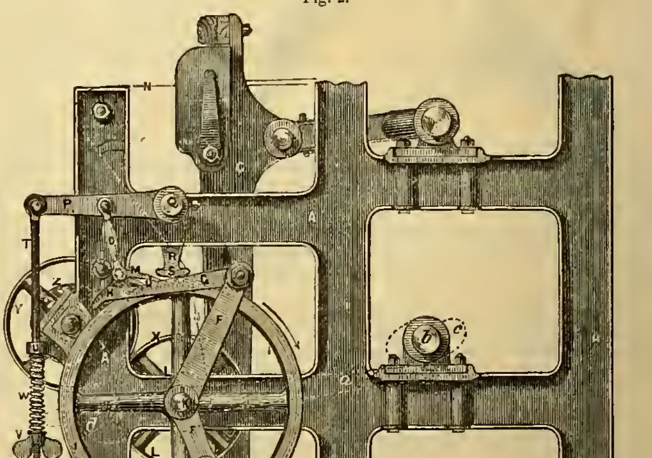


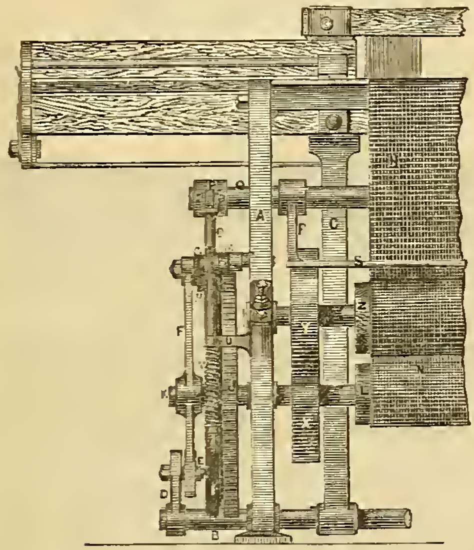
Fig. 2.



the framing, and has keyed to its extremity the spanner or short crank lever arm, D. The upper part of the spanner has a slot made in it, in which is fitted the adjustable stud and anti-friction roller, E, which, by the oscillating movement of the shaft, B, comes in contact with the lower part of the-bell crank lever or quadrant, F, each time that the slay moves back after beating up the weft.

The quadrant, F, which is moved in both directions by the arm, E, has jointed to it the arm, G; the front extremity of this arm forms a frictional catch, H, that rests upon the periphery of the frictional wheel, I, which is cast in one piece with the ratchet wheel, J. The ratchet wheel is fast to the spindle, K, of the pike roller, L, the motion of which takes up the fabric, N, as it is woven. The frictional catch, H, is connected by the link, O, to the arm, P, which is attached to the horizontal shaft, Q, and secured thereto by a transverse screw. The shaft, Q, extends across the loom framing, and is carried in bearings fitted in the side standards, on the inner sides of which the shaft carries two pendent or downwardly projecting arms, R, these in their turn carry the transverse rail, S, which rests against the cloth during the weaving operation. The outer extremity of the arm, P, is jointed to the rod, T, which passes through an eye formed in the laterally projecting bracket, U. The lower extremity of the rod, T, has a thread cut on it to which is adapted the thumb nut, V, which serves to compress the helical spring, W, against the under side of the bracket, U, and thus temper the pressure of the rail, S, against the cloth. In lieu of this arrangement of a spring, weights may be hung on the rod, T, so as to obtain the required degree of pressure. The motion of the pike roller, L, is imparted to the cloth beam, by means of the frictional pulley, X, which is in contact with the pulley, Y, on the cloth beam, Z. Or in lieu of this arrangement, spur wheels and frictional discs may be used similar to what we have before described. At the commencement of a web, the spring, W, is adjusted so as to cause the rail, S, to take

Fig. 3.



the cloth forward as it is woven, as each shot of the weft is thrown in the slight relaxing of the warp allows the rail, S, and shaft, Q, to move a little. This motion of the shaft causes the arm, P, to descend, and the frictional catch, H, comes in contact with the wheel, I, and by the continuous reciprocatory movement of the quadrant, the wheel, I, is moved round a little, and the cloth is thus wound up to a corresponding extent on the cloth beam, Z. The tightening up of the cloth brings the rail, S, back to its normal position, and the frictional catch is raised from the periphery of the wheel, I, the motion of which in a contrary direction is prevented by the pawls, M, which rest in the teeth of the ratchet wheel, J. This mode of arranging the up-taking apparatus ensures an accurate and efficient co-operation of the several working parts, and in such manner to lessen to a great extent the labour of the loom tenter. The other parts connected with this modification are in all respects similar in arrangement and action to those we have described.

In this figure is also shown in dotted lines another mode of actuating the quadrant, F. The longer arm, *a*, of the quadrant extends backwards below the tappet shaft, *b*, in a nearly horizontal direction; this arm also extends forwards in front, and carries a counterweight, *d*, which keeps the backward extremity of the arm up in contact with the cam, *c*, on the tappet shaft. With this arrangement the quadrant, F, is moved at each depression of the lower arm, the actual take-up of the cloth, however, is only effected when the frictional catch, H, is brought, by the weaving action, in contact with the periphery of the wheel, I.

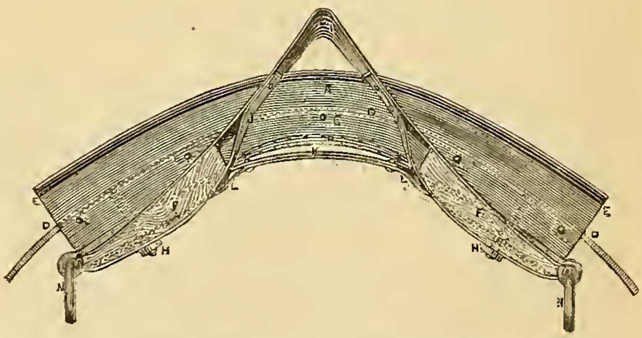
Another of the patentees' improvements consists of a mechanical arrangement for taking back the warp yarn when necessary. The spindle or arbor of the yarn or warp beam projects out beyond the side standard of the loom framing, and this spindle or arbor has fitted thereto a ratchet wheel; this wheel is made with a tubular boss to admit of its being attached to the spindle by means of a transverse set screw. The loom standard has projecting laterally from its face, a stud which serves as a fulcrum for a hand lever; this lever extends forward to the front of the loom, the handle projects out beyond the framing so as to be within convenient reach of the loom tenter. The front end of the hand lever is upheld by a projecting rest, which is cast on, or attached to, the loom framing; the backward end of the lever has a laterally projecting stud on its outer face, which carries a pawl, by means of which the ratchet is turned back when required. When the hand lever is in a horizontal position, the pawl rests upon a pin which is screwed into the framing. In this position of the several parts, the weaving goes on in the ordinary manner, the ratchet wheel being free to turn in a forward direction, and thus unwind the warp. If, however, the warp be required back a little, or to be more or less rewound upon the warp beam, the loom tenter has only to lift the hand lever, when the pawl takes into the teeth of the ratchet wheel, and turns it in a backward direction, so as to rewind the yarn upon the beam. In this way, with a few strokes of the handle, the warp may be taken back to any required extent, the long leverage enabling the loom tenter to turn back the beam with ease against the drag upon it, and so take up any slackness of the warp, or cause it to be rewound upon the beam, should any portion have been let off after the failure or during the absence of the weft. With these several improvements the operation of weaving by power is rendered more exact, certain, and efficient, at the same time the machine is more automatic in action, thus dispensing to a greater extent with the constant supervision of the loom tenter than heretofore.

CONSTRUCTION OF SADDLES.

JOHN ANGUS, *Glasgow.—Patent dated April* 23, 1859.

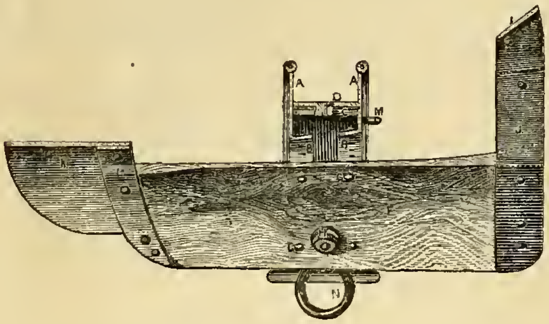
THE patentee's improvements relate to the arrangement and construction of saddles of various kinds, but in particular, those employed for harness work for carting purposes. Fig. 1 of the subjoined engravings is a front elevation of a saddle arranged according to one modification of the patentee's improvements; fig. 2 is a plan of the principal portion of the saddle, part of which figure is shown in section. The saddle delineated in figs. 1 and 2 is mainly constructed of wrought-iron, the trough or curb is composed of the two vertical side pieces of metal, A, the upper edges of which are bent over to form a hollow heading along the sides of the trough or curb. The lower parts of the side plates, A, are bent inwards and form parallel flanges, B, extending towards the centre line of the trough or curb; a series of holes is formed in each of these flanges, by means of which the side pieces are riveted to the contiguous parts of the saddle. At suitable distances asunder holes are made opposite to each other in the side plates, A, these holes are made to receive the ends

Fig. 1.



of the transverse stay pieces, C, which pass through the holes and are riveted to the plates, A. These stay pieces, C, serve to bind the side pieces, A, to each other, as well as to support the bottom piece, D, which is riveted to the stay pieces, C. The bottom piece, D, of the trough or curb is simply a strip of malleable-iron, which is widened out at the ends, as shown in fig. 2, and having holes made in it for the necessary rivets and bolts. At the ends of the side pieces, A, two thickness pieces, E, are riveted to the inner faces of the side pieces; these additional pieces are intended to prevent the lateral wear of the chain on the trough or curb. The underside of the trough is filled in with a curved piece of wood extending the whole length of the trough or curb, which is attached to the longitudinal pieces of wood, F, that form the main portion of the saddle. These parts of the saddle are firmly secured to each other by the rivets, G, and by the bolts, H, which pass through the whole, and are secured by nuts screwed on their extremities, which project through the parallel pieces of the saddle tree, F. Instead of filling in the whole length of the underside of the trough or curb with wood, the patentee prefers in some cases to use a short piece of wood, which is fitted to the central part of the underside. This piece of wood is fitted in the space between the longitudinal pieces, F, or it may extend for a short distance on each side over the longitudinal pieces, F. The head or "gullet," I, of the saddle, is formed of a strip or band of malleable iron, which is curved upwards to the proper figure; to the underside of this curved band is riveted a secondary strip or band, J, of iron. The free extremities of the

Fig. 2.



metal bands, I, and J, extend outwards to the lateral edges of the saddle-tree, F, and the metal bands are secured thereto by means of rivets, as is more particularly shown in fig. 1 of the accompanying engravings, the corners being rounded off to produce a neat finish. The backward ends of the pieces of wood, F, are connected to each other by the broad metal plate or breach piece, K, the ends of the wood being enclosed by the transverse strip or band of metal, L, which is fastened to the upper plate, K, by rivets which pass through the wood in the same manner, as the front part is finished. The outer face of the hinder side piece, A, has three staples, M, riveted therein, to which the hooks of the harness are attached, and below the expanded ends of the bottom piece, D, are fitted the eyes and rings, N. In the construction of saddles upon this principle, the minor details may be more or less varied according to the style in which the saddle is required to be got up. The patentee's improvements are also applicable to the construction of saddles in which the troughs or curbs are mainly composed of cast-iron. The vertical side pieces of the trough or curb are made of cast-iron, on the lower parts of these side pieces are cast inwardly projecting snugs, in which are holes to admit of the parts being riveted to the wood. The side pieces are connected to each other by the cross stay pieces, which are riveted thereto. The bottom piece of the trough is formed of a strip or band of wrought-iron, which is firmly connected to the wood beneath by the bolts and nuts. The longitudinal pieces of wood are connected together by means of gullet and breech pieces formed of plates, bands, or strips of iron, in manner similar to the arrangement shown in figs. 1 and 2. The thickness pieces at the ends of the side pieces are cast on them, but if preferred, properly shaped pieces of wrought-iron may be riveted thereto. Another mode of making the troughs or curbs of saddles in a simple yet effective manner, is to form the side pieces of two curved strips of sheet-iron, these are connected together by cast-iron transverse stay pieces, which in this modification are of a T shaped figure in transverse section. These stay pieces are made of malleable cast-iron, and each piece has two projecting pins formed at each end; these parts of the stay pieces are passed through corresponding holes in the side pieces and are riveted thereto. The cross pieces at the extremities of the trough or curb are formed in like manner, the strip of metal which forms the bottom of the trough is riveted to these cross pieces; and towards the extremities of the trough pass also through the longitudinal pieces of wood which form the saddle tree. This form of trough is by preference left without any filling in wood, two small pieces only of about half an inch in thickness being riveted to the side pieces, to serve for tacking the leather of the saddle thereto. These improved saddles are far more durable than those of the ordinary kind, and may be produced at a very moderate rate of cost.

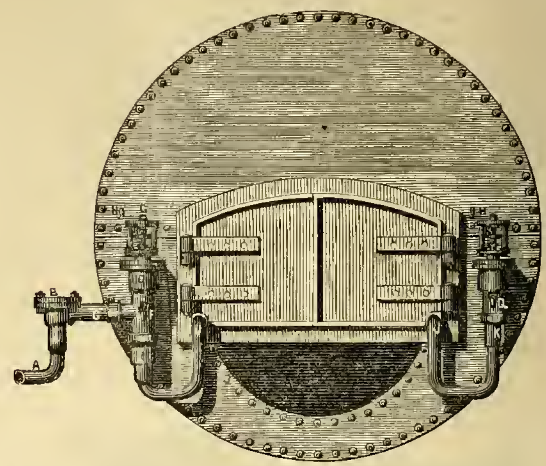
GENERATING STEAM.

Samuel Stephen Bateson, *Middlesex.—Patent dated March* 31, 1859.

In this invention, Mr. Bateson has introduced some important and effective improvements in the mode of heating, supplying, and regulating the feed-water for stationary and locomotive boilers.

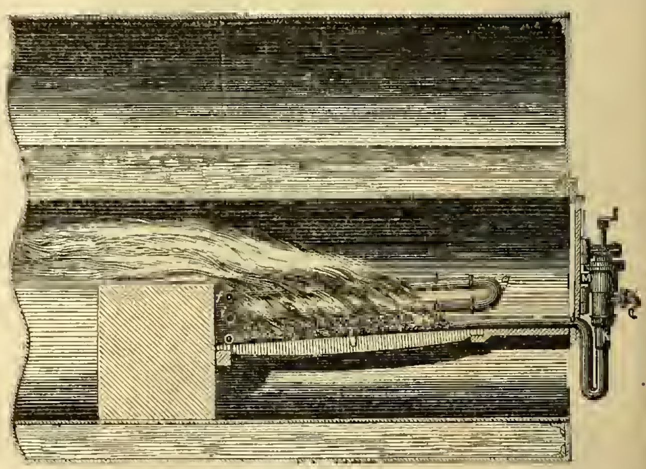
Fig. 1 of the engravings represents an end elevation of a cylindrical steam boiler and furnace of the ordinary kind, as arranged according to one modification of this invention; fig. 2 is a corresponding vertical longitudinal section of the same; fig. 3 is an enlarged perspective detail of the feed coil detached; fig. 4 is an enlarged sectional detail of

Fig. 1.



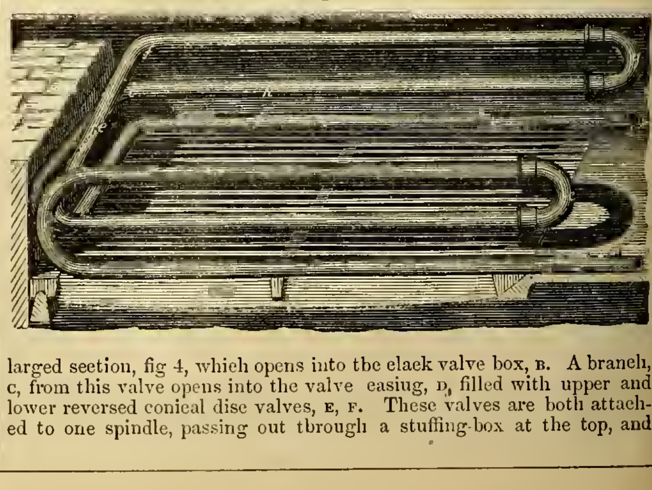
the valvular arrangements by which the feed water is admitted to the heating pipes; and fig. 5 is a similar view of the valvular details by

Fig. 2.



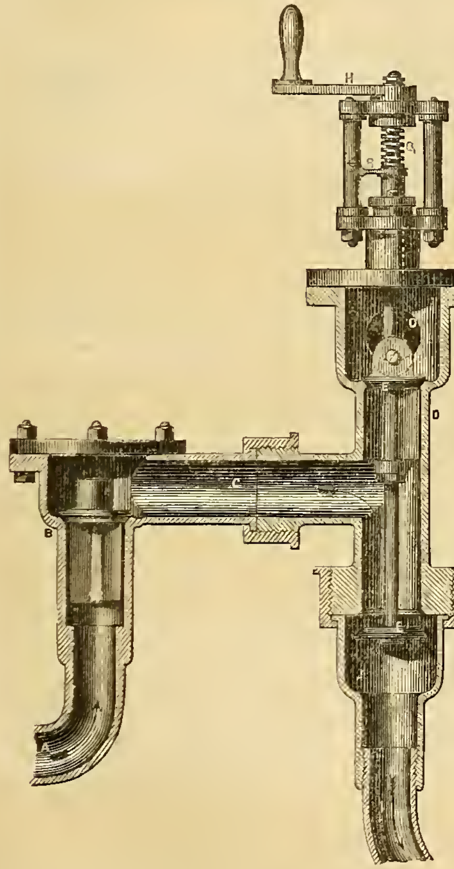
which the heated water, air, or steam, is admitted into the boiler. The feed pump, or other supplier, is connected to the pipe, A, seen in the enlarged section, fig 4, which opens into the clack valve box, B. A branch,

Fig. 3.



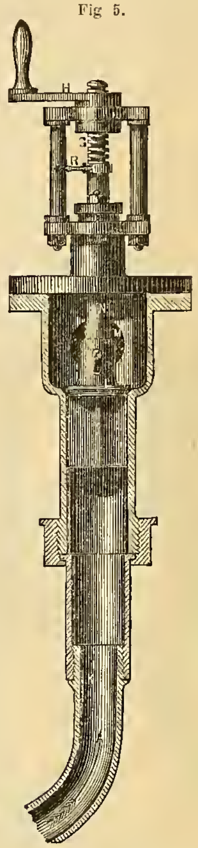
C, from this valve opens into the valve casing, D, filled with upper and lower reversed conical disc valves, E, F. These valves are both attached to one spindle, passing out through a stuffing-box at the top, and terminating in a screw, G. This screw is fitted with a nut attached to a winch handle, H. which nut works in the cross bar of a pair of guide pillars, so that on turning the handle the two valves may be simultaneously raised or lowered, as may be desired. When the valve spindle is screwed down, the upper valve, E, is closed upon its seat, whilst the lower one, F, is opened as here represented. In this condition of the parts, the feed water as it is pumped in takes the conrse indicated by the arrows. It passes by the lower valve, F, down the pipe, I, and thus enters the coil of pipe or tube, J, in the furnace. This arrangement of heating pipes or tnbes may be variously contrived. It may either be in the form of a series of arched zig-zags or serpentine coils, or it may be as shown in the detailed plan, fig. 3. In the latter case the feed water enters the pipes, J, at *a*, passing longitudinally along the furnace until it reaches *b*, where a bend is formed to bring it back again to the front. Another bend at *c* takes it back to the far end of the furnace again. There, there is a bend at *d*, leading the water into a short transverse length of tube, *e*, passing across the mouth of the furnace at or near the bridge. This portion is or may be made of a somewhat increased bore, for the purpose of holding more water at the part most likely to be subjected to the intensest heat. From this part a bend, *f*, continnes the tube into another longitudinal portion passing to the front of the furnace, where there is a bend, *g*, which is continued on into another longitndinal piece, *h*, passing back again to the bridge. This length

Fig. 4.



goes on to a bend at *i*, near the bridge, and then crosses and recrosses the furnace, finally emerges therefrom by the longitudinal tube, *j*. This terminates at K, in the bottom of the casing of the hot water admission valve, seen also in enlarged section, fig. 5, to the boiler. This valve casing has within it a single valve, L, opening upwards, to allow the heated water to enter the boiler by the branch pipe, M. This valve has attached to it a spindle, N, actuated by a screw in the manner hereinbefore described with reference to the valve arrangement for admitting the water to the fnrnace tubing, a slotted connection being employed to afford free play to the valve. With this arrangement the heated water supply to the boiler can be regulated with great nicety, either by adjusting the rate of the feed pnmp or the length of its stroke, or by so setting the valves as to admit the exact quantity necessary for the due working of the boiler. Provision is made for working a boiler fitted up in this way without circulating the water through the furnace tubes, by admitting the water directly from the upper part of the first valve casing, D, through the branch pipe, O, to the boiler. In that case the feed water would be pumped directly into the boiler, and the furnace tubes and connections may be nsed simply as a part of the boiler, or they may be put out of nse altogether. A small cock is fitted at P on this valve casing, to show that the water is really entering the valve; and a similar cock, Q, is fitted upon the other valve casing, for the nrpose of affording an external flow of heated water, as well to prove the actual transmission of the hot water, as to produce a current in the furnace tubes, at the times when these tubes are acting simply as a part of the boiler. Whatever water is discharged by this cock, Q, can be conducted back into the feed water, so as to economise whatever heat it may contain. There is provision made for indicating the position of the duplex valve in its casing, n. It consists of an index, R, carried by the screw spindle, G, and pointing out on one of the guide pillars the actual elevation of the valves. When quite up, the upper disc of the valves is opened to admit water direct to the boiler, whilst the lower disc is closed to stop the ingress of water to the furnace tubes. When screwed down, the npper disc is closed, and the lower one is opened for the circulation of the water in the furnace tnbes, as already described; whilst, when adjnsted mid-way, both discs are open. The same plan is or may be also adopted for the other valve admitting the hot water to the boiler. Stop-cocks or other valves may be adopted instead of this arrangement, but it is preferred to use the details herein shown. In locomotive engines, Mr. Bateson prefers to nse a separate water box or chamber, through which the water is forced into the furnace coil. This water box is disposed so as to be the earliest heated; and when steam is getting up, the pressure will insure water being forced from it through the coil in the furnace, and thus prevent any bnrning of the coil. This arrangement also answers for other boilers.

Fig 5.

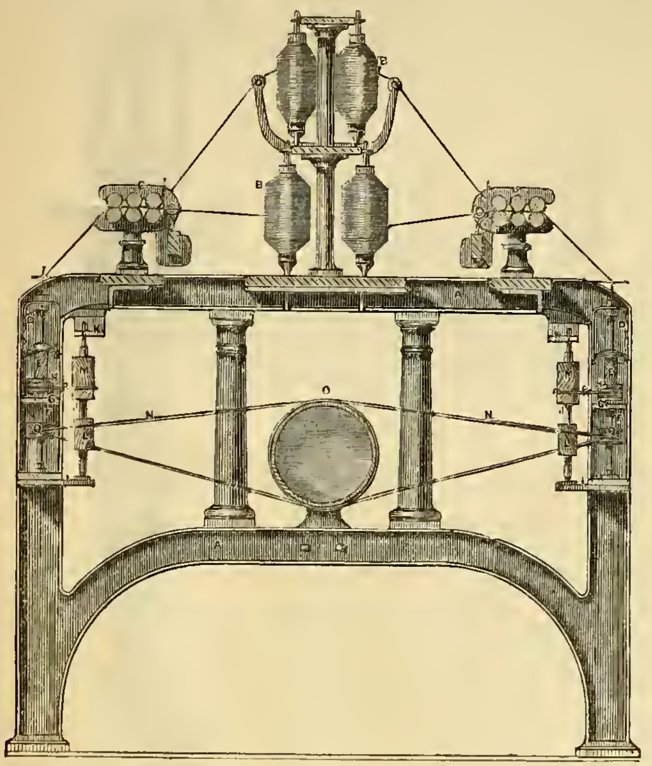


SPINNING FIBROUS MATERIALS.

WILLIAM STEVENSON, *Johnstone.—Patent dated April* 25, 1859.

THE improvements which Mr. Stevenson has specified nnder these letters patent relate to the arrangement of "throstle" spinning frames or machines, so that the present indirect drag upon the bobbins may be done away with, the winding on action being effected by a special movement for the pnrpose. Instead of allowing the bottom end or flange of the bobbin to rest upon the ordinary stationary frictional washer or cloth disc, as at present practised, the present invention comprehends the separate and distinct mechanical actuation or driving of a small pulley or disc, on which the bottom flange of the bobbin rests. The npper surface of this pulley is covered with cloth or other suitable material, and it is placed over or upon the spindle on the copping or bobbin rail, which rises and falls for the purpose of raising and lowering the bobbins.

The accompanying engraving is a partially sectional end elevation of a "throstle" spinning frame arranged according to one modification of these improvements. The framing, A, is of the ordinary kind, so also is the arrangement of the bobbins, B, on which are wound the rovings to be spun. These rovings are passed between the drawing rollers, C, and thence down to the flyers, D, by the agency of which the yarn is wonnd on to the bobbins, E, which rotate on the spindles, F, in the ordinary manner. The lower flanges or disc ends of the bobbins, E, instead of resting on discs of cloth fixed to the copping rail, G, are according to the improved system carried on the pnlleys, H, which pulleys run on the spindles, F, and are arranged between the copping rail and the bottoms of the bobbins, E. The object of interposing the pulley, H, between each bobbin and the rail, G, is to take the drag off the bottom, and so render the ordinary throstle frame capable of producing fine numbers, or in other words, much snperior qualities of yarn than has hitherto been spun with it. This is effected by imparting to the pulleys, H, a rapid rotatory movement, the speed of which shonld not, however, be so high as that imparted to the bobbin spindles, F; preference is given to a difference of speed of about twelve hundred revolutions per minute. That is to say, in spinning 40's, the pulleys, H, should revolve about 3,200 times per minute, whilst the spindles are rotated 4,400 revolutions. The pulleys, H, may be driven in various ways. In the example given the longitudinal rails, I, which support the bobbin



spindles, extend inwards so as to form a secondary supporting rail, on which are fitted the footstep bearings for the inner row of spindles, J. The upper extremities of these spindles pass through holes made in the longitudinal rails, K, which are pendent from the upper cross rails of the end standards, A. Each of the spindles, J, passes through the two small drums or cylinders of wood, L and M, which are fixed thereto. The endless bands, N, which pass round the central main driving drum or cylinder, O, are carried on each side of the smaller cylinders or pulleys, L, and so serving to give motion to the spindles, J, and thence are passed round the band pulleys or wharves, Q, on the lower part of the bobbins, F. A small endless band, P, is also passed round the cylinder or pulley, M, on each of the spindles, J; this band is carried round the pulley, H, of its contiguous bobbin spindle, and thus imparts its motion thereto. In this manner the spindles, J, revolve at a slower rate than the spindles, F, this reduced velocity being imparted to the pulleys, H; the motion greatly facilitates that of the bobbins, resulting in the production of very superior yarn. Under another modification, the spindles, J, are driven by means of separate endless bands, R, which are carried from the driving drum or cylinder, O, round the band pulleys or wharves, fitted on the spindles, J, and sufficiently high to run clear of the bobbin spindle driving bands, N. The patentee also describes another mode of driving the pulleys, H, on the bobbin spindles, in which modification eight or more pulleys are driven by means of one secondary spindle, J. The endless bands, N, which pass from the main driving cylinder, O, are carried round the wharves on the bobbin spindles, whilst the pulley or wharve on the spindle, J, is driven by a band from the cylinder, O. The pulley on the spindle, J, is double grooved, and in the upper groove is carried a band, which is then passed round the pulleys below the bobbins, E, being passed round the back and front of the first pair of pulleys, and then carried to the next pair of pulleys, and so throughout the series. In lieu of the foregoing modes of imparting motion to the pulleys below the bobbins, the same object may be effected by means of a series of vertical friction discs fitted on a longitudinal driving shaft, the friction discs being arranged to give motion to smaller horizontal discs fixed on the secondary spindles; or, in lieu of this arrangement, bevel wheels and pinions may be substituted for the discs. In some cases it may be preferred to drive the pulleys on the bobbin spindles, by means of frictional discs or wheels, fitted on the spindles themselves, and so giving motion to the vertical discs or wheels for driving the pulleys.

These modifications in spinning machinery are equally adapted for spinning hard twisted yarns, for by reversing the motion of the interposed pulleys, any amount of drag can be at once put on the bobbins by simply regulating the velocity of the retarding pulleys.

APPARATUS FOR TAKING SOUNDINGS.

J. H. Johnson, *London and Glasgow* (W. T. Trowbridge, *Washington*). —*Patent dated February* 28, 1859.

The apparatus arranged according to this invention is specially designed for taking deep sea soundings, but it is also applicable to the throwing of life lines over or across ships in distress. Both of these objects are so eminently useful in their practical results that it affords us much pleasure in bringing this improved sounding instrument under the notice of our readers. The subjoined engraving represents a vertical section of the sounding instrument. A, is a tube of tin or other metal, which contains the balls of line, B, placed one above the other; this tube may be about four inches in diameter, its length being such as to carry the requisite length of line. At its upper end there is a movable conical cap, C, which prevents the balls from escaping, having an aperture at the top through which the line, D, passes. The iron or leaden weight, E, has a hole through its entire length, and a shoulder, F, at the top, which enters a corresponding recess of a little larger diameter, made at the bottom of the case or line holder, A. Within this hole in the weight an iron bolt, G, is placed, having a suitable specimen box, N, at the lower end, and a ring at the upper end, to which the line leading from the outside of the cast ball in the tube is fastened a few feet up, the slack of the line being coiled around the shoulder, F, which is thus made to fit snug in the recess at the bottom of the line holder. When the instrument is used, the end of the line, D, leading from the inside of the upper ball is held at the deck of the vessel, while as the weight descends, the line passes out from each ball in succession, the outer end of every ball being secured to the inner end of the ball below it. The length of line contained in the case must be equal to, or greater than, the depth of the soundings, the surplus being given out as the line is hauled on deck. As the outer layer of the last ball is paid out, the line then unwinds from the shoulder, F, thereby liberating the plummet, E, and leaving it at the bottom, whilst the bolt, G, and its contained specimen box, N, are drawn up through the tube or case (which is thus left at the bottom) and brought to the surface. The endwise resistance to the line is thus entirely obviated, as it remains stationary at the very point in space in which the cylinder or case leaves it; the plummet is not retarded by the line, and it descends with a rapid and uniform velocity to the bottom; the paying out, and all the circumstances of motion being uniform, great depths present no additional obstacle to the descent of the plummet. Various forms of apparatus may be used in connection with this mode of conveying and discharging the line for the determination of the depth of the water. The instrument preferred for this purpose is known as "Saxton's Current Indicator." It consists of a pair of recording spiral vanes which have each a distinct vertical axis pendent from the frame of the instrument. Upon each axis there is an endless screw which is in gear with differential worm wheels, the number of their revolutions showing the distance passed through. Their wheels have their centres within a frame, and are so arranged as to be kept in gear by means of two rocking levers; when these levers are drawn upwards, the indicating wheels are thrown out of gear with the endless screws, so that as the instrument is drawn up the vanes revolve without moving their wheels. A string is so fastened to the case, A, and to the ends of the rocking levers, that the wheels are thrown out of gear, when, by the pull upon the main line, the register is drawn off from its socket

upon the top of the conical cap, C. Double vanes are used in order that one may afford a check to the other in case of derangement of the mechanism; they also, by revolving in opposite directions, prevent the instrument from acquiring a rotatory motion. The line may be coiled in balls as described, or in such other way as will secure its rapid discharge from the case. The line is of small size, and its strength need not be greater than will suffice to bring up the register and bolt, which together weigh about three pounds. The hemp line employed bears a direct strain of forty pounds, and a case four inches in diameter will contain about one mile of the line to each foot of its length. This instrument is used for various other purposes besides the measurement of depth, as herein described; viz., for conveying a line from the shore to a stranded vessel, the case containing it being attached to a rocket or other projectile, thus avoiding the resistance of the air to the motion of the line, which takes place when it is thrown by the modes heretofore used for the purpose.

MACHINERY FOR HACKLING FLAX.

Peter *and* James Reynolds, *Belfast.—Patent dated April* 19, 1859.

In directing their attention to the improvement of hackling machinery, the patentees have sought to produce a machine in which the hackle pins should be driven forward in a horizontal direction, so as to enter the fibrous materials at right angles thereto, and close under the holders. The machine which forms the subject matter of these letters patent, embodies these improvements, as well as other important advantages.

Fig. 1 is a longitudinal elevation or front view of a series of three hackle bars, looking upon the front part of the bars in which the pins or teeth are arranged. Fig. 2 is a corresponding elevation of a single bar, but looking upon the back of the bar; and fig. 3 is an edge view of

Fig. 1.

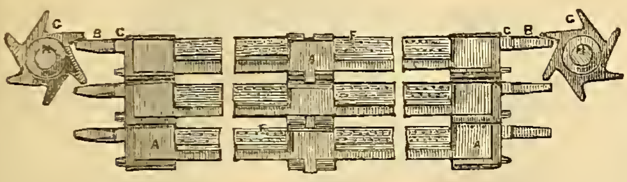


Fig. 2.

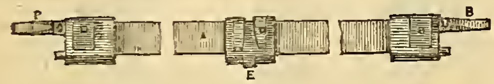
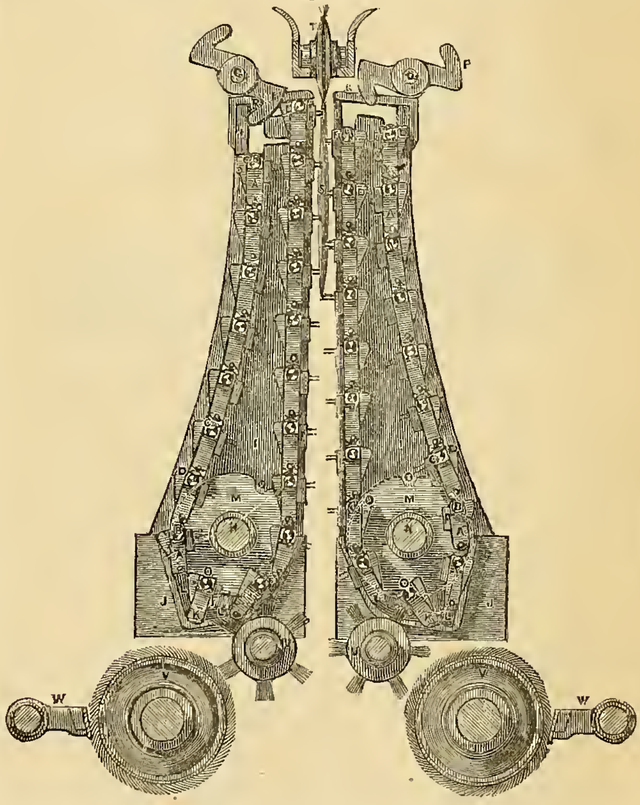


Fig. 3.

the same. Fig. 4 is a transverse vertical section of the main portion of a hackling machine, arranged in accordance with the patentees' improvements, showing the hackle bars placed in working position, and applied to a double sheet intersecting hackling machine. The hackle bars, A, are made either of iron, or of wood with iron ends. The extremities of each bar, A, is prolonged outwards, so as to form a laterally projecting pin, B; at each end of the bar, these pins are of a cylindrical figure, except at the part, C, which is immediately contiguous to the end of the bar, A, at this part the pins are square in transverse section. Just beyond the squared parts, C, a projecting piece or swell, D, is formed on the back of each bar, which projecting part is tapered off in an angular direction towards the lower part of the bar. The squared parts, C, of the hackle bars are so made in order to fit the grooves of the hackle bar guides, and there is a corresponding squared part, E, at the centre of the bar, which fits a central guide. At each side of the part, E, there is a projecting swell which tapers away towards the lower part of the bar, similar to the corresponding parts, D, near the ends. To the faces of the bars, A, are secured the hackle stocks, F, in which the hackle pins or teeth are arranged; the teeth are disposed in the usual manner, being placed gradually closer to each other towards the left hand, or *vice versa*. The hackle bars constructed in this manner are arranged in the machine one above the other, and they are caused to traverse in a downward direction by means of the wheels, G. These wheels are fitted upon transverse shafts, H, to which motion is communicated by means of gearing in any convenient manner; the teeth of these wheels are prolonged outwards in a tangential direction, forming as it were so many projecting fingers. Upon motion being communicated to the wheels, G, the teeth successively come into contact with the projecting pins, B, of the hackle bars, the pressure of the teeth causing the bars to descend in regular order. The hackle bars are guided so as to traverse the predetermined course or path by means of the vertical guides, I, two of which are shown in fig 4 of the subjoined engravings. These guides are formed of cast iron, and they may or may not form the standards of the hackling machine framing, they are made with grooves or openings to receive the squared parts of hackle bars. The hackle bars traverse down the vertical slots or openings of the contiguous guides, round a curved groove formed in the blocks, J, or lower part of the guides, and then upwards in the curved slots or openings at the outer parts of the guides. The hackle bars are caused to descend the vertical slots by the action of the wheels, G, and as they reach the lower part of the guides, an arrangement is provided by means of which the hackle teeth or pins are always turned in the direction of the fibrous material to be operated upon. At the lower parts of the extremities of each hackle bar is a laterally projecting pin, K; as the bars descend in succession and reach the blocks, J, the pins, K, take into the curved groove, L, which is formed in the face of each block. The hackle bars are carried round or caused to traverse the grooved path in the blocks by means of the wheels, M, which are fast to the parallel longitudinal shafts, N, these shafts are actuated by means of gearing that derives its motion from the main shaft. The peripheries of the wheels, M, are made with indentations, O, which, as the wheels rotate, catch on the projecting pins, K, of the hackle bars, and carry them round the grooves, L. Whilst the pins, K, of the hackle bars are traversing the grooves, the rotatory movement of the wheels, M, cause the bars to make a partial revolution round their respective pins. By this means as the pins traverse the grooves, L, the bars are brought back nearly to the vertical position, and then they fall back one below the other as they are carried upwards out of the grooves, the hackle pins or teeth being all the time presented towards the inner part of the machine where the fibrous materials are operated upon. The ascending series of hackle bars are raised by the rotatory movement of the wheels, M, as they cause the bars to come in succession one beneath the other. As each hackle bar rises to the upper part of the guide, it is struck and moved forwards with great rapidity by means of the tappets, P, which are fast to the horizontal shafts, Q, these shafts being actuated in any convenient manner from the moving parts of the machine. The upward traverse of the hackle bars is checked by the stops, R, and the rotatory action of the tappets, P, which come into contact with the projecting parts, D, instantly drives the hackle bar forward in a horizontal direction, which causes the teeth to

Fig. 4.



be driven in at right angles to the pendent strick of flax, S, which is held in the holder, T. The tappets, P, are arranged to act alternately upon the hackle bars, which are in this manner driven into the flax strictly at right angles thereto, and immediately below the jaws of the holders. As the hackle bars are caused to descend by the rotatory movement of the wheels, G, they operate in succession, and the strick is hackled upon both sides in the most effective manner. The tow is removed from the hackle teeth by the rotatory brushes, U, which are arranged at the lower part of the series of hackle bars, so as to strip off the tow as the bars are carried round in the grooves, L. The tow is removed from the rotatory brushes, U, by the doffers, V, which are arranged parallel thereto; as these doffers rotate, their surfaces are kept clear by the longitudinal knives or combs, W, which are fitted in immediate contiguity to the doffers, V. As the tow accumulates below the doffers, it is removed from time to time by the machine attendant. The patentees also describe and show in their drawings a mechanical arrangement for actuating the strick holders, by means of which a gradual lowering motion of the holders is obtained, combined with a rapid lifting action, when the fibrous materials have been sufficiently operated upon.

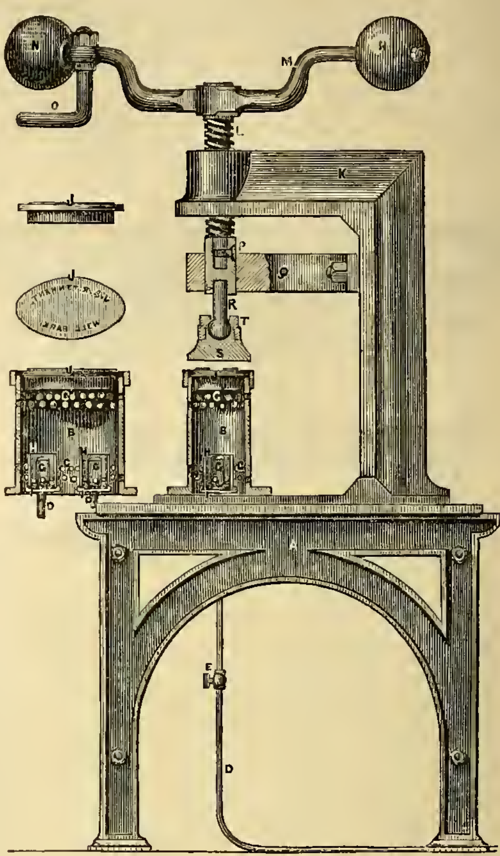
Another mode of arranging and actuating the hackle bars, consists of two parallel shafts, which have keyed to them a pair of spur wheels; these are in gear with each other, one arm of each of these wheels has a slot in it, in which is fitted a crank pin. To these crank pins are attached the lower extremities of two connecting rods, the upper ends of which are fast to two tubular slides, these slides work up and down in stationary vertical guides. The inwardly projecting parts of the slides are connected by horizontal arms to the hackle bars, the extremities of which are suitably guided in their vertical traverse. As the hackle bars are caused to descend by the rotatory motion of the spur wheels and the vertical action of the slides, they press back two blade springs, which are attached to the inner faces of the hackle bar guides; as the hackle bars reach the bottom of the guides, the springs project or force them back to the outer vertical grooves of the guides, the hackle pins being in this way kept directed towards the inner part of the machine. The slides now ascend carrying with them the hackle bars, and when they reach the upper part of the frame, the hackle bars come in contact with two springs, which are moved back upon the hackle bars, clearing the central part of the guides, the elasticity of the springs start the hackle bars forward in a horizontal direction. The sudden forward movement of the hackle bars causes the hackle pins to enter the strick of fibrous material at right angles to the pendent strick, and immediately below the jaws of the buffers or clips, which are arranged below the ordinary holder. The buffers or clips are attached to laterally projecting sliding pieces, which move to and fro in guides projecting out from the face of the hackle bar guides. The slides are made with a pendent projection on each, in which part is a pin, so that when the springs are moved back by the hackle bars, the springs come in contact with the pins, and thus open the jaws of the buffers or clips, so as to admit of the fibrous material being raised or lowered. The jaws of the buffers or clips are, however, tightly closed upon the fibrous material by the reaction of the springs, and before the hackle pins have reached the strick. By either of the foregoing modes of operation, flax or other fibrous materials may be hackled in a very superior and effective manner; and the mechanical arrangements, more or less modified, may be advantageously applied to machinery for effecting operations other than that of hackling in the preparation of fibrous materials.

BRANDING ARTICLES OF WOOD.

James Gillies, *Glasgow.—Patent dated April* 23, 1859.

The improvements specified under this specification relate to an expeditious, economical, and effective mode of branding, or indelibly marking the end or head pieces of barrels, or the barrels themselves, and other wooden surfaces, with names or marks such as are necessary in commercial transactions with barrels, boxes, and other receptacles of goods of various kinds.

Our illustrative engraving represents an elevation of one arrangement of the improved machinery or apparatus for branding or indelibly marking wood with letters, devices, or figures. Also, a vertical section of the gas apparatus, taken at right angles to the elevation, and a plan and elevation of the branding die. The apparatus consists of an open rectangular framing, A, of cast-iron, the top of which forms a table or platform, having bolted thereto the elliptical shaped casing or guard, B. This casing or guard, B, is by preference made of sheet-iron, it is open at the top, and it is perforated at the upper and lower parts with a series of holes, C, for the admission of air. This casing or guard forms the combustion chamber of a moderately powerful gas stove, the gas for which is conveyed through the two gas pipes, D, which are arranged parallel to each other, and are carried up through the table or platform of the framing, A. The flow of the gas through the pipes, D, is controlled by the stop-cocks, E, which are placed below the table, but within convenient reach of the operator; the part of the tubing above the stop-cocks, is either made of flexible materials, or is arranged upon the telescopic principle, so as to admit of the burners being adjusted as regards height. Or the tubing, D, may be lifted up to a certain extent from the ground, and the burners fixed to the desired height by means of the pincing screws, F. A mixture of carburetted hydrogen and atmospheric air is used as the heating medium, for the combination and combustion of which the burners on the extremities of the pipes, D, are especially designed. These burners consist of a copper or iron cylinder, G, which is screwed or attached to the pipe, D; the cylinder is closed at the upper part, but a series of fine holes are made at the lower part of the cylinder, through which the gas flows into the outer cylinder, H. This cylinder is open at the top and bottom; it is made of perforated sheet metal, and fits into the supporting plate, I; the atmospheric air which flows in through the apertures of the cylinder mixes with the ascending current of gas, and the compound burns at the top of the outer cylinder with a blue flame of intense heating power. The combustion of the gases serves to draw in a continuous current of atmospheric air through the lower series of holes, C, the heated products of combustion passing off by the upper series of holes. The combustion chamber, B, is made to receive the branding die plate, J, which in this instance is an iron plate of an elliptical figure, having the name or other device in sharp relief on the surface of the plate. The branding die plate, J, when placed in position, rests upon the upper edge of the chamber, an external fillet serving to confine it thereto. The flange formed on the under side of the plate projects downwards into the chamber, B, the flames of the gas burners being immediately beneath



this enclosed part, the die plate is thereby sufficiently heated to cause an impression of the letters to be burnt in a stave or other article of wood when placed thereon. This branding operation is facilitated by applying pressure to the back part of the stave, so as to cause the raised letters or device on the die plate to be forcibly indented therein. The base plate to which the combustion chamber is bolted has cast on it the overhanging standard, K, the outer extremity of which has an internal screw formed in it. A vertical quick acting screw, L, is fitted to the arm of the standard, K, the axis of this screw is in a line with the centre of the branding die plate, J, when placed on the combustion chamber, B. The upper extremity of the screw, L, is squared to receive the cross head, M, the extremities of which are fitted with the weights, N, in manner similar to the arrangement of an embossing press. The operator actuates the screw, L, by means of the handle, O, which is secured by a nut to the cross head, M; the lower end of the screw is turned to form a pin which enters a corresponding recess in the guide block, P. To admit of the pin of the screw, L, turning freely in the guide block, P, and at the same time cause the block to move with it, a groove is made in the periphery of the pin, and a screw is fitted to an internal screw made through the side of the guide block. The end of the transverse screw enters the groove in the pin of the screw, L, and thus connects the two parts together without interfering with the rotatory movement of the screw. The guide block, P, slides up and down in the guide, Q, which is bolted to the standard, K, and projects outwards therefrom in a horizontal direction, extending below the arm of the standard and parallel thereto. A recess is made in the lower part of the guide block, P, to receive the upper end of the pin, R, which is secured to the guide block by a screw passing in a lateral direction through the block. The lower part of the pin, R, is made of a globular figure, to fit a corresponding concave recess in the upper part of the pressing block, S, the two opposing surfaces forming a modification of the ball and socket joint. The pressing block has an external screw thread cut in the periphery of the upper part, to admit of its being connected by means of the nut, T, to the pin, R. The stave or other article to be branded is laid upon the die plate, J, the operator then swings round the cross head, M, by means of the handle, O, so as to cause the pressing plate to come down sharply upon the back of the wood, and forcibly press it on to the raised letters or device on the die plate. The heat imparted to the die plate by the burning gases causes the raised parts of the plate to burn the fibres of the wood, and so mark the stave or other article with incised letters or devices that are as sharp as type letters, and indelible, otherwise than by actually cutting away the surrounding wood. The object of fitting the pressing block, S, with a ball and socket connection to the pin, R, is to allow of the movement of the block either at the ends or sides, so that it may adjust itself to any inequalities of thickness in the stave or other article to be branded. With this arrangement of machinery or apparatus for branding staves or other articles of wood, the operation of marking may be carried on with great rapidity, combined with economy of labour and fuel.

LAW REPORTS OF PATENT CASES.

Dramatic Copyright: Hatton v. Kean.—This was a demurrer in the Court of Common Pleas sitting in banco—before Lord Chief-Justice Erle and Justices Williams, Crowder, and Byles—to an action for an infringement of the plaintiff's copyright in some music composed by him as an accompaniment to the dramatic representation of the play of *Much Ado about Nothing*, by using the music without plaintiff's permission. The plaintiff is the well-known and highly talented composer, and the defendant is the equally well-known and talented actor. The question raised was in effect whether this was a musical composition within the meaning of the Copyright Acts. The plea alleged that the defendant employed the plaintiff to compose the music, and that he, and not the author, was the composer of the music.

Mr. R. E. Turner, for the plaintiff, submitted that the meaning of a "composer," or "author," under the Copyright Acts was the man in whose mind the thoughts arose, or from whose mind the thoughts flowed, which were embodied in the composition, and that the defendant, who did not compose a note of the music, could not be the composer of it, because he had employed the plaintiff, who did compose it, and that the copyright had not passed out of the plaintiff, and could not, without assignment in writing.

Mr. Huddleston, for the defendant, submitted that the plea was a good answer to the action. The design of the dramatic piece was the defendant's, and he employed the plaintiff on the distinct understanding that what he did was to be part of the defendant's dramatic piece, and that he was to have the sole right of using it. The plaintiff was employed just like a scene painter, or dancer, to carry out a design which flowed from the defendant.

The Lord Chief-Justice said he was of opinion that there must be judgment for the defendant, and he founded that judgment entirely upon the facts as stated in the plea, and admitted by the demurrer. He had learned during the argument that no decision had yet been given applicable to the facts appearing on this record. The plaintiff alleged that he was the author of a musical composition, having the sole right to the representation thereof; but it appeared to him that Mr. Kean was the author and designer of the entire dramatic composition, and that with respect to a part of that entirety and accessory to the plan which he had formed—a small part considering the quantity of capital and skill that was embarked in the composition of the entirety—he employed the plaintiff, on the terms that the production of the plaintiff under Mr. Kean should be part of the composition—that Mr. Kean should have the sole right over that dramatic composition, together with the music which the plaintiff had so composed. To his mind the music seemed to have been composed under the direction and superintendence of Mr. Kean, and that the music so composed as between him and the plaintiff became the property of Mr. Kean by the contract. He could not but perceive, if the plaintiff was right in his contention, that there might be immense preparations made for producing a particular representation, and then any party connected with its production might withdraw his particular accessory to it, and thus render impossible the representation for which so much had been expended.

Judgment for the defendant.

Thrashing Machines: Goucher v. Midworth.—This was a motion in the Vice-Chancellor's Court, before Sir. W. Page Wood, for an injunction to restrain the defendant from manufacturing and selling thrashing machines having grooves or channels formed in the surface of the beaters, in imitation of the plaintiff's patented thrashing machine, and generally from infringing his patent, dated November 25th, 1848. The case set up by the defendant was that there was no novelty in the plaintiff's patented invention, which was in effect a mere colourable imitation of an older patent taken out by John Dry, of Beverley, on 2d August, 1842, now expired, and of which there were several modifications in constant use. The defendant also denied any infringement of the plaintiff's patent in the machines sold by him, and contended that upon his evidence the enjoyment by the plaintiff had not been so uninterrupted as to entitle him to an injunction before bringing his action, although his right to an account was not denied.

The plaintiff's patent is for "A machine for thrashing corn and other grain," and the specification states that the object of the invention is to prevent the crushing and breaking of the straw and grain, for which purpose the inventor proposed to construct a thrashing machine with grooves or channels in the surface of the beaters, by which the corn is beaten out, such grooves or channels being of suitable dimensions to allow of the corn and straw lodging therein, and passing through without being injured by the action of the surfaces between, and by which the corn is beaten out and separated from the chaff. These grooved beaters, the specification goes on to say, may be made either by having a grooved plate of iron securely fixed to the face of the longitudinal beater bars (as shown in figs. 1 and 2), or by winding iron wire about the bar, in the manner represented in fig. 3, or by passing the wire over the surface only backwards and forwards, in place of winding it round the bar. The grooving or channelling of the beaters forms, in fact, the essential feature of the plaintiff's invention.

Fig. 1.

Fig. 2.

The infringement complained of was a grooved beater, constructed under a patent granted to John Coulson, of the firm of J. & W. Midworth, of Newark, for "Improvements in thrashing and dressing machines," and dated November 30th, 1858. Fig. 4 represents the face

Fig 3.

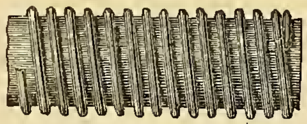
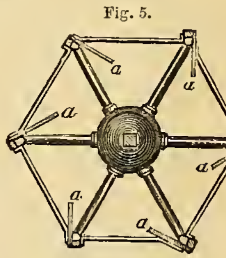


Fig. 4.

or surface of the beater complained of, which is described in the specification as being of a half octagon form in transverse section, three of the sides being furnished with oblique ridges or projections placed alternately in opposite directions, as shown in our accompanying illustration.

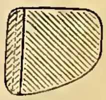
The specification of the prior patent of John Dry for "certain improvements in thrashing machines," which was relied on by the defendant as a proof of prior publication of the plaintiff's invention, and of which the defendant alleged that the plaintiff's invention was a mere colourable imitation, describes the beaters as consisting of "rows of teeth" shaped similarly to other "rows of teeth of a triangular form" fitted into a stationary semi-cylinder, within which the beater frame revolves. The revolving beater frame is shown in end elevation at fig. 5, wherein *a a* represent the beaters. These beaters, one of which is shown detached in fig. 6, consists of metal plates cut into a zig-zag shape, so as to form rows of teeth, which teeth are made to take into and pass through the interstices between the rows of triangular-shaped teeth, of the stationary semi-cylinder above referred to, the corn falling between the teeth, *a*, of the revolving frame and those of the stationary semi-cylinder.

Fig. 5.



It was contended by the defendant that the peculiar form of zig-zag beater or "rows of teeth," as described by Dry, was virtually the same as the grooved or channelled beater patented by the plaintiff, and, therefore, that there was a want of novelty in the plaintiff's invention.

Fig. 6.



The Vice-Chancellor—after observing that even where there might be considerable doubt as to the validity of the patent, still where there had been long and undisputed enjoyment the court would grant an injunction, though upon terms to be imposed upon the plaintiff—said that the statement of the defendant as to the want of novelty in the plaintiff's invention, which had been patented as long ago as 1848, was entirely unsupported. If ever there was a case of clear and undisputed possession and enjoyment it was this. Until the matter had been actually tried at law he could not, of course, say that there might not be a case to be tried. Then as to Dry's patent, looking at the specification, anything more unlike it than the plaintiff's patent could not be suggested. At present he was very far from feeling that it was a case of strong doubt, as had been suggested by the defendant, and the injunction must be granted, the plaintiff undertaking to bring an action and abide by any order as to damages.

Spinning Machinery: Potter *v.* Parr.—In this case—in the Court of Queen's Bench, before Lord Chief-Justice Cockburn, and Justices Wightman, Hill, and Blackburn—Mr. Atherton, Q.C. (with whom was Mr. J. A. Russell), moved for a rule to set aside the verdict found for the plaintiff and enter it for the defendant, and also for a new trial, upon the ground that the verdict was against the evidence. The action was for the infringement of the plaintiff's patent for improvements in spinning machinery.

The Court granted a rule to show cause.

Copyright in Prints: Gambart *v.* Sumner.—In this case—in the Court of Exchequer, before the Lord Chief Baron, Mr. Baron Bramwell Mr. Baron Watson, and Mr. Baron Channell—Mr. Lush, Q.C., moved to set aside the verdict found for the plaintiff for nominal damages, and to enter it for the defendant, pursuant to leave reserved by the Lord Chief Baron at the trial of the case in London.

The action was brought against the defendant, a stationer, for selling some prints of which the plaintiff was possessed of the copyright, and the question was whether a person who sold a print, and being totally unacquainted with the fact that it was a piracy, was liable to an action for penalties under the 8th George II., cap. 13, and 17th George III., cap. 57.

The Court was of opinion that the construction of the statute was against the motion, as it gave a right of action without proving any knowledge that the persons selling the prints knew they were a piracy, and refused the rule.—Rule refused accordingly.

Trade Marks: Association for Suppressing the Practice of Selling Goods Falsely Labelled.—Although not really subject matter for a law report, the movement now being made for the suppression of false dealing as regards the use of spurious trade marks, deserves a place usually accorded only to legal decisions. It is so intimately connected with the law of monopolies, that we think it has a fair claim to this position.

The formation of an association for preventing dishonest and needy struggling parties from copying and using the trade labels of first-rate established firms, was begun last month by a meeting of leading merchants, of the class relying a good deal upon these trade marks, at the Guildhall Coffee House, London, Mr. John Dillon in the chair. The business was opened by the secretary, Mr. Minckin, of Manchester, reading the following resolutions:—

That in the opinion of this meeting the practice of making up goods with marks or labels denoting a greater quantity than they really contain, is a serious evil, and it is incumbent upon all manufacturers and traders to discountenance the practice by every means in their power.

That an association be formed for the purpose of putting a stop to the practice alluded to; and that the following gentlemen, with power to add to their number, be appointed a committee to prepare rules and regulations for the guidance of the association, and fix upon the amount of the annual subscription, and submit the same for approval at an adjournment of this meeting, to be held at , on the day of next.

That, inasmuch as the institution is, as far as possible, to correct the evil complained of by moral means and influence, and only to resort to legal proceedings when all other means have failed, it be an instruction for the committee to make provision in the rules, that in no case shall an attempt be made to enforce the law against any individual dealer without the sanction of the executive body, obtained at a meeting specially called for the purpose.

Mr. Brook, of Manchester, proceeded in an elaborate speech to state the object for which the meeting was called. They lived in days of reform, and nowhere was it more required than in trade transactions, and he called upon all honest English tradesmen to band together and put down the great evil of "false labels." It was a great fact that the honest tradesman did not succeed, but those who pursued these dishonest practices did succeed. The speaker then entered into a lengthened explanation of the mischief that arose from the present system. He then moved the first resolution.

Mr. Thomas Coats, of Paisley, seconded the resolution, which was agreed to.

Mr. Willis moved, and Mr. Pawson seconded, the second resolution.

Mr. Matthew Clark, of Glasgow, stated that in his experience the system of false labels was a growing evil.

Mr. Symonds, of the firm of Symonds & Son, wine merchants, suggested that the first resolution should extend to false labels generally, which was agreed to.

Mr Clark moved the third resolution, but after some discussion it was withdrawn, and the following committee appointed to carry out the object of the association:—Mr. Matthew Clark, Glasgow; Mr. Thomas Coats, Paisley; Mr. Charles Brook, jun., Meltham Mills; Mr. John Clark, Paisley; Mr. John Dillon, London; Mr. Willis, Bedfordshire; Mr. Brown, Mr. Foster, London; Mr. Gibbs, Birmingham; Mr. John Howett (Ellis & Everington); Mr. Leslie, Mr. Johnson (Cook, Son, & Co.); Mr. J. F. Pawson, Mr. Stamper (G. Brittle & Co.); Mr. John Symonds, Mr. Pittman, Mr. Williams (Hitchcock & Co.); Mr. Hunt (Brook & Co.) Sub-Committee—Messrs. Dillon, Foster, Pawson, Brook, Clark, Willis, Coats, and Brown.

A vote of thanks to the chairman terminated the present proceedings, and the meeting adjourned.

We hope that something will now be done in earnest for the stoppage of the disgraceful practices which the law has recently disclosed.

Whilst on this important subject, we may direct attention to a paper on the general subject, read at the recent Social Science Congress at Birmingham, by Mr. Arthur Ryland. After describing the evil of counterfeit trade marks, and the difficulty of redress in some foreign countries, and after referring to the steps taken by some of the Chambers of Commerce, Mr. Ryland spoke to the importance of their agreeing upon a united course of action for checking the evil in order to be successful. Instead of one Chamber seeking simply a convention with France, another a registry, and a third calling for a law to make it an indictable offence, they should all agree upon one end to be sought and the means for attaining it. He recommended them first to determine whether any and what amendments are required in our own law, and then to obtain conventions with those foreign nations to whose courts recourse is desired to prevent or punish the piracy of English marks, names, or labels. Mr. Ryland stated the law on the subject prevailing in Prussia, France, Russia, Belgium, and the United States of America, in reference to their own subjects and to foreigners, showing that in all those nations not only was there a civil remedy for the party aggrieved, but the offender was liable to fine and imprisonment. He shortly noticed the remedies in England dependent entirely on the common law, there being no statute on the subject; and observed that the generally received opinion was that it was not an indictable offence, but he doubted whether this was so, it appearing to come within the principles of the common law as a cheat. Sir Richard Bethell regarded it as not indictable, and advocated its being made so, as appeared from his address to the Society of Arts in March last, from which Mr. Ryland read an extract. He then proceeded to observe, Would it not be better to set this doubt at rest, by defining the offence and affixing an appropriate punishment; and in the same act to establish a registry similar to those in the continental nations? But he expressed his disapproval of a bill prepared some years ago as unnecessarily complicated. This course might facilitate the obtaining conventions with foreign nations on the subject, as they require a reciprocity of laws as a condition precedent to a convention. Moreover, by placing the offence side by side with forgery, theft, and swindling, it might be regarded no longer as a smartness or justifiable trick of trade, but in its true character of a low and despicable vice. Mr. Daniel, Q.C., observed on the case of "Farina *v.* Silverlock," quoted by Mr. Ryland, as showing that our courts not only interfered when a name had been improperly used but to prevent its improper use, by prohibiting printers to make labels bearing the name of a maker for any other person. He said that Mr. Leoni Levi was wrong in stating in his paper—which produced Sir R. Bethell's observations—that it was not indictable. It had been settled that the piracy of a name for fraudulently selling goods was indictable at common law as a cheat. A Mr. Smith had been indicted for forgery in using a Borthwick's name on his labels; it was decided on appeal that it would not be a forgery, but the judges intimated their opinion that it was a cheat at common law; he was indicted accordingly, and pleaded guilty. The French authorities would require a written law, and would not recognise the decisions of our courts as evidence of our law; he therefore thought the suggestion of an Act of Parliament preparatory to a convention necessary. Mr. Bartleet, of Redditch, said he had suffered very greatly as a needle manufacturer from the piracy of his name in foreign markets. In some countries the needle makers sold from a card bearing not only samples of needles, but also the names of English manufacturers, and, in taking orders, asked which of the names they should use in the labels. He produced a pattern-card of a German engraver, which had round his own name *facsimile* copies of English manufacturers' labels. Mr. Bartleet strongly urged the importance of pressing the subject on the attention of Parliament and the Government. Mr. Thomas Webster, barrister-at-law, recommended that there should be a copyright in names, and that an act to grant this would be more serviceable than making it an indictable offence. Mr. Jackson, the Master Cutler of Sheffield, said the Sheffield Chamber of Commerce had applied to Lord Derby's Government, and Sir Fitzroy Kelly was engaged in preparing a bill to enter into conventions with foreign nations when his ministry went out of office. The Chamber then applied to the present Government, and it had promised its aid. What was wanted was access to foreign courts, and he urged that as the right course to take. In Prussia the rule with the manufacturers was to put on English names, the exception was to put on the makers' own names, and the worst of it was that the inferior goods followed the rule and the best goods the exception. He mentioned the registry of marks in Sheffield, for that town and six miles round, and the jurisdiction of magistrates in offences. The Right Hon. Joseph Napier, who presided in the absence of Vice-Chancellor Wood, observed that he thought the present a convenient time for action, as the late and the present Attorney-General seemed to approve of such a course. He thought the common law rather trusty. There ought not to be any doubt as to the offence being indictable. He thought the law might declare it to be a misdemeanour, and that the consolidation of the criminal law should include the offence. He observed on the importance of maintaining in all strictness the good faith of the English merchant, and he should bring the subject of the paper before Sir Richard Bethell.

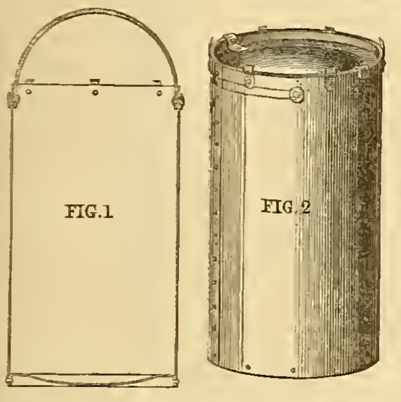
It is very plain that a widely-spread feeling on the subject is abroad, and we hope that it will bear fruit in due season.

REGISTERED DESIGNS.

IRON KEG OR CASK FOR PACKING PAINT OR OTHER MERCHANDISE.

Registered for Mr. Charles Wall, *Newton Street, Birmingham.*

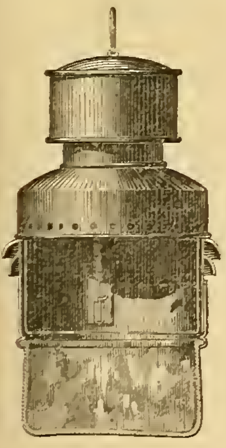
Our engravings represent this design in external elevation and vertical longitudinal section. In the section, fig. 1, the handle, A, is shown as extended upwards for use when the keg is applied to the purposes of a pail. In the elevation, fig. 2, the double dotted lines, A, represent the position of the handle or "bale" when the vessel or keg is being used as a packing case. This handle, the arrangement of which forms one of the leading features of the design, falls down inside the keg during transit, so as to be completely out of the way. Both ends of the keg are convex, so as to secure great strength and increased capacity. The arrangement is a very convenient one, for when the legitimate office of the keg has been served, no alteration is necessary to turn it into a bucket, pail, or other carrying vessel.



IMPROVED ROOF LAMP.

Registered for Mr. H. A. Holden, *Bingley Works, Broad Street, Birmingham.*

The subjoined engraving represents a vertical section (partly in elevation) of the improved lamp. To one half of the lower edge of the bottom of the body, A, of the lamp is fixed a semi-circular hollow beading, B, which may either be made separately, and fixed to the body, or be made in one piece with the said body. To the opposite side of the lamp body to that at which the beading, B, is affixed, is attached a semi-circular plate, C, turning on the lamp case at D. The lower edge of the said plate, C, has a beading, E, corresponding in shape to, and in the same plane as, the beading, B. In order to fix the lamp-glass, F, to the body of the lamp, the rim, G, on the edge of the said glass is slid into the hollow beading, B. The semi-circular plate, C, is now closed upon the said glass, F, and its hollow beading, E, made to engage upon the rim, G, on the said glass. The plate, C, is firmly fixed to the body of the lamp by a pin, H, being passed through the staple or loop, I, in the said plate, the said staple, I, when the plate, C, is closed, passing through the slot, K, in the body of the lamp. By fixing the lamp glasses according to this design, the glasses may be readily removed for cleaning, or replaced in case of fracture. This is a great improvement on the lamps of the ordinary arrangement.



REVIEWS OF NEW BOOKS.

A Manual of Naval Tactics: together with a Brief Critical Analysis of the Principal Modern Naval Battles. By James H. Ward, Commander, U.S.N. 8vo. Pp. 137. Wood Engravings. New York and London: D. Appleton and Co. 1859.

This book, which is dedicated to the Honourable Secretary of the Navy, Governor Toucey, has been written as an "endeavour to awaken attention to a most important, yet most neglected, branch of the naval profession." We presume that this opinion upon the state of naval tactics, refers more particularly to their condition in the author's own country; but as there may be some reason for it in our own, and as a reason or no reason on this point, our own naval commanders may probably learn something from the carefully considered views of a commander in the United States Navy—we give the volume a place in our reviewing columns. We may perhaps do this the more safely for the reason that we doubt if the technical literature of our country contains anything like a corresponding volume. This book is divided into four sections, which, with an introduction, embody—The order of battle; the orders of sailing; the order of retreat; the order of convoy; manœuvring fleets; engagements under sail; fighting fleets at anchor; and tactics under steam.

Commander Ward starts on the basis of an opinion that Paul Hoste is the standard author, whose system, as the basis of all established signal books, is most worthy of study. But Hoste is often difficult, and rather repulses the naval student, in the absence of assistant elementary aid. It is this elementary aid which the author now lays before us, the mass of it being drawn from Hoste, Clerk, Admiral Ekins, and from various histories; the digest having been compiled and put into instructive form whilst the author was in command of a corvette on the coast of Africa.

In the section of manœuvring fleets, the author does not lose sight of the change already partially felt, and to be apprehended, from the increasing use of steam in naval warfare. On this he says:—

"Some modification of practice is growing out of experience with fleets propelled by auxiliary steam power. But this modification must relate principally to the order of battle, for steam fleets will reserve their fuel, and, cruising under canvas, adhere to the orders of sailing. And even if fleets ever become composed wholly of steamers, as with us under an anti-colonial policy they may not soon, derangement of machinery, or want of fuel, will in many, perhaps most instances, give to such fleets practically a mixed character—that is, render some dependent on sails alone, and therefore cause the whole to adhere to the sailing order of battle. Hence, it is not proper or safe to drop the study of sailing tactics, either in reference to the orders of sailing or of battle, and to regard them as obsolete. The day on which they can be so considered with propriety, may still be distant.

"Yet it is not at all unlikely that the ultimate policy in composing fleets, will aim to assign to them, as component parts, a basis of heavily-armed 'screws' with steam power sufficient to control position, but with no reference beyond that to speed; and a flying division, with great speed and peculiar battery, say like the new gunboats under construction—bearing in mind that every ton of displacement used for steam power, diminishes by so much the capacity to sustain an armament, and that fighting power, not fleetness, is the main element sought. Such a composition of the fleet, corresponding with the various 'corps' for heavy work, and for rapid movement, which characterize an army, with the same purpose which such an army organization has in view, would alter, and will alter, the whole style of naval warfare; and to handle this combination with skill and success on the water, will admit of no diminution of the genius or the cultivation, which rendered the ancient system successful in the hands of the Hoods, Nelsons, McDonoughs and Perrys, of anterior wars.

"But whatever is to be the constitution of the future fleet, it must not be forgotten that, from the days of ancient Rome to those of modern England, from Actium to Lepanto and Trafalgar, the empire of the world has depended upon and followed, and has been lost and won with, the empire of the seas; and that this empire always has been, and always will be, contested with large fleets, little influenced by the guerilla fighting of single ships. Comprehensive minds, therefore, in devising naval construction, will look to such a combination of ships as shall produce the most effective fleet in this great contest for dominion which must one day come off—none can tell how soon. Not that fleets should be held in preparation, or even constructed, for so indefinite an event; for it is idle, as it is unreasonable, to look in a continental nation as the United States, for the living perpetual interest and favour with which an insular people, like those of Great Britain, cherish their wooden-walled defences, and patiently endure the burdens they entail. But such a degree of experimental construction as will determine the best types, is judicious; because with men, money, and material at command, it renders the problem of sudden and indefinite increase in the number of ships, of easy and safe solution in the event of war. And however politic or fashionable it just now is to laud the actual construction in France as evidence of her comparative naval strength, it is in reality *resources* for building, equipping, and manning ships, in which England vastly excels, that gives to her, or to any nation possessing them in the greatest degree, a true and actual maritime ascendency."

In continuing his subject, the author successively reviews the manœuvring policy of our great naval heroes Howe, Duncan, Nelson, Graves, Jervis, Collinwood, and others; as well as the plans of Graves, Perry, M'Donough, and other great men of the United States Navy. This is perhaps the pith of this volume, and we must expressly direct the attention of the naval students to it.

The volume, however, as a whole, will fill an important gap in the shelves which bear our literature of the ocean, and we shall be glad to see it studied in the way, and to the extent which such an instructive volume deserves.

The Architect's and Mechanic's Journal. Folio. Part I., Vol. I. Wood Engravings. Monthly. Pp. 26. New York: Harthill. 1859.

America is fruitful in scientific works, and late years have seen the literature of mechanical engineering, in particular, make very rapid strides there. According to our views of these matters, the bulk of American productions of this class belong to what we may call the rampant spasmodic school, and the opinions upon new discoveries and inventions are not always spoken by the card. The *Architect's and Mechanic's Journal*, of which the first part is before us, carries with it an air of greater honesty of purpose and mildness of expression than many of its predecessors, and we ought therefore to welcome it as a becoming addition to the serial literature of the great country which it represents. Architecture—as in the title page,—holds the first place in the matter of this first part, and the writer asks, "What is an architect?" and in giving his own reply to the query, he reads a severe lesson to the profession, by drawing a comparison between the really sound and talented man, who must be fairly paid for fair and honourable work; and the adventurer, who, upon the plea of cheapness, spares no pains to undermine his legitimate superior, and in doing so, leads his employer into annoyance and ruinous expense. Probably if the author of the paper were on this side of the Atlantic for a while, he would discover that the same thing occurs in other professions besides that of the architect. An article upon the "preservation of ideas," follows upon that to which we have referred, and argues, very properly, upon the necessity of the better treasuring up of the best of the great mass of suggestions which are being continually thrown up on the surface of professional life,—too many of those which might lead to grand ends being neglected and thrown by without bearing any substantial fruit. "The relation of the press to mechanical improvements," is a well intended dissertation upon the very subject with which we commenced the present observations, taking to task the vicious system of recklessly praising all novelties, the more startling the better, as real improvements, and, in general, adopting no strict rule of endeavouring to sift the good from the bad.

A chapter on "Building operations in New York," tells us of the wonderful number of magnificent structures now rising in all quarters of the great American city, most of them of white marble, and a similar one on "Foundry operations in New York," lets us into the secret that mechanical engineering is there, as the Americans would say, really going well a-head.

The woodcut illustrations are:—Mr. Robert Stephenson's last great work, the Victoria Tubular Bridge, across the St. Lawrence,—a Design for a Church Front,—the New Gallery of Art at Washington,—Public Drinking Fountain at Fribourg, Germany,—Mr. Ricketts' Locomotive Steam Carriage for common roads, copied from a recent part of our *Journal;* and American House, Boston, a new example of one of the enormous hotels for which our transatlantic friends are so celebrated.

As a whole, these engravings are much inferior to the work of this country. The part is, however, neatly got up, and promises well.

On the Comparative Value of Certain Salts for rendering Fabrics Non-Inflammable.—By Fred. Versmann, F.C.S., and Alphons Oppenheim, A.C.S. 8vo. Pp. 30. London: Trubner & Co. 1859.

The rendering woven fabrics, particularly ladies' light dresses and the curtains and fittings of houses, uninflammable, has been a lasting subject for investigation by practical chemists—and not without reason, for every winter reminds us by its list of fatalities how necessary it is that ladies and children should not have it in their power to ignite their clothing and burn themselves. Just as when we carry gunpowder we ought not to bring fire into contiguity with it, so with light gauzy dresses, the wearers ought not to approach fires and gas lights too nearly. But, as we cannot persuade people to use even ordinary caution in this matter, we must turn to the next best remedy, and nullify the action of fire upon dress and decorative fabrics, if we can.

The subject is now practically revived by Messrs. Versmann and Oppenheim, who, when her Majesty desired Professor Graham, the Master of the Mint, to report to her upon the matter, took charge of the scientific investigations necessary for a satisfactory development of the point aimed at. The pamphlet before us gives us a lucid detail of the experiments entered upon for this purpose. The earliest known contrivance for rendering woven goods incombustible was that of Obadiah Wild, who, in 1735, obtained a patent for "preventing combustible substances from flaming," his specific being a mixture of alum, borax, and vitriol. Subsequently, Dr. Hemptine, a Belgian chemist, made mention, in an essay on the subject, of silicate of potash, as used by Brognatelli; sulphate of iron, by Hermbstdedt; and another, but unknown substance, used by Delisle. About the same time, Gay-Lussac and Prater both mentioned the use of the carbonates of potash and soda; "water glass" was recommended by Fuchs, of Munich; and Dr. R. A. Smith, our own correspondent of Manchester, also went into the subject. This was the condition of the question when the present authors took the subject in hand. They now lay before us the results of all their trials; and their verdict is, that sulphate of ammonia and tungstate of soda are alone suited for the end in view.

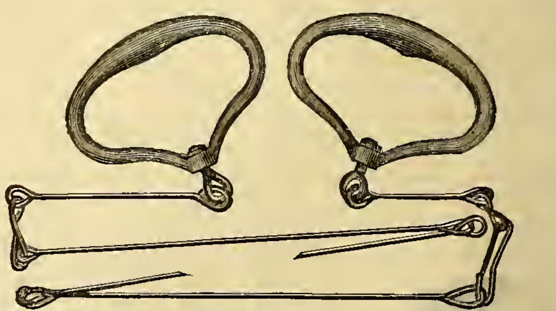
Sulphate of ammonia is the cheapest and most efficacious salt, and answers well for manufacturers' and finishers' purposes; it is prepared in a solution of 10 per cent. of the salt, the goods being dipped in it, and then dried in the hydro-extractor; but tungstate of soda, however, is the only agent recommended for laundry use. It is applied by taking a concentrated neutral solution of tungstate of soda and diluting it with water to 28° Twaddle, and then adding 3 per cent. of phosphate of soda.

The book contains a specimen piece of muslin prepared according to the new process. We find on trial that it smoulders away under the action of flame only at the immediate point of contact of the flame, so that it would appear that although the wearers of light dresses may still burn holes in their garments, they cannot burn themselves, if they adopt fabrics protected in this way.

A Short Treatise on Surveyors' Chains and Chainmeasuring. By J. M. Grumman, City Surveyor, Brooklyn, N. Y. 8vo. Wood Engravings. Pp. 28. Brooklyn: 1859.

The City Surveyor of Brooklyn here gives an account of a laudable attempt which he has made to introduce something to supersede the heavy, inconvenient, surveying chain, which has remained unaltered and unimproved in the midst of the many important improvements in surveying apparatus, which have gradually met with practical treatment and adoption. After showing the liability to derangement and false measure of the ordinary chain, Mr. Grumman presents us with this figure of his improved chain, and he thus describes it:—

"The chain is made of steel wire and tempered. It differs materially from the common chain, in that it has no rings between the links. The links are of a peculiar form, one eye being round, as in the common chain, while the other is of an oval or egg shape. This is found in practice to be less liable to kink than any other form. The long slope or sharp end of the oval forms no shoulder, making a kink unusual, and if a kink forms, producing an elbow in the chain, that will at once call attention to it. The eyes have width enough to allow the chain to be folded neatly and easily, and each link being made



by itself, and tempered, can be adjusted to such a nicety, with comparative ease, by fitting them over hardened steel points, that when the hundred are put together, the whole distance is perfect. The links should be made a trifle short and filed to adjustment. The chain then is not only perfect in its whole length but also at any intermediate link. The links are hardened and then brought to a low spring temper, so as to yield rather than break when trodden on, they are then much harder than common steel wire.

"The advantages of the chain are these: 1. It may be made considerably less than one half the weight of iron chains and be as strong. 2. It has but one third the number of joints that a chain has with two rings between each link, and is so much the less liable to stretch. 3. It is of a much harder material, and that, in connection with the fact that it has but one third as many joints as the common form of chain, makes it immeasurably less liable to lengthen by wearing. 4. It can be taken apart at any link without damage, and by having a spring catch on either handle, it can be attached to any part of the chain at pleasure. Thus making of a four pole chain, one from the length of one link to one hundred links, at the pleasure of the surveyor. These are the main advantages. The chain being so much lighter than the common form it can be readily carried in the pocket of an overcoat.

"If at any time a link should be broken by accident, the broken link can be taken out and the chain shortened one link, and at the end of the day's labour a new link may be put in the place of the broken one."

Such a chain is, of course, intended for ordinary rough measurements where extreme delicacy is not necessary. For very accurate work the author provides a spring balance and level, as in the two sketches annexed.

"The links of the chain are the same as those of the patent chain before described; but made of much lighter wire, usually of No. 17 or No. 18. At the forward end of the chain is a spring balance and level combined in the same tube. Fitting on the main tube, A, is a second tube, B, arranged to slide easy over the tube, A, with a lamp screw, C, to fix it at any particular place. When the chain is not in use it is clamped over the bubble as a protection. A scale, E, near the forward end of the tube, A, shows the expansion or contraction of the chain for every ten degrees Fahrenheit, from 0 or zero to 150°. The links of the chain are adjusted to be right at 60°, the mark for which, F F, is just the length of a link from the point of contact with the last link of the chain at Z. The spring balance, L M, is used to give an even tension or strain to the chain, and to preserve the same sag or curve when the chain is suspended. The bar, L, is generally marked on the lower side in pound divisions. On the upper side there is but one mark with a hole drilled through it to call particular attention to it. The spirit level, D, is so adjusted by the screw, I R, (which is set in the tube, A, and riveted at R, so that it will turn in the tube without vertical motion, yet passes through the plate, P, on which the bubble rests, raising or depressing it as it turns) that when the chain is suspended the two ends being on a horizontal line, the bubble will centre, as at D. At the end of the tube next the chain is a spring catch, V, attached to the tube by a small link, U. By means of this catch the spring balance and level may be attached to any link of the chain at the pleasure of the operator. A small thermometer, cased in a brass tube, about four inches long and five-sixteenths of an inch in diameter, is attached generally to the last link of the chain by means of the small hook at each end of it. It can be attached equally as well to any other link, at the will of the person measuring. At the back end of the chain is a steel bar with a spring catch, (as on the spring balance,) to attach it to the first link of the chain. It is intended to be always attached to the first link. The spring catch is only to be used in taking the twist out of the chain, as will be hereafter explained. Exactly six inches, or the length of a link from the point of contact with the first link, is a mark cut in the steel bar with a notch on each edge of the bar. From this line starts the measurement.

TO MEASURE WITH THE CHAIN.

"The surveyor, or the most competent man, takes the forward end of the chain in all cases, no matter what the old writers say on the subject. Holding the spring balance in in the left hand, throw the chain from you, then move along and let the chain run through the hands of your assistant until he comes to the handle. Then either detach the spring balance or the steel bar at the back end, from the chain, and run a cord or your plumb line through the eye of the end link; place the two ends of the cord together and draw it pretty tight, any twist there may be in the chain will run out on the cord. Attach the balance again to the chain and examine the thermometer, and set the line, G, so that it coincides with the same division on the scale, E, that the thermometer stands,—for instance, if the mercury is at 70° in the thermometer, set the line, G, so that it coincides with the 70 division on the scale, E, clamp it fast and you are ready to measure. Let your assistant put you in the right line by means of his plummet, then let him hold the chain so that the starting line of measurement is directly over the point from which you wish to measure, then draw the balance to the required strain as shown by the mark on the line, L, and raise or lower the chain until the bubble centres, when the two ends of the chain are on the same horizontal line. Then keeping the balance still at the same strain, prop your plummet from the line, G, and set a pin in the point denoted, then move on until your assistant comes to the same point when the operation is repeated.

"As the chain is always intended to be used off from the ground, it will be observed from what I have written of the common chain, that to be fifty feet long when suspended, it must be over fifty feet when at rest. A chain of No. 17 wire, with a strain of six pounds, that measures fifty feet when suspended, will measure twenty-two hundredths of an inch more if laid on the ground, or any level surface. I find also that with the same strain the difference at twenty-five feet will be but four hundredths of an inch whether suspended or resting. Instead therefore of making the chain of exactly equal lengths, I make the first five feet exactly right, the second five feet is † 01 inches; the third, †·01 inches; the fourth, †·01 inches; the fifth, †·01 inches; the sixth, †·02 inches; the seventh, †·02 inches; the eighth, †·03 inches; the ninth, †·04 inches; the tenth, †·06 inches, making in all †·22 inches. The chain is then right in all its parts by drawing the same strain with the chain suspended. A chain of No. 18 wire makes but 12 inches difference, which is divided in the same manner."

We think we have here given enough to show the great pains which Mr. Grumman has taken to obtain an accurate measuring chain, but his pamphlet, to which we must refer inquiring readers, affords a vast number of further hints on the subject.

SHIP VENTILATION; or Sea Sickness mitigated, by Supplying Pure Air in Ships. By J. P. Booth. 8vo. Lithographs. Pp. 22. Cork: Roche. 1859.

MR. BOOTH, who seems to be fully impressed with the necessity of securing pure air on board ship in all weathers, proposes to accomplish this end by applying vertical shafts and tubes, through which air may pass, so as to be conveyed both transversely and longitudinally in the ship, the air channels being placed on the floor or under the ceilings. In passenger ships he prefers to place the air channels under the berths in the dormitories, and under the sofas in the saloons, thence passing off to distribute pure air all over the ship. The air makes its ingress and egress by shafts and tubes opening above the deck, moveable cowls being fitted up to suit the wind. Mr. Booth describes his plan very minutely, as applied to the Cork Steamship Company's vessel, *Sabrina*, and to a ship of war, by the aid of seven lithographs on a large and clear scale. The new ventilating arrangement is fitted on board the *Sabrina*, where it answers perfectly in keeping the ship cool and fresh. In this case the plan is such that each passenger can adjust his individual supply of air.

Mr. Booth's pamphlet also contains an appendix in the shape of "Two Letters upon the Ventilation and Sanatory Condition of the Cork Workhouse;" and he shows, that by his system of ventilation he has succeeded in greatly improving the health of the workhouse inmates. We are glad to be able to draw attention here to the inventor's plans, for there is hardly one amongst us who does not feel that our practice in ventilation stands greatly in need of improvement.

THE LONDON ARABIC LITERARY FUND; An Appeal on behalf of 80,000,000 of the Human Family. By Antonius Ameuney, of Syria. 8vo. Pp. 16. London: Madden. 1859.

THERE are eighty millions of the human family, who are either Arabs, speak the Arab language, or use that language for their religious services. The Arabic language is spoken from the western coast of Africa to the Persian Gulf, and from the Mediterranean to the Arabian Sea. The author of the present pamphlet, with these facts before him, seeks, in conjunction with other benevolent men, to establish in London an independent journal to be published in the Arabic language, and thence circulated in the vast regions where, as we have shown, that language prevails. For the last four years he has formed one of a party who have wished to publish an Arabic newspaper at Beyrut, and he relates the heart-breaking results of this and similar attempts, owing to the despotism and dreadful espionage exercised by the Turkish government.

Two newspapers in the Arabic language are now published in Paris; they are in the interest of members of the Roman Catholic persuasion. The author now proposes to publish in London, a literary, scientific, political, and commercial weekly newspaper in Arabic, to be called the "Light of the East." We have now learnt that the chief agent in fomenting differences between nations is ignorance of one another. We know of nothing more likely to dispel such ignorance than the carrying out of Syed Ameuney's project. The Arabians, and the speakers of Arabic will then be able to learn exactly what we are, and to familiarise themselves with the world's progress. We may well breathe a fervent wish that some such project may grow into solid and enduring practice.

REPORT OF THE COMMITTEE ON STEAMSHIP PERFORMANCE; Presented to the British Association for the Advancement of Science, at their Meeting in Aberdeen. 8vo. Tables. Pp. 22. London. 1859.

OUR readers who have paid attention to the proceedings of the British Association this year at Aberdeen, will be already aware of the subject matter of this Report. We therefore place its title here, simply for the purpose of announcing that the marine engineer may now possess himself of the results of the Committee's labours, in a convenient tabulated and pamphlet form.

THE SHIPWRECKED MARINER; A Quarterly Maritime Magazine. 8vo. Parts. Pp. 52. Wood Engravings. London: Morrish. 1859.

WE notice this serial here for the express purpose of directing public attention to the great debt which we all owe to humanity, in the matter of providing efficient means of safety for shipwrecked mariners on our rocky coasts. We have already repeatedly drawn attention to the working of the Royal National Life Boat Institution, in the labours of which society the magazine before us worthily joins. Its title sufficiently indicates the hue and tone of its contents, but, in addition to its main work of discussing the question of safety for the sailor, it contains a set of interesting papers,—"Visits to the Sea Coast,"—pleasantly written, and conveying a large amount of pithy information upon the details of our sea board, about which we can hardly ever learn enough.

THE IRONMONGER AND METAL TRADES' ADVERTISER; A Monthly Trade Circular. 8vo. Pp. 96. London: Firth, Bow Lane. 1859.

THE subdivision of labour for which our times and those immediately preceding them have become so noted, has at last, it seems, brought about a subdivision of trade literature. Who, a very few years ago, would have dreamt of the existence of a serial paper, bearing the name of "The Ironmonger?" Here it is, however, and we find that it has reached its seventh monthly part. It presents a mass of matter which we daresay is very useful to ironmongers, and those who have large and direct dealings with them, although it must be somewhat unintelligible to general readers. As a medium for the circulation of the varied information necessary for the successful posecution of the different metal trades, we should think it is a very useful publication.

CORRESPONDENCE.

BARRANS' TRACTION ENGINE FOR COMMON ROADS.

As we have lately had occasion to look into the merits of the various traction engines now before the public, and without depreciating the excellencies of others, have selected one which bids fair to answer our purpose admirably well, but of which, at the same time, very little is known—we ask the liberty of stating the results of our experience in your columns.

The engine for which we contracted is known as Barrans' Traction Engine. It is destined for San Francisco, to be re-shipped from thence around Cape St. Lucas, through the Gulf of California, and up the Colorado River, to Fort Yuma, from whence it goes inland some thirty miles to the borders of the Great Desert. Its purpose is to travel sixty miles back and forth across this desert, carrying its own water, and conveying provisions to and from the Mariposa copper mines—a work hitherto and at present done by mules, driven by half-breed Mexico-Indians.

Our contract with Mr. Barrans called for ability "to haul a load of 35 tons weight, at the rate of 2½ miles an hour, on the Kent Road, or a similar one thereto, or 15 tons at the rate of from 4 to 5 miles per hour; and on a road with a gradient of 1 in 18 the traction engine shall take 20 tons; and in a gradient of 1 in 7 it shall take 10 tons, both at the rate of 2½ miles per hour."

The work, from first to last, was done at the Perseverance Iron Works of Messrs. J. Whitham & Son, on the Kirkstall Road, Leeds; and as by the contract they had but sixty-eight days in which to complete the whole in perfect running order, to be tested and then shipped, it is but justice to remark upon the workmanlike manner in which every part and detail of the machine was finished within the time—the more creditable, too, inasmuch as they were constantly in antagonism with their own doubts and the incredulity of their best workmen.

The first trial was made on the Kirkstall Road—a highway, as every tourist to the fine old Abbey knows to his sorrow, utterly discreditable to Yorkshire thrift, and rendered even worse at this time by the recent rains. The novelty of the thing made it impossible to keep the operatives at work, so that the 700 workmen of the Perseverance Iron Works, together with their wives, children, friends, neighbours, and acquaintances, became spectators of the experiment. At eleven o'clock the engine, steered by Mr. Whitham, senior, and driven by Mr. Barrans, threaded its way slowly through machinery and piles of iron out of the long shop, turned at a sharp angle into the yard, and ran out of the archway into the road. From inexperience in the handicraft of the steerer, or from too much power on the engine, she ran into the gutter on the opposite side of the way, burying the leading wheels deep in the mud. From her great weight (above 10 tons 18 cwt.), and the stiffness of the new bearings, it was for a while feared that she was inextricably fast, but a few sudden reversings of the wheels, judiciously applied, brought her back upon solid ground, and she turned down the road, taking a small car with thirty persons behind her, and proceeded on her first trip. Under a pressure of forty-five pounds of steam, a speed of six miles an hour was attained, over the level part of the Kirkstall road, the machine being regulated in speed and course of direction with great ease. Turning on to the Birley road, where there is a steady ascent for nearly one hundred rods, up a gradient varying from 1 in 8 to 1 in 6, with an uneven and stony surface and one sharp angle, the traction engine passed over it at a speed of four miles to the hour, and on attaining the summit was greeted by cheers from the crowds which had followed out of town. The descent over a circuitous and even more difficult pathway, the gradients of which rose in parts as high as 1 in 4, was made with an equal speed, and the power of the engineer to slacken, increase, or entirely cease the motion in a moment, was conclusively shown. At the foot of the hill, in turning into a narrow lane, the near driving wheel plunged into a partially covered sewer, completely losing its bearing, and burying three-fourths of its diameter in the hole, but, as before, the sudden reversing of the engine brought it safely out, backed it again to the main street, and the run home was satisfactorily made.

It will be noticed that this was simply the engineer's trial trip, and had nothing to do with our contract, the ability of the traction engine to answer the terms of which being still doubtful. After a half hour's delay, with Mr. Barrans at the wheel and two workmen at the engine, a second start was made, trucks loaded with eighteen tons of pig iron being attached, to run again over the Kirkstall road. With fifty lbs. of steam, a speed of five and a half miles an hour was attained and kept up along the whole distance of the Kirkstall road, and a speed of four miles an hour up the before-stated gradient of the Birley road. Thus far, then, the contract terms were fully met, and it remained only to be seen whether the engine could more than double its power, or haul thirty-five tons at the rate of two and a half miles per hour over the Kirkstall road.

It was now getting late in the day, but the willing help of Messrs. Whitham's men shortly loaded and weighed five and thirty tons of pig iron upon the trucks, and attached them to the traction engine. The scene was a novel one for Leeds. The huge machine stood puffing on the road. Truck after truck was wheeled out of the works and attached to the one before it. Thousands of operatives from the various mills lined the way. Passing vehicles of all descriptions were arrested in their course, and their occupants became spectators among the crowd. Fences, trees, posts, windows, and even roofs of houses and sheds, were occupied as "coignes of vantage" from which to see the show. Just after sunset the foreman of the Perseverance Works declared that the required weight was attached, and Mr. Whitham gave the word A moment of suspense, and the long train of waggons, with their huge piles of pigs, moved, gradually increased in speed, and, in the midst of the hurrying crowd of people, attained within five minutes a rate of progress of more than five miles an hour, which it kept up until, exhausted by running, we gave the word to stop. Up to this moment, during each of the trials, it had been with great difficulty that the workpeople had been kept from hanging on to the waggons, and now, as much to gratify the interested artisans as to further test the powers of the engine, Mr. Whitham gave leave for them to get on. Amid great struggling, one hundred and twenty men mounted upon the waggons, thus adding at least nine tons more to the prodigious load, and the engine again started, and again attained a rate of speed equal to five miles an hour.

Of course, the contract conditions were fully met, and the traction engine accepted and shipped to San Francisco. We cannot forbear, however, from remarking, in justice both to the builders and the contractor, that out of all the various trials of these new applications of locomotive power, we have never been better satisfied, and we do not see how better satisfaction could be given, either with respect to the principle of the invention or the perfect workmanship of the machinery.

DODGE & GIANDONATI.

44 *St. Paul's Churchyard, London, Nov.*, 1859.

THE CORNISH ENGINE AND STEAM JACKETS.

I THINK it must be in the recollection of some of my engineering friends and others, that about thirty years ago Mr. Samuel Grose introduced into the Cornish steam engine, the more effectual clothing of cylinders, boilers, steam-pipes, &c., in order to prevent as much as possible the radiation of heat from them, and was enabled thereby to effect a considerable saving of fuel. Mr. Watt had introduced the use of the steam-case for cylinders, but from the manner in which it was made it was generally very defective; an improvement also took place in this, and considerable credit was awarded to it as an economiser of fuel; but it appears from what has been doing recently, and which I will explain, that the saving of fuel is not due to the steam-case, but to the more effectual clothing, and no doubt in some measure to the improved construction and care in fixing. My attention was particularly called to this some time ago in making an alteration in an 80-in. cylinder engine, by the application of a steam-case, where such a thing had not been used before. I there found that, instead of the packing of the piston continuing without being replaced some eight or nine months, it had to be packed every five weeks; this in an engine of that size was very expensive, and also caused delays in the underground operations. The matter was complained of by the agents, and I, therefore, made an attempt to remedy it. I first examined the cylinder, and found it very good, and not at all likely to injure the packing. I then considered that it must be caused by the high temperature of the steam in the case. I at once lowered the pressure, and, consequently, the temperature of the steam, about one-half, and then found that the packing remained good just double as long. I next prevented any steam from entering the steam-case, and the result was the packing stood seven months instead of only five weeks, and this without any increase in the consumption of coal. Since then I have tried it in several other engines, and with similar results. In one, an 85-in. engine, where the packing would last no more than five weeks when the steam-case was in use; this packing was examined a few days ago, after it had been packed sixteen weeks, and found still very good. In this engine, as in the other, I can find no increase in the consumption of coal. In smaller engines similar results have been obtained. I am desirous to make this matter generally known, as it very clearly shows that instead of the steam-case being of considerable benefit, as generally supposed, it has had a contrary effect, and that the clothing the cylinder with some good non-conductor, sufficient to prevent the escape of heat, not only does away with the cost of the steam-case, which is an item of considerable expense, but also saves packing and loss of time. I would remark that the effect in destroying the packing is in proportion to the load of engine, and the consequent temperature of the steam required. I would also remark that the steam in the steam-case is the same pressure as the steam in the boilers, varying in proportion to the load of engine—say, from 20 lb. to 50 lb. on the square inch. In these remarks I refer to condensing engines only, and working expansively.

James Sims.

Redruth, Cornwall, November, 1859.

ROSIN GAS.

For many years past the manufacturing of gas from rosin, for the purpose of illumination, has been abandoned in England, as well as in some parts of the continent of Europe, for the want of two great essentials—to wit, an efficient apparatus for its manufacture, whereby the whole of the rosin might be decomposed; second, a regular supply of rosin at a moderate price, such as might be procured in America or Spain, where rosin is indigenous and coal is scarce, and an indifferent producer of gas. Now, I claim to be the inventor of an apparatus whereby rosin gas, the illuminating power of which is more than equal to double that of the best coal gas that can be made, at a price per 1000 cubic feet little exceeding the price per 1000 cubic feet at which coal gas is sold. I do not contemplate that in England rosin gas can compete with coal gas, but I do contend that in America, where rosin is procurable in unlimited quantities, this gas can be made and sold for prices lower than those of coal gas. I shall be glad to furnish you with some notes upon this interesting manufacture, for publication in the *Practical Mechanic's Journal*, as I am sure that they will be interesting to some of your American readers. These notes shall be founded upon what has actually been accomplished in working practice.

E. Gilbert.

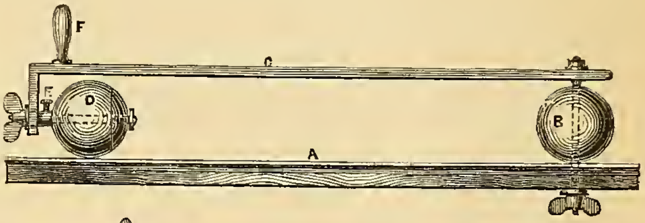
Galmpton Marlborough, Kingsbridge, Devon, Nov., 1859.

THE AXIS OF CELESTIAL BODIES.

I am not aware what construction or meaning Sir John Herschel may put upon the term axis when talking of celestial bodies, but if by axis Sir John means a line passing through the centre of any mass of matter —that is, taking the mechanical idea of an axis, "the line real or imaginary on which it may revolve," *vide* Dr. Johnson. I candidly assert that I am one of those who object to the illustration quoted in the review of his book, as follows:—"Should any of our readers be in this predicament, we recommend him to plant a staff upright in the ground, and, grasping it in both hands, walk round it, keeping as close to it as possible, with his face always turned towards it, when the unmistakeable sensation of giddiness will effectually satisfy him of the fact of his rotation on his own axis." Now, the whole of this sentence is, in my opinion, what in law would be termed a *quibble*. That a man, because he acquires the sensation of giddiness, is satisfied that he turns upon his own axis, is not a fact. 1st Because he may arrive at the sensation of giddiness a thousand ways—looking over a precipice, walking a narrow plank over a rapid stream, and others too numerous to mention. 2d. Because (mechanically speaking) no man can walk round his own axis in any way, much less can he turn upon it when holding on to any fixed object, which must be external to his body—he may walk his axis round any object he pleases, but he cannot in any sense walk round his own axis. 3d. A man holding by a stick and revolving round it turns on the axis of the stick and not on his own axis, the axis of the stick becoming in this case the common axis of both man and stick. 4th. It may appear to some that the man has turned on his own axis on account of the alteration of the relative position of the objects around; in walking round the axis of the stick the man has only dragged his axis after him, and not turned upon it. 5th. "Keeping as close to it as possible" is certainly the nearest approach to turning on his own axis; but until the man is impaled upon the stick and turned on it, he does not revolve (mechanically speaking) on his own axis. But what is the converse of this "keeping as close as possible?" &c., &c. The following—Keep as far as possible from the stick, and walk round it, and you will not feel the unmistakeable sensation of giddiness, and therefore be satisfied that you have not rotated upon your own axis.

If I am right, Sir John Herschel holds that, because the moon shows the same face to the earth, it does revolve upon its axis. Mr. J. Symmons holds the contrary, that because the moon turns the same face to the earth, it does not turn upon its axis. I hold that, whether the moon turns on its axis or not, it may turn the same face to the earth, which I venture to illustrate by the following figure (fig. 1):—

Fig. 1.



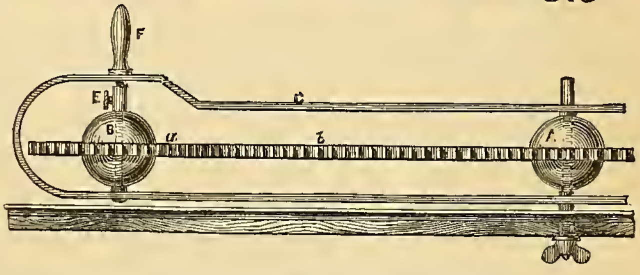


Fig. 2.

A, part of a table on which the earth and moon are placed. B, the earth. C, an imaginary rod or frame connecting the earth and moon. D, the moon, having a short piece of tube fixed at the back, by which it may be fixed or allowed to run loose on its axis, by the use of the binding screw, E. F, handle. Now, if the handle be taken and held upright, and the binding screw slack, in turning the moon round the earth, it will fairly, and without any quibble, rotate upon its axis, keeping at the same time the same face to the earth. Again, tighten the binding screw, and move the moon round the earth as before, it will now drag along the table without turning upon its axis, keeping at the same time the same face to the earth.

I now come to Sir John's illustration. He asserts that the moon when rotating upon a vertical axis can show the same face to the earth. Taking the moon upon a vertical axis appears to me to make his position still less probable, as the following illustration, I think, will prove. For this purpose I take the beautiful contrivance of the sun and planet wheels invented by the celebrated Watt, to prove that the moon cannot rotate upon a vertical axis, and at the same time keep its same face to the earth. Fig. 2. Now, suppose A to be the earth and B the moon, attached together by a frame, C, and gearing into each other, the one being four times the diameter of the other (now mechanically speaking), the wheel, B, being drawn round by the handle, will make four turns on its axis, or four revolutions on its own axis in going round the larger wheel, A, *(Sir John would say five according to his theory.)* Now, you may turn this wheel representing the moon, and turning on its axis as long as you will, and it will never keep the same face to the earth, and no power of astronomical words or contrivance of the mechanic can make it do so, while rotating on its own axis in a vertical position. The only means of so doing will be to draw the wheels asunder until the teeth are disengaged, and preventing the moon from turning on its axis by tightening the binding screw; by this operation the axis of the moon will be neutralised, and the axis, or centre of the earth, becomes the common centre of rotation of both bodies, and only by this (that is, by stopping the moon from rotating on its own axis), can the moon be made to keep the same face to the earth when on a vertical axis.

The only way I can see of getting out of this difficulty is to allow, that as the axes of celestial bodies are imaginary, so are their rotations under peculiar circumstances.

Bertram Mitford.

Cheltenham, November, 1859.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

MEETING OF THE BRITISH ASSOCIATION AT ABERDEEN, 1859.

Section C.—Geology.

"On the geology of Aberdeenshire," by Prof. Nicol.

"On coast section between Aberdeen and Dunnottar Castle," by the Rev. J. Longmuir.

"On the chronology of the trap rocks of Scotland," by Mr. A. Geikie.

"On the origin of cone in cone structure," by Mr. H. C. Sorby.

This structure consists of an assemblage of imperfect cones, enclosing other cones, which all have their apexes in the same direction, and usually occur in hands parallel to the stratification of the work in which they are found. By examining their transparent slices with polarised light, the author had come to the conclusion that this structure is due to the growth of minute prismatic crystals, of more or less impure carbonate of lime, which, starting from particular points, grow upwards or downwards in such a manner that the peculiar and curious compound conical masses were formed by the interference of the crystals with each other, and with the uncrystallisable impurities of the rock.

"On new fossils from lower old red sandstone of Scotland," by the Rev. H. Mitchell.

"On the junction of granite with stratified rocks," by Mr. T. F. Jamieson.

"On sphenopteris hookeri and icthyolites, from Kiltorkan Hill, Kilkenny," by Mr. W. H. Baily.

"Notice of the discovery of upper silurian fossils in the Devonshire slates," by Dr. Bryce.

"On coal at Ambisheg, Isle of Bute," by Dr. Black.

"On human remains in superficial drift," by Dr. Anderson.

Dr. Anderson gave a view of the alleged cases in connection with the discovery of human remains in the superficial drifts, alluvial detritus, and such diluvial accumulations as are of an ancient or pre-historic origin. Undoubted cases existed of human remains inclosed in hard compact concretionary rocks, buried deep in the silts of rivers, and high up in caverns associated with the bones of elephants, lions, tigers, hyenas, and other extinct carnivora now only existing in southern latitudes. One is startled at the idea of a North Briton inhabiting the same cave with an African lion, or Indian mammoth, or a huge Polar bear, and all apparently contemporaneous occupants, according to their species, of the British Isles. Sir Charles Lyell's remarks, in his recent opening address, not only deepened vastly the importance of the subject, but added fresh difficulties to the more recent historic views which he (Dr. Anderson) strongly entertained. As to the instances occurring in beds of lakes, rivers, and seas, and which have become mineralised, he contended that a few years, or even months, often sufficed for the formation of a compact durable mass of calcareous and silicious rock, in which human bones, skeletons, pottery, coins, and implements were imbedded. He referred to a case betwixt Aberdour and Burntisland, in Fife, which he examined a few weeks ago, where an incrustation was now forming of great depth, and in which are embedded large shells, branches of trees, and where on the face of the incrusted cliff, twigs of the living trees are becoming entangled in the calcareous breccia. The Rev. Doctor quoted the case of a cannon-ball—a thirty-two pounder—lately presented to him by a fellow townsman—deeply incrusted with ferruginous mud, and completely indurated, which was raised on his anchor in the harbour of Copenhagen; and, he doubted not, an identical bullet of our naval attack of fifty years ago. The skulls of Amiens and Abbeville, the remains in the caverns of Torquay, and those in Sicily, the flint weapons in veined limestone in Cantire, and the arrow-heads with elephant remains in Suffolk, were then successively brought under review in the paper—the solution of all these given by Dr. Anderson being, that from the action of petrifying springs the subsidence of tracts of country, the falling in of the roofs of caverns, the undermining of cliffs and headlands, the superficial soil is incrusted or buried beneath the strata on which it was originally superimposed. He saw no evidence deducible from the superficial drifts to warrant a departure from the usually accepted data of man's very recent introduction upon the earth. We have more positive evidence that his first appearance was characterised by many proofs of high intellectual condition which our sacred beliefs attach to his origin, and that he was not primarily the ignoble creature that arrow-heads and flint-knives, and ossiferous caverns would so lamentably indicate. The mighty ruins spread over the plains and great river water-sheds of the East clearly indicate his Oriental cradle-land, when, in conjunction with the traditions of all nations in the most remote times, he dwelt in palaces, luxuriated in gardens, worshipped in temples of solemn grandeur, and reared towers and pyramids enduring as the rocks from which they were hewn. The arts and sciences and commerce accompanied the progress of his terrestrial occupation, bringing in their train the elegancies, luxuries, and perfected implements of defence or attack which the highest stages of civilization imply. Races of the human stamp have perished—are perishing; and, as if it were a law of nature, where a race cannot rise and maintain itself beyond a certain standard civilization, instead of benefiting, only leads to their more rapid extirpation from the face of the earth. Certain it was, that islands and tribes in the Pacific, which, in Cook's time were enumerated by hundreds of thousands, can now be counted by their tens or twenties; and just as certain that, where the christianising element accompanied, the onward progress of civilization would know no limits until the Divine principle in man should vindicate his heaven-chartered claims to universal earthly dominion.

Sir C. Lyell agreed with Dr. Anderson as to the necessity of using extreme caution in arriving at conclusions as to the ambiguity of the human race founded on the association of bones in caverns with human remains; also that it was impossible, from the data at present acquired, to pretend to calculate the exact period; but he thought the evidence was very strong in favour of a very high antiquity, as would be seen when other papers were read.

"On the remains of the cretaceous formation in Aberdeenshire," by the Rev Dr. Longmuir.

"On drift beds of the north of Scotland," by Mr. T. F. Jamieson.

"On the submerged forests of Caithness," by Mr. J. Cleghorn.

"On the ossifferous fissures of Oreston," by Mr. W. Pengeley.

"On Canadian caverns," by Mr. G. D. Gibb.

"On the origin of the ossiferous caves of the Plymouth limestone, with deductions from the observed facts," by Mr. H. C. Hodge.

"Report on the exploration of the upper silurians of Lesmahagow, in terms of the Association's grant to Mr. Slimon," by Mr. D. Page.

During the last summer, Mr. Slimon and his son had diligently explored the fossiliferous tract of upper silurian strata in the parish of Lesmahagow, and the result of their operations had been to exhibit still further the highly fossiliferous character of the Nilherry silurians, and to give ample indication of a very varied and curious crustacean fauna, altogether new to palæontology.

"On some new boreal forms from the pleistocene deposits of Scotland," by Mr. D. Page.

"On restoration of pterichthys," by the Rev. Dr. Longmuir.

"On some fishes and tracks from the passage rocks, and from the lower old red sandstone of Herefordshire," by Rev. W. S. Symonds.

"On some new fossils from the old red sandstone of Caithness," by Dr. Miller.

"On certain volcanic rocks in Italy, which appear to have been subjected to metamorphic action," by Prof. Daubeny.

"On certain phenomena attendant on volcanic eruptions and earthquakes in China and Japan," by Dr. Macgowan.

"On the coal-fields of North Staffordshire," by Messrs. Garner and Molyneux.

This was a joint paper by the two gentlemen, and the reader (Mr. Garner) gave the greater share of the credit of the paper to Mr. Molyneux. It gave an account of the geology of the district in question, and especially of the coal-fields, and the icthyolites and other fossils, particularly some undescribed vegetable remains found therein. Four gravels, of very different ages and constituents, were mentioned—northern drift, gravel with chalk flints, ananchites, &c., the hunter sandstone gravel with decomposing agates, and a more ancient one of less rounded pieces of limestone, millstone-grit, and basalt. One bed of flagstone, of the millstone-grit formation, contains large bivalves, of which Mr. Garner had no doubt, but of the animal nature of these there was a difference of opinion. In the limestone occur conularia, pteronitis, pleurorhynchus, an orthoceras allied to paradoxus, and numerous small trilobites. The fish-remains were many of them collected on the estate of the Duke of Sutherland, and consisted of two tolerably perfect specimens, various fin-rays, plates and scales, stings, teeth and bones of at least a dozen genera.

Sir P. Egerton drew attention to the very interesting and remarkable collection of icthyolites. Several of them he believed to be new. He had corresponded with Mr. Molyneux, and was the more anxious to do justice to the specimens, as that person was in a rather humble sphere of life, and gave the time to the work which in ordinary men was appropriated to repose. He might observe that the specimens of ctenoptychius, a genus somewhat allied to squatina, and those of the dorsal armature of orthacanthus, were very fine. Much praise was due to the authors.

Mr. Binney begged to say that so far from the fossils being common, several of them were new. The coal-fields were not like the old red, regular fish-ponds, but a man might spend a whole year and not meet with a tolerably perfect specimen. This was the best collection he had seen in England.

"On the geology of Lower Egypt," by Dr. Buist.

"On brachiopoda, and on the development of the loop in terebratella," by Mr. C. Moore.

"A letter to Sir Charles Lyell on the occurrence of a land shell and reptiles in the South Joggins coal-field, Nova Scotia," by Dr. Dawson.

"On the relation of the gneiss, red sandstone, and quartzite in the north-west highlands," by Prof. Nicol.

"On the newly discovered reptilian remains from the neighbourhood of Elgin," by Prof. Huxley.

Having received specimens of sandstone containing what he considered traces of reptilia, in order to work out the problem of their character, he was put in communication with Mr. Duff and the Rev. Mr. Gordon, but for whose efficient co-operation his labours must have been in vain. He was fortunate to obtain specimens containing impressions which led him to conclude it was a reptile, and not a fish. He next obtained impressions in the sandstone of what appeared to have been once a bone, resembling the bony plates of an alligator, from which he came to the conclusion that the reptile was one of the crocodilian species. Looking for further coincidence, he had received a fossil, which Prof. Agassiz had declared the most extraordinary he had ever seen; and a cast taken from it appeared to represent the tail of the old reptile. He then had a cast taken from a fossil having a most extraordinary cavity in it, which appeared to be its dorsal vertebræ; from another specimen he got a piece of vertebræ, such as support the hips in crocodiles; and he, too, got a bit of sandstone having an impression of vertebræ, with marks peculiarly characteristic of the neck; and to ascertain what the teeth or head was like, they had obtained a piece of stone with the impression of an upper jaw and a series of teeth, essentially resembling those of a crocodile, and from these and other traces he came to the conclusion that it had been a crocodilian reptile allied to the dinosaurian series, but presenting various points of difference from all existing or fossil species, and that the period of its existence must have been that presented by the green sandstone He also gave an account of the impressions in other pieces of sandstone—which Mr. Gordon had sent him—indicating another reptile, with curious palatial teeth, which, in honour of the Rev. Mr. Gordon, he called *hyperodapedon Gordoni*. He also received two bits of rock, one containing a reptilian impression like a staganolepis.

Prof. Owen said no one could fail to be impressed with the extreme minuteness and accuracy with which Prof. Huxley had examined the facts, and with the clearness with which the facts had been described; and still more with the accuracy and soundness of the deductions which Professor Huxley had made. The paper read afforded very instructive evidence of the value of the law of co-relation of structure; because, at the last meeting of the British Association at Leeds, he had arrived at the conclusion, from observing a portion of the bone then exhibited, that these specimens were reptilian in their nature, and had published that opinion in an article in the "Encyclopedia Britannica." He concurred entirely with the conclusions which Prof. Huxley had drawn from a more complete view of those bones. He now for the first time began to feel that the evidence of the structure of the cranium was most interesting, and necessary to be made known before they had a complete and satisfactory idea of the nature of the staganolepis.

"On the yellow sandstones of Elgin and Lossiemouth," by Prof. Harkness.

"On the age of the reptile sandstone of Morayshire," by Mr. J. Miller.

"On the supposed wealden and other beds near Elgin," by Mr. C. Moore.

"On Dura Den sandstone," by Rev. Dr. Anderson.

"On faults in Cumberland and Lancashire," by Prof. Sedgwick.

"On some observations on the parallel roads of Glenroy," by Prof. Rogers.

"On the structure, affinities, and geological range of eurypteridæ," by Mr. Page.

"On sections along the southern flanks of the Grampians," by Prof. Harkness.

"On some old red sandstone fossils," by Mr. J. Wyllie.

"On new fossil fish from Caithness," by Mr. C. W. Peach.

"On tertiary fossils of India," by Mr. W. H. Baily.

"On a horse-shoe nail found in the red sandstone of Kingoodie," by Sir D. Brewster.

"On a fragment of pottery found in superficial deposits in Paris," by M. A. Radiguel.

"Report on the results obtained by the mechanico-chemical examination of rocks and minerals," by M. A. Gages.

"On the rocks and minerals in the property of the Marquis of Breadalbane," by Mr. C. G. Thost.

"On the elephant remains at Ilford," by Mr. A. Brady.

"On some curious results in the water supply afforded by a spring at Ashey Down, in the Ryde water-works," by Mr. E. R. J. Knowles.

The President stated a curious case that had come under his own notice at Portsmouth Victualling Yard. A supply of water was wanted. On the opposite side of the estuary were two artesian wells, at depths of 250 feet and 280, or thereby, respectively. Taking the advice of some persons who were geologists, the superior officer proceeded to lay out the money granted for water supply in digging another artesian well on the Portsmouth side, naturally expecting to find water at about the same depth as on the other side. At 300 feet, however, in the London clay no water appeared; his superior got uneasy, but was persuaded to go on; at 400 feet no water! Again they went on, but only at 560 feet, or thereby, on getting through into the plastic clay, was water obtained, which rose to within three feet of the surface.

"On the constitution of the earth," by the Rev. J. Dingle.

"On slickensides," by Mr. J. Price.

"On a cave near Montrose," by Mr. J. Beattie.

"On the remains of lower oolites in Urquhart, Elgin," by the Rev. J. Morrison.

"On some basaltic formations in Northumberland," by Mr. W. S. Gibson.

INSTITUTION OF CIVIL ENGINEERS.

NOVEMBER 8, 1859.

This was the first meeting of the new session, Mr. Locke, M.P., the President, in the chair. Previous to the commencement of the substantial business of the evening, he said:—I cannot permit the occasion of opening a new session to pass without alluding to the irreparable loss which the Institution has sustained by the death, during the recess, of its two most honoured and distinguished members. In the midst of difficulties of no ordinary kind, with an ardour rarely equalled, and an application both of body and mind almost beyond the limit of physical endurance; in the full pursuit of a great and cherished idea, Brunel was suddenly struck down, before he had accomplished the task which his daring genius had set before him. Following in the footsteps of his distinguished parent, Sir Isambard Brunel, his early career, even from its commencement, was remarkable for originality in the conception of the works confided to him. As his experience increased, his confidence in his own powers augmented; and the Great Western Railway, with its broad gauge line, colossal engines, large carriages, and bold designs of every description, was carried onward, and ultimately embraced a wide district of the country. The same feeling induced, in steam navigation, the successive construction of the *Great Western* steamer, the largest vessel of the time, until superseded by the *Great Britain*, which was in its turn eclipsed by the *Great Eastern*, the most gigantic experiment of the age. The great ship was Brunel's peculiar child; he applied himself to it in a manner which could not fail to command respect; and if he did not live to see its final and successful completion, he saw enough, in his latter hours, to sustain him in the belief that his idea would ultimately become a triumphant reality. The shock which the loss of Brunel created was yet felt, when we were startled by an announcement that another of our esteemed members had been summoned from us. Of that friend I feel it to be a difficult task to speak without giving way to feelings better fitted for the closet than a public assembly. Robert Stephenson was the friend of my youth, the companion of my ripening years, a competitor in the race of life; and was as generous as a competitor as he was firm and faithful as a friend. This will, I know, find an echo in the hearts of all around me; and your feelings will supply that laudation in which it would seem inappropriate for me to indulge. Like Brunel, Robert Stephenson commenced his professional career under his father, George Stephenson. His early years were devoted to the improvement and construction of the locomotive, and to him we owe the type of those machines, many of which are now actually in use on our railways. From the time of the Liverpool and Manchester Railway—when our joint report contributed in a great degree to the adoption of the locomotive engine as the means of transport—and of the subsequent London and Birmingham line, with its long Parliamentary contests, its Kilsby tunnel, and other difficulties inherent in so new an undertaking, a multitude of other lines followed, in which there had to be foreseen and provided for numerous difficulties, all of which were met and surmounted with coolness and consummate skill. Among these great works may be mentioned the Royal Border and high level bridges, and more especially the Conway and Britannia bridges, which were the first examples on so vast a scale of the tubular principle, and the bridges across the St. Lawrence and the Nile, remarkable alike for their grandeur of conception and successful execution. To my present hearers the enumeration of the works in which Robert Stephenson was engaged would be as a "twice-told tale," but we must look back with interest upon the days of the "Battle of the Gauges"—the discussions upon the atmospheric system—and the numerous topics which have been argued within these walls and elsewhere. In the enjoyment of a distinguished name and reputation, Robert Stephenson, like Brunel, has been cut off while still in the middle period of life, and though he pursued his profession with persevering energy, and accomplished in it those triumphs of the successful application of a mind well trained and stored with practical and theoretical knowledge of various kinds, and achieved some of the greatest works of art which have been witnessed in our day, he at the same time obtained an eminence in the scientific world rarely reached by any practical professional man. It is not my intention, at this time, to give even an outline of the works achieved by our two departed friends. Their lives and labours, however, are before us, and it will be our own fault if we fail to draw from them useful lessons for our own guidance. Man is not perfect, and it is not to be expected that he should be always successful; and, as in the midst of success we sometimes learn great truths before unknown to us, so also we often discover in failure the causes which frustrate our best directed efforts. Our two friends may probably form no exception to the general rule; but, judging by the position they had each secured, and by the universal respect and sympathy which the public has manifested for their loss, and remembering the brilliant ingenuity of argument, as well as the more homely appeals to their own long experience often heard in this hall, we are well assured that they have not laboured in vain. We, at least, who are benefited by their successes, who feel that our Institution has reason to be proud of its association with such names as Brunel and Stephenson, have a duty to perform, and that duty is to honour their memory and emulate their example. I ought to add, in conclusion, that among the many private and public bequests made by Robert Stephenson is one to this Institution of the munificent sum of £2,000.

"On the process of raising, and on hanging, the bells in the clock tower at the New Palace, Westminster," by Mr. Jabez James.

SESSION 1859-60.

THE Council invite communications on the following, as well as other subjects, for premiums. As they differ somewhat from the list given last year, we here reprint the whole:—

1. A review of the plans which have been proposed, at different times, for the embankment of the river Thames.
2. On the principles upon which the works for the improvement of river navigation should be conducted, and the effects of the works on the drainage and irrigation of the district; including accounts of the systems of moveable dams ("barrages mobiles") in rivers on the Continent.
3. On the effect of engineering works in causing injurious scour, flooding, or silting-up, in tidal estuaries or rivers.
4. On the main natural and artificial drains of the country, the extent to which they have been effected by the increasing amount of agricultural land drainage, and the general influence upon the main river outfalls.
5. On reclaiming land from seas and estuaries.
6. On the results of the employment of steam-tugs on canals, and of other measures for the improvement of canals as a means of conveyance for heavy traffic.
7. On the methods of constructing foundations for large structures, in deep water.
8. Description of cast or wrought iron cranes, scaffolding, and machinery, employed in large works, in stone quarries, hoists, or lifts on quays, in warehouses, &c., especially where either steam or water is used as a motive power.
9. On the results of experiments on the crushing weights of different materials, particularly as to the resisting powers of rubble masonry, set in different limes and cements.
10. The selection of sites for the construction of docks on the course of tidal streams, with reference to communication with railways, and with inland navigation.
11. The selection of sites for, and the principles of, the construction of breakwaters, harbours of refuge, piers, moles (whether solid or on arches), sea walls, and shore defences; illustrated by examples of known constructions.

12. The construction of lighthouses; their machinery and lighting apparatus; with notices of the methods in use for distinguishing the different lights.
13. On the mechanical methods of boring and of sinking large shafts, of introducing the tubing and the impervious lining, and of traversing running sand, and other difficult strata.
14. The results of contrivances for facilitating the driving of tunnels, or drifts in rock.
15. The results of a series of observations on the flow of water from the ground, in any large district; with accurately recorded range-gauge registries in the same locality, for a period of not less than twelve months.
16. On the construction of catch-water reservoirs in mountain districts, for the supply of towns, or for manufacturing purposes.
17. Accounts of existing water-works; showing the methods of supply, the distribution throughout the streets of towns, and the general practical results.
18. The comparative duty performed by, and improvements in the construction of, modern pumping engines for raising water, for the supply of towns, or for the drainage of mines; noticing in the latter cases, the depth and length of the underground workings, the height of the surface above the sea, the geological formation, the contiguity of streams, &c.
19. The results of the use of bucket and rotatory pumps, for lifting large quantities of water to a limited height; as at the Haarlem Meer, or at Whittlesea Mere; with descriptions of the machinery employed, and the application of such machinery to the raising of the sewage of such towns.
20. On the methods in use in various countries for raising water, for the purposes of irrigation.
21. The drainage and sewerage of large towns; exemplified by accounts of the systems at present pursued, with regard to the level and position of the outfall, the form, dimensions, and material of the sewers, the prevention of emanations from them, the arrangements for connecting the house drains with the public sewers, and the disposal of the sewage, whether in a liquid form, as irrigation, or in a solid form after deodorisation.
22. On boiler inspection as practised in this country and on the Continent, with remarks as to the comparative merits of the two systems.
23. On the most recent systems of smoke prevention, in stationary, marine, and locomotive boilers; and a discussion of the existing difficulties.
24. On the causes of the alleged failure in economising fuel, in working steam expansively, and the probable conditions for insuring success.
25. On the results of the use of superheated steam.
26. On substitutes for steam, and the causes of their failure.
27. On the results of the use of tubular boilers, and of steam at an increased pressure, for marine and other engines, noticing particularly the difference in weight and in speed, in proportion to the horse power and the tonnage.
28. On the best methods of reducing the temperature of the engine and boiler room of steam vessels, and of preventing the danger arising from the overheating of the base of the funnel.
29. The substitution of machinery for manual labour, for raising, lowering, and reefing the sails, weighing the anchor, &c., on board ship.
30. On steam vessels of light draught for the shallow rivers of India, &c.
31. Description of the *Great Eastern* steamer, and of the results of the trial voyages.
32. On the form and materials of floating batteries ("Vaisseau bélier"), and the points requiring attention in their construction.
33. On the ascertained duration, and other qualities, of the numerous systems of permanent way in use in England and in other countries, with their original cost and expense of maintenance.
34. Improvements in the construction of railway carriages and waggons, with a view to the reduction of the gross weight of passenger trains; also of railway wheels, axles, bearings, axle-boxes, and brakes, and of bearing, traction, and buffer springs; treating particularly their ascertained duration and their relative friction.
35. Description of the various kinds of machinery in use in the principal shipping ports, for the shipment of coal; noticing particularly those in which the greatest expedition is combined with the least amount of breakage of the coal; and also accounts of the means of unshipping and measuring, or weighing the coal, on its arrival in port.
36. On the means of utilising the products of the distillation of coal, so as to make coke commercially as cheap as coal; with descriptions of the ovens, and of the best processes used in Great Britain and on the Continent, in the manufacture of coke.
37. The precautions adopted for guarding against accidents by fire-damp and after-damp in mines.
38. The most effective arrangement and form of centrifugal and reciprocating blowing apparatus.
39. The chemical analysis, and the application to economic purposes, of the gases generated in iron blast furnaces.
40. Description of modifications of the present systems of smelting iron ores, of improvements in the conversion of cast-iron into the malleable state, and of the manufacture of iron generally, comprising the distribution and management of iron works.
41. An investigation of the causes of "red" and of "cold-shortness" in malleable iron, and other chemical characteristics which affect the physical properties of cast, or of wrought-iron.
42. Improvements in the manufacture of iron for rails and wheel tyres, having special reference to the increased capability of resisting lamination and abrasion; and accounts of the machinery required for rolling heavy rails, shafts, and bars of iron of large sectional area.
43. On the use of steel bars and plates in engine work and machinery, for boilers and for ship building.
44. The process of manufacture, and mode of treatment, of aluminium.
45. On the importance of balancing the rotating, or alternating parts of machinery.
46. On the forms and dimensions of journals of machine shafts, axles, &c.; with the best composition for the linings of bearings, and the most approved methods of lubricating.
47. On the mechanism of astronomical instruments, with suggestions for its improvement.
48. On machinery adapted for the better separation of the various substances found in combination with metallic productions.
49. On machinery for crushing ores.
50. On the substitution of machinery for manual labour in mining operations and on hydraulic machinery in mines.
51. On the improvements which may be effected in the buildings, machinery, and apparatus from producing sugar from cane in the plantations and sugar-works of the British colonies, and the comparison with beet-root, with regard to quantity, quality, and economy of manufacture.
52. Accounts of the improved systems of storing, cleansing, and drying corn, and of producing flour.
53. Description of the machinery adapted for the preparation of Indian corn.
54. Improvements in flax machinery, and in the processes for preparing the flax for manipulation.
55. The uses of vulcanised or mineralised caoutchouc; the means of increasing its durability, and the modes of causing its adhesion to metal.
56. On the application of photography to engineering.
57. The construction of clocks to be moved simultaneously by the agency of galvanic electricity.
58. On the form and construction of submarine telegraph cables, most suitable for certain specified depths; and an investigation into the nature of any new substances adapted foi the insulating medium.
59. Memoirs and accounts of the works and inventions of any of the following engineers:—Sir Hugh Middleton, Arthur Woolf, Jonathan Hornblower, Richard Trevethick, William Murdoch (of Soho), Alexander Nimmo, and John Rennie.

Original papers, reports, or designs, of these, or other eminent individuals, are particularly valuable for the library of the institution.

The communications must be forwarded, on or before the 30th of January, 1860, to the house of the Institution, No. 25 Great George Street, Westminster, S. W., where copies of this paper, and any further information may be obtained.

INSTITUTION OF MECHANICAL ENGINEERS.

July 27, 1859.

This was a general meeting in Birmingham, and after the routine business, the discussion on Mr. H. Martin's paper "On the construction of hot-blast ovens for iron furnaces," when Mr. J. B. Neilson, the celebrated inventor of the hot-blast, gave some very interesting details connected with the subject. The discussion was followed by a paper "On the application of the decimal system of measurement to mechanical engineering work," by Mr. John Fernie, Derby.

September 6 and 7.

This was the annual gathering at Leeds, when the Civil Court was placed at the disposal of the Institution. Mr. John Penn, the President of the Association, occupied the chair, and the attendance included several eminent engineers from various parts of the kingdom. The following is a list of the papers read:—

"On file-cutting machinery," by Mr. Thomas Greenwood, of Leeds.

"On the economy and durability of some classes of steam boilers," by Mr. R. B. Longridge, of Manchester.

"On a direct acting steam crane," by Mr. Robert Morrison, of Newcastle-on-Tyne.*

"On a new pressure gauge," by Mr. Alexander Allan, of Perth.

"On Haste's safety valve for steam boilers," by Mr. W. Naylor, of London.

The members afterwards visited several of the principal manufactories of the town, including the flax-mill of Messrs. Marshall and Co. In the evening a *conversazione* took place in the Victoria Hall. Amongst the most interesting objects exhibited were Hattersley's type-composing machine, a very curious and ingenious invention; an atmospheric clock; a collection of photographs, including views of the birth-place of the late George Stephenson, and some of the early engines which he constructed; and a collection of microscopical objects. Distributed in various parts of the ball there were also several models and drawings illustrative of recent improvements in steam engines, boilers, machinery, and tools, together with philosophical apparatus and specimens of mechanical art generally. On the following morning the reading of papers was resumed in the Civil Court. The following is a list of the communications:—

"On the application of super-heated steam in marine engines," by the President.

"On Fryer's apparatus for supplying locomotive tenders with water," by Mr. James Fenton of Low Moor, Bradford.

"On the construction of steam boilers," by Mr. Benjamin Goodfellow, of Manchester.

"On improved brake power for stopping railway trains," by Mr. Alexander Allan, of Perth.

"On a steam crane," by Mr. J. Campbell Evans, of London.

"On the pumping engines at Arthington Waterworks, near Leeds," by Mr. Filliter, the Leeds borough surveyor.

At the close of the meeting the following objects of interest were exhibited for the inspection of the members:—A steam carriage for common roads, at the works of Messrs. Whitham, Kirkstall Road; Naylor's steam hammer, Kirkstall Forge;† two locomotive engines, with welded boilers, at the Midland Station;

* Engraved by us in Part 135 of the *Practical Mechanic's Journal* for July last.
† Engraved in our Part 136 for July last.

Ayton's safety miner's cage, in a yard opposite the Town Hall; ‡ roof and large bell of the Town Hall; Hattersley's type-composing machine, in the Victoria Hall; and Mr. James's machine for winding up clock weights, in the entrance to the Victoria Hall. The members of the Society proceeded in the afternoon to Arthington to view the waterworks, which belong to the Leeds corporation, and in the evening they dined together at the Scarborough Hotel. On the 8th there was an excursion to Low Moor Ironworks, and to Saltaire, the establishment of Mr. Titus Salt, M.P., which terminated the proceedings in connection with the annual meeting of the Institution of Mechanical Engineers.

NOVEMBER 2, 1859.

AFTER an allusion by the Chairman—Mr. Henry Maudslay—to the recent death of Mr. Stephenson, and the loss thereby sustained by the institution, the following papers were read:—

"On Oates's brick-making machine," by Mr. J. E. Clift, of Birmingham.

"On a new construction of high-pressure steam boiler," by Mr. J. F. Spence.

ASTRONOMICAL SOCIETY.

JULY 8, 1859.

Rev. R. Main, President, in the chair. R. L. J. Ellery, Esq., Superintendent of the Astronomical Observatory, Williamstown, Victoria, was duly elected a Fellow of the Society.

"Places of Donati's comet, from observations made at the Armagh Observatory," by N. M'N. Edmondson, assistant astronomer.

"Results of the observations of small planets, made at the Royal Observatory, Greenwich, in the month of June, 1859," by the Astronomer Royal.

Letter to the President from M. le Comte G. de Pontécoulant, accompanying a memoir containing "Observations on the new terms which Mr. Adams has proposed to introduce into the expression of the coefficient of the secular equation of the moon."

"Sur le réfractions anormales dans les éclipses de soleil et la détermination des longitudes par les éclipses," by M. Liais.

"Note on the triplicity of ν scorpii," by Capt. Jacob.

"Micrometrical measures of the triple star ν scorpii," by Capt. Noble.

"Note on the occultation of saturn, May 8, 1859," by G. F. Pollock, Esq.

Mr. Alvan Clark's new micrometer for measuring large distances.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

NOVEMBER 1, 1859.

MR. JOULE, the chairman, stated that he had received a letter from Professor Thomson, explaining that, although he had mentioned five per cent. of loss per minute as a perfection of insulation easily attained in his apparatus, he found that by carefully selecting the glass stems, and having the atmosphere in which they are placed well dried by sulphuric acid, the loss by imperfect insulation of the testing conductor might readily be diminished to five per cent. per hour. He had found also that the Leyden phial, to the inside coating of which the index was connected, did not lose as much as one per cent. per day, even when the instrument was exposed to sea spray in a boat, to rain, and to fog, besides experiencing great changes of temperature.

"On experiments on the strength of cast-iron girders," by Mr. James G. Lynde.

The beams experimented on were eighty-nine in number, and were cast by Mr. Mahon, at the Ardwick Iron Works, Manchester, from iron of the following descriptions:—

One charge of the cupola consisted of

12 cwt. Goldendale, Staffordshire.
12 „ Lane End, „
12 „ Ormesby, Yorkshire.
12 „ Blair, Scotch.
12 „ Calder, „
All No. 3 hot blast iron.
12 „ scrap.

The beams were cast on their sides, and were a very good sample of workmanship.

The section of each beam was of the form recommended by Professor Hodgkinson, and upon which his formulæ were based; the total depth of the beam in the centre was $24\frac{1}{4}$ inches, and at the ends 20 inches; the bottom flange was 15 inches wide, and $2\frac{1}{4}$ inches thick; the vertical part of the beam was $1\frac{1}{2}$ inch thick; and the top flange was $4\frac{1}{2}$ inches wide, and $1\frac{1}{2}$ inch thick; the total length of the beam was 34 feet 6 inches, and the distance between the supports was 30 feet 9 inches; the weight of the beam was 3 tons 8 cwt. 1 qr. One of the beams was tested up to the breaking weight with the following results:—

With a load in the centre of	31 tons	8 cwt.	the deflection was	·87 inch.
„ „	42 „	16 „	„	2·00 „
„ „	46 „	12 „	„	2·25 „
„ „	50 „	8 „	„	2·56 „
„ „	54 „	4 „	„	2·70 „
„ „	58 „	0 „	the beam broke, the ends springing	

back from each other 2 feet 3 inches, the fracture indicating a good sound casting.

There was no permanent set observable in any of the experiments, until the breaking weight was applied, the beam being allowed to recover itself on the removal of the load in each case. Each of the remaining beams was tested with a load of 20 tons in the centre, the deflection varying from $\frac{5}{8}$ths to $\frac{7}{8}$ths of an inch.

‡ Engraved in our Part 129 for December last.

The calculations for the strength were based on the following formulæ, given by Professor Hodgkinson in his "Experimental Researches on the Strength and Properties of Cast-Iron":—

First formula, art. 146:

Let W = the breaking weight in tons placed on the centre of the beam,
a = the area of the bottom flange in inches,
d = the total depth of the beam in inches,
l = the length between the supports in feet,

then $W = \frac{2 \cdot 166\, a\, d}{l}$

In this case

$$a = 36,\quad d = 24 \cdot 25,\quad l = 50 \cdot 75,$$

which gives 60·09 tons as the breaking weight of the beam.

The second formula, art. 147, takes into account the thickness of the vertical part of the beam, and is as follows:—

Let W = the breaking weight in tons placed on the centre of the beam,
l = the length between the supports in feet,
b = the breadth of the bottom flange in inches,
b' = the thickness of the vertical part in inches,
d = the whole depth in inches,
d' = the depth from the top of the beam to the upper side of the bottom flange in inches

then $W = \frac{2}{3\, d\, l}\left(bd^3 - (b-b')d'^3\right)$

In this case

$$l = 30 \cdot 75,\quad b = 15,\quad b' = 1 \cdot 5,\quad d = 24 \cdot 25,\quad d' = 22 \cdot 03,$$

which gives 62·19 tons as the breaking weight of the beam.

The actual breaking weight being 58 tons, it would appear that the constant co-efficient assumed is in each instance too high for the quality of iron of which these beams were cast. This result appears to have been anticipated by Professor Hodgkinson in the case of large beams; and in one of his experiments, art. 147, on a beam cast for Messrs. Marshall and Co., of Leeds, he gives ·625 as the co-efficient, which agrees with the result of this experiment. Applying this co-efficient to Professor Hodgkinson's formulæ, they will be as follows:—

First formula, $W = \frac{2 \cdot 05\, a\, d}{l}$

Second formula, $W = \frac{\cdot 625}{d\, l}\left(bd^3 - (b-b')d'^3\right)$

The first of these would give 58·2 tons, and the second 58·31 tons as the breaking weight; either of which calculations would be sufficiently correct for any practical purpose.

MATHEMATICAL AND PHYSICAL SECTION.

October 13, 1859.

"On the phenomena of groups of solar spots," by Mr. Baxendell.

Mr. Heelis produced, for the inspection of the members, a copy of the "Selenographia" of Hevelius, including his observations upon the solar spots.

Messrs. Sidebotham and Heelis also stated that the conclusions drawn by Mr. Baxendell were partly confirmed by their own observations.

"On the relation which appears to subsist between orbit *distances* and orbit *inclinations*, when the latter are referred to the solar equator as a fundamental plane," by Mr. Thomas Carrick.

Taking orbits of each kind in groups successively receding from the sun, there is, with the exception of the planetoids, a progressive increase in the mean inclination of each group, as under:—

PLANETS.	Inclination.
4 minor planets, ...	4°·89
50 planetoids, ...	9°·60
4 major planets, ...	5°·76
COMETS.	
11 comets with periods under 6 years, ...	10°·28
2 „ „ from 6 to 16 years, ...	39°·52
13 „ „ from 16 to 1000 years, ...	47°·35
175 „ with still longer or undetermined periods, ...	50°·65

BIRMINGHAM PHOTOGRAPHIC SOCIETY.

SEPTEMBER 27, 1859.

"On the application of photography to art and art purposes, but more especially to painting," by Mr. J. T. Brown.

MONTHLY NOTES.

MARINE MEMORANDA.

At the last meeting of the Royal National Life-Boat Institution—rewards amounting to £42 10s. were voted to the crews of the institution's life-boats stationed at Filey, Rhyl, Berwick, Aberdovy, and Tenby, for saving a large number of lives during the recent terrific storms on the coast. The life-boats of the society stationed at Lowestoft, Pakefield, Yarmouth, and Appledore, had also rescued many shipwrecked crews, but the reports of these services had not as yet reached the institution. The gold medal (and £5) of the institution were ordered to be presented to Joseph Rogers, a man of colour, who, when the *Royal Charter* was thrown broadside on the Anglesea coast, had bravely volunteered to battle with the boiling surf and convey a line to the shore. By this means several persons were rescued from the watery grave which closed upon 450 others. Rewards amounting to £35 were also voted to various crews of boats for their courageous conduct in rescuing shipwrecked crews on different parts of the coast during the recent boisterous weather. It was reported that nearly 1000 lives had perished from 400 wrecks on our coast during the recent fearful hurricanes. It was also reported that a lady, resident in Staffordshire, had munificently presented to the Life-Boat Institution the cost of two life-boats, and that a city merchant had also given the like substantial proof of his desire to succour, in the hour of distress, sailors who might be shipwrecked on the Scotch coast. A benevolent military officer offered to give £50, if other gentlemen would contribute the like amount, towards the establishment of a life-boat station. A report was read by the inspector of life-boats to the society on his recent inspection of its life-boats on the north coast of England and in Scotland, and payments amounting to upwards of £1040 were made for various life-boats and their appurtenances.

"Amicus," a well known energetic Manchester man of the true forward school, draws our attention to the all-important part which iron plays in ship building and ship sailing affairs, "It would seem to commend itself to the common sense of every man that, in building an iron sailing or steam ship, which is to be subjected to all the strains and buffetings of tempest tossed seas, which will be freighted with hundreds of human beings and the most precious cargoes, and which must run the risk of collisions and strandings, none other than the very best and strongest materials should be employed. The toughest iron, the best seasoned spars, and the stoutest planks and ropes should alone find places in such a venture. But in our ordinary every-day practice is this the case? Is not any kind of iron thought good enough to build a ship with? What is the meaning of "boat plates" being the lowest priced in any ironmaker's list? If we pay £25 or £30 a ton for the plates of which a locomotive boiler is made, why should we give only £8 10s. or £9 per ton for those of which a ship is built? If safety can only be bought at the high price in the one case, are we not courting disaster with the low price in the other? Who will draw the fine line of distinction in moral responsibility between the directors of a railway company who should take your fare, place you in a comfortable first-class carriage, and drive you at 40 miles an hour over a viaduct which was miserably insecure, and the owners of vessels who send passengers to sea in ships sheathed with plates which are as brittle as glass? The only answer to this question in the way of excuse is, I fear, that most men are really and truly ignorant of the facts. In the eyes of the merchant in London or Liverpool who orders the building of a ship, iron is iron. He probably does not know that in this material there are as many shades of quality as there are in the wines or fruits which all bear one common name, and yet I am within the mark when I say that he might, by paying £2 or £3 per ton increased price upon the plates forming the outward sheathing of his ship, immensely increase the vessel's strength and duration." Now, we have here a well merited, and well directed rebuke—on a matter about which, few men of mark apparently dare to speak. The writer is a man who has been familiar with iron, and iron working and structures all his days; and we hope that his remarks will be inwardly digested by all whom the quality of the iron in an ocean going ship directly concerns, as well as those indirectly concerned —the whole human race. Any one knows that if a ship of 1,000 tons, with an expensive outfit, is contracted for at £13 or £14 a ton—a common rate—neither the work nor the material can be what they ought to be. We are under deep obligations to "Amicus" for his open promulgation of what—*sub rosa*—is well enough known; but we must take an objection to his signalling out the Clyde and the Tyne as localities where disreputable iron ship building is carried on. Locality has nothing to do with the matter. Steamship companies usually prepare their own specifications. And as they too often take cheapness as the test for the builders to be employed—even when prices descend far below what they well know they ought to be—on the companies must we lay the blame of using inferior materials, worked in an inferior way by inferior hands. We certainly shall not single out the Clyde and the Tyne as being the only places where honest plates and honest workmanship are used; but we do say that if we single out any precise places where iron ships are built, we should come across a great many—the sins of which are far more serious than those of the two named.

Messrs. Napier are now well on with their order for twelve pairs of 80-horse power engines for gunboats, to be ready by the end of the current year. They are likewise commissioned to make six pairs of engines of 200-horse power for sloops of war, as well as two pairs of frigates, of 500-horse power each. While thus active in preparing vessels and engines for war purposes, the Messrs. Napier have also on hand two screw steamers for Messrs. Burns and M'Iver, to be employed in the New York service. They are also finishing a large steamer for the Russian government, of about 1,200 tons.

Mr. J. F. Ure, the engineer to the River Tyne Commission, and formerly engineer to the River Clyde Trustees, has now in hand some very important works in the Tyne. He proposes to bring a deep channel right up to the Northumberland and Tyne dock entrances, sufficient for vessels of the largest size. The works required to carry out these views would be to form a channel of about fifteen or sixteen feet deep at low water spring tides on the entrance, and continue it up to the docks, removing the inland and middle ground, and otherwise strengthening the navigable channel, which improvements would be continued upwards as expeditiously as practicable. The mode proposed to accomplish the general deepening of the river is by the application of dredging machinery, named in the first part of this report, in combination with the existing machinery for the river. The proposed dredging machine is 250 feet long, with four rows of buckets, driven by an engine of 80 horse power, and the dredgings are proposed to be carried to their deposit at sea by three screw hopper barges, each 155 feet long, 30 feet beam, driven by engines of 60 horse power, and are expected to carry in rough weather 400 to 500 tons, and in fine weather 700 to 800 tons each trip. The capital cost of this machinery is estimated at £40,000; the total working expenses, inclusive of interest and depreciation, about £8000 per annum; and the quantity of work performed in such period about 700,000 to 800,000 tons, equal to 600,000 cubic yards. Such a system of improvement must obviously immensely improve the great Newcastle river and harbours.

Messrs. J. and G. Thomson, of Glasgow, have just completed the *Rangatira*, of 720 tons, and 130 horse-power, for the Australasian Steam Navigation Company, being the fourth vessel supplied to this company by the same firm. Her sea speed was thirteen miles an hour. The company has worked various steam ship lines on the Australian coasts with great regularity, and the flotilla now consists of twenty ships, with an aggregate tonnage of 7,956 tons, and 2,587 nominal horses power. A slip and engineering works have been erected by the company at Sydney, that the line can now be kept in the highest state of efficiency. It has now been decided by the company to extend their line of operations to the colony of South Australia, in connection with their powerful steamers running between Sydney and Melbourne, and for this extension the *Rangatira* in intended.

Few notes about the *Great Eastern* afford a better idea of the size of this monster of the deep, than a statement of the anchors, blocks, chains, pendants, and bridles, which now form her moorings in Southampton water. The north arm of the moorings consists of an anchor of 95 cwt. laid up the river; to this are attached 60 fathoms of chain—viz., 10 fathoms of 60 cwt., 10 fathoms of 45 cwt., and 40 fathoms weighing 160 cwt., giving a total weight to the north arm of 18 tons. The south arm, with the anchor laid down the river, is the counterpart of the north arm in every respect. The east and west arms of the moorings consist of two blocks of 7 tons each, laid across the river. To each of these are attached 10 fathoms of chain of 50 cwt., 10 fathoms of chain of 45 cwt., and 40 fathoms of 160 cwt., giving a total weight to the east and west arms each of 19 tons 5 cwt. The four arms are connected by an immense shackle, weighing 20 cwt. 26 lb., which has been tested with a strain of 108 tons. From the shackle extend two pendants, seven fathoms each in length, the links of which are 3½ in. diameter iron. To the pendants are attached the two bridle chains of six fathoms each, the links of which are 1 in. in diameter. The total weight of the moorings, exclusive of the pendants and bridle chains, are about 78 tons.

The working account of the Royal Mail Steam Packet Company, for the half-year ending the 30th of June last, showed that £382,802 had been received, including £134,996 from the Government contract, and £250,220 expended, leaving a surplus of £132,582. The repair and renewal fund showed a balance to be provided for of £20,593, and the general reserve fund a balance of £33,520 to be provided for. The insurance account showed a balance in favour of the company of £224,380, subject to loss of the *Paramatta*. The loss of this splendid vessel, on her first outward voyage, has of course been a sadly mortifying blow to the concern. The company's fleet consists of twenty-four ships, of an aggregate tonnage of 45,211 tons, and 11,730 horse-power; in addition to which the *Seine* (iron), of 3,092 tons, builder's measurement, and and 800 horse-power, is now building.

The *Royal Charter*, lately lost under such deplorable circumstances, on the Anglesea coast, was an auxiliary screw steamship belonging to the Black Ball and Eagle line of Australian packets. She was built at Sandycroft, on the Dee, in the latter end of 1855, by Mr. Patterson, the builder of the *Great Britain*. Her length over all was 320 feet, breadth of beam 41 feet 6 inches, and depth of hold 26 feet 6 inches. Her burthen was 3000 tons. She was a full-rigged ship, with double yards on fore and main masts, and could spread the extraordinary quantity of 15,000 yards of canvass. Her engines were of 200 horse-power, and were constructed by Messrs. Penn and Son, of Greenwich. The vessel was magnificently fitted up, and had accommodation for nearly 600 passengers, besides a crew of about 80. It will be remembered that the late lamented Dr. Scoresby sailed in this unfortunate ship on her first trip to Australia, for the purpose of testing the effects of iron vessels upon the compass.

It has long been known that the Cunard Company had in view the building of a large iron ocean going steamer for the Atlantic line, to be larger than anything afloat, with the single exception, of course, of the *Great Eastern*. The building of this vessel has now been decided upon, and Messrs. Napier have taken the contract for her. She is to be a paddle ship of 4,000 tons, or 500 tons larger than the *Persia*, and is to be named the *Scotia*. She is to be built to beat everything afloat, and she will no doubt distance a long way the *Great Eastern*, so long looked upon, before she was tried however, as the great "flie away" of the seas.

Mr. Laird, of Birkenhead, has just completed a vessel for a company formed under the auspices of the Baron de Mana, of Rio Janeiro, for the navigation of the river Amazon. This vessel is named the *Manàos*, she is 225 feet long and 25 feet beam. Her tonnage, old measure, is 681, and she is intended to combine great carrying capacity with speed. She is arranged something on the plan of the American river boats, the decks being carried out to the extreme width of the paddleboxes, and the whole of the accommodation for first and second class passengers is in large deck houses, leaving the holds entirely free for cargo and coals. Her engines, also constructed by Mr. Laird, are of 180 horse power nominal, but worked on the trial to between 950 and 1,000 indicated horse power. The paddle-wheels are on the feathering plan, and the boilers are fitted with superheating apparatus and other modern improvements. In order to test this vessel's capabilities for speed and seagoing qualities, she was despatched from Liverpool to Beaumaris, and made the passage from the Rock Light (a distance of 48 statute miles) in three hours, giving an average speed of 16 miles per hour. She returned from Beaumaris to Liverpool in 2 hours 50 minutes, being an average speed of 17 miles an hour. The *Manàos* was partially loaded, and had on board two large iron barges shipped in pieces, to be riveted together on arrival at Para, besides a considerable quantity of coal. The distance between Liverpool and Beaumaris has never been accomplished in so short a time before. The vessel and machinery have been constructed, and the above trial of speed made, under the superintendence of Commodore Hoffsmith, a distinguished officer of the Brazilian navy, who was sent over by the company for that purpose, and also to superintend another vessel now being constructed by Mr. Laird for the same owners.

The Messageries Impériales has obtained the concession of the Brazil line, and have just launched their first steamer, which has been built at La Flotât, near Marseilles, and is of 3,055 tons burthen, and 460 horse power.

The Great Ship Canal, from Amsterdam to the sea, is about to be commenced by the Dutch Government. A new line of steamers to ply between St. Petersburg and Antwerp has been authorised.

The Liverpool docks now cover an extent of 240 acres of water area, and they have 15 lineal miles of quay space. When the Birkenhead docks are finished, they will have water area of 170 acres, with a quay length of 9 miles. They cost £3,000,000. The Liverpool docks represent an investment of capital of £7,000,000. Whilst other steamers have kept in port, the Dover mail packets have kept regularly to their work during the late dreadful gales. Captain Smithett may well be proud of having safely bid defiance to the elements in such weather as we have lately experienced.

Royal National Life-Boat Institution.—This admirable association has at length found a home for one of its out-lying branches in Glasgow. Hitherto that great commercial city has not lent any directly helping hand; but now—thanks to Mr. Andrew A. Ranken—a meeting has been held for the purpose of inducing Scottish merchants, and the Scottish public generally, to look into the matter.

The meeting, which was held on the 21st instant, in the offices of Messrs. G. & J. Burns, the eminent steam ship owners, so largely connected with the Cunard steam line, attracted the attention of many of the leading gentlemen of Glasgow. Mr. George Burns was called to the chair. After a preliminary statement by Mr. Ranken,

Captain Crawford, seconded by Mr. D. Macbrayne, moved the first resolution, which was cordially agreed to, to the effect that the Royal National Life-Boat Institution is a most praiseworthy one, and deserves the hearty support of the nation at large.

Mr. John Innes Wright, seconded by Mr. Cunningham Smith, moved the second resolution, to the effect that, although Glasgow, from its inland position, does not require to support a local life-boat, it ought nevertheless to support liberally an institution supplying and managing life-boats on various parts of the coast, and which may, while performing good service in the cause of humanity, be the means of annually saving many Glasgow citizens from shipwreck.

The resolution was unanimously agreed to.

The third resolution, moved by Mr. James Crum, seconded by Mr. Johnson, and agreed to, was to the effect that those present should form themselves into a committee, with power to add to their number, with the view of giving the National Life-Boat Institution as much support as possible.

Mr. John Burns, seconded by Mr. Crum Ewing, jun., moved that Mr. Ranken be appointed secretary, and Captain Small, treasurer to the commitee, which was heartily agreed to.

A vote of thanks to Mr. Ranken for having originated the meeting, and to Mr. Burns for his conduct in the chair, terminated the proceedings.

Manufacture of Artificial Chlorates and Nitrates.—Messrs. Drouet and Lecocq have discovered a process for making certain salts capable of being substituted for the chlorates and nitrates used in the industrial arts; the chlorates being advantageously employed in dyeing, and in the manufacture of matches, and the nitrates of potash being more particularly brought into use to replace saltpetre in the manufacture of gunpowder. In producing these artificial salts, a solution of common marine salt (chloride of sodium) is first formed, of a strength of about 22 deg. to 25 deg. Baumè; after having been filtered it is to be saturated with ammonia to a sufficient extent to turn Litmus paper, which has been reddened by a strong acid, blue. A current of oxygen gas is then directed into the solution, until no more oxygen can be absorbed, when the solution is evaporated over a slow fire until the salt begins to deposit, after which it is allowed to cool and crystalise, the crystals being washed more or less frequently according to the purity desired. These crystals, in most cases, may be employed in lieu of the chlorate or nitrates. If it is desired to impart to this product a still further degree of oxygenation, a solution of chloride of sodium is first prepared saturated with ammonia, as above stated, and nitric acid added thereto, sufficient to completely neutralise the ammonia—this will raise the temperature and cause a disengagement of caloric—and where the current of oxygen is passed through it, the solution will absorb a greater quantity and become coloured. By subsequently submitting the salts to a washing process, a salt is obtained, identical in every respect in its chemical effects with the chlorates in general, and particularly with the chlorate of potash. In carrying out the manufacture on a larger scale, the apparatus ordinarily employed in the production of saturated solutions may be used, with an apparatus for producing oxygen of a size proportionate to the amount to be produced, communicating with a series of vessels similar to Woulf's apparatus. For the purifying and washing process, the apparatus employed in the refining of saltpetre may be used.

Williams & Fuller's Multi-Sided Screw Cutting Stocks and Dies.—In these stocks and dies, which are made by Mr. J. H. Fuller, of 70 Hatton Garden, London, the improvement chiefly consists in the use of two square dies, with a cutting surface on each edge or face; so that by shifting the dies round as required, four different sizes of screws can be cut as perfectly as one, no matter how they may vary in the pitch of thread. Our first sketch shows a die stock in plan, and indicates how, by simply setting round the dies, the necessary change is obtained. Our second view shows another form of stock for obtaining variable screwing sizes. The stock is in one piece, dispensing with the

Fig. 1.

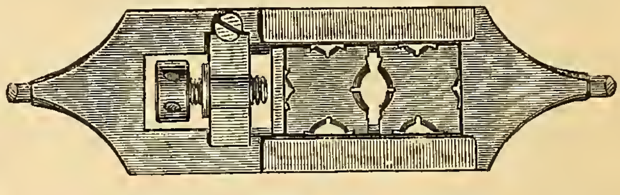
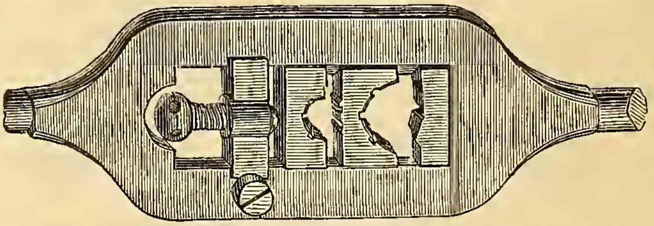
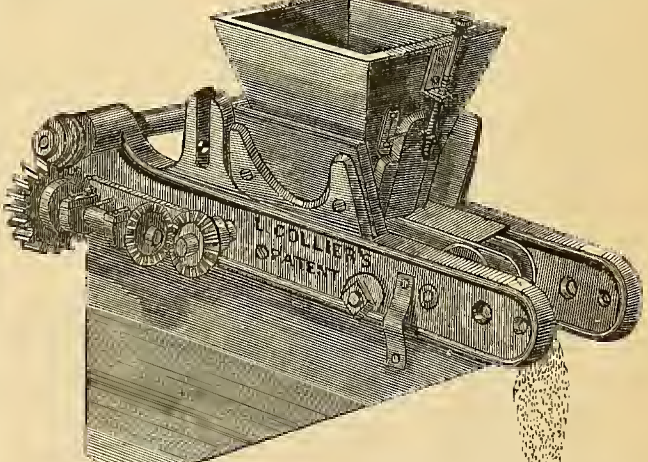


Fig. 2.



the screw handles, and being at the same time the most convenient for use. The loose dies of ordinary stocks sustain more damage by lying about when out of use, than by actual screwing wear. They are, besides, often mislaid, so that they are not to be found when most wanted. There, however, all the dies are always there in the stock. A further advantage is found in the saving of time. The change of position required to cut another size than that last used, is effected almost instantaneously. A lid or cover is drawn off like the lid of a domino box, the dies turned out on to the hand, replaced in the required position, and the lid slid on again, an operation performed in less than a fifth of the time ordinarily occupied.

Endless Band Feed for Grinding Mills.—Our engraving represents in perspective, an ordinary grinding mill, as fitted with a very simple and effective feeder, lately invented by Mr. L. Collier, of the Wellington Works, River Street, Rochdale. The feeding apparatus consists of nothing more than an endless cloth or band passing over rollers carried by the framing, and running through the bottom of the supplying hopper. As the band passes through during the working of the mill, it carries with it a layer of the material to be ground—the thickness of such layer being determined by the vertically sliding door in front,



actuated by a hand screw. It is so fixed that the front roller stands over the the centre of the grinding parts, and as the cloth moves on, it drops the material to be ground into the eye of the mill with great regularity, and in whatever quantity it may be adjusted for. It thus prevents that greatest of evils—choking. The belt or feed cloth is driven off the main shaft by a worm and wheel and pair of bevil pinions, as shown upon the front of the figure. The arrangement answers for all classes of grinding mills, but, in particular, for grinding lump sugar and drugs.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When city or town is not mentioned, London is to be understood.

Recorded August 6.

1813. Alexander S. Stocker and George J. Farmer, Birmingham, Warwickshire—Certain improvements appertaining to articles to be affixed to boots and shoes, and to the feet of animals, and in machinery and means to be employed for producing the same.

Recorded August 9.

1842. Frederic L. Lawrence, 50 Berner's Street, Oxford Street—Improvements in colouring and hardening elastic gums for dental purposes.

Recorded September 12.

2074. Henry W. Ripley, Bradford, Yorkshire—Improvements in finishing dyed piece goods.

Recorded September 14.

2090. Salomon Hecht, 36 Gresham Street—A new mode of advertising.

Recorded September 15.

2099. John Robinson, Sutton, near Hull—An improved agricultural implement.
2100. Joseph Addenbrooke—An apparatus for wrapping, folding, or packing up goods or parcels.
2101. Julien Briere, Brussels, Belgium—Improvements in railway brakes.
2102. Joseph T. Wood, Strand, Westminster—Improvements in printing and embossing dies.
2103. Henry Winter, Albion Place, Hackney—A machine or apparatus for lifting and weighing loaded sacks, and also merchandize.
2104. John P. Clarke, King Street Mills, Leicester—Improvements in the manufacture of spools or reels for the winding on of cotton, linen, thread, silk, or other fibrous materials.

Recorded September 16.

2105. John W. Hadwin, Kebroyd Mills, Halifax, West Riding, Yorkshire—An improvement or improvements in apparatus or machinery used for drawing fibrous substances or materials in any of the processes or machines for preparing to be spun, or for spinning the same.
2106. James Bottomley, and Alexander H. Martin, North Bierley, Bradford, Yorkshire—Improvements in means or apparatus employed in weaving.
2107. Nathaniel Heckford, Forest Gate, Essex—A method of purifying the Thames and other rivers, and of treating night soil.
2108. Bernard Lauth, Manchester—Improvements in the manufacture of rails for railways.
2109. William E. Newton, 66 Chancery Lane—Improvements in machinery for forming hat bodies.—(Communication from H. A. Burr, New York.)
2111. Henry Jackson, Oak Works, Oak Lane, Limehouse—Improvements in fire bars.
2112. Joseph Beck, Colman Street—Improvements in stereoscopes.

Recorded September 17.

2113. Joze Luis, 1B Welbeck Street, Cavendish Square—A new brick and tile making machine.—(Communication from Alexis Maigne, Paris.)
2114. Joze Luis, 1B Welbeck Street, Cavendish Square—Improvements in mechanical hammers.—(Communication from Jean Schmerber, Haut Rhin, France.)
2115. Joze Luis, 1B Welbeck Street, Cavendish Square—Further improvements in brakes for railway carriages.—(Communication from Laurent Rigolier, Rhone, France.)
2116. Joze Luis, 1B Welbeck Street, Cavendish Square—An automaton bell for the prevention of collisions at sea.—(Communication from Gallois Foucault, St. Martin, France.)
2117. Joze Luis, 1B Welbeck Street, Cavendish Square—A slip bridal for stopping runaway horses.—(Communication from Cesar B. Bouchot, Paris.)
2118. Joze Luis, 1B Welbeck Street, Cavendish Square—Improvemente in cooling apparatus for liquids, especially beer.—(Communication from Jean L. Baudelot, Paris.)
2119. Joze Luis, 1B Welbeck Street, Cavendish Square—An improved disc and lantern signal with double repeaters.—(Communication from Jules Rousseau, Paris.)
2120. John J. Kerr, Twickenham—Improvements in the manufacture of cartridges containing shot.
2121. Samuel N. Bodier, Prospect Cottage, Strand-on-the-Green, Chiswick—Improvements in the regulation of gas burners, which he calls "Rodier's regulating gas valve."
2122. Thomas Elliott, Manchester—Improvements in lubricators, especially applicable to steam engines.
2123. Abraham J. Norman, Gore Lodge, Turnham Green, Chiswick—Paving roads and surfaces.

Recorded September 19.

2124. Edward H. Taylor, Saltney, Chester—Improvements in the mode of securing the bolts in fish joints and other fastenings for rails on railways.
2125. Frederick N. Gisborne, 3 Adelaide Place—Paying out submarine telegraphic cables.
2126. John Hawkins, Lisle Street, and Charles Hawkins, Walsall—Improvements in fly presses to be worked by steam, water, or other power.
2127. William Robertson and John Tweedale, Johnstone, Renfrewshire—Improvements in hydrostatic jacks or lifting apparatus.—(Communication from John Robertson, Brooklyn, New York, U. S.)
2128. Robert M'Call, Dublin—Improvements in obtaining precipitates of copper, parts of which improvements are applicable to the production of yellow ochre.
2129. James Wright, 42 Bridge Street, Blackfriars—Improvements in the construction of carriages, coaches, omnibuses, and other such like conveyances.—(Communication from Rene Sauvage, De St. Marc, Lyons, France.)
2130. Thomas C. Eastwood, Bradford, Yorkshire—Improvements in means or apparatus for preparing and combining wool, cotton, and other fibres.
2131. Peter Fairbairn, Leeds, Yorkshire—Improved machinery for finishing the teeth of spur and other gearing.
2133. Richard A. Brooman, 166 Fleet Street—Improvements in elevators or lifts, for hotels, warehouses, and other structures.—(Communication from Otis Tufts, Boston, U. S.)
2134. William Clar, 53 Chancery Lane—Certain improvements in electro-magnetic telegraphs.—(Communication from Leverett Bradley, Folsom City, Sacramento, California.)
2135. Louis Engler and Ernest F. Krauss, 29 Boulevart St. Martin, Paris—A new or improved system of insulators for electric wires.
2136. John Court, Brompton Row—Improvements applicable to gas and other lamps and lights, and also gas stoves for effecting more complete combustion therein.

Recorded September 20.

2137. Alexandre Mandré, 10 Rathbone Place, Oxford Street—The manufacture of a colouring matter for colouring spirits, beers, vinegar, and other liquids and beverages.
2139. William Weild, Manchester—Improvements in fluted rollers, used in machines for preparing, spinning, and doubling cotton, wool, flax, silk, and other fibrous materials, and in the manufacture of such rollers.
2140. William M'Ilwraith, Glasgow—Improvements in weaving.
2141. John Beads, Pendleton, near Manchester—Improvements in machinery or apparatus for spinning cotton, wool, or other fibrous substances, part of which improvements is applicable to other purposes.
2142. Andrew Lamb, Southampton, Hants—An improved method for heating feed water for boilers.
2143. William E. Newton, 66 Chancery Lane—Improvements in projectiles.—(Communication from A. B. Stoughton, Washington, U. S.)
2145. Edward Collier, Myddleton Street, Clerkenwell—Improvements in ear dilators.

Recorded September 21.

2147. Henry Corless, West Derby, Lancashire—Improvements in apparatus for washing, wringing, and mangling.
2148. Henry A. Jowett, Sawley, Derbyshire—Improvements in breaks for railway and other carriages, with means of communication between guard or conductor and driver.
2149. John Blair, Manchester—Certain improvements in the treatment of yarns during the operation of spinning, which treatment is also applicable in "roving," "slubbing," or "doubling" machines.
2151. William E. Newton, 66 Chancery Lane—An improved mode of and apparatus for condensing the waste steam of marine engines.—(Communication from Messrs. Mazeline and Co., Paris.)
2152. Robert Davidson, London Street—Improvements in the construction of holders for containing liquid or air and other æriform fluids, especially adapted for use in refrigerators.
2153. Joseph Harrison, Glossop, Derbyshire—An improvement in spinning mules, applicable also to the machines called twiners.
2154. Edwin B. Dimock and Julius H. Baker, Ware House Point, Hartford, Connecticut, U. S.—A new and useful improvement in mechanism or apparatus for drying woollen or other cloths.—(Communication from Charles F. Bennett, Hartford, Connecticut, U. S.)

Recorded September 22.

2155. Thomas Field, 5 Rose Gardens, Hammersmith—A new means and system for cleaning, ironing, pressing, and glazing women's stays, corsets, supporting bands, men's jackets, coats, trousers, and waistcoats, chintz, laundry work (that is to say, goods and articles generally washed by laundresses), window blinds, and textile fabrics generally.
2156. Richard B. Mowbray and Thomas Coatman, Manchester—Improvements in machinery or apparatus connected with and applicable to steam boilers and heating apparatus.

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 20th October to 16th November, 1859.

Oct.	20,	4206	William Hewitt, Birmingham—"Connectors for connecting bags to the dash-boards of vehicles."
	21,	4207	Samuel Last, 256 Oxford Street, W.—"Travelling Bag."
	28,	4208	John Muirhead, Gloucester Road, Regent's Park, N.W.—"A Daniell's battery."
Nov.	3,	4209	John Stewart Margetson, Cheapside, E. C.—"Wristband."
	5,	4210	James Medwin, 86 Regent Street, W.—"A rifle club boot."
	7,	4211	George Palmer Evelyn, 8 Onslow Crescent, Brompton, S.W.—"Sword and pouch belt."
	14,	4212	Edwin and Alfred Ludlow, Birmingham—"Reversible cartridge carrier or box."
	16,	4213	S. and T. Carrington, Stockport, Cheshire—"A disc and rim for supporting the "tip," and in lieu of the ordinary crown lining of hats."

TO READERS AND CORRESPONDENTS.

Mauve Dye.—We have already described the basis of the process of preparing this very beautiful colour, in our article, "Colouring Matter from Coal Tar, Guano, and Grass," at page 22, vol. iii., second series *Practical Mechanic's Journal.* At that time the name "mauve" had not been given to this fine purple blue colour; and we do not see how, or why, it acquired such a designation. According to the present practice of preparing the colour, equivalent proportions of sulphate of aniline and bichromate of potash are dissolved in water, mixed together, and allowed to stand for some hours. The mixture is then filtered, and the black precipitate taken off is washed and dried, and afterwards dissolved in coal tar naptha to extract a brown resinous matter, and finally digested with alcohol, to dissolve out the colouring matter which is left behind on distilling off the spirit. The peculiarity of the colour is the fine blending of the red and blue; thus we have both a red mauve and a blue mauve.

Fitzmaurice's Light.—A correspondent is anxious to obtain some particulars of this new light. Can any of our readers tell us anything about it?

J. R.—We wrote per post, but as the address was not full, we cannot answer for its reaching its destination.

Maculæ on the Sun.—A few errors crept into Mr. Walenn's letter of last month on this subject. In the lower enlarged view of a spot, the reference, No. 1, is omitted. For the letter "S" at the apex of the solar orb, read "Z;" Z and N respectively being the initials of zenith and nadir, and the dotted line vertical.

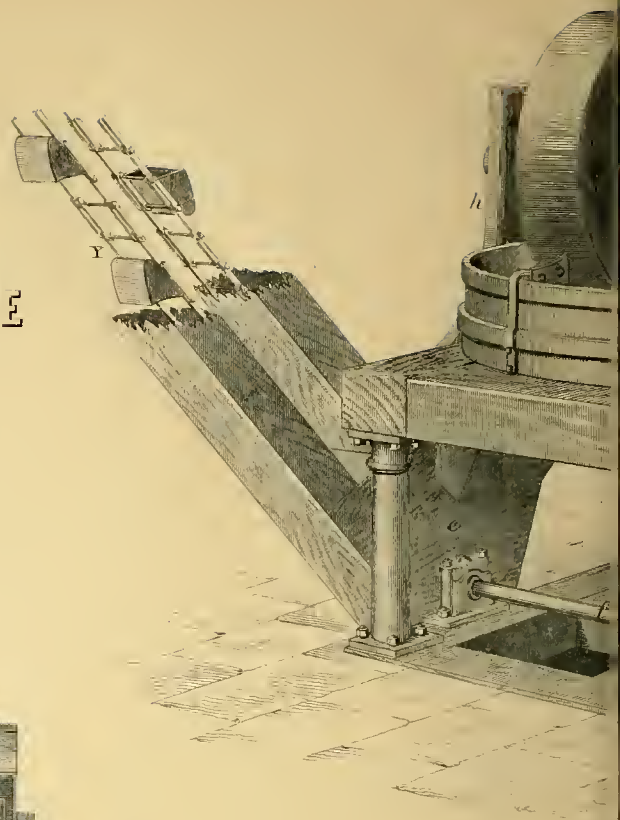
Thew's Draw Spring.—Messrs. Fletcher, Jennings and Co., of the Lowca Engine Works, Whitehaven, requests us to state that the "Draw Spring for Ship's Cables and Towlines," of which an engraving and description appears in our last, (p. 202,) is the invention of Mr. C. H. Thew, of the Whitehaven Junction Railway, who has obtained a protection for it; and that any merit which may attach to its successful performance on board the *Ajax* belongs to him and not to them.

Plate. 250.

DRY CLAY BRICK MAKING MACHINE

MESS[RS] BRADLEY & CRAVEN,

ENGINEERS.



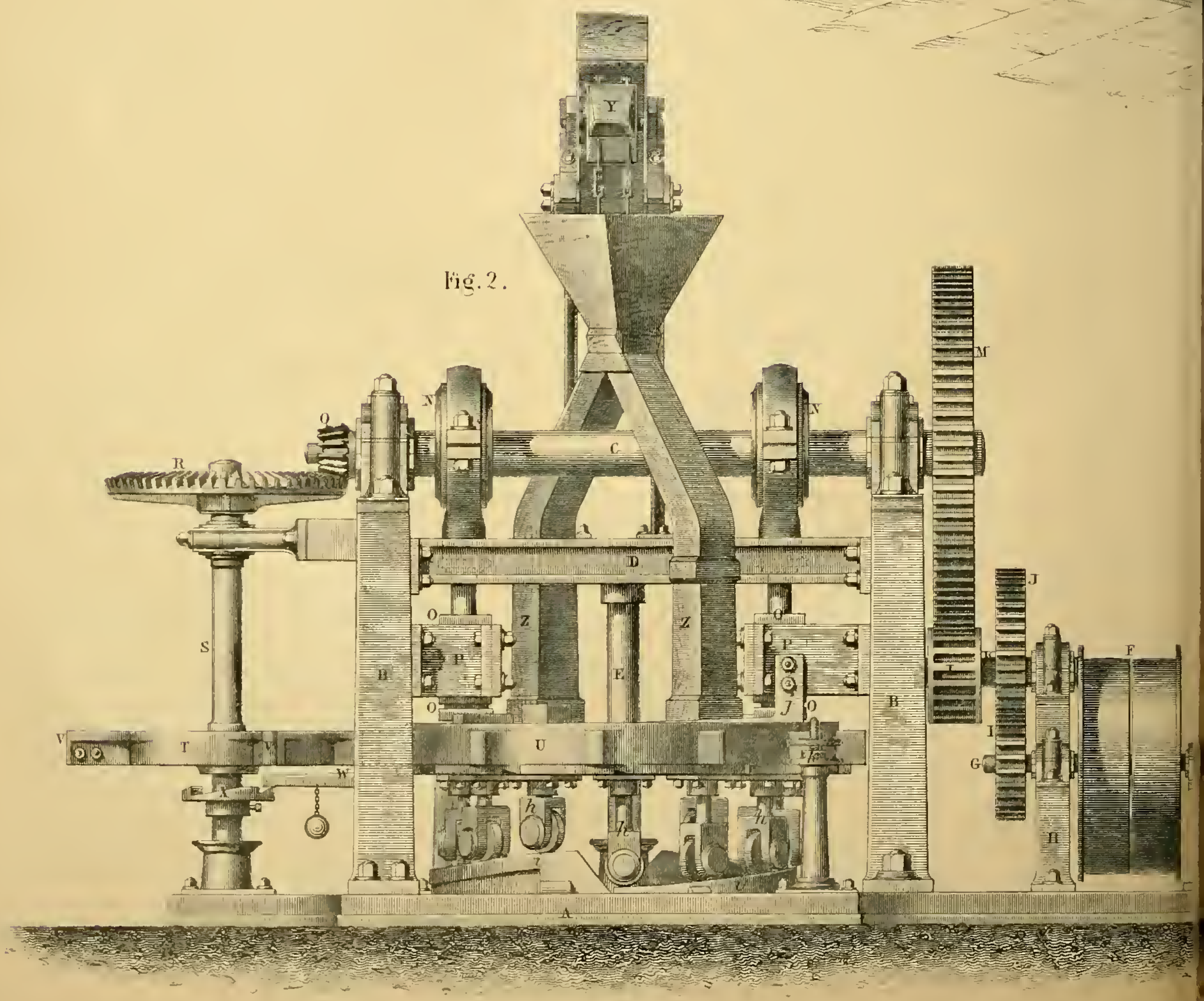


Fig. 2.

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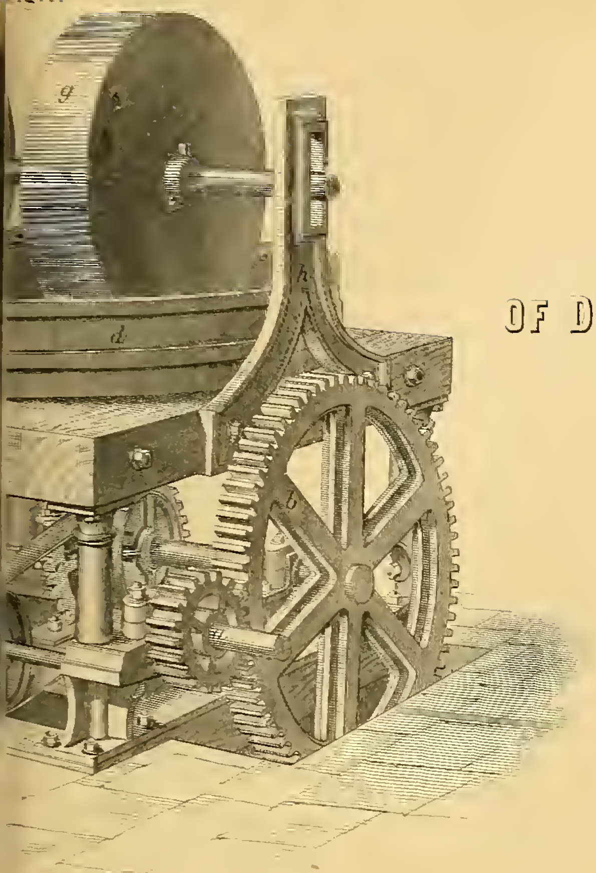
Fig. 1.

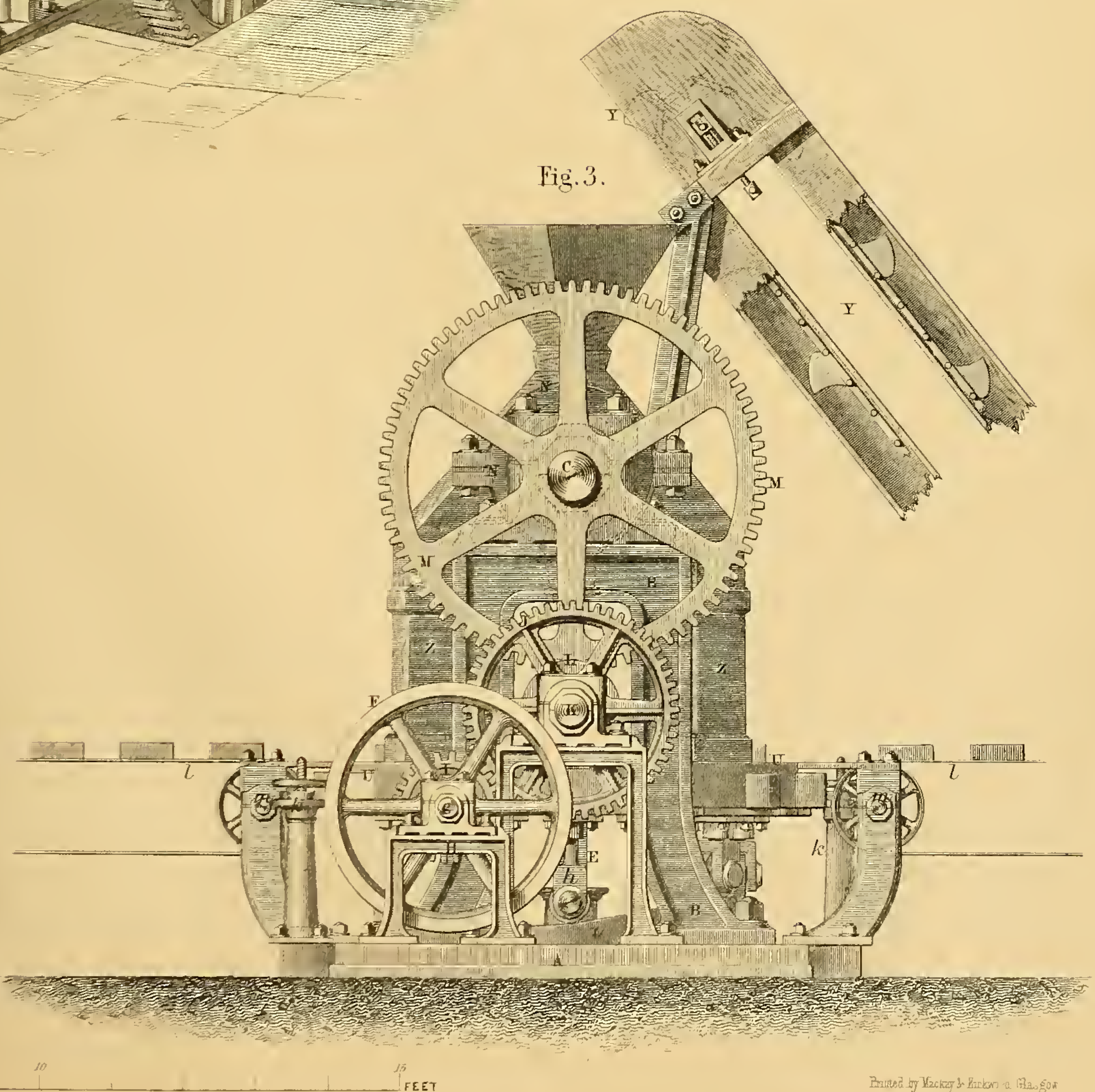


OF DIFFERENTIAL PRESSURE ACTION,

WESTGATE FOUNDRY, WAKEFIELD,

PATENTEES.

Fig. 3.



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DRY CLAY BRICK MAKING MACHINE OF DIFFERENTIAL PRESSURE ACTION,

MESSRS BRADLEY & CRAVEN, WESTGATE FOUNDRY, WAKEFIELD,

ENGINEERS. PATENTEES.

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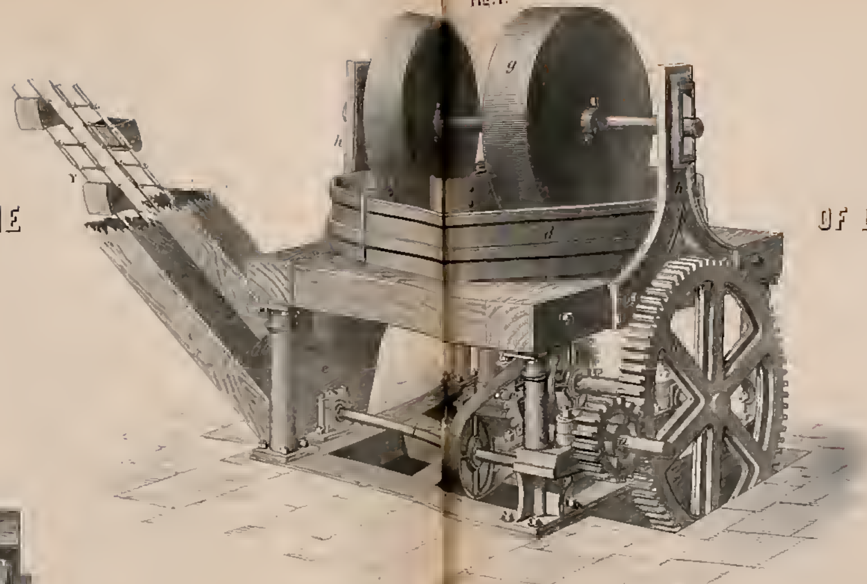

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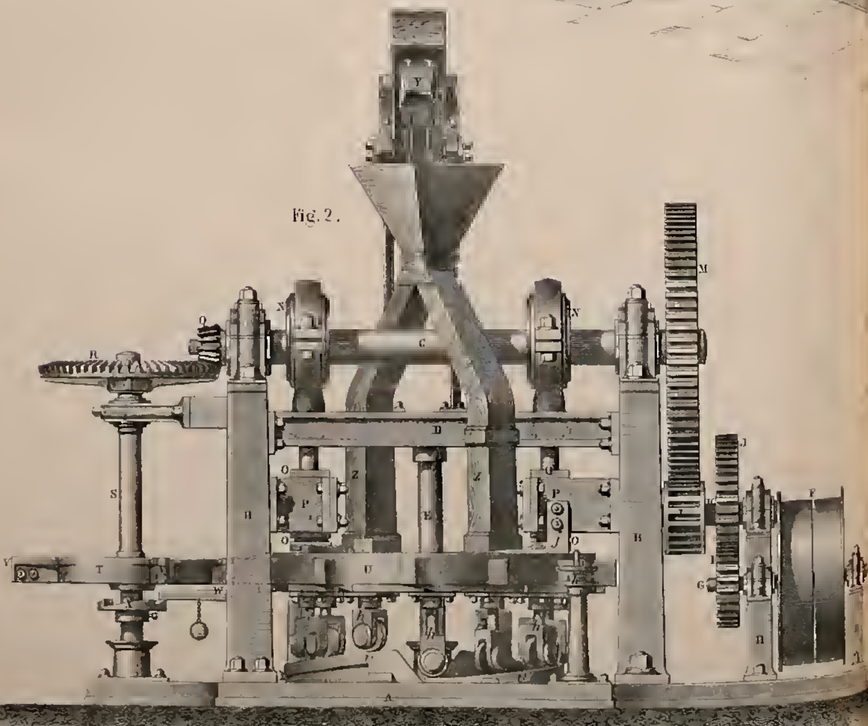

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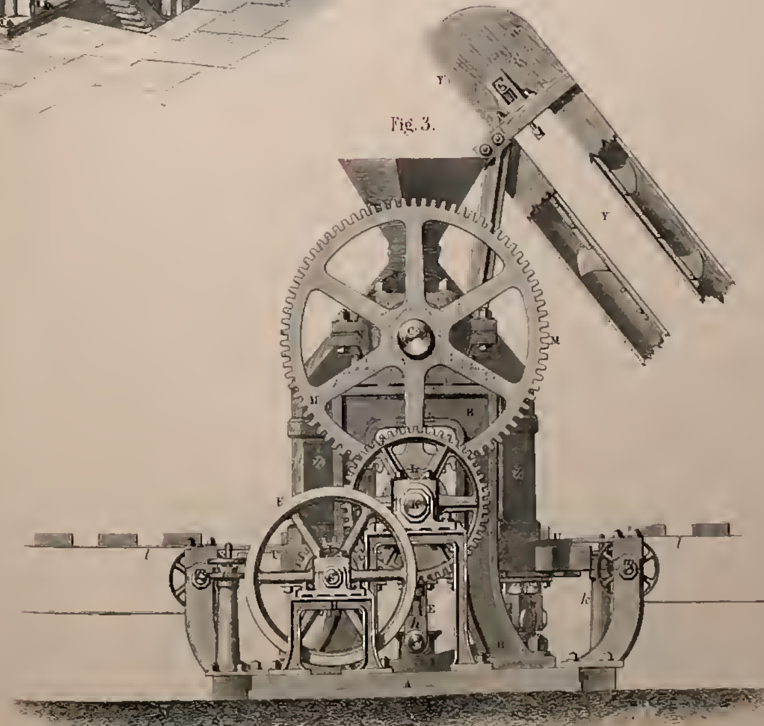


DRY CLAY BRICK-MAKING MACHINE OF DIFFERENTIAL PRESSURE ACTION.

By Messrs. Bradley & Craven, *Engineers, Westgate Foundry, Wakefield.*
(*Illustrated by Plate* 250.)

In the enormous brick manufacture of this country, we have a curious example of a convertive system, peculiarly adapted for treatment by mechanical agencies, hitherto almost wholly neglected by mechanical men. In the manufacture of pins, needles, buttons, steel pens, and other trivial, though importantly necessary, articles, mechanical aids have been drawn upon to a wonderful extent; whilst in the brick trade, involving the continuous production of millions of articles of one form, and that a simple one, machinery is but even now beginning to find its way to employment. With our existing experience and mechanical knowledge, what would be thought of our spinning cotton on single, hand-worked spindles, instead of upon forests of them, combined into that beautiful steam propelled machine, the self-acting mule, which has so wonderfully cheapened the productions of the loom? Yet here we still have bricks made one by one by hand, to a vast extent, and of very inferior quality, and at a high cost.

Recently, it is true, mechanical men have devoted a large share of attention to the conversion of clay into bricks by mechanical means, and at the time we write, such machinery is really making most important strides; but very much has to be done to bring up the manufacture to its true mechanical level. Few men have done so much to further this great end as Mr. Humphrey Chamberlain, formerly of Kempsey, near Worcester, but now of Sandford Works, Wareham, Dorset. That gentleman has spared no trouble, either in inventing himself or seeking out the best inventions of others, for the practical development of brick-making machines; and he is now busy introducing the dry clay brick-making machine, recently patented by Messrs. Bradley and Craven, of Westgate Foundry, Wakefield. We now present an elaborate plate of this very important machine.

Messrs. Bradley and Craven's plans relate to the manufacture of bricks, tiles, and other similar articles, from pulverised clay by compression; the main object of the invention being the obviating the difficulties usually attendant upon the presence of air in the material under pressure. The inventors submit the pulverised clay to three successive pressures from three distinct pistons or rams. The clay is fed into suitable moulds in a revolving table, which moulds are made considerably deeper than the required thickness of the brick or tile, to allow for the comparatively great bulk of the clay before compression, and for the thickness of the bottom piston. The first pressure is given by a piston forming a moveable bottom to the mould, and travelling along a fixed incline, by which means it gradually rises and presses the clay against a top plate or cover on the upper side of the table. This has the effect of not only partially compressing the clay, but also of expelling a certain amount of air therefrom. The next pressure is derived from a piston working downwards from above, and actuated by a crank or eccentric on the main overhead shaft. A second piston, worked in a manner precisely similar to the first, and situated at the opposite edge of the table, imparts the third and last pressure to the clay, after which the compressed brick or tile is expelled from the mould by any convenient arrangement of mechanism. During the time that the partially compressed brick or tile is travelling from the first upper piston, which gives the second pressure, to the second piston which completes the pressure, it is gradually raised to the top of the mould by the under piston, which travels along the fixed incline before referred to, and consequently greater facility is afforded for the escape of any air which may be confined therein, whilst the stroke of the last piston may thus be greatly reduced. If the quality of the clay will make a good article by two pressures, then the production of the machine is doubled, as it delivers a brick on each side and manufactures one under each eccentric, as represented in the accompanying plate. The table may be caused to revolve by a tappet motion consisting of a pair of arms carried on opposite sides of a horizontal wheel or disc, fixed on a vertical shaft, which is driven from the main or eccentric shaft. As these arms revolve, they alternately strike one of a series of corresponding projections, formed on the periphery of the table, and at each stroke they bring a fresh mould under the upper pressing pistons. A spring detent or catch is used for holding the table fixed after each motion, and so preventing any chance of its becoming displaced by the pressure of the incline on the under piston in discharging or raising the brick. In order to allow for the varying bulk of the clay, which, when very dry, will occupy a small space in the moulds compared to what it would occupy were it moistened slightly, that portion of the incline upon which the under piston rests when the clay is fed in, is made adjustable in height, by means of a lever and screw spindle, so as to elevate more or less the position of the piston, and thus reduce or increase the depth or capacity of the mould.

Fig. 1, on our plate 250, is a perspective elevation of the dry clay or fire clay mill, through which the clay is previously passed on its way to the actual brick-making machine. This view shows a portion of the endless chain elevator, by which the clay is delivered upwards from the mill; fig. 2 is a complete side elevation of the brick-making machine; and fig. 3 is a corresponding end view of the machine, as looking on the driving gear. In both these latter views are also shown portions of the elevator, as in the act of delivering the clay into the receiving hopper; and in fig. 3, are also shown positions of the two endless bands which carry the bricks away as they are moulded, the machine being arranged to form two bricks at a time.

Although we have for the purposes of our plate represented the dry clay mill, fig. 1, as above the level of the brick-making machine, it will be understood, that when at work, in conjunction with the brick-making machine, the mill is below or on the same level as the other machine; the proper relation of the parts being shown by the direction and angle of the two portions of the elevator, in figs. 1 and 3.

The whole of the movements of this mill are given by the horizontal first motion shaft, *a*, carrying a spur pinion in gear with the large spur wheel, *b*. This wheel is fast on the outer end of a second horizontal shaft, the opposite end of which carries a bevil wheel, *c*, in gear with a wheel upon the main central grinding spindle. This spindle rests at its lower end in a cup on the bottom frame, and in a collar bearing in the upper frame, above which it carries the horizontal grinding pan, *d*, which revolves with the spindle.

The centre of the pan and that part on which the material is crushed, is of solid metal, while the outer circle or largest diameter of the pan is fitted with gratings of any desired dimensions, over which the crushed rock or clay is spread; and that which will not pass the grating is again returned under the runners to be re-ground. The dust which passes the grating is received in a large, fixed receiver, *e*, within which work several arms for delivering the dust to the elevator box, whence it is raised to the hopper of the machine. These arms are worked from the shaft, *f*, driven by an endless belt from the second motion horizontal shaft. The rollers, *g*, run on a stationary cross shaft, which is carried in two side cheeks, *h*, with slotted guides, so that when the mill has a heavy charge of clay, the rollers ride over, and thus by their weight and the grinding action of the rotating pan under the fixed runners, break it down. The clays ground by these mills are thoroughly mixed, both in the top grinding pan and in the delivery pan after shifting. It must therefore be obvious to any person who well considers the subject, that a great amount of labour and expense which is thrown away in mixing this clay with water, merely for the purpose of readily moulding it, and afterwards to again evaporate the whole of this water before the bricks are in a proper state for burning.

The whole of the machinery is carried upon a long horizontal sole plate, A, on which are bolted down the two main vertical standards, B, in the upper ends of which are the bearings for the main horizontal shaft, C; these standards being bound together at the top by the frame, D, which carries the top bearing of the central upright shaft, E, the lower end working in a footstep bearing made fast to the sole plate, A. Motion is given to the entire machine by the fast and loose belt pulley, F, on a short, horizontal spindle, G, running in bearings in the tops of the two standards, H, also carried on the sole plate. This spindle has fast upon it a spur pinion, I, in gear with the spur wheel, J, fast on the second motion shaft, K, which carries a spur pinion, L, in gear with the main large spur wheel, M, on the main shaft, C. This shaft carries a pair of eccentrics, N, which work rods attached to pistons, O, working through guide brackets, P, bolted to the main standards, B. It is these eccentrics which actuate the positive compressing apparatus for the bricks. The main shaft, C, also carries a bevil pinion, Q, in gear with a bevil wheel, R, fast on the upper end of the vertical shaft, S, running in a footstep on the sole plate, and in a collar bearing in a bracket bolted to one of the main standards, B. On this shaft is carried the horizontal duplex cam wheel, T, which works the actual presser table, U, carried by the central shaft, E, in its revolution, as the four projections, V, come in contact with the stops shown on the edge of the table, U. The proportion between the bevil wheel, R, and the pinion, Q, is four to one, and four tappets, as this arrangement works the moulding table much steadier. In working the machine, to prevent the four tappets turning the moulding table too far, there is fitted a horizontal pawl or detent, W, to be worked by a small tappet, X, carried on the vertical tappet shaft, S. As the table, U, revolves, the inner end of this detent is worked into an indentation in the edge of the table, on the underside, and this motion stops the table at exactly the right place. The detent, W, is centred on a stationary stud in one of the standards, B, and one end falls into the indentation in the tappet, X, as it rotates: this end of the detent is kept in contact with the surface of the tappet, by means of a counterweight. When the outer end of the detent is in one of the indentations in the tappet, X, the inner end takes into notches on the under edge of the table, U, and thus holds it whilst a brick is being formed. The brick moulds are formed at regular intervals in the table, U, and into these the pulverised clay is lifted by the elevator, Y, and falls into the hopper below it, and down the diverging feed pipes, Z, to the moulds. So soon as the clay is supplied, the primary pressure is given to it by the pistons, O. The moveable bottoms of the moulds form pistons, which are attached to the rods, *h*, which travel with the moulding table over the stationary inclines, *i*, in the base of the machine. These inclines cause the piston bottom to gradually rise and compress the clay against the lower surface of the top plate or cover, *j*, of the table. The positive pressure is derived from one of the eccentrics, N, working a piston, O. The brick, as it travels onwards during these pressures, is gradually raised to the top of the mould by the under piston, *h*, during the travel of the latter along the bottom incline, and hence, any contained air can more easily escape. To allow for the varying bulk of the clay just as it may be dry or moist, that portion of the incline on which the under piston rests when the clay is fed in, is made adjustable as to height, by means of a lever and screw spindle, *k*. By turning the hand wheel of the screw spindle more or less in either direction, the position is more or less affected correspondingly, and thus the capacity of the mould is more or less varied. The moulded bricks are removed from the moulding table, either by hand or by any simple mechanical contrivance, and placed on an endless carrying band, *l*, running over a pulley on a shaft, *m*, which conveys them away.

With this machine, the clay, of any quality, may be worked either quite dry, or as damp as it leaves the earth. Some clays, as metallic marls and sandy loams, produce a better article when damp than when quite dry. The bricks can be made by it to any density, as the pressure can be set to anything from 10 to 100 tons on each brick.

In some recent tests as to the power absorbed in working the machine, it has been found that with quite dry clay, six horses power are necessary, and four horses power when the clay is damp. To include both grinding and making, a power of from ten to twelve horses is ample. The quantity which the machine will make is limited only by the capabilities of removal of the bricks. If driven at two revolutions of the table per minute, it makes forty-eight bricks in that time, or 28,800 in ten working hours. As the bricks are delivered on both sides simultaneously, the machine is obviously equal to two as regards the facilities of removal. Considering its productive capabilities, the machine is excessively simple in its details, so much so, that with fair usage, it can hardly ever get out of order. We think that Messrs. Bradley and Craven deserve a large share of credit for the design of this machine; whilst Mr. Chamberlain's sagacity in introducing it, is equally note-worthy.

DUTY OF CORNISH ENGINES.

The table of work performed in 1858, by Cornish pumping engines, which we append to the present article, communicates the astounding fact that in spite of all the vast improvements of modern times, the "duty" is considerably less than that of former years.

In connection with the mining interests of the county of Cornwall, there are few subjects of more importance than the economic performance of the steam engines, and still fewer that have promoted the prosperity of the mines more, than the various advances towards perfection, which have from time to time been made in those machines—having, according to the "Historical Statement of the duty performed by the steam engines of Cornwall, compiled at the request of the British Association in 1839," resulted at that time in an annual saving to the mines, in the matter of fuel alone, of nearly one hundred thousand pounds sterling—and that merely by the improvements made in the previous twenty-one years.

When, therefore, it is remembered that by the documents exhibited in that "Statement" these improvements are shown to have been *gradual*—being an average increase of "duty" performed of about nine millions of lbs. lifted one foot high by the consumption of 94 lbs. of coals, in each of the septennial periods from 1814 to 1835, it becomes an important subject of enquiry whether the same progress has continued since the last period to the present time; but, on referring to the official monthly reports from 1838 to the past year, it appears that there has been no progress made in the duty performed in this second period of twenty-one years. The question then naturally presents itself—"Has the application of steam as applied to our machinery reached perfection? But here we are met by the startling fact, that in this very period there has been a decided deterioration, and that to a very considerable extent, as will be seen from the annexed abstract of the duty performed by the engines, inserted in "*Lean's Engine Reporter* for 1858," showing an average duty of 43·8 millions instead of about 52 or 53 performed twenty years since.

What has caused this change? Is it true, that engine-houses, which were once the pride of all engaged, are now remarkable only for dirt and grease? or has any cause intervened to check that friendly rivalry between the engineers of the county, to which may be attributed much of that remarkable progress prior to 1839? Has not the fact which presents itself, while examining these monthly records, some connection with this decrease of duty? viz.:—that in this period of twenty-one years there has been a gradual decrease in the number of engines officially reported, implying an apathy regarding the performance of the steam engines, which, viewed in connection with the interest exhibited in the matter during the twenty-one years prior to 1830, is cause of surprise. May not much of the decrease of the duty be attributed, in a degree, to this apathy on the part of those connected with the management of our mines, thus shown in the discontinuance of the public reporting? That the mere reporting of the "duty" performed by the engines, by itself, causes any improvement, no one will for a moment maintain; but that it has and does stimulate all means of raising the credit of the Cornish engines, above those of all England, is a fact known to all. Or, as Mr. Sims remarks in his letter to the Polytechnic Society, in September, 1857:—"Although the principle hitherto adopted for reporting has its imperfections, it has been the means of doing immense good to the mining interests of this county, and has been the chief means of raising the character of the Cornish engine above that of any other engines; and when we take into consideration the immense consumption of coal by the whole of the steam engines in Cornwall, and the high price paid for it, it is important that means should, if possible, be adopted to make further improvements; or if nothing more than to cause engineers to take the greatest care of such engines as may be under their charge, and to raise a spirit of emulation amongst them, it would be of considerable benefit to the mining interest to adopt the same principle, with such improvements as may be necessary, as have been the great cause of the improvement in steam power in this and other counties since the commencement of the Reports."

It becomes, therefore, matter for regret, that such an efficient prompter to improvement and watchfulness on the part of all those having the care of machines, involving so great an annual expenditure, should have been allowed to become so comparatively discontinued, as appears from *Lean's Engine Reporter* for 1858, which contains only twenty engines, or less than one-third the number reported in 1839; about which time the maximum duty was performed.

We think that the Cornish engineers and employers of engines should look to this matter, for the world has been so long accustomed to look upon Cornwall as the county *par excellence* of economically working engines, that it would be a pity to wholly destroy the *prestige* thus gained.

ABSTRACT OF LEAN'S ENGINE REPORTER FOR 1858.—PUMPING ENGINES.

Mines.	Engines, and Diameter of Cylinder. Inches.	Horse power of the Engine.	Length of stroke in the Cylinder.	Length of stroke in the Shaft.	Period in months over which this account stands.	Average number of strokes per minute for the whole period.	Pressure of steam per sq. inch in boilers.	Load per sq. inch on the piston.	Cwts. of Coals consumed in the whole period.	Total number of millions of lbs. lifted one foot high during the whole period.	Duty; or millions of lbs. lifted 1 ft. high by consuming 1 cwt. of coals.	Remarks. Kind of Piston, &c.	Remarks. Machinery attached to the Engine, &c.	Remarks. Engineers' Names.
Alfred Consols	Davey's, ...80	335	10·0	10·0	2	3·6	39	10·2	1772	127006	71·6	Spring piston.	....	S. Grose.
" "	Field's, ...60	188	9·25	8·25	2			9·0	*	*	*	Packed piston.	100 fms. dry rods in the shaft...	"
Botallack	" 30	47	6·33	5·5	12	3·6		20·1	3745	157853	42·1	"	34 fms. do.	J. Rowe.
Cargoll Mines	" 70	256	9·75	9·75	12	5·1	34	14·0	24924	1383698	55·5	"	....	Hocking & Loam.
Carn Brea	" 76	302	9·0	7·0	12	2·9	33	15·4	21720	874628	40·2	"	....	"
Dolcoath	" 76	302	9·0	7·5	12	5·6	32	14·0	34967	1686800	48·2	"	55 fms. dry rods underground..	"
East Basset	" 60	188	8·5	7·2	2		41	8·1				"	....	"
East Pool	" 60	188	9·75	7·75	12	3·9	48	12·8	16866	799597	43·8	"	....	J. West
Great Work	Leed's, ...60	188	9·0	7·0	12	7·9	50	16·5	22721	1573763	69·2	Packed spring piston.	....	P. Roberts.
" "	Deer Park,..40	83	10·0	9·0	3	5·9		8·5	969	51167	52·8	"	....	"
North Pool	" 50	130	9·0	9·0	12	5·0	38	20·5	21172	982358	48·6	"	4 fms. flat rods........	Sims & Son.
North Roskear	Doctor's,....70	256	10·0	8 0	12	5·8	41	14·2	27474	1628714	59·2	Packed piston.	....	J. West.
St. Aubyn & Grylls	" 40	83	9·0	7·5	12	4·5	30	14·5	6778	384415	56·7	"	....	S. Grose.
South Crenver	" 70	256	12·0	12·0	12	2·8		10·9	16995	744081	43 7	Packed spring piston.	75 fms. flat rods at surface, and 85 fms. dry rods underground..	Matthews and West.
South Wheal Frances	Marriott's,..75	294	11·0	9·0	12	2·4	32	15·4	15430	946999	61·3	Packed spring piston.	....	T. James.
Treloweth	" ..60	188	9·0	8·5	12	5·7	54	18·0	23405	1283072	54·8	Spring piston.	....	S. Grose.
Wheal Basset	" ..40	83	8·33	6·66	3			13·6	†	†	†	Packed spring piston.	220 fms. dry rods........	Sims & Son,
Wheal Kitty	" ..33	57	6·0	6·0	12	3·2	36	12·7	5532	109559	19·8	Spring piston.	....	"
Wheal Margery	" ..40	83	8·33	7·33	12	4·1	40	20·7	9728	507364	52·1	Packed piston.	....	G. Eustice.
West Wheal Providence	" ..50	130	11·0	9·0	12	8·0	44	17.2	22318	1241537	55·6	"	....	"
									275517	14422611	52·3	Average "duty" of the whole per 112 lbs. of Coals.		
											43·8	" " " 94 lbs. "		

* Counter idle. † Changing the Lifts.

STAMPING ENGINES.—There have been four reported, the *average maximum* duty being 52·4 millions per 112 lbs. of Coals.

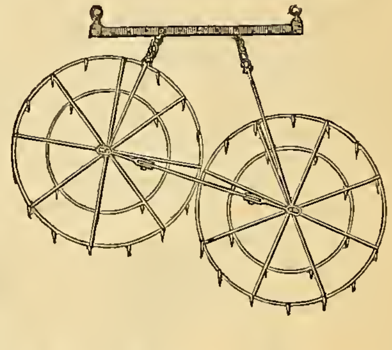
SMITHFIELD CLUB SHOW, 1859.

We beg to congratulate this Society on the increasing popularity and importance of its annual exhibitions, and we are glad to hear that steps are being taken for the obtainment of a more commodious and suitable building than the one at present made use of by the society, which, however well it may have answered in years gone by, is now altogether inadequate for the purpose. As we strolled along the galleries, the constant complaint of exhibitors was want of space. One poor fellow—we really did feel sorry for him, although it was rather absurd—had brought a first-rate farm cart, but when it arrived he was compelled to pull the wheels off, and tip it up on end with its shafts in the air, a position by no means calculated to set off its points to advantage.

Our readers will no doubt excuse us from attempting any comments upon the unctuous monstrosities of live stock, of which we caught a bird's eye glimpse from the gallery, and of course were deeply impressed, our mind somehow immediately reverting to that very excellent "society for the prevention of cruelty to animals." As regards the implement department, wherein we felt more at home, we marked a great improvement both as to quality and quantity.

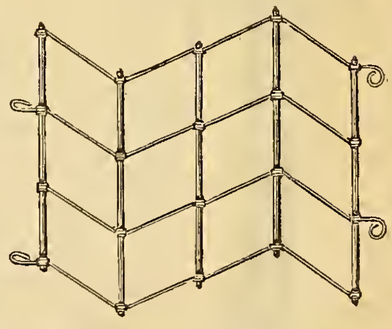
The first familiar and striking object on entering, is M'Cormick's reaper, which, though an old acquaintance, has by no means outlived its popularity as yet, but has succeeded in carrying off the first prize wherever it has been exhibited, either at home or abroad.

The object which appeared to attract most attention was an ingeniously constructed inclined revolving cylindrical wire screen, by Ransome and Sims, for separating light grain from a sample of wheat or barley. This screen is composed of two separate wire cylinders, the wires of which run in a spiral direction from end to end, and when the two cylinders are put together concentrically, the wires of the one lie between those of the other. One of these cylinders rotates slightly eccentrically to the other, being carried on an adjustable eccentric at each end. By suitably adjusting these eccentrics by a lever for that purpose, the wires of the two cylinders will be brought more or less flush with each other, and will therefore diminish or increase accordingly, the size of what we may call the *mesh*, and so afford facility for separating, more or less, light corn as desired. The eccentric motion also enables the screen to be self cleaning, as at the upper side of the screen, the two series of wires are more or less separated, and hence any grain which may be carried round will drop out on reaching the top.



Messrs. A. & E. Crosskill exhibited a very effective pair of rotatory harrows. These harrows, a cut of which we annex, may be described as a pair of light wrought iron curb wheels, laid flat upon the ground, and furnished with teeth on the underside of the rim and spokes. The two curb wheels are coupled by a distance rod or bar, which extends from the centre of each, and maintains them at a proper distance apart. On the draught being applied, which is from the centres of the wheels, they pass over the ground with a horizontal rotatory motion, effectually breaking up the surface, and maintaining themselves free from clogging.

Mr. Wm. C. Cambridge exhibited his far-famed clod crusher, which has had, we understand, a most unprecedented run over the entire kingdom. An inspection of the implement will satisfy any man of ordinary mechanical genius that it is faultless in principle, and cannot but accomplish the end in view, namely, to crush clods without clogging. The principal novelty at Mr. Cambridge's stand was a set of patent harrows, invented by Mr. Joseph Seaman, of Basingstoke. We have seen a few harrows in our time, patent and otherwise, good, bad, and indifferent, but for strength of parts and lightness, and simplicity of construction, we must award the palm to Mr. Seaman's "Excelsior," as he has not inaptly termed it. The annexed cut will give our readers a good idea of the peculiarities of this harrow.



In the first place the teeth are all bolted to the *sides* of the beams by long bolts passing transversely through the several beams and rows of teeth, with intermediate tubular stretchers, to maintain the bearers at a proper width apart. The fewness of parts in these harrows is a great recommendation for the export trade, as a set of three, we were informed, can easily be taken to pieces and packed in ten minutes, all that is required being the unscrewing of *six* nuts, and withdrawal of the long bolts, when the whole tumbles to pieces, teeth and all. We also noticed this harrow at the stand of Messrs. Wallis and Haslam, of Basingstoke, and therefore augur that it is being rapidly brought before the public—the quicker the better we say.

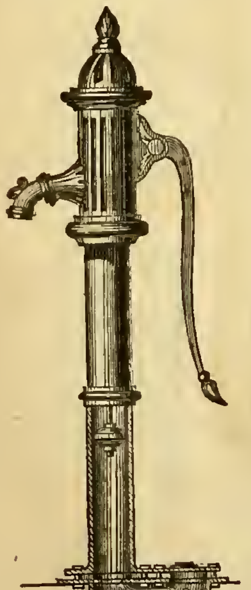
Messrs. Wallis and Haslam exhibited one of Roby's corn screens, the main feature of novelty in which appears to be the use of cleaning washers protruding between the wires of the screen, which is flat, and works by a reciprocatory motion, the cleaning machines remaining stationary, being threaded upon transverse bars or rods beneath the wire work of the screen, so that as the screen vibrates to and fro, the washers keep the spaces from being clogged by the lodgment of grain therein. An adjusting movement is also applied for regulating the spaces between the wires. We were much pleased with a spherical bearing also exhibited by these gentlemen. Another useful article was a light and simple two-horse power thrashing machine.

Mr. William Snowdon, of Longford, near Gloucester, exhibited — amongst numerous other useful articles, but not of sufficient novelty to occupy our space here—a paring plough, which promises to be a valuable adjunct to the farm. This implement is fitted with paringknives or skimmers, which pare the surface to a depth of from $\frac{3}{8}$ of an inch to 4 inches, turn it over and cut it into 1 or 2 feet lengths, as may be required for draining, burning, road making, water furrowing, relaying, or removal. On peat land the paring plough will excel, it is capable of paring and cutting up $1\frac{3}{4}$ acres of turf peat, or "old lays," with one or two horses, according to the stiffness of the land, per diem.

Messrs. James Smyth & Sons, of Witham, Essex, exhibited an ingenious machine by Mr. Padwick, for protecting turnips and other crops from the ravages of that horror to farmers, the fly. This machine is constructed similarly to a drill, and consists of a water tank mounted on wheels, and capable of having air powerfully compressed therein. This tank is provided with a number of small nozzles fitted with stop-cocks, and directing each a fine jet of water, under pressure of the compressed air in the tank, through fine wire gauge surfaces placed beneath each nozzle. The result is, that the water is blown out of the tank on to the leaves of the plants, in the form of very fine spray, resembling dew. The leaves in this moistened state are well powdered with lime, dust, sulphur, or other insect destroyer, which dust will adhere well to the plant by reason of the moisture with which it has just previously been supplied. The usual practice is to sprinkle the plants whilst the dew is on the leaves, but this limits the time to the very early morning hours, whilst by Mr. Padwick's patent machine an artificial dew can be made at any time.

We noticed some excellent specimens of mill stones at Messrs. Hughes and Son's stand, which need no comment from us, they are well known to millers.

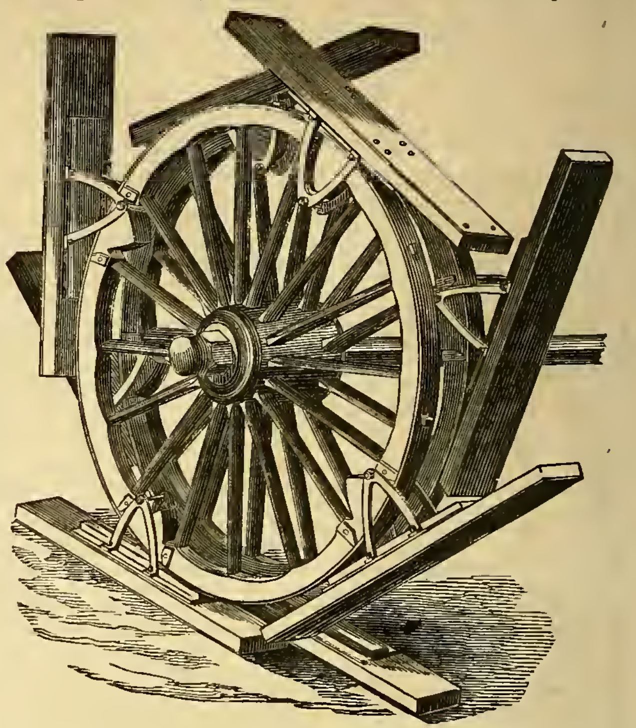
Messrs. Dodge & Giandonati, of St. Paul's Churchyard, exhibited a vast display of India-rubber piping and hose for farm and garden purposes, as well as some fine specimens of mill bands, composed of alternate layers of cotton webs and India-rubber.



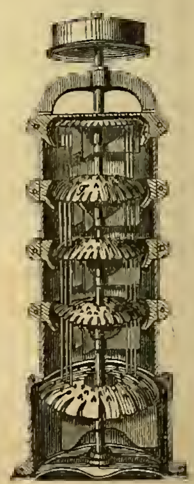
We noticed a drawing and small modern model (exhibited by a Mr. Hellard) of an ingenious and very simple adaptation to reaping machines for raising beaten or laid corn. The improvement consists in the simple application of vertically inclined fingers attached separately to the ordinary fingers of the reaper, their action being to enter beneath the laid stalks of corn, and, as they advance, to lift them up nearly to a vertical position before they reach the cutters.

Benjamin Fowler & Co. had a large assortment of pumps, for which they are justly celebrated; and exhibited also a working model of a hydraulic ram. We give a cut of their side foot valve pump, which merits attention for the novelty of its arrangement. The foot valve is contained in a small box on one side of the pump barrel, and is covered by a lid or flat plate, which can be readily removed when the valve becomes clogged, and the valve taken out without interfering in any way with the pump works. They also exhibited some cast-iron spherical valves for gas works, these valves being well adapted to withstand the action of tar and ammonia.

One of the best things we saw was Romaine's patent traction engine, a well-executed model, showing the principal features, being exhibited and explained by the inventor. The annexed cut will give our readers a very correct notion of Mr. Romaine's invention. The main object here is to obtain a larger bearing surface than has hitherto been attained by either Boydell or any one else. For this purpose Mr. Romaine uses double sets of sleepers of a combined length of about double that of the circumference of the wheels, and double the length of the actual bearing rails. The wheels enter upon one rail before they leave the previous sleeper and rail, and the sinking of the contiguous ends of the sleeper as the wheels pass over



the junction is entirely obviated, the sleepers laying perfectly flat on the softest ground, and presenting a way approximating as nearly as possible to the fixed railway. We carefully examined this model and tested its capabilities, and are convinced that it is what the Boydell class of tractions must come to.



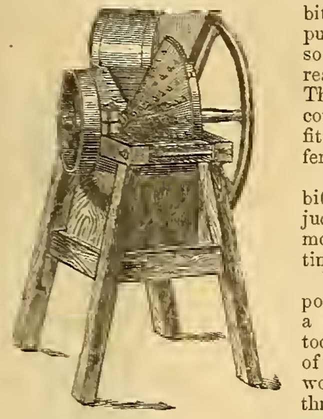
The annexed cut is a vertical section of a patent smut machine or scouring screen, exhibited by Messrs. Child & Owen. The corn is fed in at the top of the machine, and falls upon the corrugated circular plate, when by the centrifugal force of this plate, which is rotated by the pulley on the vertical driving shaft, it is thrown to the surface, and passing down, is conveyed by a flange into the fans and beaters, and upon the nippled and corrugated disc, when it is again scoured against the side, and is directed by flanges to another set of fans and beaters and nippled disc with a like result, the operations being repeated until it issues from the machine at the bottom perfectly cleaned and dressed.

Mr. John R. Peill, of Southwark, exhibited a useful invention in the shape of a self-regulating wind engine, the peculiarity of which is that it regulates the angle of its sails to the force of the wind, and is capable of being instantly stopped by throwing all its sails simultaneously edge on to the wind. Each sail is composed of one flat surface, and not of louvre boards, as in the common windmill, and turns or pivots on a centre of its own in the main boss, so as to be readily adjusted to any angle desired. We should be glad to see wind engines more general than they are, for they cost little to erect, and in many localities where pumping for irrigation is required they would be found most useful, as well as for other labour on a farm.

On arriving at the stand of Messrs. Clubb and Smith (better known, perhaps, as Mary Wedlake & Co.), we were very politely presented with a most ponderous tome, in the form of a descriptive and illustrated catalogue, extending to 136 pages! *Apropos* of catalogues, we cannot omit to notice the excellent and artistic manner in which these useful adjuncts to trade are now got up; indeed, many of the illustrations contained in them would do credit to any first-class publication, both as regards style of engraving and beauty of impression. As regards drawing, no doubt the artist is greatly indebted to that oldest of all draughtsmen—the sun!

—who never errs in his perspective. But to return to our subject, Messrs. Clubb and Smith exhibited some well-made chaff cutters amongst a host of other articles too numerous to refer to in detail. These chaff cutters are fitted with adjustable feed mechanism, which enables them to cut from two to four different lengths of chaff, and are coustructed for steam, water, horse-power, or manual labour.

Although, perhaps, rather out of our legitimate course, we must mention a mammoth gourd exhibited amongst a goodly company of gigantic Swedes by Gibbs & Co. This gourd, the largest we have seen, measures three feet in diameter, and weighs 234 lbs.



The trustees of W. Crosskill exhibited one of Lambert's patent root pulpers. This is a capital machine, so simple in its construction, as our readers will see by the cut annexed. The pulper consists of a cast-iron cone, into which hooked knives are fitted, which works against a ribbed fence.

Bower's gas apparatus was exhibited by Porter & Co., of Lincoln, and judging from the very flattering testimonials it has received, still continues the favourite.

We noticed no striking novelty in portable engines, but may mention a well-built one by Tuxford, which took the first prize at the last trials of the Royal Agricultural Society, working at eight horse-power, for three hours, on one cwt. of coal. We may also mention a very fine portable donble cylinder engine by Robey & Co., of ten horse-power, for ploughing purposes. This engine is quite a pattern for good workmanship.

Messrs. P. & H. P. Gibbons, of Wantage, exhibited a combined thrashing machine, fitted with Nalder's grain dressing cylindrical screen.

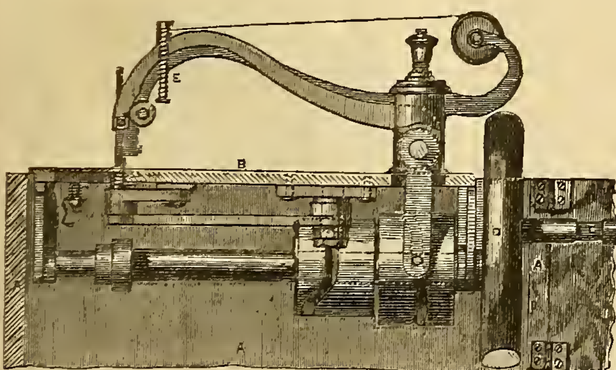
We were much struck with a fixed corn mill of two pairs of stones, by John Fye, of Lincoln. The several parts are admirably arranged, and the general design is most creditable to the makers. It stands in a very small space on a light cast-iron, open framework, and requires neither bolts nor stays. The driving wheels are geared with wood to prevent noise, aud the iron wheels on the spindle slide out of gear, so that one or two pairs of stones can be worked at pleasure. Governors are also attached for regulating the stones when at work; indeed, every requisite for grinding is combined into a space of about 9 feet by $4\frac{1}{2}$.

HISTORY OF THE SEWING MACHINE.

ARTICLE XXII.

Mr. William Emerson Baker, of the Grover and Baker Sewing Machine Company, U.S., obtained a patent on the 16th of August, 1855, for improvements in sewing machines, the chief features of the iuvention being the making of the stands or frames of sewing machines, in the form of a box or case, which is to enclose the machine when out of use, and keep it free from dirt and dust. Also a mode whereby the bulk of

Fig. 154.



the machine may be reduced, so as to be capable of being packed or contained in a conveniently sized box, which object the patentee proposes to accomplish by making the driving handle or crank pin, capable of being passed through the fly-wheel inside the machine when out of use and of being pulled out and projected outside the wheel when required for working the machine. Another point in the invention is the use of a peculiar combination of helical spring and slotted spindle for keeping the thread in a proper state of tension. Also a mode of sewing two parallel rows of stitches by employing only one retaining or locking thread at the back of the fabric. Lastly, the application of apparatus to sewing machines for winding thread on to the machine bobbins. The annexed illustration, fig. 154, represents a side view partly in section of Mr. Baker's sewing machine, as coustructed and arranged according to the invention in question. It will be at once observed that the leading features of the machine are the same as those of the Grover and Baker machine, patented in 1852 by Mr. Hughes, and already referred to by us. A, is the box or case which encloses the machine under a lid or cover when not in use. The base plate or table, B, is hinged iu such a manner to the box as to be supported by the lower part of the box as a stand. In order to reduce, as much as may be, the size of this box or case, the crank pin or handle, C, screws into the fly wheel, D, and is capable of passing through it inside the machine when required to be packed. A drawer is fitted beneath the stand for the convenience of holding thread spools and other articles required in the working of the machine. E, is the spring for keeping the needle thread in a state of tension, this spring is fitted on to, and surrounds a slotted spindle, through the slot in which the thread is passed, and held pressed against the upper end by the expansion of the spring.

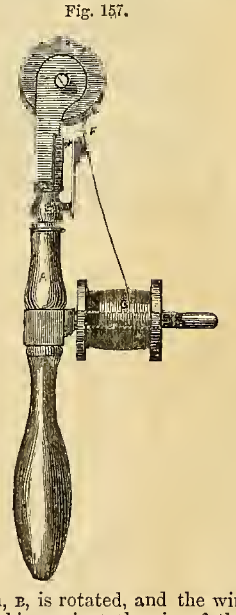
Fig. 155.

Fig. 155 is an enlarged diagram of a double row of stitching secured by one locking thread, in place of having a separate locking thread to each seam or row of stitches. This locking thread for the double seam is inserted through the loops by the circular needle, in precisely the same way as for single seam or row of stitches, excepting that the nose of the needle passes through two loops simultaneously in place of through one.

Fig. 156 and 157 represent respectively a front and side elevation of an ingenious little contrivance to be applied to a sewing machine for winding thread on to the machine bobbins. A, is a handle or holder for the machine bobbin, B, this bobbin being fitted on to a centre point at one end, and against a chuck or rotatory disc, C, provided with studs at the other end. A spiral thread or worm is formed on the periphery of this chuck or disc, which thread or worm gears with a worm wheel, D, imparting a to and fro motion by means of the link, E, to the thread guide, F, which distributes the thread passed through a notch in the guide in an even and regular manner upon the bobbin, B, as fast as it

Fig. 156.

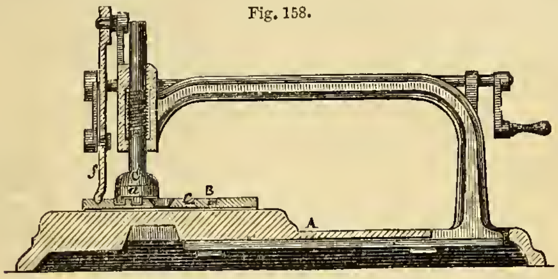
Fig. 157.



unwinds from the spool, G. The bobbin, B, is rotated, and the winding effected by pressing one end of the bobbin against the rim of the flywheel, the friction obtained thereby being sufficient to cause the bobbin to revolve and wind on its thread, laying it evenly at the same time by the aid of the slotted guide, F. The chief features of novelty claimed by the patentee are, the making the stands or frames of sewiug machines in the from of a box or case as described; the arrangement and manner of applying the crank or handle; the combined apparatus for keeping the sewing thread in a state of tension; the mode of sewing two rows of stitches by employing only one retarding thread at the back; and the thread winding apparatus applied to sewing machines, as described.

A patent was granted to John Avery for improvements in sewing machines, communicated to him from abroad, dated August 25th, 1855, which improvements relate to certain means of feeding the material to be sewed, which are applicable to the working of button holes, embroidery, and the sewing of curved or crooked work generally. Fig. 158 represents a sectional elevation of those parts of a sewing machine to which this invention relates, and fig. 159 is a plan of the same. A, is the table of a sewing machine, against the upper surface of which the material to be sewed is confined by a feed plate, B, whose under surface is roughened or notched so as to take hold of the material. This feed plate is held down by a helical spring applied to the shank or stem of the shoe, C, which bears upon the top of the feed plate. This shoe also serves to guide the feed plate, by means of two pins on its underside entering two parallel grooves in the upper surface of the feed plate. These grooves are made to correspond in form with the form or contour of the seam or line in which the sewing is to be produced. For example, for working a button hole, portions of the grooves are in the form of parts of circles, which are concentric with the circular portion at one end of the button hole, whilst the other portions are straight and parallel

Fig. 158.



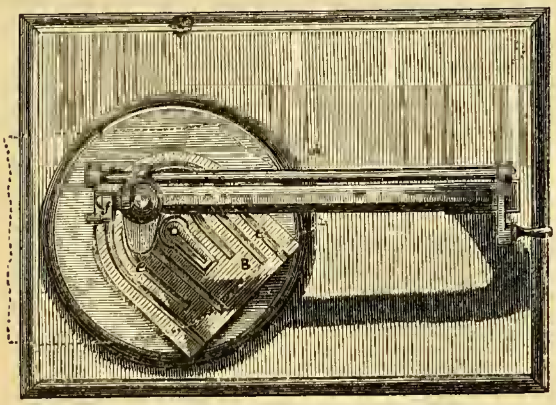


Fig. 159.

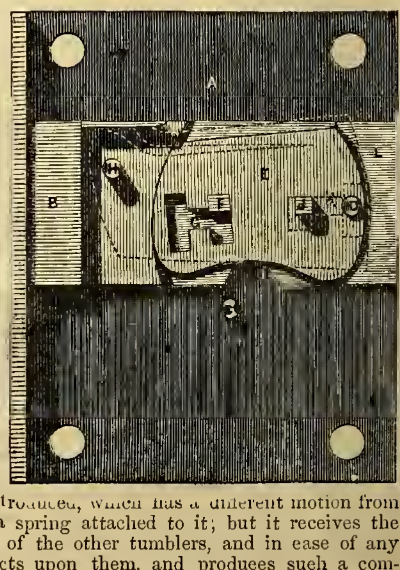
with the sides of the button hole; all the parts of the respective grooves being equi-distant from the nearest parts of the button hole. The two pins on the underside of the shoe, C, do not stand opposite to each other in their respective grooves, but at some distance from one another, in order to give greater steadiness to the feed plate and prevent improper lateral motion. For the purpose of giving the feed plate the necessary movement to carry the cloth in a proper direction beneath the needle, a third groove, E, is formed on the feed plate, which may be of a V or other form in transverse section, but in plan should correspond in form with the intended line of sewing, and parallel or concentric with the other two grooves. This last mentioned groove receives a dog or feeder, F, which may have either a reciprocating or a rotatory motion—the illustration represents it as having a reciprocating motion. The end of this dog or feeder and the interior of the groove, E, have their surfaces serrated or roughened in such a manner, that as the dog moves in the groove between the times of taking the stitches it will take hold of it and move it a certain distance. The motion of the dog should be so regulated that it will be greater on passing a curve than a straight line, as the curve in the groove is described with a radius so much larger than the radius of the curve of the line of sewing. In order to give the material a lateral movement to the line of sewing, which is necessary in working button holes, embroidery, and some other kinds of sewing, the head, D, which carries the shoe, is arranged to receive a movement in the requisite direction, the feed plate being in that case moved by the pins of the shoe and the needle working in a fixed line.

THE "STELLA" OIL LAMP.

We have recently had brought to our notice a very simple, cheap, and efficient lamp, manufactured by Messrs. Broad & Co., of Drury Lane, for burning their patent "stella" oil. This oil, which is prepared from Petroleum or Rangoon tar, burns with a clear and intense white flame, is all but free from smell, and has the further advantage of economy in burning. We once were staunch believers in the "moderator," but after a trial of six years, we confess that it is by no means what we call a comfortable or a cheap light, there is so much winding up of the oil required, attended with spurting and spluttering of the oil over the chimney, trimming of wicks, (particularly so if your oilman treats you badly,) to say nothing of the constant liability to derangement of the working parts, that we are quite tired out with moderators, and hail with delight a step towards economy and simplification. The "stella" oil lamp, a cut of which we annex, requires no periodical winding up of the oil, and when the wick is once adjusted it will burn for months, with an occasional trimming only. The "stella" lamp consists simply of an oil reservoir or cup, surmounted on a metal or porcelain stand, and fitted with a circular wick and elevator, the whole being surmounted by a chimney and globe, or chimney alone, according to the uses of the lamp. We have great pleasure in drawing the attention of our numerous artizan readers to this lamp, as from the specimens we have seen, we feel convinced that it is one which will be appreciated both in the workshop and cottage, whilst the fact of the oil not being ignitable on the surface, like camphire, naphtha, and other substances of an equally dangerous nature, is a great recommendation on the score of safety. Although our attention was most attracted by the cheaper make suitable for the workman, it is also adapted to the most ornamental designs fit for the mansion.

THE PATENT MARINE LOCK.

An excellent machine made lock, combining the important elements of simplicity and security, is now being manufactured by Messrs. Miles and Co., of the Patent Lock Works, Forest Hill, near London. This lock is the invention of Mr. L. P. Miles, and has been designated the "marine lock," on account of the internal parts being wholly composed of brass or other non-corrosive metal. The tumblers and parts connected therewith are so arranged that the lock effectually resists picking by means of pressure on the bolt. This highly important end has been obtained by simple means, and without involving the addition of parts which tend more to complicate the construction of the lock than to render it a reliable means of security against fraud or violence. The machinery necessary for the production of these locks, has been made the subject of unremitting attention in the way of improvement, until it has attained a high state of efficiency and completeness, and we may congratulate Messrs. Miles on their diligence and skill in this department, as well as on their prospects of pecuniary recompense.



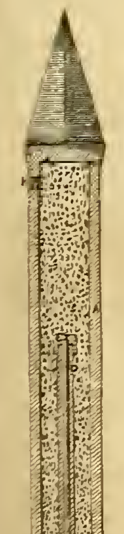
Any number of tumblers may be used, each combined with its own spring, for which purpose brass will be found the most suitable, so that for marine, and other similar purposes, the objectionable use of steel or iron in any portion of the lock can be avoided. A tumbler, called "the regulator," is also introduced, which has a different motion from the others, being without a spring attached to it; but it receives the pressure from the springs of the other tumblers, and in case of any attempt at picking, it reacts upon them, and produces such a combination of difficulties as must insure the highest amount of safety in the lock.

Our illustration represents an elevation of the interior of the lock with the bolt thrown back. The case, A, has a stud for the slot of the bolt, B, to work upon; C, is a pin for the pipe of the key; D, is the regulator stump, on which the regulator, E, fits. The bolt has a slot to work on the stud in the case, A; to the left of this is the regulator stud, F, fixed in the bolt to act within the aperture, G, of the regulator; the tumbler stump, H, is fixed in the bolt; a portion of the bolt is raised level with the regulator for the tumbler springs to press against; I, is the aperture for the key to move the bolt. The regulator or double-action tumbler has a stud, J, fixed in it, to act within the apertures, K, of the tumblers. The bolt is laid upon the case with its slot placed over the stud in the case, which comes flush with its surface; the raised portion, L, of the case is also level with the bolt. The regulator or double-action tumbler, E, is then placed on the bolt and fitted on the regulator stump, D, and resting on the part, L. The aperture, G, also works upon the regulator stud, F, which is level with the surface of the regulator. The tumbler stud, J, is fixed into the regulator to work within the apertures, K, of the tumblers. These tumblers, of which the number may be varied as circumstances require, have, with two exceptions, the upper and lower portions of their apertures, K, fitted with the usual catches. Two of the tumblers, which may be termed guide tumblers, are each deficient of one catch on the upper portion of their apertures, and have instead, a plain side, each in an opposite direction to that in the other, so that when the bolt is shot, a pressure is maintained by the plain side of the aperture in the guide tumbler, against the tumbler stud and regulator, at the same time the catch of the other tumbler is in operation. On the contrary, when the bolt is drawn, the guide tumbler has, as represented by the dotted lines, the plain side of the upper portion of its aperture, K, pressing against the tumbler stud, J. Thus, either when the bolt is drawn or shot, the pressure of one or the other of these guide tumblers preserves the regulator in its due position.

The different parts being completed and put together, a key is fitted so as to raise the regulator and the other tumblers to the exact height requisite to disengage their respective studs, and permit the bolt to pass, and should any attempt be made, either more or less, than sufficient to raise any one or more of the tumblers or the regulator to the exact height necessary, such attempt must fail to move the bolt.

To be able to obtain a reliable lock of simple construction, at a moderate price, is a matter that is of personal interest to nearly every one of us, and we are glad to bring before our readers a good arrangement of an article in which confidence can be placed.

BALCHIN'S PATENT BOMB LANCE.



Within a recent period the mode of capturing whales has undergone a complete revolution; the now old-fashioned harpoon, propelled by the hand of a marksman from the bow of the whaling boat, has given place to other more effectual and more destructive projectiles, discharged from guns constructed specially for the purpose. This mode of capturing these monstrous creatures is vastly superior to the old system of the hand harpoon; the modern projectile being driven into the whale with a velocity that causes it to sink very deep, and by its explosive properties the creature is quickly destroyed. An improved construction of projectile, adapted for the requirements of the whale fishery, has been recently introduced by Mr. Balchin, of Mytongate, Hull, for which he has obtained letters patent.

The accompanying engraving shows the improved lance projectile in longitudinal section, taken through the centre of the lance. The lance, A, is cast in iron of a cylindrical form, and hollow, but tapering at one end to a kind of bayonet point, which is solid; the rear end of this pointed cylindrical shell or lance is tapped to receive a hollow metal plug, B, which carries a wad, C, and when screwed up secures the wad to the rear end of the lance. Through the plug, B, is inserted a tube, D, which is intended to receive a fusee match, and project it a considerable distance into the powder chamber, so that it may ignite the explosive compound near the middle of the chamber. The inner or forward end of the tube is covered by a pierced cap piece, E, and its rear end by a plug of soft wood, F, which is passed over the fusee match before the match is inserted into the tube, D, and driven tight into the hollow metal plug. The object of this wooden plug is to prevent the match from being driven in when fired from the gun. A plate, G, furnished with a central hole, is attached to the rear end of the metal plug, B, by screws, and thus the match is secured with its rear end projecting out through the plate. Near its closed or pointed end, the cylinder is furnished with a tapped hole, which is closed by a screw plug, H. Through this hole the powder or explosive compound for charging the projectile is admitted into the cylinder, A, which, when filled, is closed by screwing down the plug. To reduce as far as possible the friction of the projectile against the sides of the gun when being discharged, the extremities only of the cylinder are made to fit the bore of the gun; the diameter of the intermediate part being reduced, as shown in the figure. This explosive lance may be fired from an ordinary harpoon gun, and the match being made to burn a suitable time after the discharge takes place, the lance will, after it has struck the whale, explode, and inflict a mortal wound, and thus prevent the lingering torture to which whales are often exposed before their final capture.

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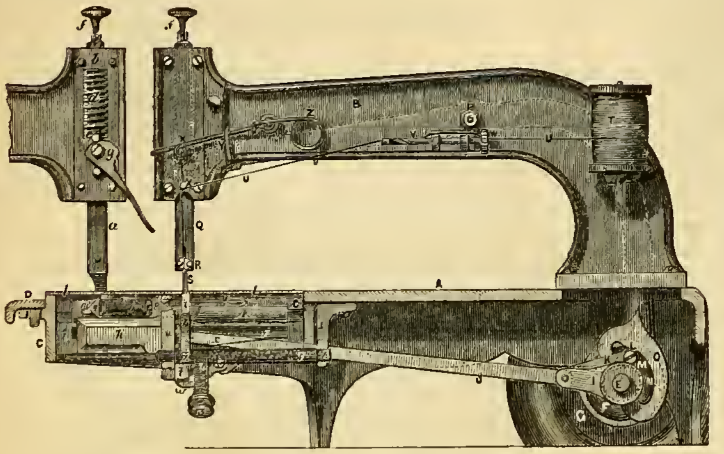
RECENT PATENTS.

SEWING MACHINES.

J. T. Jones *and* R. E. Simpson, *Glasgow.—Patent dated February* 15, 1859.

The improvements which have been introduced by Mr. Jones in the sewing machine, which forms the subject matter of these letters patent, have been very ably carried out in the manufacture of the machines, under the joint superintendence of Mr. R. E. Simpson, and Mr. J. Cremer. The result of which has been the introduction of a machine admirably adapted for the general purposes of the manufacturer, so that the proprietors have, in consequence, been enabled to command a large share of public patronage, which is daily increasing as the merits of the machine become known.

The accompanying illustrative engraving is a longitudinal elevation partially in section, of one modification of the patentee's sewing machine; parallel with the upper part of this figure is also shown the second or opposite side of the extremity of the overhanging arm, with the mechanical arrangement for regulating the pressure of the foot or presser on the material to be sewn. The framing, A, of the machine, is in part similar to that of the ordinary needle and shuttle machines; it consists of a table or platform, supported on four standards. To the backward end of this platform is bolted an overhanging arm, B, the front part of the platform is curved inwards, and from the centre of this part, a curved projecting piece, C, is cast with the platform. This part is of a segmental figure, and its configuration enables the operator of the machine to sew round the curved or hollow parts of garments, as for example, sewing in the sleeves of coats, round the bottoms of trousers, closing boot legs, and so forth. But to do work that may be more conveniently sewn upon a flat surface, there is provided a moveable piece, D, the under side of which has a pin cast on it at the front end, this pin falls into a slot made in the snug on the front of the curved part, C, of the framing. The back end of the moveable piece, D, has upon it two projecting pins, which enter corresponding holes in the front part of the platform, so that the moveable piece is very readily removed or fixed in its place, when either a round or flat surface is required to work upon. The moving parts of the machine are actuated from the horizontal shaft, E, which is carried in bearings that are cast on the under side of the table, A; this main or first motion shaft, E, is formed in two parts, which are connected by cranks. The shaft, E, has fast to it a pulley, F, round which an endless hand passes, this hand is carried round a wheel fast to a crank shaft fitted below the table, on which the machine is placed, motion being communicated to the crank shaft from a treadle actuated by the foot of the operator. One extremity of the shaft, E, projects out beyond the table, A, and to the end is fast a small fly-wheel, G, which serves to equalise the movements of the machine. Advantage is taken of this fly-wheel to make it form the driving wheel for filling the shuttle pins or spools. For this purpose a groove, H, is formed on the periphery of the wheel, and a small winding apparatus is secured to the table on which the machine stands; the spindle of this winder carries a pulley, which is driven by an endless cord that is passed round the pulley and the wheel, G. A small knob projects from the face of the wheel, G, which serves as a handle to put the wheel in motion when the spools are to be filled; in this way the silk or cotton to be used in the sewing may be wound



upon the shuttle spools with ease and regularity. One of the inner extremities of the shaft, E, has formed upon it the crank, I, the pin of which serves to connect it to the connecting rod, J, and the link, K. The backward extremity of the link, K, is fast to the pin, L, of the crank, M, this pin is entered into the curved slot, N, of the cam piece, which forms the lower extremity of the bent lever, O, so that the eccentric motion of the crank, M, causes the stud pin, L, to traverse the curved slot, N, and lift the lever, O, with a differential or variable reciprocatory movement. The bent lever, O, works within the hollow arm, B, of the machine, and it is centred on a stud at P, the arm, B, being made sufficiently deep to admit of the vertical movements of the lever. The front extremity of the lever, O, has a rectangular slot formed in it, in which is fitted a correspondingly shaped piece of metal, which works freely on a stud that projects laterally from the inner face of the sliding needle bar, Q. The needle bar is made to fit easily within the recess which is formed for the purpose in the front plate, Q^1, that is screwed to the lateral face of the arm, B. To the lower extremity of the needle bar, Q, a small metal plate, R, is fastened by two screws, this plate serves as a clip to hold the needle, S, in a vertical position, so that it moves up and down with the bar, Q. The needle used with this machine is of the kind ordinarily fitted in sewing machines of this class. The upper end of the needle is made flat and left rough, so that when this part is placed between the plate, R, and the bar, Q, the tightening of the screws holds the needle firmly, and its removal or replacement is very easily effected. The bobbin, or spool, T, from which the thread or silk, U, for supplying the needle is drawn, runs loosely upon a small vertical spindle, that is carried in a bracket projecting laterally from the face of the arm, B. From the spool, T, the thread, U, is carried forward to an arrangement that is fixed at the side of the arm, B; this little apparatus regulates the tension or drag upon the thread as it is unwound from the spool. It consists of a short horizontal spindle, V, which fits closely to the small bracket piece projecting from the face of the arm, so that it turns somewhat tightly therein. To the backward end of the spindle, V, is fitted a milled edged head, W, in which is made a small hole, through which the thread or silk is passed. The thread is carried forward and passed through an eye at the front end of the spindle, V, and thence out at the tubular end of the spindle; in this position, by turning the milled head, W, the thread is wound more or less on the spindle, V, and thus requires more or less force to draw it off the reel, T. From the extremity of the spindle, V, the thread is carried forward to the centre of the needle bar, Q, where it is passed through the eye of a stud, X, fast on the face plate of the needle arrangement. The thread passes up through this stud eye from below, and then through the eye of a wire lever arm, X^1, the backward end of which turns on a stud projecting from the lateral face of the arm, B. After passing through the eye of the lever, the thread again descends through the stud eye, X, on its way to the needle. The lever arm, X^1, is passed through a guide, Y, that is fast to the bent lever, O, and works out through a slot cut in the side of the arm, B, which guide serves to control the extent of the spring's traverse in a vertical direction, as well as to keep it in its proper position. The lever arm, X^1, is connected to the free end of the volute spring, Z, one end of which is passed through a hole made for the purpose in the rim of the arm, B, the other extremity of the spring is curved to form an eye that encircles the backward part of the lever arm, X^1. There are two holes made in the rim of the arm, B, so that by inserting the end of the spring, Z, in the hole nearest to the lever arm, X^1, its upward pressure thereon is increased, so that it springs up with greater force. This arrangement of the lever arm, X^1, and the spring, Z, draws up the slack of the thread when the needle bar, Q, rises, and by adjusting the spring, Z, in one or other of the holes in the rim of the arm, B, more or less jerk may be put on the thread according to the thickness of the material that is being sewn. The fabric to be sewn is held down upon the curved surface of the part, C, by means of a spring presser, *a*; this spring presser is fitted at the extremity of the arm, B, and parallel to the needle bar, Q. The spring presser consists of the narrow sliding bar, *a*, the lower end of which is curved and bent at right angles, so as to rest fairly upon the fabric. The presser bar, *a*, slides vertically in a recess cut in the plate, *b*, which is secured to the arm, B, by screws, and corresponds in all respects to the plate, Q^1, on the other side. A rectangular opening is made through the upper part of the plate, *b*, through which a stud, *c*, projects; this stud is fast to the bar, *a*, which is pressed in a downward direction by the flattened spiral spring, *d*, which surrounds the sliding bar, *a*. The lower part of the spring, *d*, rests upon the stud, *c*, whilst its upper part is secured to a narrow plate, *e*. The back of this plate has a nut formed on it, through which the screw, *f*, works, so that by turning the milled head on the upper extremity of the screw, the plate, *e*, and the spring, *d*, may be depressed so as to increase the pressure of the foot at the lower end of the bar, *a*, on the fabric, at pleasure. The spring presser is raised from the fabric by means of the cam lever, *g*, which is centred upon a stud screwed into the plate, *b*; the tail of this lever extends outwards and forms a handle, the raising of which lifts the presser off the fabric. As delineated in the accompanying engraving, the needle is represented in its lowest position, and the pin of the crank, M, is just commencing its descent down the curved slot, N, in the lower end of the bent lever, O. During this downward traverse of the crank pin the needle only receives a very slight reciprocatory movement, which, however, is sufficient to slightly ease the thread and admit the point of the shuttle. When the crank pin, L, reaches the lower part of the curved slot, N, the crank, M, then passes the lowest point, and turns towards the front part of the machine; as the crank pin passes over the swell at the front part of the curved slot, it carries with it the lower end of the lever, O, which thus raises the needle to the limit of its upward traverse. Meanwhile the guide, Y, draws up the lever arm, X^1, which carries with it the thread, U, the slack of which is drawn tight by the spring, Z. When the crank pin, L, has passed the central part or swell of the curved slot, L, the needle begins to descend, and continues to do so whilst the pin travels round the upper part of the curved slot, N, until it reaches the point in which it is shown in the engraving, where it is at the limit of its downward traverse. As the needle only passes a series of loops through the fabric, it is essential to secure these by means of a secondary thread or silk; and this is done by causing the shuttle, carrying a thread or silk, to pass through each loop. The shuttle and parts connected therewith are actuated by the connecting rod, J, which is driven by the crank, I, on the shaft, E. The front extremity of the rod, J, is fast to a slide, *h*, which traverses to and fro along the vertical face of the web, *i*, screwed on the underside of the curved projecting part, C. This web, *i*, has a slot, *j*, formed in it throughout its length, and at the upper part is a curved trough, *k*, which serves as a race for the traverse of the shuttle. A portion of the part, C, of the stand, immediately over the shuttle race, *k*, is cut away to afford access to the shuttle during the working of the machine; this longitudinal opening is closed by sliding brass plates, *l*. The slide, *h*, is connected by screws, which pass through the slot, *j*, of the web, *i*, to a small frame, *m*, which forms a holder and driver for the shuttle. The frame, *m*, has two arms which extend upwards round the race, *k*; the points of these arms are bent over and within the race, so that when the shuttle is placed within or between these arms its pointed extremity projects beyond the backward arm, so that it cannot escape therefrom, and must partake of the motion of the frame or shuttle driver, *m*. Thus, when rotatory motion is communicated to the shaft, E, the rod, J, draws the slide, *i*, and frame, *m*, to and fro, the relative positions of the cranks, I and M, being so arranged that when the needle is at the lowest point, the slide, *i*, and the shuttle, *n*, are at the limit of their forward traverse, as shown in the accompanying engraving. The needle in its descent passes down a groove made for the purpose in the face of the web, and the shuttle, *n*, lies with its flat or open part closely against the planed surface of the web. Thus when the needle begins to rise, the shuttle also commences its backward traverse, so that the point of the shuttle is interposed between the needle and the thread, just as the former begins its upward movement. Before the needle has risen clear of the working platform, the shuttle has passed entirely through the loop, and is upon its forward traverse, which is completed simultaneously with the needle reaching its highest elevation. The shuttle, *n*, is by preference made of steel, the hollow part being made to receive the spool or bobbin, *o*, on which the silk or thread is wound. The spool is retained within the cavity of the shuttle by the pressure of a spring fitted in the nozzle or fore end, this spring presses upon the small projecting stud, *p*, into which the pointed end of the bobbin spindle enters. When the bobbin is put in, the stud, *p*, is pushed back by the front extremity of the spindle: the backward end is then pressed down a shallow groove at the heel of the shuttle, and the point of the spindle sinks into a hole made for the purpose, in the part *q*, at the backward end of the shuttle. A curved blade spring, *r*, is riveted at one end to the fore part of the shuttle: this spring extends backwards to the heel of the shuttle, where its free extremity, which is bent to a right angle, enters a small hole made through the side of the shuttle. The silk or thread from the bobbin or spool, *o*, is passed through one or more of a series of holes made along the edge of the shuttle, and through a slot made parallel to these holes, thence under the spring, *r*, and up through the hole in the working platform. The arrangement of the spring, *r*, in conjunction with the slot and holes, admits of any amount of drag or tension being put upon the shuttle silk or thread as it is unwound from the bobbin, *o*. Near the fore end of the shuttle, and on its upper side, is a small cavity, against the backward end of which, the curved point of the front arm of the frame, M, comes in contact as the shuttle is moved forward. Thus whilst the pointed extremity of the shuttle projects beyond the arm of the frame, so as to readily enter the loop formed by the partial rise or slightly jerking action of the needle, the shuttle is at the same time wholly free, so as to pass readily through the loop. The horizontal reciprocatory movement of the connecting rod, J, and the slide, *h*, is made use of to actuate the feed motion, by which the fabric is carried forward as the stitches are put in. The needle passes down through a small hole made in the steel plate, t^1, which is let into the curved surface of the part, C, of the platform: the needle aperture is immediately contiguous to the sliding plates, *l;* and there is also made in the guide plate, t^1, a rectangular aperture through which the feed lever works. The feed lever, *t*, consists of a bent piece of metal, arranged in a vertical position, and centerd at its lower end on a stud that projects from the face of the transverse web, *u*, which is cast on the part, C. The upper extremity or horizontal face of the feed lever, *t*, is serrated, and the aperture through which the retaining stud passes at its lower end being somewhat elongated, admits of a certain amount of vertical as well as rocking motion being imparted to it. When free, the feed lever, *t*, is retained in a position level with the working platform by a spring, *v*, one end of which is fast to the underside of the working platform, whilst the other extremity is entered into a hole made in the side of the feed lever. The rising motion of the feed lever, *t*, is effected by means of the bent lever, *w*, which is centred upon a stud that is screwed into the lower part of the longitudinal web, *i*. The front end of this lever, *w*, is bent downwards, and rests against the lower end of the feed lever, *t*, whilst its other and longer arm projects somewhat above the face of the web, *i*, along which the slide, *h*, moves. It follows, therefore, that as the slide, *h*, traverses forward, and the needle is rising, the backward end of the slide depresses the free end of the lever, *w*, thus causing the fore end to raise the feed lever, *t*. Immediately following, or almost simultaneously with this vertical action, a forward movement is imparted to the feed lever, and this is done by means of an inclined piece, *x*, upon the side of the connecting rod, J. This inclined piece, *x*, at the forward transverse of the slide, comes in contact with the projecting arm or rib, *y*, which projects laterally from the horizontal rocking shaft, *z*. One end of the rocking shaft, *z*, is carried in the transverse web, *u*, and the other in a pendent bracket, 1, that is screwed up to the under side of table, A. At the front part of the shaft, *z*, there is a small vertical rib or arm, 2, which rests against the feed lever, *t*. Thus, as the inclined piece, *x*, passes over and depresses the projecting rib, *y*, the shaft, *z*, is partially turned upon its axis, so that the vertical rib, 2, presses against the upper end of the feed lever, *t*, and causes it to move forward. The upward motion of the feed lever, *t*, nips the fabric firmly between it and the spring presser, whilst the forward movement carries the fabric onwards preparatory to making another stitch. The two forces thus acting upon the feed lever, *t*, impart to it a compound or elliptical movement in the guide plate, *t*, which carries the fabric forward in a highly effectual and satisfactory manner. According as more or less motion is imparted to the rocking shaft, *z*, the fabric is moved in a corresponding ratio, so that by limiting this motion, the length of the stitch is regulated. This adjustment is obtained by means of the screw, 3, which passes through an angularly projecting arm, 4, on the shaft, *z;* this screw presses against the side of the web, *i*. The upper extremity of the screw is furnished with duplex milled heads, so that the screw may be firmly fixed in the required position. The partially rotatory motion of the shaft, *z*, is regulated by lengthening or shortening the screw; by unscrewing it, so as to make the part within or beyond the arm, 4, shorter, the play of the shaft is increased, and with it, the motion of the feed lever, *t*, and by screwing the screw, 3, inwards to its full extent, all lateral motion of the feed lever may be stopped, so that the fabric will not move at all in a lateral or progressive direction. With these improvements, the operation of sewing by machinery is greatly simplified and rendered very easy, whilst the work produced is strong, and beautifully uniform and regular.

PROPELLING AND STEERING VESSELS.

J. H. Johnson, *London and Glasgow*, (John Eaton, *Belleville, Upper Canada.)—Pated dated February* 17, 1859.

This improved system of propelling and steering, consists in the application of a scroll shaped bore or casing placed in a horizontal position beneath the surface of the water, and connected to the stern or other convenient portion of the vessel. Within this bore works a rotatory fan or series of blades attached to a vertical shaft, which extends upwards into the vessel, and is driven by means of a steam engine or other suitable prime mover.

Fig. 1.

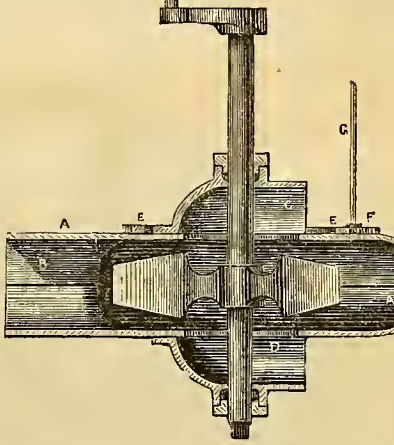
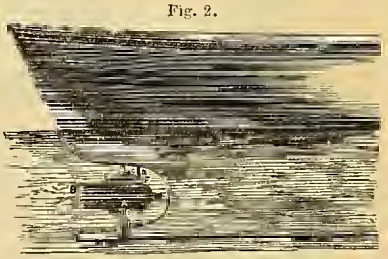


Fig. 1 of the annexed engravings, represents a longitudinal vertical section of the improved centrifugal propelling and steering apparatus attached. Fig. 2 is an elevation of the stern of a vessel, showing the mode of applying this apparatus. A, is the outer casing of the propeller, it is of a scroll shape, and contains within it a rotatory fan or series of blades, keyed on to the lower end of a vertical crank shaft. This shaft extends through the upper side of the casing, A, and into the vessel, and is drawn by a steam engine or other suitable prime mover. B, is the discharge mouth or aperture, and C, D, are the two inlet orifices for the entrance of the water. These orifices are formed by two semicircular pipes or hoods bolted to the upper and under sides of the main box, A, which is also formed in two halves, and bolted together by flanges at the centre. These mouths or entrances, C, D, are situate diametrically opposite to the discharge mouth, B, and thus the water enters at the forward side of the propeller, passing into the fan wheel by upper and lower eyes or centres of the main box, when it is forced out at the periphery through the back aperture, B. On the top of the casing, A, a spur wheel or circular rack, E, is made fast, into which gears the spur pinion, F, fast on the lower end of the spindle, G, which passes upwards into the vessel. The vacuum produced in the casing or box, A, by the rapid rotation of the blades causes an influx of the surrounding water through the orifices, C, D, which water, as fast as it enters, is forced out again in the form of a powerful jet through the discharge mouth, B. This jet, by reaction, effects the propulsion of the vessel, in a direction exactly contrary to that in which the jet issues. By simply adjusting or turning the casing, A, more or less round the bottom of the crank shaft, by the spindle, G, and the pinion and rack, F, and E, it is obvious that the issuing jet may be directed with the greatest facility in any required direction, so as to steer or control the course of the vessel.

Fig. 2.



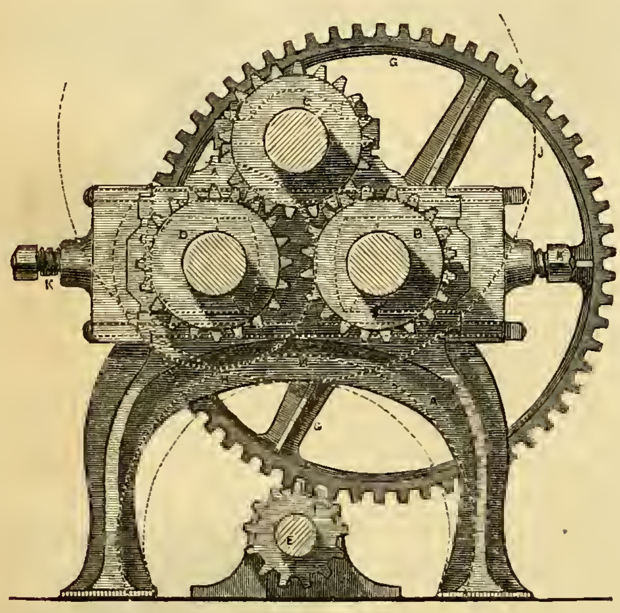
PREPARING AND TREATING INDIA-RUBBER.

J. H. Johnson, *London and Glasgow*, (A. G. Day, *Connecticut, U.S.*)—*Patent dated May* 13, 1859.

The improvements specified under these letters patent comprehend the peculiar arrangement and construction of machinery or apparatus for breaking down and cleansing, as well as for mixing and grinding, India-rubber, and other similar gums, and consists in the employment for such purposes of peculiarly constructed toothed rollers, arranged either in pairs or in sets of three rollers, working together by the aid of suitable gearing. The rollers which it is proposed to employ are covered with quadrangular, pyramidal teeth, arranged in rows parallel with the axis, and also at right angles thereto; that is, in a series of parallel rings. The teeth of one roller work in the intervals between the parallel rings of teeth on the next roller, so as to admit of a slipping motion, which is accomplished by driving each roller faster than the preceding one. When crude rubber is to be cleansed and purified from foreign matters, it is submitted to the action of these rollers, preferring a set of three for the breaking and cleansing process, and is thereby thoroughly broken down and separated into small pieces, from which, by other operations, the foreign matters may be readily removed.

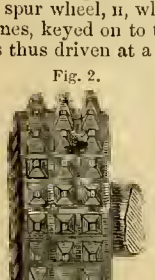
Fig. 1 of the accompanying illustrative engravings represents a longitudinal sectional elevation of the machine, and fig. 2 is a front elevation of part of one of the rollers. A, is the main framing of the machine, provided with three rollers, B, C, and D, of which B is the feeding roller, C the crushing roller, and D the friction or stretching roller.

Fig. 1.



E, is a centre shaft, which carries a pinion, F, gearing into the large spur wheel, G, keyed on to one end of the axis of the feeding roller, B, and turning consequently with a slow motion. This shaft carries also a spur wheel, H, which gears into another spur wheel, I, shown in dotted lines, keyed on to the end of the axis of the stretching roller, D, which is thus driven at a greater speed than the feeding roller. The crushing roller, C, is similarly driven from the main shaft, through the large spur wheel, J, keyed on to the end of the axis of the crushing roller, also shown in dotted lines. The whole of the above gearing is so arranged as to drive the feeding roller at a rate of about ten revolutions per minute, the crushing roller thirty revolutions per minute, and the stretching roller ninety revolutions per minute. K, are set screws connected with the sliding bearings, L, of the rollers, B and D, for the purpose of regulating the space between the rollers, so as to feed fast or slow, according to the character of the material under treatment. The quadrangular, truncated, pyramidal teeth or projections on the surfaces of the rollers are arranged in rows, parallel to the axes of the rollers, and also in a series of rows or parallel rings, at right angles to the axes. The annular rows of teeth, at right angles to the axis on the feed roller, B, mesh into or work in the corresponding annular spaces, left between similar rows of teeth on the crushing roller, C. By this arrangement the teeth on the roller, B, can approach very close to those on the roller, C, without at all interfering with the slips occurring between the two rollers, by reason of the one running at three times the speed of the other. This slipping motion causes the gum to be effectually raked, torn, and disintegrated, on its passage between the surfaces of the two rollers, B and C, which treatment is repeated as it passes between the rollers, C and D, since the latter roller, D, in its turn revolves three times faster than the crushing roller. The effect of the above treatment is to detach and loosen foreign bodies and impurities from the gum, and to reduce the gum to small pieces, in which state it is easily treated by the chemical agents.

Fig. 2.



The patentee states that he is aware gums have been broken down and treated by toothed cylinders, working together similar to spur wheels, and known as the "masticator," but the effect of such machine is to work the gum into a homogeneous mass, whilst the object of the present invention is to separate the gum into small pieces, from which, by other and separate processes, the foreign matters are readily removed. According to one of these processes the broken or comminuted gum, on leaving the rollers, is subjected to the action of a watery solution of caustic or carbonated alkali, in such a manner that the alkali shall penetrate into the pores of the gum, and of the foreign bodies imbedded therein or intermingled therewith, by the aid of exhaustion alone, or by exhaustion and compression. When the mass of the rubber has been thoroughly charged with the alkaline liquor, it is removed therefrom, or the liquor is drawn off, and the mass is well washed with water, and again passed through the toothed rollers, by which and the abundant supply of water, the bark and sticks are loosened, and sink to the bottom of the cistern, whilst the gum floats on the surface of the water. To remove those impurities which are not removed by simply soaking in alkali, such, for example, as dried or moist sap contained in cavities within the mass of gum, the mass, after leaving the breaking rollers, is placed in an iron cylinder, and the air exhausted to a practical vacuum, by which the cavities of the rubber expand, and the liquid contents exude, whereupon the alkaline solution is let in, and the cylinder is filled. To increase the effect, the patentee proposes to use a force pump, so as to produce a pressure of twenty to thirty-five pounds to the square inch, by which means the alkaline liquor is forced into the minutest pores of the gum, and that by the subsequent action of the rollers and the water, the foreign bodies are almost entirely removed. The gum and alkali are allowed to remain in contact from fifteen to sixty minutes, after which the mass is removed from the cylinder, and thoroughly washed in water, the foreign matters sinking to the bottom, and being carried off by a current through the washing vessel. The mass is thus brought to the rollers again, which work in water, and is thereby run into sheets. This process squeezes out the remaining alkali, which carries with it the sap and colouring matter, which are removed by the plentiful supply of pure water.

The same kind of toothed rollers are also applicable for grinding and mixing rubber, and incorporating with it sulphur and other ingredients. These rollers are also used for rolling the material into sheets, for which last mentioned operation they are provided with smaller pyramidal teeth than when intended for the breaking up of crude gums. It will be found that the cleansing and breaking process can be equally well accomplished by two rollers as by a set of three, but the work will not be effected so rapidly. When a pair of rollers are used, the feeding roller makes about ten revolutions for twenty revolutions of the crushing roller, both rollers being of equal diameters.

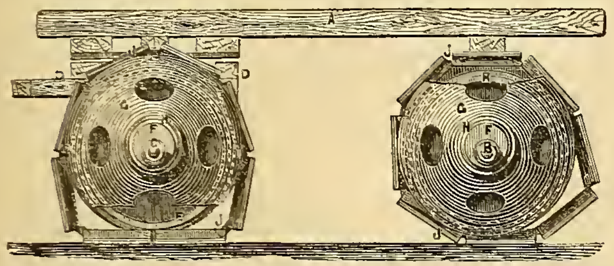
FACILITATING THE DRAUGHT OF CARRIAGES.

Matthew Leahy, *Westbourne Park, Middlesex.—Patent dated May* 14, 1859.

These improvements are specially intended to facilitate the draught or transport of heavy carriages over ordinary roads, or over soft and marshy land. In carrying out this invention it is proposed to fit on the axle or axles of the vehicle, and on each side of the bearing wheels an eccentric, upon which eccentrics revolve freely a pair of disc wheels. The centres of the disc wheels are maintained slightly higher than the centres of the bearing wheels, by the aid of the fixed eccentrics before mentioned. Each pair of disc wheels carries an endless chain of short lengths of rail, the several lengths being connected together by metal or vulcanised India-rubber links, or links composed of a combination of rubber and metal, or other materials of a flexible and yielding nature. These endless chains support the bearing wheels, and serve as endless railways for the vehicle to run upon. The object of the eccentricity of the disc wheels is to prevent the endless chain of rails from coming in contact with the peripheries of the bearing wheels, except at the actual bearing point, by which means a great portion of the strain on the joint pins of the rails, and the friction attendant upon the working of the rails round the wheels, as the whole advances, is prevented.

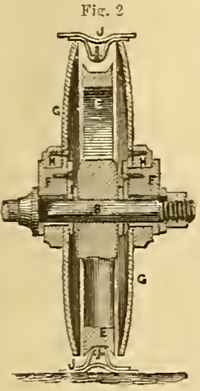
Fig. 1 of the accompanying engravings represents a side elevation of the lower part of a waggon or truck fitted with these improvements. Fig. 2 represents an enlarged sectional edge view of one of the bearing wheels, showing the endless chain of rails resting at top, on its accompanying pair of eccentric disc wheels. A, is the body frame or

Fig. 1.



floor of a truck or waggon, intended for the carriage of bulky articles of a ponderous nature, such as large blocks of hewn stone. This waggon is provided behind with a fixed axle, and in front with a swivel axle and the ordinary locking or turning carriage, or both axles may be made to turn on centres if desired. The actual bearing wheels, E E, (shown more clearly in the section, fig. 2,) may be either flanged or left plain on their peripheries; these wheels turn freely upon their axles, B and C, upon which are keyed the eccentrics, F, one on each side of each bearing wheel. Upon these eccentrics, (the centres of which are some inches above the centres of the axles,) the discs, G, turn loosely. A boss, H, in the centre of each disc fits loosely between a shoulder on the outer edge of each eccentric, and an internal plate, I, which is screwed to the inner side of the eccentric, thus the disc wheels are maintained in proper position as regards the main wheels, whilst at the same time they are perfectly free to turn as required; or the eccentrics may be made in two parts bolted together. The endless chains of rails, J, are entirely supported and carried by the disc wheels, and as the upper edge of these wheels stands some distance above the periphery of the bearing wheels, it follows that the endless chain will be kept entirely out of contact with the periphery of the bearing wheels, excepting at the bearing points beneath the bearing wheels, thereby considerably reducing the friction of the chains over the wheels, and obviating the injurious straining on the links which occurs when the chains are simply passed over and carried by the bearing wheels themselves. The endless chains of rails may be constructed of different sections according to the shape of the rim of the bearing wheels.

Fig. 2



When applied to locomotives the heavy wheels are fixed on their axles, and the eccentrics are loose thereon, but are maintained in their proper position by sliding in suitable guides or guard irons in which their bosses are made to fit. Or in lieu of disc wheels, one or more rollers may be employed, carried by arms fixed to the axles or framing, such rollers projecting over the upper edge of the bearing wheels, and supporting the endless chains of rails which pass over them. When flanged wheels are used, the patentee prefers to use the bridge form of rail shown in section, fig. 2, each length of rail, H, being jointed to its neighbour by a short link of metal or vulcanised India-rubber, or other yielding material. The patentee does not confine himself to the particular form of rail herein described.

IMPROVED CHURN.

Robert Tinkler, *Penrith.—Patent dated February* 5, 1859.

Mr. Tinkler's invention relates, in the first place, to rotatory churns of the barrel class; and it consists of a simple arrangement, whereby the user can set the barrel steady or fixed in several different positions as regards its rotation. Secondly, to the application of bungs or stoppers, composed of a piece of India-rubber combined with wood, and strengthened at the back with a metal plate. Another part of the invention consists of an improved air discharge valve for churns, which is so constructed that it can be readily taken out and cleaned when requisite, and in order to prevent any injurious effect upon the milk, and secure cleanliness, the metal portion of the bung and valves are electro-plated.

Fig. 1 of the annexed engravings represents a perspective view of a barrel churn fitted with the patentee's improvements; fig. 2 is a sectional detail of the improved bung; and fig. 3 is a vertical section full size of the improved air discharge valve. A, is the framing or support of the churn, which consists of an ordinary barrel, or other shaped rotatory vessel, B, supported at each end by spindles, C, working in any convenient bearings, D. A winch handle, E, serves to impart the requisite rotatory motion to the churn. At one end of the churn is attached a plate, F, having a number of holes made therein, arranged in the form of a segment, the centre of which coincides with the centre of rotation of the churn. On the top of the support, A, is fitted a sliding bolt or catch, G, which is capable of engagement with any one of the holes in the plate, F; and serves, when so engaged, to maintain the body of the churn in any required position as regards its rotation. By this means the churn may be fixed in any required position, so as to afford facility for the introduction of the milk or cream therein, or extraction of the contents thereof. This is accomplished through an aperture, closed by a bung, H, of a peculiar construction, as shown at fig. 2. This bung consists of a plate of metal, J, stamped or not into a dished or recessed form, and covered on the inner surface by a piece of vulcanised India-rubber, I, made to fit accurately the inner surface of the metal plate, and secured thereto by screws and washers, K, so as to be readily removable when requisite, for the application of a fresh piece of India-rubber. A cross piece of wood, L, inserted in the hollow or recess of the upper surface of the bung, and maintained in its place by two of the screws, K, above referred to, serves as a convenient handle to the same. The metal plate, J, may be electro-plated for the purpose of ensuring greater cleanliness and durability. The improved air discharge valve, shown in sectional detail in fig. 3, consists of an outer cylindrical shell or tube, M, screwed externally at N, for attachment to the barrel of the churn, and provided internally at the inner end with a conical lift valve seat. Within the interior of the shell, M, works a valve spindle, O, which carries a conical valve, P, fitting accurately, so as to be air-tight on the valve seat. The spindle, O, works freely through the tubular boss of the internal metal disc, Q, which disc serves as a bearing for the helical spring, R, interposed between the disc and the hollow cap, S, which is screwed on to the outer end of the valve spindle, the object of the spring being to keep the valve tightly closed, except when the cap, S, is depressed by the hand, in which case the air valve is opened, and the air escapes by the lateral apertures, T, made round the shell, M, of the valve. All the metal parts in connection with this valve are electro-plated, or otherwise protected from the action of the milk.

Fig. 1.

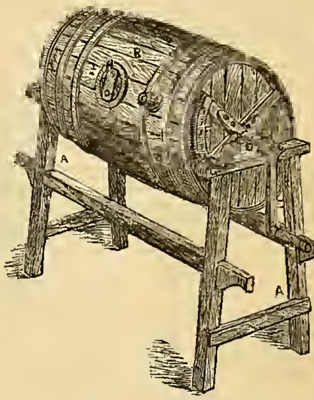
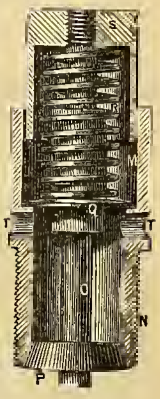


Fig. 2.

Fig. 3.



CONSTRUCTION OF PIANO-FORTES.

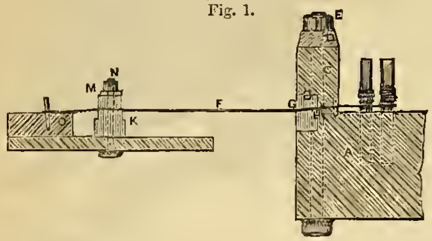
J. H. Johnson, *London and Glasgow* (George Vogt, *Philadelphia*).—*Patent dated May* 5, 1859.

The improvements specified under these letters patent have reference to the arrangement and construction of the "rest" and "bridge" of piano-fortes, with a view of obtaining increased brilliancy of tone, and obviating certain disadvantages inseparable from the ordinary construction.

Fig. 1 of the annexed engravings represents a sectional elevation of a portion of a piano-forte, showing the improvements applied thereto; fig. 2 is a corresponding plan of the same. On the front of the tuning block, A, and along its upper surface is secured, and partly let in, the bar of ivory, B; which bar may either consist of one entire piece, or be composed or made up of any convenient number of separate pieces, joined together in such a manner as to present an unbroken surface. Over and upon this bar is placed the wooden cap piece, C, which should be about double the thickness or width of the bar, B, the hinder part of which extends down behind the bar, B, and rests upon the tuning block,

A. A strong metal bar, D, is laid upon and covers the cap piece, C, and is bolted firmly down thereon by the bolts, E, which pass entirely through the cap piece and tuning block, and impart great solidity and firmness to the parts referred to. The strings, F, are passed through holes drilled through the ivory bar, B, the diameter and position of these holes being such as to admit of no further contact of the springs with the bar than at the two points, G and H; for this object, the holes are drilled obliquely through the bar, B, being inclined upwards slightly towards the "rest" pins. By this arrangement the string bears against the upper side of the hole at its front end, G, and crossing the hole diagonally,

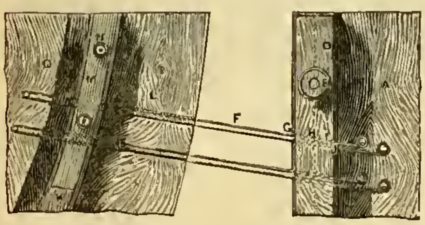
Fig. 1.



rests upon the under side at the back end of the hole, as shown at H. The lower part of the cap piece, C, forms a back to the bar, B, and is perforated at I, such perforations coinciding with the holes in the bar, B. The bottom sides of the perforations, I, are slightly bevilled or inclined, so as to form a single contact point or bearing surface for the string at J, a space being left between the points, J and H, upon which the string does not bear. The object of the bearing point, J, is to destroy all false impeding vibration of that portion of the string combined between the "rest" pin and point, J; and this bearing further serves to relieve the points, G and H, from the direct pressure incurred by the tension of the string. K, is an ivory bridge resting on the sounding board, L, in the usual manner, and covered by a metallic bar, M, the two being firmly united together to the sounding board by means of the bolts, N. The bridge, K, is provided with holes for the reception of the strings, such holes being similar to those in the bar, B, as regards their size and upward inclination towards the pin clock, O. In order to facilitate the drilling of the holes in the proper direction, at that part of the bridge where, from the sharpness of its curve, the strings necessarily pass through it at an acute angle, it is proposed to adopt the arrangement shown in the plan.

The advantages obtained by the use of these improvements are numerous and important. The first and most important is the entire removal of all impediment to the direct vibration of the strings, since all the bearing points are brought in a line with the direction of the vibrations imparted by the hammer. The avoidance, moreover, of any contact of the strings with wood or metal, which, as regards those points exerting an influence on the sound, obviates not only the peculiar dul-

Fig. 2.



ness of tone imparted by wooden contacts, but also the disagreeably shrill sound obtained where metal contacts are used, whilst the employment of ivory in the bearing or contact points gives that clear, full, and brilliant tone, so peculiar to this substance when employed in the construction of musical instruments. Another important advantage is the solidity and body imparted both to the "rest" and "bridge" by the peculiar combination of the cap piece, C, and metal bars, D and I, with the ivory bar, B, and ivory bridge, G. The very slight deviation of the strings from a straight line at their extremities, greatly reduces the depressing influence exerted upon the sounding board by the tension of the strings, thereby allowing greater freedom to the vibrations of the sounding board, and consequently, increasing the tone of the instrument; whilst on the other hand, the avoidance of any sudden bend facilitates the yielding of the strings when tuning, serves to insure the instrument standing in tune for a longer period than is usual with pianos of the ordinary construction, and greatly reduces the liability to breakage of the strings.

APPARATUS FOR STOPPING HORSES.

J. H. Johnson, *London and Glasgow*, (Madame Achet, *Paris*)—*Patent dated February* 28, 1859.

This apparatus consists of two pressing pads or surfaces, which are attached to a blade spring screwed to the front of the nose-band, and which are caused to approach each other and pinch the nose of the animal at a particular point, a little above his nostrils, on tension being applied to a suitable curb rein for the purpose, which passes through each end of the spring before referred to, and through a ring behind the animal's jaws. The apparatus is enclosed in an outer casing which effectually conceals it and resembles the ordinary head gear. The particular point upon which the pressure should be applied is situate just below the intersection of the chanfrin bone with the lachrymals and lower jaw bone.

Our engraving represents a front elevation of one form of the apparatus drawn one-half full size. This apparatus consists essentially of two pads, B, fitted to the ends of a steel blade spring, C, which is attached at its centre to the nose-band, D, by a pin, or rivet, F, the actuating rein, A, being passed through a ring, E, at each end of the spring, C. These reins unite in the hand of the rider, after respectively passing through the rings, G, on the nose band, D, and passing along the interior thereof, whence they issue through an opening in the casing, H, hereafter referred to, and cross each other through a ring attached to the nose band under the jaws of the horse's head. The case, H, of the nose band, D, seen in section in the engraving, serves to effectually enclose the pressing pads, B, and springs, and conceal them entirely from

view. This casing is strengthened internally by a metal plate, and is attached to the nose band by the central bolt or pin, F, the whole being covered over with leather, so as to resemble as much as possible the ordinary nose band. The nose band itself is composed of a steel band, open at each side for the purpose of allowing the pressing pads, B, to pass through it, when acted upon or drawn tight by the rein, A, they assume the position indicated by the dotted lines, thereby compressing the nostrils of the animal, and bringing them into contact with each other, so as to entirely stop respiration, and consequently compel the animal to come to a stand. It will be readily understood that the reins, A, being passed through the fixed rings or eyes, G, and through those at E, on the blade spring, C, which carries the pads; the tightening of this rein will bend the blade, C, and bring it into the position indicated by the dotted lines; but so soon as the pull or tension of the rein is relaxed, the elasticity of the spring, C, will cause the pads to assume their original position again, as indicated in the illustrative figure.

LAW REPORTS OF PATENT CASES.

Fish Joints for Railways: Harwood and Others *v.* The Great Northern Railway Company.—In the Court of Queen's Bench, before Lord Chief Justice Cockburn and a special jury. We have already twice reported the proceedings in this case, at pp. 273 and 301 of our last volume. The plaintiffs are really the Permanent Way Co., sueing in the names of the executors of the late Charles Heard Wild, and they sued the Great Northern Railway Company to recover damages for the infringement of a patent granted to Mr. Wild on the 16th of March, 1853, for "improvements in fishes and fish joints for connecting the rails of railways." The action has been already once tried, when the defendants obtained a verdict, but the Court subsequently granted a new trial upon the ground of surprise.

It appeared from Mr. Wild's provisional specification that, in securing the joints of rails, it had been found advantageous to attach pieces of iron to each side of the rail by means of bolts and nuts, and such pieces of iron were commonly called "fishes." Chairs had been constructed on a similar principle to support one side of the rail, while a "fish" was applied at the other side, and secured to the chair by bolts and nuts. Mr. Wild stated that his invention consisted in forming a recess or groove in one or both sides of each "fish," so as to reduce the quantity of metal at that part, and be adapted to receive the square heads of the bolts, which were thus prevented from turning round when the nuts were being screwed on. In his specification subsequently filed on the 19th of September, 1853, Mr. Wild, after minutely describing the invention, stated its advantage to be, that "the groove renders the 'fish' lighter for equal strength, or stronger for an equal weight of metal, than a 'fish' which is made of equal thickness throughout." Having described the nature of his invention, and in what manner the same was to be performed, he claimed,—"1. The constructing 'fishes' for connecting the rails of railways with a groove adapted for receiving the heads of the bolts or rivets employed for securing such fishes, and the application of such fishes for connecting the rails of railways in manner hereinbefore described. 2. The constructing fish-joints for connecting the rails of railways by means of fishes applied to the joints of divided or split rails, in manner hereinbefore described. 3. The constructing fish joints for connecting the rails of railways with fishes, secured by three or more bolts and nuts or rivets, of which the central bolt or bolts, or rivet or rivets, is or are of greater diameter than the extreme ones, as hereinbefore described. 4. The constructing fish joints for connecting the rails of railways with grooved fishes fitted to the sides of the rails and secured to them by bolts and nuts or rivets, and having projecting wings firmly secured to and resting upon the sleepers or bearers, so as to support the rails by their sides and upper flanges, in manner hereinbefore described." A great many scientific witnesses were called on the part of the plaintiffs to prove the novelty of the invention. They admitted that grooves had been in use for the purpose of preventing the heads of bolts from turning round, but they denied that grooved iron or timber had ever been employed in the manner of a "fish" to unite two pieces of iron or timber. On the part of the defendants, several scientific witnesses were called, who gave contrary testimony, and the model of a bridge, called the Hackney Bridge, on the South Devon Railway, was produced, in which they said, a grooved or channelled iron was used as a "fish" to strengthen and support a scarf-joint in the tie-beam. The plaintiffs' witnesses denied that the channelled iron in question was so used, and thus the question at issue resolved itself chiefly into an inquiry as to the precise functions performed by the channelled iron in the Hackney Bridge.

At half-past 4 o'clock the jury found that channelled iron for strengthening, and also for keeping in place bolt heads, was in use before the patent, but that the combination in Mr. Brunel's bridges was accidental, and they did not deem it "fishing."

The Lord Chief Justice said that would be a verdict for the plaintiffs, with leave to the defendants to move to enter the verdict in their favour, should the Court above be of opinion that the transfer, as it might be called, to "fishing," and the combination therewith, would not support the patent.

Verdict for the plaintiffs accordingly, with leave for the defendants to move to set aside the verdict upon several points of the United States' Patent Law.

Jacquard Carpet Weaving: Crossley and Others *v.* Talbot.—This action, in the Court of Queen's Bench, before Lord Chief Justice Cockburn and a special jury, was brought by Messrs. Crossley, carpet manufacturers at Halifax, to recover £2,000 from Mr. Talbot, also a carpet manufacturer at Kidderminster, as royalty for the use of their patents in connection with the Jacquard loom. The royalty was secured by a deed between the parties, and the defendant, by plea, denied that in making his carpets he had used any of the plaintiffs' inventions or any part thereof.

Before the case commenced, the Lord Chief Justice said there was another patent case in to-day's paper. He really could not take up the whole time of the sittings in trying patent cases.

Mr. Atherton had not concluded the opening for the plaintiffs, when

His Lordship suggested that it was a matter which might be much better settled by some scientific person from an inspection of the machinery than by an inquiry in court, which would occupy two or three days.

Mr. Knowles for the defendant, said he quite concurred with his Lordship. At the end of two or three days the jury would not have arrived at the knowledge necessary to commence the investigation.

The Lord Chief Justice said these patent cases were nuisances. Laymen, perfectly unacquainted with the points which they were called upon to determine, were not in such an advantageous position at the end of several days as a scientific person would be in as many minutes.

A Juryman said he could confirm his Lordship's view. He had served upon a jury in the Court of Exchequer in a very similar case, and he believed that half of the jury were so confused by the conflicting testimony they could scarcely arrive at any conclusion.

The Lord Chief Justice said it was very difficult to decide between conflicting evidence in ordinary cases, but especially so when the subject-matter was not within their cognizance.

A verdict was then taken for the plaintiffs, with the damages in the declaration subject to a reference.

Mr. Knowles said that all parties ought to be obliged to his Lordship for making the suggestion. He was certain that this case could not have been satisfactorily tried in any other way, and few patent cases could be satisfactorily disposed of by a jury.

The Lord Chief Justice—One mind conversant with the subject is infinitely better than twelve or thirteen who are not.

This is certainly a very extraordinary proceeding. Here we have a Lord Chief Justice reminding counsel and jury before anything was done, and before he could possibly know anything of the merits of the case, that there was "another patent case in to-day's paper," and declaring that "he really could not take up the whole time of the sittings in trying patent cases." We have the defendant's leading counsel concurring with his Lordship "that it was a matter which might be much better settled by some scientific person from an inspection of the machinery, than by an inquiry in Court," and asserting that "at the end of two or three days, the jury would not arrive at the knowledge necessary to commence the investigation." Then we have his Lordship giving his opinion that "these patent cases were nuisances;" "laymen (is every man not a lawyer, a layman?) perfectly unacquainted with the points which they were called upon to determine, were not in such an advantageous position at the end of several days as a scientific person would be in as many minutes;" and finally we have a juryman confirming his Lordship's view. Really we might suppose that my Lord Cockburn had no experience in patent matters; that as one of the first counsel of his time, he had never pocketed a fat fee in a patent action, and fought well for it too, before that very tribunal over which he now presides with so much ability; and that he had never been either solicitor or attorney-general, nor had realised thereby a particularly handsome income out of the very patent system, the working progress of which he has here attempted in some sort to arrest.

We might also suppose that Mr. Knowles was new to the matter. Probably if he had not received his *honorarium* previously, he might not have been so excessively ready to second the stoppage of the case. No one can be more anxious for the settlement of disputes in patent cases than we are. But we all know what arbitration and reference matters are, and how difficult they often are in practical management. The Lord Chief Justice receives his salary, we presume, in virtue of his disposing of all legitimate cases coming before him, and we cannot see why patent cases should be stigmatized as "nuisances." Are they more so than divorce, lunacy, breach of promise of marriage, or sea collision cases? Every newspaper reader will know how much valuable time is taken up with such business, and certainly the general public will have an opinion of its own as to whether such matters or patent cases have the better claim to the time of the sittings.

Starch and Food: MacKean's Petition for Patent—Opposition to Sealing.—This was a petition presented by William MacKean praying that the Great Seal might be affixed to letters patent for his alleged invention of "improvements in the manufacture or treatment of farinaceous matters for the obtainment of starch and food." The facts of the case are these:—Mr. John Polson, of the firm of Brown and Polson, of Paisley, obtained letters patent for his invention of "improvements in the manufacture of starch," dated the 21st March, 1854, and having reasons to believe that MacKean's application was in respect of a subject matter similar to Mr. Polson's, entered his opposition. The petitioner applied for letters patent on the 9th of July, 1859. On the 2d of August following the usual advertisement appeared in the *Gazette*, but was not seen by Mr. Polson; and it was not until after the time for entering an opposition before the law officer, that Mr. Polson became acquainted with the fact of the petitioner's application for a patent. The law officer having issued his warrant for sealing the petitioner's patent, on the 3d September last Mr. Polson gave due notice of his intention to oppose the sealing. On the 10th October last the petitioner served Mr. Polson's solicitor in London with his petition, which it was known would probably be in the paper for hearing on the 2d November. There being facts to be proved in opposition to the sealing, affidavits were made and filed by Mr. Polson about an hour before the petition was called on in court, and about two hours previously copies of the affidavits were handed to the petitioner's solicitor. The petition having been called on, counsel for the petitioner submitted to the court that inasmuch as the respondent, Mr. Polson, had not filed his affidavits earlier, he ought not to be *heard* in opposition, more especially as no opposition had been entered before the law officer. Mr. Karslake, of the Chancery Bar, appeared as counsel for Mr. Polson, and contended that he had a right to be heard, that the respondent's case was complete, that he was ready to go into and argue it, that it was the practice of the Court of Chancery in analogous proceedings to allow the party in court whose case was perfected, by filing affidavits on the very eve of coming into court, to be heard; and this although the filing of such affidavits had been *purposely* delayed, but without prejudice to the right of the other to reply to such affidavits, and to a postponement of the hearing to enable him to do so. And with reference to the fact of no opposition having been entered before the law officer, it was submitted that a party had a right to detain his opposition until application should be made for sealing the patent.

The Lord Chancellor commented very strongly upon the fact of no opposition having been made before the law officer, and observed that the reason assigned for not doing so—namely, that Mr. Polson had not seen the advertisement in time—was inadmissible, because the advertisement having been duly published must be assumed to have been seen by him. His Lordship also remarked, that by allowing the patent to be sealed, Mr. Polson could not be prejudiced; for if the petitioner's invention should turn out to be the same as Mr. Polson's, the latter would have his remedy either by *scire facias* to annul the petitioner's patent, or by an action for infringement, in case the petitioner exercised his invention. Considering that the respondent, Mr. Polson, had been guilty of laches in not filing his affidavits earlier, he was not entitled *to be heard at all*, and His Lordship refused to allow his case to be gone into, and ordered the patent to be sealed; but although the petitioner applied for costs of the opposition, His Lordship declined to make any order as to them, stating that this was not a case for payment of costs.

We venture to assert that even within the peculiar jurisdiction which the Lord Chancellor assumes in respect of applications for patents, there is no precedent for the course adopted by His Lordship in this case. And if we refer to the every-day practice on motions in the Court of Chancery, not only is there no such precedent, but that the very contrary course is recognized and allowed. The case of the Electric Telegraph Co. *v.* Nott, 11 Jur, 273, laid down that a party had a right to file affidavits *at any time before* the hearing of a motion, but that no affidavit filed *after* the hearing had begun could be read. The corollary to be deduced from this decision is, that a respondent to a petition, who comes into court with his case complete, and ready and willing to argue it, shall not be heard unless his case be completed in sufficient time before the hearing, to enable the petitioner to perfect his case. We submit with the greatest respect and deference to his Lordship, that a more erroneous judgment has never issued from any court, more particularly when it is remembered that from the decision there *is no appeal.*

Purifying Gas: Hills *v.* the London Gas Light Company.—This is another of those cases which, owing to their lingering progress through the Law Courts, we have had frequent occasion to report, our latest notice of it is given at page 101 for July last. It was an action in the Court of Exchequer, before the Lord Chief Baron, Mr. Baron Bramwell, and Mr. Baron Watson, and it was brought for infringing a patent, taken out by the plaintiff in 1849, for improvements in purifying gas, and was originally tried before the Lord Chief Baron, in Middlesex, about two years ago, when his Lordship, upon witness saying that that which was sold by chymists as carbonate of iron would practically be oxide of iron, as an exposure of the substance to the atmosphere for a very short space of time would convert it into oxide, ruled that the jury ought to find for the defendant. An application was made to the Court for a new trial, upon the ground that the answer given by the witness was altogether a mistake, and a rule was granted and ultimately made absolute, and the case carried down for a new trial before Mr. Baron Bramwell, at Guildford, in the summer assize of 1858, when the jury found a verdict for the plaintiff, with damages, £5 5s.

The plaintiff's specification claimed for a method of purifying gas from sulphuretted hydrogen, cyanogen, and ammonia, by passing it through a porous material, and of renovating the material after it became inert by taking the sulphates, the oxychlorides, or the hydrated or precipitated oxides of iron, either by themselves or mixed with sulphate of lime, or sulphate or muriate of magnesia, baryta, strontia, potash, or soda, and absorbing them or mixing them with sawdust or peat charcoal, in coarse powder or breeze, or other porous or absorbent material, so as to make a very porous substance easily permeable by gas.

Mr. Bovill, Q.C., on the 13th of November, 1858, moved for a rule to show cause why the verdict for the plaintiff should not be set aside, and entered for the defendants, or a nonsuit, on these grounds:—1. That the plaintiff's invention was not new by reason of Croll's and Laming's patents and specifications respectively, and what was disclosed in them, and from what was done by Croll and Laming in relation to their inventions. 2. That the plaintiff was not the inventor on similar grounds. 3. That the plaintiff's specification was insufficient and bad for not specifying which hydrated oxides of iron would answer the purpose, or for claiming all hydrated oxides of iron, though some would not purify gas. 4. That the mere application of hydrated oxides of iron to absorb sulphuretted hydrogen from gas was not the subject of a patent, its properties and effects with reference to sulphuretted hydrogen being previously well known. 5. That the renovation of hydrated oxide of iron by exposure to air, being previously well known, was not, nor was its application to purifying gas, the subject of a patent. 6. That the specification of the plaintiff as amended by the disclaimer is not within the title of the patent as amended. 7. That, having disclaimed that part of his title which related to obtaining certain substances applicable to the purifying of gas, the plaintiff could not claim for the renovation of the purifying material as he had done; or why a new trial should not be had, on the ground that the verdict was against evidence upon the several points left to the jury, except upon the point that the plaintiff had taken out his patent and lodged his deposit paper for a different invention from that which he afterwards specified. Croll's specification, dated in the year 1840, claimed the purification of gas from ammonia by means of chloride and sulphate of manganese and muriate of iron and sulphuric and muriatic acids, and the purification from sulphuretted hydrogen by means of the oxide of manganese, the oxides of iron, and the oxides of zinc. Laming claimed, seven years later, the use of the carbonate of iron for the purification of gas, but neither claimed renovating the material after it had become inert by exposure to air, although it was said that one or both arrived at the same result by means of heat. For infringing this part of the plaintiff's patent the present action was brought.

Pile Carpets: Curtain *v.* Crossley and Others.—This was an action in the Court of Exchequer, before the Lord Chief Baron and a special jury, brought by the plaintiff, who is the patentee of certain improvements in the manufacture of carpets, for an infringement of his patent by the defendants, who are the well known carpet manufacturers at Halifax, in Yorkshire. The infringement complained of, was the using by the defendants of a wire with a bladed end for cutting the pile of Brussels pile carpets, in the course of their manufacture, in the manner pointed out by the specification of the plaintiff's patent. It was shown that the old method of cutting the pile could not be applied to power looms, and there was no question as to the fact of the defendants having used the bladed wire. For the defence it was proved that wire constructed on the same principle as that used by the plaintiff had been used in the manufacture of pile carpets, velvet, and velvet lace anterior to the date of his patent. An extract was read from the *Dictionnaire des Arts*, published in Paris prior to the plaintiff's patent, and sold in London, describing the raising of the pile of Gobelin tapestry by a process similar to that employed by the plaintiff in his manufactures under his patent.

After Mr. Atherton had summed up his evidence, and Mr. Huddleston replied upon the whole case,

The Lord Chief Baron, in the course of his summing up, told the jury that if they believed the witnesses called for the defendants, they must find their verdict for them.

The Jury found a verdict for the defendants.

On referring to the plaintiff's specification we find that his plan involved the use of two reeds, the one through which the warp first passed being formed with cutting edges upon its dents. There are no cutting "wires," as understood by practical carpet manufacturers, nor does the plaintiff make any claim to a mode of cutting pile. Automatic cutting actions in looms are indeed very old.

Treating Cotton Cops: Fielden *v.* Lord and Others.—This was an action in the Court of Queen's Bench at Guildhall, before Lord Chief Justice Cockburn and a special jury. The plaintiff, a workman employed in a cotton mill, brought his action against a mill-owner for an infringement of his patent for improvements in the construction and building of cops, and the defendants alleged that one Enoch Fielding was the true and first inventor, and that the plaintiff obtained his patent by fraudulent representations. A cop is the cotton wound off on the spindle in a conical shape at the ends, having a hole throughout, as in an ordinary cotton reel, caused by the spindle, and used in placing the cop on the shuttle. In practice it was found that a great deal of cotton was wasted by the bottoms of the cops being "britted" while being taken from the mules in baskets to the machinery for the next process of manufacture. To obviate the difficulty, gutta-percha foundations for the cops were used; but a more complete remedy was discovered in running a brush of paste along the mules, so as to coat the bottoms of the cops and render them less liable to injury. John Fielden, the plaintiff, and Enoch Fielding were friends, and, in a conversation one Sunday afternoon, the latter suggested that paste would do. John Fielden experimented and took out a patent first. Enoch Fielding stated that before the conversation he had experimented and tested by success the value of his invention. He also took out a patent, and Messrs. Lord defended this action, relying upon Enoch Fielding being the first inventor. Verdict for the defendants.

Coating Iron Ships: Beckford and another *v.* The Royal Mail Steam Packet Company.—This action was for an infringement of a patent, known as Westwood's or Day's patent, for coating the iron of vessels with black varnish and asphalt, to prevent corrosion. The company defended under an indemnity by Messrs. Miller and Co., of Glasgow, who had, as it was alleged, committed the infringement by applying a coating to the Company's ship *Oneida*. The question was whether what Messrs. Miller used in the first instance was substantially the same as black varnish, or a composition of a different nature, but having the same effect in causing the asphalt to adhere.

The jury found their verdict for the plaintiffs, damages £150.

Hinges, Elastic Cushions, Studs and Plates: Oxley *v.* Holden.—This was an action in the Court of Common Pleas, before Chief Justice Erle and a special jury, and it was brought to recover £50, being the amount claimed for royalty upon the sale of certain hinges, elastic cushions, and studs and plates intended to be used in the windows and doors of railway carriages, the object of which was to prevent the noise and jarring usual when trains are in motion. The plaintiff, who claimed to be the inventor of the above articles, had entered into an agreement with the defendant, whereby the latter was permitted to manufacture and sell them, paying upon each a royalty of 4d., it being further stipulated that the plaintiff should be paid at all events £100 per annum by four equal quarterly payments. There were pleas negativing the novelty of the alleged inventions, and that the defendant was induced to enter into the agreement by the fraud and misrepresentation of the plaintiff.

The jury found a verdict on both issues for the plaintiff.

Screw Propellers: Griffiths *v.* Royal Mail Steam Packet Company.—This was an action in the Court of Queen's Bench, Guildhall, before Lord Chief Justice Cockburn and a special jury. The allegation was, that in the company's steam ship *Tasmania* they had used a screw propeller which infringed the plaintiff's patent.

After the examination of one or two witnesses, it was arranged to enter a verdict for the plaintiff, upon terms.

Trade Marks: Names of Articles—Cigar Labels. Ormond *v.* Harrison.—This was a motion in the Vice-Chancellor's Court for an injunction to restrain the defendant, James Harrison, of Hanover Street, Liverpool, from selling any cigars under the name or description of "Vevey Fins," and from making up for sale any cigars manufactured by him in bundles or parcels, having affixed any wrapper or label so contrived or expressed as by colourable imitation or otherwise to lead the public to believe that the cigars manufactured and sold by the defendant were cigars manufactured and sold by the plaintiff. The plaintiff carried on the business of a cigar manufacturer at Vevey, in the canton of Vaud, Switzerland, under the style or firm of "Ormond and Co.," and he, in the year 1857, obtained the silver medal at the exhibition of arts and manufactures called "Exhibition Suisse de l'Industrie et des Beaux Arts," held at Berne, in respect of the cigars there exhibited by him, and called the "Vevey Cigars." The defendant was manufacturing and selling cigars called "Vevey Fins," and tied up in bundles similar to those in which the plaintiff's cigars are tied up, and bearing likewise the plaintiff's name in imitation of the plaintiff's signature, and the object of the present motion was to obtain an injunction to restrain such sale.

The defendant did not appear.

The Vice-Chancellor accordingly made an order for an injunction in the terms asked, upon an affidavit of the service of notice of motion upon the defendant.

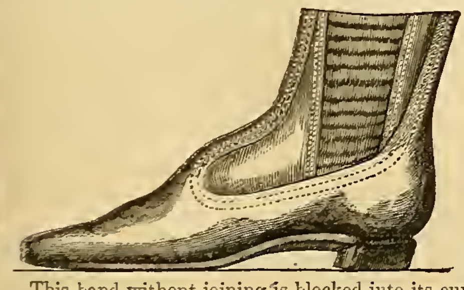
Trade Marks (Starch): Wotherspoon *v.* Turner.—This was a motion for an injunction in the Rolls Court. The plaintiffs, Messrs. Wotherspoon, the well-known starch manufacturers, are the exclusive proprietors of Messrs. Fulton and Co.'s right of manufacturing a flour starch known as "Glenfield's double-refined powder starch," moved for an injunction against the defendant from selling a starch in wrappers too closely similar as to device, colour, and description to those used by the plaintiffs. No material objection being offered to the motion, the Court granted a perpetual injunction against the defendant, subject to the minutes of the order being settled by counsel on either side.

REGISTERED DESIGN.

RIFLE BOOT.

Registered for Mr. Medwin, *Regent Street, London.*

Mr. Medwin, the eminent boot-maker, has introduced a capital boot, which has been specially designed for the use of the members of the now highly popular rifle corps, but which we consider is equally well adapted for the ordinary purposes of the civilian, as for military service. Our accompanying engraving shows the boot to be made with elastic side springs. The quarter of the boot is cut to the usual form, the main difference being in the "golosh," which forms a band rising over the instep, and extending to the top, as shown in the figure.



This band without joining is blocked into its curved form, and covers the join or seam necessary to unite the two quarters. By this arrangement great strength with neatness of appearance is obtained; complete protection from rain and breakage—the band and golosh being of one piece of leather, and in the form shown. Transverse seams across the tender part of the feet are avoided, preventing the great inconvenience which results from their being so placed. The rigid seams over this part of the foot, usually taking all the strain and weight, cutting like a cord, so that instead of yielding to, they resist the expansion of the foot, and become excessively painful. The boot, as a whole, becomes much stronger, and better calculated to resist water; besides its special adaptation to the exigencies of the rifle corps and infantry, it is eminently adapted for the gentleman farmer or tourist.

REVIEWS OF NEW BOOKS.

Evenings at the Microscope, or Researches among the Minuter Organs and Forms of Animal Life. By Philip Henry Gosse, F.R.S.

We congratulate the Society for Promoting Christian Knowledge, in having secured the publication of this very interesting volume. Mr. Gosse's works are deservedly well-known, they are pleasantly descriptive, and abound throughout with evidences of painstaking scrutiny into the works of nature, and of an honest love which prompts the requisite labour. Hence, this author is always an acceptable visitor when he comes forward and tells us what others have found out, but more when he details what he himself has observed. We cordially recommend the book to our readers. As specimens of some of the curious incidents touched upon, and the author's manner of handling them, we select the following:—

"Not many years ago an eminent microscopist received a communication inquiring whether if a minute portion of dried skin were submitted to him he could determine it to be human skin or not. He replied that he thought he could. Accordingly, a very minute fragment was forwarded to him, somewhat resembling what might be torn from the surface of an old trunk, with all the hair rubbed off. The professor brought his microscope to bear upon it, and presently found some fine hairs scattered over the surface; after carefully examining which, he pronounced, with confidence, that they were *human* hairs, and such as grew on the naked parts of the body; and still further, that the person who had owned them was of a fair complexion. This was a very interesting decision, because the fragment of skin was taken from the door of an old church in Yorkshire, in the vicinity of which a tradition is preserved, that about a thousand years ago a Danish robber had violated this church, and, having been taken, was condemned to be flayed, and his skin nailed to the church door as a terror to evil-doers. The action of the weather and other causes had long ago removed all traces of the stretched and dried skin, except that from under the edges of the broad headed nails, with which the door was studded, fragments still peeped out. It was one of these atoms, obtained by drawing one of the old nails, that was subjected to microscopical scrutiny; and it was interesting to find that the wonder showing tube could confirm the tradition with the utmost certainty; not only in the general fact that it was really the skin of man, but in the special one of the race to which that man belonged, viz., one with fair complexion and light hair, such as the Danes are well-known to possess."

We do not remember to have any where met with a statement of the following interesting fact, connected with the common "gold-fish:"—

"The brilliant golden or silvery reflection that constitutes the beauty of these lovely fishes, depends, not on the scales themselves, but on a soft layer of pigment spread over their inner surface, and seen through their translucent substance. On carefully detaching a scale, we see on the under side, opposite only to that portion that was exposed (all the concealed parts being colourless), a layer of soft gleaming substance easily separable, either silvery or golden, according to the hue of the fish. If, now, we remove a small portion of this substance with a fine needle, and spread it on a plate of thin glass, we shall find, by the aid of the microscope, that it consists of two distinct substances, the one giving the colour, the other the metallic lustre. With a power of 300 diameters, the former is seen to be a layer of loose membraneous cells of an orange colour, in what are properly called the gold-fishes, and whitish or pellucid in the silver fishes. If we now add a minute drop of water to the map, and gently agitate it with the point of the needle, and again submit it to the microscope, we shall have a beautiful and interesting spectacle. The water around the mass is seen to be full of an indefinite number of flat spiculæ or crystals, varying much in size, but of a very constant form—a flat oblong prism with angular ends. By transmitted light, they are so transparent and filmy, as to be only just discernible; but, by reflected light, and especially by the sun's rays, they flash like plates of polished steel. But what appears most singular is, that each spiculum is perpetually vibrating and quivering with a motion apparently quite spontaneous, and each independently of the rest, so as to convey the impression to the observed that each is animated with life. Owing to this irregular motion and consequent change of position, each spiculum, as it assumes or leaves the reflecting angle, is momentarily brightening or waning, flashing out or returning into darkness, producing a magic effect."

The following is a very singular fact with reference to the connection between legal and microscopic investigation:—

"An illustration of this occurred not long ago, in which a murder was brought home to the criminal by means of the microscope. Much circumstantial evidence had been adduced against him, among which was the fact, that a knife in his possession was smeared with blood, which had dried both on the blade and on the handle. The prisoner strove to turn aside the force of this circumstance by asserting that he had cut some raw beef with the knife and had omitted to wipe it. The knife was submitted to an eminent professor of microscopy, who immediately discovered the following facts:—1. The stain was certainly blood. 2. It was not the blood of a piece of dead flesh, but that of a living body; for it had coagulated where it was found. 3. It was not the blood of an ox, sheep, or hog. 4. It was human blood. Besides these facts, however, other important ones were revealed by the same mode of investigation. 5. Among the blood were found some vegetable fibres. 6. These were proved to be *cotton* fibres, agreeing with those of the murdered man's shirt and neckerchief. 7. There were present also numerous tesselated epithelial cells, which cells, in this form, are found only in the lining of the gullet or lower part of the throat. The result of the investigation left no doubt remaining that with that knife the *throat* of a *living human* being, which throat had been protected with some *cotton* fabric, had been cut. The accumulation of the evidence was fatal to the prisoner, who, without the microscopic testimony, might have escaped."

On Colour. By Sir T. Gardner Wilkinson. London: John Murray.

Anything coming from the mental easel of Sir Gardner Wilkinson is entitled to more than ordinary attention, particularly on a subject connected with art; and perhaps more so such a subject as is here treated of, and upon which his eye has been long and carefully disciplined, by observing the multifarious examples which, both in nature and among the works in art, must have continually come before him in the East. He does not, however, confine himself to mere colour in this volume, but adds to it many remarks on the necessity for a general diffusion of taste among all classes, with observations on what may be considered the beginning of a new subject in these times—the laying out of dressed or geometrical gardens. The work is very fairly illustrated with examples of good and bad taste shown in wood-cuts, and coloured plates in contrast.

The author says, very justly, that "it is not by forming a theory, the harmony of colours is to be acquired. Like a correct ear for music, it is a natural gift. Theory will not furnish, as theory will not enable, any one to detect a false note. The power depends on the perceptive faculty." It must, nevertheless, be confessed that such plain and appreciable theories as have been advanced by Chevreuil, Field, and Owen Jones, are capable of producing an enjoyment and a practical application of the beautiful, whether true or not, as to induce us to receive this saying of the author with due reserve. He too much relies upon this, and hence arises often an apparent confusion in his teachings, which must be ascribed to inadequacy of the language he makes use of to convey the impression he desires. He does not desire us to see with his eyes, but to see and acknowledge the beauty and harmony which his eyes see.

The following observation is a just one:—

Some there are who maintain that because in nature certain two colours are found in juxtaposition, they must necessarily be concords; and cite those in various flowers to support their argument; but they forget that besides the petals and the leaves, their eye sees at the same time the yellow anthers, the brown stalk, or other coloured objects; even when the flower is plucked, and many more when it is viewed in the bed where it grows. The light and shade, and sometimes the semi-transparency of the petals, also give to the hues in flowers a somewhat different effect from what they would have as flat colours. But whatever may be the *cause* of the difference, there is no doubt of the fact, and this is all that is necessary for us to notice in considering the agreement or disagreement of the colours. If, too, in the great variety of combinations presented to us by nature, there must necessarily be perfect harmony; and if nature is expected always to supply us with concords, we shall have no choice left but to receive the most opposite combinations with equal favour.—P. 19.

The following remarks, too, cannot be regarded as completely thrown away, in these days of the restoration of the decorated art of early ages:—

Among the many conditions of coloured glass windows, I may notice the following:—that they should be subservient to the general ornamentation, their object being decorative; they should assimilate to, and aid the decoration and style of the building; they should not be a contrast to a white wall; nor pretend to be a painting or large picture the small figures in the medallions, though conventional, should be good, not imitations of a rude style, and should be part of the coloured effect of the window when seen at a distance; broad opaque shadows should not be introduced, nor an attempt be made to convert the flat into a round style; figures, larger than life, should be avoided as injurious to the proportion of a building; no great expanse of one colour, in one plan, should catch the eye; and a picture, extending over two or more lights cut by an opaque mullion, is inconsistent and offensive. A quantity of white glass is bad and poor, and yellow is better than white for preventing red and blue from appearing purple at a distance. The border should be in proportion to the size of the light; too small, and even too large a quantity of ground between medallions should be avoided; the medallions should not be all of the same form, and the patterns should not be too small, nor have a spotted appearance as in a kaleidoscope; the primary colours should predominate over the secondary and tertiary; and the best windows for imitation are those of the 1200. In rosette windows the tracery lights or openings should radiate from the centre rather than be concentric. But coloured glass is not required in building of the Renaissance style.—P. 53.

The book is rather presumptuously divided into numbered paragraphs which have not always distinct ideas, nor do the ideas flow naturally one from the other. Had there been more method adopted in linking the thoughts together it had been better.

There is a rather long tabular list of the names of the principal colours in seven different languages, which is a desideratum to students, although we do not remember how they could be benefitted by any work or observations on colour appearing in either the Greek or Arabic—two of the languages brought forward.

After all, the less that is merely *said* on the subject, and the more that is *shown* is the more instructive; and hence, a walk in the South Kensington Museum, or any good gallery of modern pictures, would teach more than such teachings as are before us, but which we must now have done with.

Examples of Modern Alphabets, Plain and Ornamental, including German, Old English, Saxon, Italian, Perspective, Greek, Hebrew, Court Hand, Engrossing, Tuscan, Riband, Gothic, Rustic, and Arabesque—with several Original Designs, and an Analysis of the Roman and Old English Alphabets, Large and Small; and Numerals for the use of Draughtsmen, Surveyors, Masons, Decorative Painters, Lithographers, Engravers, and Carvers. Collected and Engraved by F. Delamotte. Long Folio. Pp. 48. London: E. & F. N. Spon. 1859.

We do not often transcribe so long a title as this. We have a well grounded objection to long titles, for we have not unfrequently found that when there was a long story outside the cover, there was little told, or left to tell within. So much, apparently, is told upon Mr. Delamotte's cover, that the author has not reserved enough to eke out an analysis of his subject, or even a prefatory remark upon what he had in view in producing his "Examples of Modern Alphabets." We are therefore left to proceed at once, from the title page of the book, to the mass of the matter treated of in the succeeding forty-eight pages.

The examples upon which the author has relied in his project of teaching us "Modern Alphabets," are the several styles of—Ornamental; Egyptian, for Carving; Egyptian Spurred Letter; Tuscan; Ornament Fleardelis; Large and Small Old English Riband; Imitation Saxon; Riband Letter; Italian Shaded; Small Italian; Roman Shaded, various; Egyptian; Ornamented German, Large and Small; Ornamental Italic; Gothic, Large and Small; Egyptian Shaded; Perspective Italian; Rustic, Large and Small; German Riband, Large and Small; Roman Shaded; Perspective Italic; Pearl Letter; Large and Small Relief; German Arabesque; Roman Analytical, Large and Small; Italic; Ornamental Riband, Large and Small; Examples of Letters; Old English Analytical, Large and Small; Italic Shaded; Italic, Large and Small; Velvet Letter; Hebrew and Greek; Examples of Letters; Examples of Numerals; Engrossing and Court Hand; Example Alphabet.

Since the appearance of Mr. Wilme's "Manual of Writing and Printing Characters," which we reviewed in No. 13, vol. ii., first series, *Practical Mechanic's Journal*, 1849, we believe we have had nothing in the way of a guide to ornamental lettering; and we are, therefore glad to find another author coming forward in the cause of a much neglected art. Mr. Wilme, however, gave us a preliminary lecture upon his project, and the mode in which it was to be carried out; and in so far, he exercised a wiser discretion than Mr. Delamotte has thought proper to do in the present instance. Apart from this defect, we cannot but admire the beautiful designs which Mr. Delamotte has here given us. His "riband" and "perspective" letters are in particular to be admired, not merely because they are intrinsically beautiful, but because they bring us back in some measure to the recollection of the letters of a bye gone age. Some of his "ornamental" characters also are extremely beautiful. But the author ought not to have overlooked the fact that lettering of all kinds, and for all purposes, is as much reducible to a rule as the productions of the type founder; and that rule, and the general theory of lettering should have been enlarged upon in this volume. It is all very well to give the student handsome letters in various styles, and we gladly admit that Mr. Delamotte has done this, and done it well; but the student cannot always use the precise size of letter which the present volume gives him, and he therefore stands in need of rudimentary teaching to enable him to adapt given examples to his special purpose. If the volume before us had possessed such a guide it would have commanded our unqualified—as it does now, our qualified approval.

Mitchell's Steam Shipping Journal, a Weekly Newspaper devoted to the Interests of Steam Navigation. Parts i. to xvi. 4to. Pp. 16. Wood Engravings. London: Mitchell. 1859-60.

The marine steam navigation system of Great Britain is one of the gigantic facts of our time. It involves, we believe, much more important interests than the general public are aware of, although the readers of the *Practical Mechanic's Journal*, who pay anything like minute attention to ocean steaming, will know from our own pages, how great an interest is concerned in the various associations which now carry passengers and goods across every sea, and up every creek and river where navigable depths are to be found.

We have hitherto devoted a considerable space to marine memoranda, and the general consideration of the details of our steam marine of all classes; but the promoters of the present undertaking seem to have thought that the time was ripe for an independent publication, which should attend directly and entirely to the interests of steam navigation.

Mitchell's Steam Shipping Journal is in the form of a weekly newspaper, illustrated by good engravings on wood, and containing matter, which, as far as the sixteen numbers before us show, bids fairly for practical success. A somewhat closer acquaintance with mechanical engineering, and the chapters of history and accident appertaining thereto, would perhaps have prevented the appearance of a few blemishes in its pages. We have before reminded our readers that the three-cylinder engine introduced by Mr. Scott Russell, is nothing more than Mr. M'Naught's multi-cylinder engine.* This is a blunder which, however, may perhaps be said to be atoned for by the supplementary publication with the first part, of a complete list of British merchant steamships, as registered up to the beginning of 1859. This is a most valuable statement, and its appearance speaks well for the future management of the journal.

We have carefully looked over the subsequent parts, and they all appear to contain good earnest of a prosperous career. We are especially glad to see that each part has its contents printed on its title page, an arrangement without which we cannot consider the arrangement of any publication to be perfect. We shall watch the forthcoming parts of this journal with much interest, for the double reason that what we have seen of it is very creditable to its promoters, and that there is abundant room for a publication of the kind.

A good deal too much space, considering all things, is accorded to the *Great Eastern*, and with many of the opinions upon that gigantic blunder, we must join direct issue. We are also surprised to find what has before been termed "Mr. Edwin Clark's hydraulic lift," again brought forward, as if it had not been over and over again shown to be Mr. Scott's hydrostatic lift. †

A "steam shipping journal," professing to deal with modern marine engineering, ought not to assist in the perpetuation of errors of this kind, and we should certainly have thought that its editor would have known the difference between "hydraulic" and "hydrostatic," to which latter class of mechanical powers all water pressure apparatus most undoubtedly belongs.

Electro Chemistry, with Positive Results. By Charles Chalmers, late of Merchiston Academy. 8vo. Pp. 32. Wood Engravings. London. 1859.

Mr. Chalmers is an old and indefatigable worker in electrical and electro-chemical matters, and his name is by no means new in our reviewing columns. In the volume before us, he proposes to demonstrate "that there is a latent electricity existing in bodies, as well as a latent heat; and that those bodies, when deprived of their latent electricity, indicate a change in their characteristic properties. He begins his discussion by asking, "Are the two electricities material elements?" and he then goes on to advocate the view that the two electricities combine with the other material elements as those elements combine with each other; and that compound bodies are decomposed by the two electricities precisely as the ponderable elements decompose those bodies—namely, by respectively combining with the constituents of the body which is under decomposition; and thus in all electro decompositions, those bodies which are given off at the positive wire, are given off in combination with the positive electricity of that wire, and those given off at the negative wire are given off in combination with the negative electricity of that wire. And, therefore, when a compound body is decomposed by electricity, we do not obtain the constituents of that body, but new compounds—the two electricities having respectively combined with the constituents of the body which has been decomposed. Accordingly, in the decomposition of a neutral salt by electricity, we do not obtain the constituents of that body, but new compounds. One of the constituents of the salt having combined with positive electricity, a compound is formed, possessing properties different from either of the constituents, an acid being the product; the other constituent of the salt having combined with negative electricity, a compound is formed, possessing properties different from either of the constituents—an alkali being the product; and in order to obtain the constituents of the decomposed salt, we would require to disunite positive electricity from the acid, and negative electricity from the alkali.

In support of these views, he adduces the results of a series of six experiments, begun previous to 1849, and coming down to the present time. For the details of these, we must refer the enquiring reader to the author himself, who has here given us a succinct and well detailed account of his practical researches, all of which have been conducted in the belief that he was on the right track; and, therefore, with that untiring energy which alone can bring about a satisfactory conclusion of any scientific pursuit. The details of the experiments are followed by an appendix embodying notes on the two electricities, in which he shows most conclusively that the electrical action derivable from an electrical machine, is not produced from the earth as is commonly supposed, but from the machine itself. Mr. Chalmers' book well deserves the attention of thinkers upon electrical science.

The Twenty-Sixth Annual Report of the Royal Cornwall Polytechnic Society, 1858. 8vo. Pp. 137. Falmouth: Lake.

We place a notice of this report in our reviewing columns for the reason that it is less a mere report of the proceedings of a scientific society, than a general retrospect of scientific and other matters connected with the country. In addition to a statement of the ordinary routine business of the society, the report embodies an account of the annual exhibition, annual meeting, and the reports of the judges and prizes awarded in the mechanical, fine arts, statistics, naval architecture, natural history, school productions, and fancy work departments of the exhibition; a statistical investigation into the mortality of miners in the district of Lelant, by Mr. R. Q. Couch; a particular description of some circumstances hitherto little known, connected with the process of exuviation in the common edible crab, by Mr. J. Couch; observations on the crystalline forms of native metals, by Mr. W. Vivian; observations on engine reporting, with an abstract of *Lean's Engine Reporter* for 1858; contributions to Falmouth fauna, by Mr. W. P. Cocks; register of dredging operations, 1858; and meteorological registers kept at Helston in 1858, by Mr. M. P. Moyle, and at Bodmin, by Capt. Liddell.

This list shows that the society deals with a tolerably wide range of subjects. It is a pity that the late date of its publication brings us into 1860, before we can notice what has been done by the practical scientists of Cornwall in 1858.

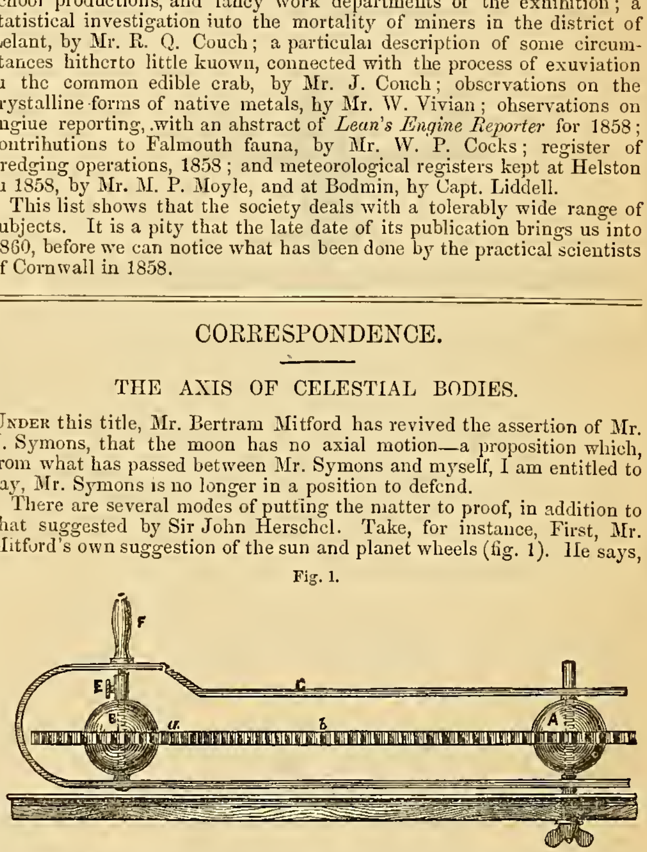
CORRESPONDENCE.

THE AXIS OF CELESTIAL BODIES.

Under this title, Mr. Bertram Mitford has revived the assertion of Mr. J. Symons, that the moon has no axial motion—a proposition which, from what has passed between Mr. Symons and myself, I am entitled to say, Mr. Symons is no longer in a position to defend.

There are several modes of putting the matter to proof, in addition to that suggested by Sir John Herschel. Take, for instance, First, Mr. Mitford's own suggestion of the sun and planet wheels (fig. 1). He says,

Fig. 1.



"Now suppose A to be the earth, and B, the moon, attached together by a frame, C, and gearing into each other, the one being four times the diameter of the other (now mechanically speaking), the wheel, B, being drawn round by the handle, will make four turns on its axis, or four revolutions on its own axis, in going round the larger wheel, A. (Sir John would say five according to his theory.)" The only question left, therefore, is, whether the number of turns is four, as Mr. Mitford believes, or five, as Sir John "would say." Now for the proof. Let the spindle of B protrude upwards through the frame and receive the handle, F; so that as B turns upon its axis, the handle, F, must turn with it. Next, take a piece of broad tape or ribbon, attach one end of it to the ceiling, over A, and the other end to the top of the handle, F, taking care that the tape or ribbon shall be wholly free from twist. Lastly, cause the frame, C, to make one complete turn round A. Now, since B, at every turn that it completes, must needs give the tape one complete twist and no more, the number of twists found in the tape will prove whether Mr. Mitford's four, or Sir John's five, is right. I affirm the latter.

Secondly. Take Sir John Herschel's experiment, viz.: "Plant a staff upright in the ground, and grasping it with both hands, walk round it with the face always turned towards it." But, for the present purpose, erect the staff under some projection from a building, as, for instance,

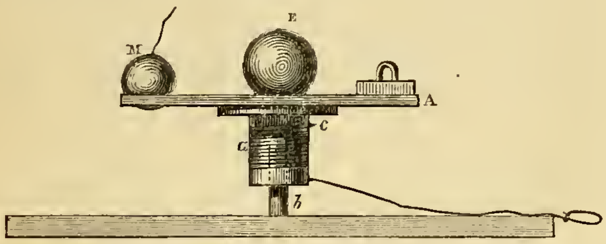
* *Practical Mechanic's Journal*, part 97 for April, 1856, and part 130, for January, 1859.
† Page 291 *Practical Mechanic's Journal*, for February, 1859.

lamp iron, or a staff projected from a chamber window like a fish rod; or under a bough of a tree; and to such projection or bough, tie the upper end of a broad tape or ribbon, attaching its lower end to the hat or cap worn by the experimenter, taking care that the tape shall be quite free from twist. Now, if the fact be, as Sir John Herschel alleges, viz., that the experimenter, in walking round the staff in the manner prescribed, does necessarily turn upon his own axis once in each circuit, it cannot but follow that he must twist the tape once in each circuit; but if the fact be as Mr. Mitford alleges, viz., that the experimenter does not turn upon his axis at all, then assuredly, be cannot twist the tape at all. It will be easy to see whether the tape is twisted, and how often. Doubtless one twist will be found for each circuit made by the experimenter.

Or, to vary the experiment, let the experimenter tie one end of a tape to his neckcloth, giving the other end to his assistant to be held loosely in his hand; then (upon Sir John's theory), for every time he walks round the staff, the experimenter must wind the tape once round his own neck. Of course, the assistant must *not* walk round the staff, nor must the staff be above breast-high, or it will catch the tape.

Thirdly. Try the following experiment.

Fig. 2.



This apparatus (fig. 2) resembles a turnstile, having only one swinging cross-bar instead of two. A, is this swinging bar or board, having a socket, which drops upon the fixed upright spindle, *b*, allowing the board, A, to swing round freely. The socket has a projecting pin, *c*, to receive the loop of a string which should be coiled round the socket, in readiness for putting the apparatus in motion. E, represents the earth, and M, the moon. This last is not fixed to the board, but merely lies in a circular hole. A fine but strong thread must be tied to M, its other end being passed through an eye in the ceiling, over E, and brought down to the hand of an assistant, who, by pulling it a few inches can at any moment raise the ball, M, out of its hole, and thereby disengage it from the rest of the apparatus.

Let the swinging board, A, be now set in motion, causing M, to revolve rapidly round E; and when at its swiftest, let the assistant pull the string and disengage, M. Now if M has acquired an axial motion, that motion will continue for a time, the ball spinning round as it hangs on the thread. But if it has not acquired any axial motion, no such spinning can take place; for the mere lifting up of the ball, M, can have no tendency whatever to give it axial motion. To prevent the twist of the thread from interfering with the result, plaited thread may be used, or the ball may be previously allowed to untwist the thread until it stills itself. By a little dexterity in steadying the thread, the swinging of the ball when disengaged may be stopped, and its continuing axial motion observed in stillness.

Fourthly. To impress both of the motions in question upon a massive body, must obviously require a greater mechanical effort than would be required to impress one motion only. Therefore, if as Sir John Herschel maintains, the moon has been endowed with both orbital and axial motion, a greater projectile force must have launched her on her brilliant path, than would have been required had creative wisdom decided upon imparting orbital motion alone.

The mechanical laws that govern the vast, equally govern the minute. Hence M, in the apparatus before us, together with its counterpoise, being constrained to turn one face always towards E, in the centre, will offer a greater resistance to the power that sets the swinging board in motion, than they would offer were such restraint removed.

To put this to proof, it will be best to remove M, and its counterpoise, and to substitute two horizontal wheels, having heavy rims like fly-wheels, and so hung as to turn as freely as possible upon their vertical axes. Next ascertain the power required to get up a given rate of revolution in the apparatus; which may be done by carrying the outer end of the string (that gives the motion,) over a pulley, and using a weight as the motive power. After this, the two wheels may be tied by a string, passing tightly from the one to the other, so as to constrain them, each to turn one face constantly to E; and the power then ascertained that will be required to get up the same rate of revolution as before the wheels were tied together.

If this experiment be performed with due care, and with the apparatus in nice order, I feel confident that additional power will be found necessary when the wheels are tied—such additional power being absorbed in giving to the wheels the axial motion necessary to keep one particular face of each constantly turned towards E, instead of such face remaining turned towards a given point of the compass—as north or south—as would be the case when left untied.

Lastly, the following mode of proof may, perhaps, be the most convincing of all:—Make a square (fig. 3) by scratching four lines on the ground. Let the experimenter stand at S (the middle of the south line), with his face northward. Next let him walk sideways to the south-west corner of the square, and there "right face;" that is, make a quarter turn on his axis, bringing his face to eastward. Let him proceed in like manner to the north-west corner, and again "right face;" then to the north-east corner, and right face a third time; then to the south-east corner, and right face a fourth time; and lastly to S, the point from which he first set out. He will now have made four quarter turns on his axis, exactly equal to one whole turn.

Fig. 3.

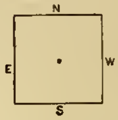
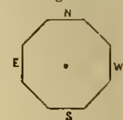


Fig. 4.



Next, by cutting off the corners of the square, he may make an octagon (fig. 4); and in walking sideways round it, keeping his face towards its centre, he must make one-eighth of a turn at each of the right corners—equal to one whole turn as before. A polygon of any number of sides will require a corresponding number of fractional turns, equal collectively to one whole turn; and by increasing the number of sides, the polygon will soon become practically a circle.

Now, if it prove, 1st. That a body having a motion analogous to that of the moon will certainly twist a tape or string attached to it vertically, or will coil up such tape or string, if attached to it horizontally. 2d. That such body when suddenly detached from the moving apparatus, and left depending upon a fine thread, will always exhibit axial motion corresponding in direction with its orbital motion at the instant of detachment. 3d That a greater projectile force is required to make a body revolve in a given orbit at a given rate when that body is constrained to turn always one particular face towards the centre of its orbit than is required when no such constraint is put upon it. And, lastly, That when a polygonal orbit is substituted for a circular one, the body moving along its sides will have to make a fractional turn upon its axis at every corner, in order to keep its face from leaving the direction of the centre of the polygon—the sum of such fractional turns amounting in all cases to one complete turn—what room can be left for doubting that the moon cannot but have the axial motion in question, more especially as it is well known that the moon experiences the alternations of day and night, sunrise and sunset, just as our earth does: excepting that whilst our number of days and nights in the year is $365\frac{1}{4}$, her number is only $12\frac{1}{3}$; her day and her night each somewhat exceeding our fortnight.

E. HILL.

London, December, 1859.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

MEETING OF THE BRITISH ASSOCIATION AT ABERDEEN, 1859.

SECTION D.—ZOOLOGY AND BOTANY, INCLUDING PHYSIOLOGY.

"On the characteristic features of the Aberdeenshire flora," by Dr. Dickie.

"On a new genus of lucernariadæ," by Professor Allman.

This creature was a kind of fixed medusa, having a structure resembling many of the common forms of floating jelly fishes, but was fixed to rocks by means of a pedicle or stalk. It had been found on the more northern shores of Scotland, and he proposed for it the name of *Carduella Scoticus*.—Mr. Peach had found this creature under stones in Caithness. He stated, as a curious fact, that many creatures which he had observed in the deep sea off the coasts of Cornwall were littoral on the shores of Scotland.

"On some new species of birds," by Mr. Gould.

"On drift pebbles found in the stomach of a cow," by the Rev. W. S. Symonds.

"Short account of a bone cave, near Montrose," by Mr. Beattie.

"Notice of the skull of a wombat from the bone caves of Australia," by Dr. M'Bain.

"On the varieties and species of new pheasants recently introduced into England," by Mr. Gould.

"On the vegetative axis of ferns," by Dr. Ogilvie.

"On a species of galago from Old Calabar," by Mr. A. Murray.

"On the orders of fossil and recent reptilia, and their distribution in time," by Professor Owen.

"On the identity of *Morrhua vulgaris* (the common cod) and *Morrhua punctata* (the speckled cod), hitherto described as distinct species," by Dr. Dyce.

"On the upper limits of cultivation in Aberdeenshire," by Dr. Dickie.

Professor Allman described the case of a species of Pycnogonida parasitic upon *Coryne pusilla*.

"On the vegetable ivory manufactures of Birmingham," by Dr. Bennett.

Dr. Lankester read a paper from Dr. Buist, of India, "On the failure of bright-coloured flowers in forest trees to produce effect unless accompanied by abundance of green leaves."

The President gave a notice of *Syrrhaptes paradoxus*.

"On the distribution of British butterflies," by Mr. H. T. Stainton.

"Notice of the skull of a seal from the Gulf of California," by Dr. M'Bain.

"Notice of a skull of a manatee from Old Calabar," by Dr. M'Bain.

This was a minute description of the anatomy of the skull of this rare animal.

"Notice of the duration of life in the *Actinia mesembryanthemum*, when kept in confinement," by Dr. M'Bain.

The author exhibited a specimen of the *Actinia mesembryanthemum* which had been in the possession of Sir J. Dalyell and Dr. Fleming for thirty-one years. The exhibition of this now celebrated actinia produced great interest in the section.

"On the osteology of *Lophias piscatorius*," by Professor Macdonald.

"On the employment of the electrical eel *(Gymnotus electricus)* by the natives of Surinam," by Dr. G. Wilson.

After alluding to the paper he had read at the last meeting of the Association on the electrical melapterurus from Old Calabar, the author gave an account of the employment of the gymnotus, in Surinam, as a medicinal agent. He had obtained his information from a gentleman who had expressed his willingness to forward to England living specimens of this electrical fish for experiment.

Mr. A. Murray remarked on the difficulty of bringing over these fish alive, and mentioned several instances in which they had died on the voyage, especially when they arrived in the channel.—This discussion resulted in the formation of a Committee of the Section to draw up directions, in order to guide those who were engaged in transporting these fish from their native haunts to Great Britain.

"On the structure of the shell in some species of pecten," by Dr. Dickie.

Mr. Macdonald referred to the fact, that all fragments of shells from the deep sea presented a tubular structure. He believed this arose from the action of organic agents, and was inclined to refer the phenomenon to the growth of minute plants.

"On the flora of the shores of Davis's Straits," by Mr. J. Taylor.

"Remarks on the Greenland and Iceland falcons," by Mr. J. Taylor.

"On the zoophytes of Caithness," by Mr. C. W. Peach.

He commenced by extolling the utility of local catalogues of natural history, and stated that he was desirous of showing how rich the Scottish shores are in these lovely gems, in order that he might induce many to draw up these beauties from ocean's caves. He then mentioned Mr. J. Macgillivray's list, the result of about three weeks' examination on the Aberdeen coast, as the only Scottish one he had—it contained 64 species; and then proceeded to compare his own with those of Couch's for Cornwall and Alder's for Durham and Northumberland—the former contains 124 species, the latter 164; thus giving a preponderance of 40 species to Alder's. He enumerated in his 150 species, and thus a balance of 14 only is left against Caithness, &c. He believed this will soon be reduced when greater attention has been paid to the fresh water ones and the more obscure forms, and when the dredge has been used; for hitherto all had been collected between tide-marks and from the refuse of the fishermen's lines, and all (with the exception of *Plemularia myriophyllum*, at Peterhead, by the Rev. Mr. Yevill), by himself and sons: the greatest number of southern forms being found at Wick) and, as well, the Wick list is a little the longest. A few forms found at Peterhead are wanting at Wick, and *vice versâ*.

Mr. Croall read a paper in which he gave an account of the more remarkable plants found in Braemar.

The Rev. J. Yates exhibited the cones of several species of cycadaceous plants grown in England. He stated that the cycad known as *Dion edule* was truly the *Macrozamia pectinata* of Leibmann. He gave some account of the method of culture of these plants, and stated that they required an average temperature of 70° Fahrenheit.

Dr. Lankester read a paper giving an account of a diatomaceous deposit found in the island of Lewis, by Mr. H. Caunter. The deposit contained several species of diatomaceæ, and is situate in a lake district 150 feet above the level of the sea, and had evidently been deposited from a lake now dry. It is situate in the western part of Uig, about five miles from the parish church.

Mr. Peach stated that he discovered a diatomaceous deposit of a similar kind to the one described, in Caithness.

Dr. Dickie gave a detailed account of a deposit of diatomaceæ in the neighbourhood of Loch Neagh in Ireland. This deposit was so hard that in one place it had been quarried, and blocks of it used for building walls. He was also aware of two other deposits in Scotland.

"On the growth of trees in continental and insular climates," by Mr. D. Vaughan.

Dr. Lankester laid before the section a report from Professor Buckman "On the growth of plants."

The report stated that the author was continuing his experiments on the influence of cultivation in altering the specific characters of plants. Several instances were given in which the character of a plant was so much changed by culture as to lead to the supposition that certain forms which had hitherto been regarded as distinct species were only varieties.

"List of the birds of the North of Scotland, with their distribution," by Mr. F. Jamieson.—This paper was laid on the table, but not read.

"On the disguises of nature," by Mr. A. Murray.

The author in this paper drew attention to the external resemblances of natural objects which differed widely in their true structure and affinities. Numerous instances were given of the resemblances between plants and animals and animals and plants. Also resemblances in plants and animals which were widely separated.

"On the mollusca of Aberdeenshire," by Dr. Dickie.

The number of species amounts to two hundred and thirty. The hills of Aberdeenshire are singularly deficient in land mollusca, only three species having been found.

Mr. Gould exhibited several new species of birds of paradise.

Dr. Lankester exhibited a series of drawings from life of the various species of British spiders by Mr. Tuffen West.

Mr. H. T. Stainton expressed his admiration of the faithful and life-like sketches of Mr. West.

Mr. Hogg exhibited a species of phalangista, which had been recently shot in the county of Durham, and which was undoubtedly an escape from a menagerie.

"Remarks on the cultivation of the opium poppy of China," by Dr. M'Gowan.

"On the structure of the otolites of the cod *(Gadus Morrhua)*," by Dr. Redfern.

"Note on the method of production of sound by a species of notonecta," by Dr. Redfern.

The sound was produced by the scraping together of its fore feet.

"Notes on different subjects in natural history, illustrated by specimens," by Mr. Peach.

The various specimens of natural history collected by Mr. Peach on the coast of Wick, and presented by him to the museum of Marischal College, were exhibited to the section.

The Rev. W. S. Symonds gave an account of the fish-rain at Aberdare, in Glamorganshire. The evidence of the fall of fish on this occasion was very conclusive. A specimen of the fish was exhibited, and was found to be the common stickleback. A discussion ensued, in which various cases were related of the transference of living objects by the agency of the whirlpools produced by storms.

Dr. Adams read a paper containing remarks by himself and his son "On the birds of Banchory."

A communication was read from Mr. Price "On the best method of capturing, keeping, and observing the various forms of beroe and cydippe."

Two papers were read from Mr. Nourse,—one "On the colour of the leaves of plants," and another giving an interesting account "Of the habits and instincts of the chameleon."

Dr. Daubeny read a paper by Mr. Masters "On vegetable morphology," in which he endeavoured to assign the relative value to the labours of Wolfe, Linnæus, Gœthe, and Robert Brown, in the present position of the science of vegetable morphology.

"On the temperature of flowers," by Mr. E. J. Lowe.

This was an account of a series of apparently carefully conducted experiments on the temperature of the flowers of plants, as compared with the air and the earth in which they grew. The difference of the temperature was so great in some cases that a doubt was thrown out as to the accuracy of the observations.

"Personal observations on the zoology of Aberdeenshire," by Mr. S. M. Burnett.

Dr. Ogilvie read the "Report of the Dublin bay dredging committee."

Sub-Section D.—Physiology.

"On the structure of the nerve tubes," by Professor Bennett.

"On the admixture of nervous and muscular fibres in the nerves of the leech," by Dr. Redfern.

"On the repair of tendons after their subcutaneous division," by Mr. B. E. Brodhurst.

"On the beat of the snail's heart," by Mr. M. Foster.

"On the necessity of a reform in nerve physiology," by Mr. G. H. Lewes.

"Lactation in an impregnated female of *Canis familiaris*," by Dr. J. Adamson.

"Report on the productive organs of the hydroid zoophytes," by Prof. Allman.

"The genetic cycle in organic nature," by Dr. G. Ogilvie.

"Handwriting and drawing of the insane—as illustrative of some modes of cerebral functions," by Prof. Laycock.

"On the origin of morbid growths, with reference to the connective tissue theory," by Prof. Bennett.

"On the homologous development of the muscular system," by Rev. J. D. Milne, jun.

"Reproduction in gasteropoda, and on some curious effects in endosmosis," by Mr. R. Garner.

"An experimental inquiry into the action of alcohol on the nervous system," by Dr. Marcet.

"On the molecular theory of organization," by Prof. Bennett.

"On the organs of the senses, and on the mental perceptive faculties," by Mr. W. E. C. Nourse.

"On the specific chemical and microscopical phenomena of gouty inflammation," by Dr. Garrod.

Dr. Garrod attempted to show that specific chemical and microscopical phenomena *invariably* accompany gouty inflammation; and these consist in the deposition of nitrate of soda, in a crystalline form, within the cartilages and ligamentous structures of the joints; and that such deposition is altogether pathognomonic, never being found in any other disease than true gout; and again, that such deposition is probably the cause, rather than the effect, of the inflammatory action. Lastly, the author pointed out the great importance of ascertaining the true nature of the disease, as a means of conducting to its rational and successful treatment.

"On the supposed distinction between sensory and motor nerves," by Mr. G. H. Lewes.

"A demonstration of the muscular sense," by Mr. G. H. Lewes.

Mr. Lewes endeavoured to show that this sense resides in the muscles, and that it is so far different from ordinary sensibility.

"On the structure and mode of formation of starch granules, according to the principle of molecular coalescence," by Mr. G. Rainey.

"On the homologies of the coats of tunicata, with remarks on the physiology of the pallial sinus system of brachiopoda," by Mr. J. D. Macdonald.

"A second physiological attempt to unravel the perplexities of the hypothesis of Berkeley," by Dr. Fowler.

"On the sequence observed in the phenomena observed in man under the influence of alcohol," by Dr. Smith.

"On the comparative action of hydrocyanic acid on albumen and caseine," by M. A. Gages.

"On certain subjective sensations, with especial reference to the phenomena of second sight, visions, and apparitions," by Dr. Camps.

"On certain imperfectly recognized functions of the optic thalami," by Dr. Camps.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

October 18, 1859.

The president, Mr. Fairbairn, announced the formation of a mathematical and physical section in connection with the society.

Dr. F. Crace Calvert presented, in the name of Mr. Arnaudon (from Turin), a paper and samples of green colours used in painting and printing, and especially referred to two new chrome greens, one of which is a new compound, corresponding to the monohydrate of sesquioxyde of chrome $Cr^2 O^3 HO$.

The author commences in his work to point out the qualities which a good green ought to possess in order to be suitable for painting. Then he reviews in a few words the different greens which are found at present in the market, together with the nature and properties of the same. Beginning with the history of the works already published on this subject, he next gives the description of his process for preparing his monohydrate of sesquioxyde of chrome, and which consists in exposing the bichromate of potash mixed with phosphoric acid and any deoxydizing agent (for example, ammonia) for some time to the action of heat. The soluble salts are then removed by washing.

The green so prepared has not only a beautiful shade, but like that of Mr. Guignet (made by decomposing the borate of oxide of chrome by water) possesses the curious property of remaining green under the influence of artificial light.

Dr. Calvert also presented some muslins printed by M. Camille Kœchlin, of Mulhouse, with fuchsine, a product obtained from the aniline of coal tar. This colour was very remarkable from the exquisite bloom of the pink shade obtained when fixed with albumen.

The following extract of a letter received from Professor W. Thomson, F.R.S., was read by Dr Joule.

"I have a very simple 'domestic' apparatus by which I can observe atmospheric electricity in an easy way. It consists merely of an insulated can of water to set on a table or window sill inside, and discharge by a small pipe through a fine nozzle two or three feet from the wall. With only about ten inches head of water, and a discharge so slow as to give no trouble in replenishing the can with water, the atmospheric effect is collected so quickly that any difference of potentials between the insulated conductor and the air, at the place where the stream from the nozzle breaks into drops, is done away with in my apparatus at the rate of five per cent. per half second, or even faster. Hence a very moderate degree of insulation is sensibly as good as perfect, so far as observing the atmospheric effect is concerned. It is easy, by my plan of drying the atmosphere round the insulating stems, by means of pumice stone moistened with sulphuric acid, to insure a degree of insulation in all weathers, by which not more than five per cent. per minute will be lost by it from the atmospheric apparatus at any time. A little attention to keep the outer part of the conductor clear of spider lines is necessary. The apparatus I employed at Invercloy, stood on a table beside a window on the second floor, which was kept open about an inch, to let the discharging tube project out without coming in contact with the frame. The nozzle was only about two feet and a half from the wall, and nearly on a level with the window sill. The divided ring electrometer stood on the table beside it, and acted in a very satisfactory way (as I had supplied it with a Leyden phial, consisting of a common thin white glass shade, which insulated remarkably well, instead of the German glass jar—the second of the kind which I had tried, and which would not hold its charge for half a day).

"I found from $13\frac{1}{4}°$ to $14°$ of torsion required to bring the index to zero, when urged aside by the electromotive force of ten zinc-copper water cells. The Leyden phial held so well, that the sensibility of the electrometer measured in that way did not fall more than from $13\frac{3}{4}°$ to $13\frac{1}{2}°$ in three days.

"The atmospheric effect ranged from 30° to above 420° during the four days which I had to test it—that is to say, the electromotive force per foot of air measured horizontally from the side of the house, was from nine to one hundred and twenty-six zinc-copper water cells. The weather was almost perfectly settled, either calm, or with slight east wind, and in general an easterly haze in the air. The electrometer twice within half an hour went above 420°, there being at the time a fresh temporary breeze from the east. What I had previously observed regarding the effect of east wind was amply confirmed. Invariably the electrometer showed very high positive in fine weather, before and during east wind. It generally rose very much shortly before a slight puff of wind from that quarter, and continued high till the breeze would begin to abate. I never once observed the electrometer going up unusually high during fair weather without east wind following immediately. One evening in August I did not perceive the east wind at all, when warned by the electrometer to expect it; but I took the precaution of bringing my boat up to a safe part of the beach, and immediately found by waves coming in, that the east wind must be blowing a short distance out at sea, although it did not get so far as the shore.

"I made a slight commencement of the *electro-geodesy*, which I pointed out as desirable at the British Association, and in the course of two days, namely, October 3d and 4th, got some very decided results. Macfarlane and one of my former laboratory and *Agamemnon* assistants, Russel, came down to Arran for the purpose. Mr. Russel and I went up Goatfell on the 3d instant, with the portable electrometer, and made observations while Mr. Macfarlane remained at Invercloy, constantly observing and recording the indications of the house electrometer. On the 4th instant the same process was continued, to observe simultaneously at the house and at one or other of several stations on the way up Goatfell. I have not yet reduced all the observations, but I see enough to leave no doubt whatever but that cloudless masses of air, at no great distance from the earth, certainly not more than a mile or two, influence the electrometer largely by electricity which they carry. This I conclude because I find no constancy in the relation between the simultaneous electrometric indications at the different stations. Between the house and the nearest station the relative variation was least. Between the house and a station about half way up Goatfell, at a distance estimated at two miles and a half in a right line, the number expressing the ratio varied from about 113 to 360 in the course of about three hours. On two different mornings the ratio of house to a station about sixty yards distant on the road beside the sea was 97 and 96 respectively. On the afternoon of the 4th instant, during a fresh temporary breeze of east wind, blowing up a little spray as far as the road station, most of which would fall short of the house, the ratio was 108 in favour of the house electrometer—both standing at the time very high—the house about 350°. I have no doubt but that this was owing to the negative electricity carried by the spray from the sea, which would diminish relatively the indications of the road electrometer."

"On irregularities in the winter temperature of the British islands," by Mr. Hopkins.

This paper was a continuation of one previously read to the society, in which it was maintained that the superior warmth of the British islands in the winter, is due to the large amount of vapour that is then condensed over them. To this proposition an objection has been taken, that the degree of warmth experienced in the locality is not always proportioned to the condensation of vapour as indicated by the fall of rain. This was admitted, but it was contended that the objection taken did not invalidate the general proposition. It was then shown that when vapour was condensed in abundance, and the local atmosphere thereby much heated and expanded, the adjoining heavier air forced the lighter to ascend to upper regions, conveying the liberated heat of the condensation with it to warm those regions, and of course leaving the lower air unheated. But in the winter when the vapour was supplied from the ocean in more moderate quantities, at the time that the surface of the earth was cold, the vapour was condensed by that cold, and gave out the heat of elasticity near the surface. In this way it was shown that ice was often formed on very cold ground; and mist and fog produced at moderate heights over land not so cold, leaving the liberated heat of vapour to warm the lower regions; and this warmth remains near the surface when the condensation takes place during thick fogs and light drizzling rains, because there is not sufficient heat set free to produce an ascending aerial current. The western coasts of Ireland and Scotland in the winter are in this way enveloped in a warm mist, a thick fog, or a small drizzling rain, which gives out a considerable amount of heat that remains in the lower regions, thus raising their temperature. The same processes take place over England, and the whole of the western coast of continental Europe, making them misty and warm in proportion to the extent to which vapour is condensed over them, as compared with parts farther east in the same latitudes. Instances were quoted of this kind of heating in northern mountainous countries.

In the course of the discussion which followed the reading of the paper, the Rev. W. N. Molesworth supported the hypothesis that the favourable climate enjoyed by Great Britain was in a great measure owing to the influence of the Gulf Stream. He believed also that a current existed in the Pacific Ocean, near the western coast of North America, by which a warm stream was carried from the tropics to higher latitudes, thus raising the annual temperature of Vancouver and Queen Charlotte's Islands, and the neighbouring coasts.

Mr. Hopkins, in reply, remarked that the existence of the latter oceanic current had not been established by any satisfactory proofs.

November 15, 1859.

"On a curiously shaped fossil, found in the upper red sandstone in a quarry near Rimom," by Mr. John Atkinson.

Mr. Baxendell stated that Mr. Heelis had received a letter from Mr. May, of Westminster, relative to the remarkable atmospheric pressure on the 10th instant. Mr. May's barometer, situated at an elevation of twenty-five feet above the mean level of the sea, stood at eleven A.M. on that day so high as 30·804, the temperature being 53°. Mr. Baxendell added that the reading of the barometer in Manchester was almost identical with that in London, allowing for the difference of altitude.

"Observations on the gold districts of Australia," by Mr. W. S. Jevons, late assayer in the Sydney branch of the royal Mint.

Mathematical and Physical Section.

November 10, 1859.

"On storms, with some attempt to ascertain their tracks in the neighbourhood of the British islands, and their analogy to other cosmical phenomena," by Mr. T. Heelis.

Mr. Baxendell mentioned that for some days previous to the late gales, the direction in which the storm approached was indicated by the direction in which meteors fell.

Mr. Dancer exhibited a photograph of the moon on glass, taken by him from a small negative obtained by Mr. Hartnup.

Mr. Mosley and Mr. Baxendell reported the maximum altitude of the barometer on this day (being the time of transit of the great November wave of pressure) as having been at eleven A.M., according to the barometer on the Exchange, 30·62, thermometer 49°; and by the barometer at the Town Hall, 30·63, thermometer 50°. About one o'clock the barometer began to fall.

INSTITUTION OF CIVIL ENGINEERS.

November 6, 1859.

Discussion on Mr. Grantham's papers.

November 15, 1859.

"On the origin, progress, and present state of the Government water works, Trafalgar Square; with a few facts relating to other wells which have been sunk, or bored into the chalk formation," by Mr. C. E. Amos.

The author commenced by stating, that a good supply of water having been required for the fountains in Trafalgar Square, it was determined, in the year 1843, to carry out a plan which had been suggested by Mr. James Easton. This was so framed as to include the water supply for the public offices. The water was to be obtained and raised by engine power, from the springs beneath the London clay. The quantity of water required for condensing the steam of the engine being too great to be taken from the main spring, in full quantity, it was considered expedient to use cooling ponds; and it was thought that a small quantity of water in excess of that required for the public offices, running continually into the cooling ponds, would keep the water clean, and in a state fit for the purpose of condensation. The basins of the fountains were intended to form the cooling ponds. The water from them was to be taken for the use of the condenser, afterwards to be raised into a cistern, from whence it was to be conveyed to, and be passed through the jets of the fountains, where, meeting with the resistance of the air, it would be partially cooled and returned to the basin, for further circulation.

Estimates having been made, it was found, that the yearly interest on the cost of erection, added to the cost of working, would be less than the sums hitherto paid annually for the water supply to the public offices, and that, consequently, the playing of the fountains could be effected without cost to the Government. A contract was then made with Messrs. Easton and Amos for the execution of the works; and a piece of ground having been selected in Orange Street, the works were commenced in January, 1844, by sinking the first well to the depth of 174 feet. A cast-iron pipe, 15 inches diameter, was then driven through 30 feet of plastic clay and 10 feet into a stratum of gravel, sand, and stones, being left standing several feet up in the well. Within this another pipe of 7 inches diameter was driven through 35 feet of green coloured sand, and 3 feet into the chalk formation, and the boring was then continued to the total depth of 300 feet from the surface. A considerable quantity of water came from the sand, but a much larger supply was obtained from the chalk. A second well was sunk in the enclosure immediately in front of the National Gallery, to a depth of 168 feet from the surface. A pipe, 14 inches diameter, was then driven through the plastic clay, and into the gravel, sand, and stones beneath it. Within this a pipe, 7 inches diameter, was driven through 42 feet of green coloured sand, and 3 feet into the chalk, the boring being continued to the total depth of 393 feet. The springs were found to be stronger than those in the well in Orange Street. A tunnel 6 feet diameter, and about 400 feet long, was driven to connect the two wells; the bottom of it being about 123 feet below T.H.W.M. A catch well, 5 feet 6 inches diameter, and 32 feet deep was sunk just outside the engine house. A tunnel was driven from it, passing beneath Castle Street and the National Gallery, to contain the pipes for bringing the water back from the basins of the fountains to the catch well.

The paper then proceeded to describe the situation of the different tanks, or reservoirs, in the water-tower, and their purpose; and next gave a brief account of the high-pressure, condensing steam engine, on the Cornish principle, for working two sets of pumps, one being capable of raising one hundred gallons of water per minute from the springs to the tank, and the other five hundred and fifty gallons per minute from the catch well into the tank for condensation and for the supply of the fountains. An auxiliary high-pressure, single-acting steam engine was also provided, to be used when the principal machine needed repair.

The works were finished in December, 1844. Their total cost, as completed, amounted to nearly £3,400. The water rose to within 90 feet of the surface (about 48 feet below T.H.W.M.), and was found to be of good quality. When the engine was pumping one hundred and ten gallons of water per minute, it could only lower the water 4 feet in the well.

In 1846, a further demand for water having been made, a larger pump was substituted, which was capable of raising three hundred and fifty gallons of water per minute from the springs.

In 1849, a second well was sunk in Orange Street, and an engine of 60 H.P., on Woolf's principle, was erected. The well was carried to a depth of 176 feet, and a tunnel was driven to connect it with the other wells. A bore pipe was driven through the plastic clay, within which it was intended to drive a smaller pipe through the sand into the chalk, and then to continue the boring as in the other wells. But an accident having occurred in driving the large pipe, which allowed sand to come up the bore hole, and made the water foul, the hole was stopped with bags of clay, and no further use had been made of it, than as a sump well to contain the pumps. The accident was accounted for in this way:—In driving the pipe great resistance was offered by the "hugging" of the plastic clay, and considerable percussive force had to be used. In consequence several of the screws which held the joints were shaken out, and the pipe having been improperly driven through the layer of gravel, sand, and stones, into the sand beneath, there was an escape of water through the screw-holes, and sand followed in sufficient quantity to cause inconvenience.

The steam engine worked one double-acting pump for supplying the fountains, and two other pumps for raising water from the springs into the tanks above the building. At an average speed of sixteen strokes per minute, the first could throw six hundred and sixty gallons, and the other two together six hundred gallons per minute. This engine is the one now mainly used. The supply of water from the springs was still found to be abundant. The pumping of 600 gallons per minute lowered the water from twenty feet to twenty-four feet, when it remained stationary as long as the engine was kept working. The level of the water did not appear to be gradually lowering, and it was stated that on December 1st, 1858, it rose to within 66 feet of T.H.W.M., being about the same level as it stood in December, 1847. The author thought there could be no doubt that the greater portion of the water was obtained from the chalk.

He then referred to the fact of the towns of Brighton, Croydon, Deal, Epsom, Ramsgate, and Woolwich, being all supplied with water from the chalk formation. There was an uncertainty, however, of obtaining a good supply from the chalk, as was illustrated in the case of the well sunk at Messrs. Truman's brewery. In 1857, a greater supply of water being required by the Messrs. Truman, it was determined to extend the works. In the first place the sand and water above the chalk were shut out, then the well was continued to a depth of 300 feet from the top, when it was discontinued, as no water came up the well hole. As the chalk showed indications of water at the depth of 285 feet, the floor of the tunnels was commenced at that level. These tunnels were 5 feet 6 inches high by 4 feet wide; that on the north side was driven to a length of 57 feet, and that on the south side to 48 feet. The quantity of water now obtained did not exceed twelve and a-half gallons per minute. The water of the springs in the sand had been taken by tapping the cylinders, at the bottom, instead of, as hitherto, near the top of the sand stratum.

A well sunk at Messrs. Combe's brewery, to a depth of about 48 feet into the chalk, produced a supply of seventy gallons per minute. The water stood 20 feet higher in this well than in the Trafalgar Square well, while the water in both wells was in a state of rest.

November 22, 1859.

Discussion on Mr. Amos' paper.

After the meeting Mr. John Poole exhibited and explained a "parallel motion safety valve."

It was pointed out, that the ordinary valve simply rested on its face, or seat; its vertical, or upward motion being guided by a spindle on the lower side, passing through a box, or feathers in the steam pipe. The area of the discharge pipe was thus reduced one-third, and in some cases as much as one-half. This valve was pressed upon by a weighted lever, moving on a hinge, or centre on one side. When in a state of rest, the lever and the centre of the spindle were at right angles to each other; but as soon as the valve rose, the angle became more acute. This brought an unequal load upon the valve, and caused friction, inducing a tendency in the spindle to twist, and on the valve to jam, or stick. The guide spindle, being below the valve face, was also liable to be corroded by foul or dirty water, and to unequal contraction and expansion. It was likewise found, that these valves, when out of order, invariably leaped on the side nearest the hinge of the lever.

In the "parallel motion safety valve," the spindle was on the upper side, the seat, or face was flat, and the discharge pipe was free of interior incumbrances, so that less leverage and weight were necessary. The spindle passed through a guide above, and to the centre of the spindle, on which the valve was hinged, the parallel motion was attached. It was shown, by a sectional model, that the radial action of the lever did not control the vertical action of the valve, which therefore could not stick, or jam in its seat.

November, 29, 1859.

"On arterial drainage and outfalls," by Mr. R. B. Grantham.

COVENTRY WATCHMAKERS' ASSOCIATION.

November 1, 1859.

Mr. James Ferguson Cole, the Vice-President of the British Horological Institute, London, delivered a lecture "On horology."

He commenced by stating that his object was to make a few remarks on the principle of timekeepers, chiefly with reference to chronometers and pocket watches, as portable machines dependent for time-keeping effect on the vibratory motion of a balance governed by the elastic resistance of a balance-spring; while clocks, as fixed machines, depended upon the oscillatory motion of a pendulum, governed by the principle of gravity. With reference to the "spring" or "weight," as the usual motive power applied to the machines alluded to, he explained that neither one nor the other of these was of itself a power, and hence the mainspring as belonging to the class of timekeepers now treated on might be considered as only a reservoir of the force exerted by the hands in the act of winding up the spring. Elasticity was not, therefore, a power, but, on the contrary, a constant principle of resistance, tending only to obstruct motion, and to remain, like the inert matter of a weight, constantly in a condition of rest; but when a spring was wound into tension, its tensile force would be given out in the way of re-action, and whether it be a mainspring, a balance-spring, or the tremulation of a bell, all were alike obedient to the great ruling principle of nature, in which the deepest philosophical scrutiny had never detected the smallest error. Having described the construction of the chronometer or pocket watch, he proceeded to observe that escapements were of various constructions, but those most generally adopted in the manufacture of watches during the last half century were the horizontal, the duplex, the chronometer detached, and the detached lever escapement. There was also another class of escapement, known as the remontoire, but after many experiments, he found that the remontoire spring must always be fully under control of the mainspring at its lowest tension as an arbitrary condition, and that when the mainspring was fully wound to its highest tension, the pressure from the motive force to the scape-wheel locking was so great against the delicate remontoire spring which had to discharge it, that it required too nice an adjustment of the force and resistance to be relied on. The same disadvantage attended the remontoire in regard to fusee movements, where the maintaining spring was inferior to the mainspring; and although the same objection to the remontoire did not so strongly apply where the motive power was uniform by a weight as in clocks, in this application of the principle, under the most favourable circumstances it was still open to objection, as the smaller irregularities of power through the train of wheel-work, together with the impediment of thickened oil, and the effect of various temperature on the spring, rendered this delicate winding action so very doubtful that he had long since given up the use of the remontoire escapement. The principle involved in all escapement mechanism in watches was in its general aspect of simply a mechanical character, and, viewed in this light, must appear only as a means of transmitting impulse powers to the pallet plains. Such, however, was not strictly the case, as any undue resistance arising from defective application, or from a want of correctness in the formation of the locking angles, &c., on whatever principle of escapement, was well known to effect both the mechanical result in motion produced, and also the isochronous result on time. With regard to the lever escapement now generally adopted for ordinary pocket watches, the rudimentary principle was strictly that of Graham's pendulum clock, although ascribed to Mudge as its inventor, and it must be regarded in its present shape as a valuable improvement for its greater simplicity and ease of execution, and as effecting the important object of detachment of the balance. In reviewing, as he had done, the various modes of construction of chronometers, pocket watches, and other timekeepers, it was not his intention to offer any rigid rule or process for the attainment of an end which practical watchmakers arrived at by their own peculiar modes established by custom and experience. What he proposed was a reduction of the proportions of the mechanical parts of the detached lever escapement to a rule, which, if correctly observed and adopted, must lessen or prevent the liability to failure in the ultimate mechanical and time-keeping results when made by workmen of less mature experience. The first consideration was, what should be the proper diameter and weight of the balance for the proposed watch movement; this, he need not say to the scientific watchmaker, was only to be ascertained in the first instance by mechanical trial and by the result in motion produced. That the weight should bear some preferable relation to the diameter could not be doubted, as either carried to an extreme must destroy the harmony of proportion. The lecturer here proceeded to detail at considerable length the mode by which he had attained the object alluded to, and with the aid of diagrams clearly showed to his audience the state of simplicity to which he had reduced his principle. In conclusion, the lecturer urged upon all watch manufacturers the desirability of rendering the construction of chronometers, pocket watches, and other timekeepers, as little complicated as possible, remarking that all the varied and improved modes of action described by him had been found to work well, and it was owing to their being based upon the simplest form of the principle that he gave them the preference.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

NOVEMBER 7, 1859.

THIS was the first general meeting—Earl de Grey, president, in the chair. After some preliminary remarks upon the origin, progress, and condition of the association—in the course of which the president drew attention to the fact, that the members now number 416—Mr. Tite, M.P., then addressed the meeting, touching most particularly upon the recent competition for the Government buildings.

In this case the instructions were intelligible and clear; the reward was distinctly announced; the drawings were fairly comparative, and there could be no question of the honour and competence of the judges. Unhappily, however, there was one miscarriage, which has led to most of the subsequent difficulties. Inasmuch as only one building could be erected out of the great mass of propositions open for competition, no doubt the successful architect for that building must have been chosen to carry it out; but after the decision was made public, it became known that in this particular instance the first premium had been awarded by the professional judges to the architects who were placed sixth only in the order of merit; and that in point of fact the architects who received the second premium were entitled to the first. This introduced great difficulty into the discussion. It was agreed on all hands that it was impossible to erect the first design. This led to an inquiry as to the original instructions with respect to the actual site of the offices which had been determined to be built. Grave doubts arose on that subject; the whole proceedings fell into abeyance, and certainly for a time were entirely abandoned. If they had merely remained in this situation the competitors would have had no right to complain, any more than a builder who in competition gives in the lowest tender for a building has a right to complain if the estimate should be so large as to prevent the work from being executed at all. In the one case the architect gets both his premium and his reputation, and in the other the successful competitor among the builders is entitled both by law and equity to the expense of making his estimate. But the Ministry of the country having been changed, the question assumed another shape, and, in the midst of the difficulties, the Government resolved on referring all the questions to the examination of a parliamentary committee. Of the composition of this committee no one could complain; it was fairly chosen as regards politics or opinions; it was presided over by a man of learning; but upon it, it was perfectly well known, there was a great preponderance of feeling in favour of Gothic architecture. The report of the committee did not very much improve the business; but, excepting the statement that apart from the evidence that Gothic architecture was not essentially dearer than Classical architecture, and might as well be adapted to the common purposes of business, the Government was not legally bound to employ the successful competitor. The committee, therefore, generally left the question to be dealt with as the Government thought fit. It appears indisputable that the premeditated plan, No. 2, ought to have been adopted, because it was agreed on all hands that the arrangement suggested met the requirements of the case far better than those of any other plan, and that the elevations and external decoration were moderate, agreeable, and consistent. If the feeling of the country was so decidedly in favour of Gothic architecture, that Gothic forms and Gothic decoration were to be considered essential, there was nothing in the plan No. 2 to prevent the adoption of that style, and it was perfectly well known that the accomplished architects who had designed and arranged the external elevation in the Italian style, could just as easily, if required, have adapted the architecture of any other nation or period. It seems, to say the least, that employment of the author of the plan No. 3 was unjust to the architect who had gained the second premium, and also unjust to our profession. It is not my purpose to revive at this meeting, or to promote a discussion or a re-discussion of all that has followed, whether in the House of Commons or in society. The architecture of the approved design is neither Gothic nor national, in the sense in which those terms are generally understood. It is very considerably more costly than the same amount of building in the Italian style of architecture. It is neither so well adapted nor fitted for the purposes to which it should be applied as Italian architecture; and the building, if erected as proposed, whether Gothic or Italian, will involve the destruction of the State Paper-office on the west, and of all the important offices on the south, now forming the west end of Downing Street. This will not be at all the fault of either architect, but if the edifice be erected as it is at present arranged, it can only prove to be a blot and an incongruity.

AMERICAN PHOTOGRAPHIC SOCIETY.

SEPTEMBER 12, 1859.

"On the iodo-cyanide of potassium," by Dr. J. M. Sanders, Connecticut. It is by no means proved that iodo-cyanide of potassium can be made, and Dr. Sanders cannot be said to have really produced it. If it is made, it is very unstable, and soon resolves itself into cyanide of iodine and potash.

"On certain defects in the Fothergill process," by G. B. Coale, Baltimore.

"On the stereoscope," by Mr. Seelay.

"On phosphorescence," by the President.

He stated that there are two kinds of phosphorescence; first, that observed in the slow combustion of bodies, as phosphorus and decaying wood. Second, that exhibited without any combustion, by certain substances, after they have been exposed for a moment to the light. The luminosity of the fire-fly and other insects does not depend on their nervous system or vitality, except so far as that they voluntarily open the valves of their spiracles, and admit the air to certain glands in which oxidation then takes place.

Having selected, for satisfactory reasons, fluor-spar and diamonds as the bodies for examination, he established these points. First, that these substances when they shine undergo no change of size. Second, that by the most delicate thermometers no trace of heat can be detected.

He then described the methods he had resorted to for the measurement of the light they yield at their utmost brilliancy; these were both photographic and also direct, by the process known as that of the extinction of shadows.

In conclusion, he showed that all solid substances, except the metals, are phosphorescent, if properly examined, and hence the property is not a peculiarity of a few bodies.

OCTOBER 11, 1859.

"On the fading of photographs," by Dr. Van Der Weyde.

In the first place, he endeavoured to show that fading was not due to exposure to light. Two photographs, of the same fading tendency, kept under the same conditions, except one being in the light, the other in darkness, will fade at the same rate. The light in producing the photograph seems to have exhausted its energy, and does not further change it. The chief sources of fading are moisture, heat, and corrosive gases. Photographs are affected by the sunbeams, but only by reason of the heat they carry; if the light could be filtered from the heat, it would have no effect. If a Daguerreotype be covered with a glass which has a crack in it, a stain will soon show itself under the crack. The stain comes from the penetration of corrosive vapours. If the Daguerreotype be unprotected by a glass, it soon becomes entirely covered with stains. The composition of the photographic image on paper is so similar to that of the Daguerreotype, that like causes produce similar effects. A glass in front of a paper photograph is a great protection.

At the conclusion of the business, Professor Reuben brought forward various objections to the wave theory of light, and advocated a theory of his own, wherein he made out light to be a force, possessing powers similar to those of gravitation.

ROYAL SCOTTISH SOCIETY OF ARTS.

NOVEMBER 14, 1859.

THIS was the annual general meeting—Professor C. P. Smyth, president, in the chair. After the delivery of the usual address, the report of the prize committee awarding the prizes, for session 1858-59, was read, and the prizes were delivered by the president to the successful competitors, as follows, viz.:—

1. To Mr. C. H. Gustavus Thost, manager of the Marquis of Breadalbane's mines, for his communication "On the conveyance of small sized solid bodies by water-power, in angular troughs or pipes, &c."—The society's silver medal and plate, value ten sovereigns.

2. To Mr. John Young, gas engineer, Dalkeith, for his communication "On the manufacture of the carbon elements for Bunsen batteries."—The society's silver medal and plate, value ten sovereigns.

3. To Mr. Frederick J. Ritchie, clock and watch maker, Edinburgh, for his "Working model and description of the clock-drop for the time-ball on Nelson's monument, Edinburgh."—The Reid and Auld prize, value nine sovereigns.

4. To Mr. Robert Frew, M.E., Glasgow, for his communication "On the working and ventilation of coal mines."—The society's silver medal and plate, value five sovereigns.

5. To Mr. Henry Cadell, M.E., Grange, Bo'ness, for his "Description of an improvement in the construction of brick-kilns, for economising fuel and prevention of smoke."—The society's silver medal and plate, value five sovereigns.

6. To Mr. J. Darsie Morrison, surgeon-dentist, Edinburgh, for the "Ingenious mechanical arrangements in his apparatus for the application of cold for producing local anæsthesia."—The society's silver medal and plate, value five sovereigns.

7. To Mr. Robert H. Bow, C.E., for "Improvements on spirit-levels which may be used without a tripod or other fixed stand."—The society's silver medal.

8. To Mr. Alexander Bryson, F.R.S.E., for his "Description of a new gauge for measuring watch-glasses."—The society's silver medal.

9. To Mr. James Melville Balfour, C.E., for his "Description of an instrument for dividing circles on paper."—The society's silver medal.

10. To Mr. John Sang, C.E., Kirkcaldy, for his communication "On measuring water by weirs."—The society's silver medal.

11. To Mr. Evans Grant, carriage inspector, Edinburgh and Glasgow Railway, for his "Improved mode of hanging railway and other carriage windows."—The society's silver medal.

12. To Mr. Robert Thoms, Densbrae, Dundee, for his exertions towards devising "A mode of preventing fire on shipboard."—The society's silver medal.

On the recommendation of the committee, special thanks were given to the following gentlemen, viz.:—To Dr. Stevenson Macadam, F.R.S.E.; Dr. Alexander Hunter, of the Madras School of Design; Professor John Wilson, F.R.S.E; Mr. Andrew Findlater, M.A., Edinburgh; the Rev. William Taylor, F.R S., London; Mr. Alexander Bryson, F.R.S.E.; and Mr. H. G. C. Smith, teacher of mathematics, Edinburgh; for communications made by them during the session.

The committee further reported that they had again postponed a deliverance on Mr. James Sinclair's "life preserver" and his supplementary communication thereon, read 14th February, 1859, the committee not having yet reported thereon; and they also reported that the Keith prize had not been awarded this year—no communication of sufficient importance having, in their opinion, been submitted to the society, in competition for that prize.

SOCIETY OF ARTS.

NOVEMBER 16, 1859.

THIS was the first ordinary meeting of the 106th session, and, according to custom, the chairman of the council, Sir Thomas Phillips, delivered an address, in which he paid a well-merited tribute to the memory of the late Mr. Andrew Ross, the eminent optician, followed by similar expressions with reference to Mr. Brunel, Mr. Stephenson, Mr. Jacob Bell, Professor Henfrey, and Mr. Hetherington Henry. He afterwards stated that it had been determined to put off the next Great Exhibition until 1862, and that it was in contemplation to extend the present annual exhibitions of patented inventions so as to comprise manufactures and raw produce.

The chairman then presented the medals awarded by the council at the close of the last session, as follows:—

To Messrs. Hamilton and Nash, for an "Improved lock."—The society's silver medal.

To Messrs. Peter and Charles Garnett, for their "Toothed-roller cotton gin."—The society's silver medal.

To Mr. F. Joubert, for his invention of "A method of rendering engraved copper plates capable of producing a greatly increased number of impressions," and for his paper explanatory of it, read before the society.—The society's silver medal.

To Mr. E. J. Reed, for his paper read before the society "On the modifications which the ships of the Royal Navy have undergone during the present century, in respect of dimensions, form, means of propulsion, and powers of attack and defence."—The society's silver medal.

To Monsieur Théophille Silvestre, for his paper read before the society, "Les arts, les artistes, et l'industrie en Angleterre, depuis la dernière moitié du dixhnitième siècle jusqu'à ce jour."—The society's silver medal.

To Dr. J. Forbes Watson, F.R.S., for his paper read before the society "On the growth of cotton in India; its present state and future prospects, with special reference to supplies to Britain."—The society's silver medal.

To Mr. Leonard Wray, for his paper read before the society, "The culture and preparation of cotton in the United States of America, &c."—The society's silver medal.

To Mr. John Bell, for his paper read before the society, "Some remarks on the application of definite proportions and the conic sections to architecture, illustrated chiefly by the obelisk, with some history of that feature of art."—The society's silver medal.

To Messrs. Parkins and Gotto, for "A cheap and portable writing case."—The society's silver medal and £20.

NOVEMBER 23, 1859,

"On China and its relations to British commerce," by Sir John Bowring.

DECEMBER 7, 1859.

"On the forces used in agriculture," by Mr. J. B. Lawes.

ASSOCIATION OF FOREMEN ENGINEERS.

NOVEMBER 5, 1859.

THE members of the London Association of Foremen Engineers met at St. Swithin's Lane, city of London, under the presidency of Mr. J. Newton. There was a goodly attendance on the occasion, and after the election of Messrs. Fowler and Ellery, and the disposition of other business, Mr. Hayes resumed his series of papers on the "Enfield Rifle." The reader dwelt more particularly on what is designated the "furniture" of the deadly weapon, and, taking each portion of it in detail, described its mode of manufacture and use. The minute carefulness displayed in his descriptions, afforded conclusive evidence of Mr. Hayes's knowledge of his subject, whilst the assistance rendered him by Colonel Dixon, of the Small Arms Factory—who had forwarded *bona fide* articles of Enfield furniture in various stages of preparation—made the paper still more practical and valuable. Mr. Burton, chief engineer at the Enfield Works, as well as Messrs. Hepburn, Williams, and Hague, foremen, obtained their share of commendation as improvers of machines, and the means of working them, and Mr. Hayes received, at the conclusion of his paper, a vote of thanks.

The Magenta phenomena of the earth, illustrated by diagrams kindly sent from Flew Observatory, were subsequently spoken of by Messrs. White and Brickleigh, and the announcement by the President of a paper in conclusion of the rifle subject, and more particularly referring to the manufacture of the *stock* and the *lock*, on the 4th of December.

ROYAL GEOGRAPHICAL SOCIETY.

NOVEMBER 28, 1859.

"On sun signals for the use of travellers," by Mr. Francis Galton. If a piece of looking glass be held in such a position that a person at a distance can see some portion or other of the sun's disc reflected in it, it assumes the appearance of an exceedingly brilliant star of solar light. The object of Mr. Galton's invention has been to provide an optical arrangement by which the signaller may know whether he is holding the mirror aright. The smallest size of hand heliostat can literally be carried in the waistcoat pocket; yet, by its means, whenever the sun is shining, a signal can be instantly made that shall be visible to the entire neighbourhood of any given spot within sight. A distance of 12 miles on a day of average clearness is well within the power of the little instrument. If the flash be replied to, a regular communication can be carried on, in which the signals are varied by gentle movements of the hand, that cause the flash to be seen and to disappear alternately. Words and sentences are communicated by a notation of long and short flashes, but the mere power of calling attention from great distances, and of conveying three or four simple signals, such as a series of single flashes for affirmation, and of doublets for negation, is of the highest consequence to a traveller. Sir Edward Belcher and the Astronomer Royal of the Cape testified to the enormous distances at which heliostatic lights were visible when employed in triangulating a country.

"Latest accounts from the Central African expedition from Dr. Livingstone, F.R.G.S., with illustrations," by Dr. Shaw.

INSTITUTION OF ENGINEERS IN SCOTLAND.

NOVEMBER 23, 1859.

"On a sediment collector, and on a furnace grate for steam boilers," by Mr. J. Braidwood.

"On the treatment of steam for the development of power," by Mr. J. G. Lawrie.

"Remarks on locomotive pistons," by Mr. W. Neilson.

ROYAL SOCIETY.

NOVEMBER 17, 1859.

"Report of scientific researches made during the late Arctic expedition of the yacht *Fox*, in search of the Franklin expedition," by Capt. M'Clintock.

NOVEMBER 30, 1859.

This was the anniversary meeting at Burlington House, when Sir B. Brodie, president, delivered his annual address. The medals were then awarded as follows:—The Copley medal to M. Weber, of Göttingen, and the two Royal medals to Mr. Arthur Cayley and Mr. George Bentham. The ballot for the election of the council and officers was then taken, and the following gentlemen were declared duly elected:—President—Sir Benjamin Collins Brodie, D.C.L.; treasurer—Major-General Edward Sabine, R.A., D.C.L.; secretaries—William Sharpey, M.D., and Mr. George Gabriel Stokes, M.A., D.C.L.; foreign secretary—Mr. William Hallows Miller, M.A.; other members of the council—Mr. C. Cardale Babington, M.A., Rear-Admiral Sir George Back, D.C.L., Rev. John Barlow, M.A., Mr. Thomas Bell, Mr. Arthur Cayley, William Farr, M.D., D.C.L.; Sir H. Holland, Bart., M.D., D.C.L.; Mr. Thomas Henry Huxley, Sir Roderick I. Murchison, M.A., Mr Thomas Webster, M.A., Rev. William Whewell, D.D., Alexander William Williamson, Ph. D., Rev. Robert Willis, M.A., Sir William Page Wood, D.C.L., the Lord Wrottesly, M.A., and Colonel Philip Yorke.

SOUTH LONDON PHOTOGRAPHIC SOCIETY.

October 20, 1859.

This was the first meeting of the society, and it was held in the Lecture Hall, Carter Street, Walworth. After an address by the secretary, the following papers were read:—

"Truth in art illustrated by photography," by Mr. H. L. Keens, sen.

"Hints on positive printing," by Mr. Leake, jun.

CHEMICAL SOCIETY.

November 3, 1859.

"On the immediate source of the carbon excreted by the lungs," by Dr. E. Smith.

"On the crystalline hydrates of baryta and strontia," by Professor Bloxam. He showed, in opposition to the statements of most authors, that hydrate of strontia, unlike hydrate of baryta, is decomposed at a red heat.

GEOLOGISTS' ASSOCIATION.

5 Cavendish Square, London.

October 3, and November 7, 1859.

"On the echinodermata of the chalk," by Mr. Cresy.

MONTHLY NOTES.

MARINE MEMORANDA.

The entire fleet of twelve steamers belonging to the General Iron Screw Collier Company (limited) has been sold to Mr. Capper, of the Victoria Docks, London, for a private company, for the sum of £60,000.

The Greenock Foundry Company have contracted with Government for the construction of four pairs of marine engines, from 160 to 200 horse power each. They are to be worked at day and night until finished.

Steam conquers wherever it goes! The picturesque little lake of Coniston, not far from Windermere, now boasts its steamer. She is a screw, and built of steel plates in the gondola style. The steel plates were separately conveyed to the margin of the lake, and there built into their form and launched.

Nothing can better show the disastrous result of the scheme of the Collins's line of steamers, than the financial statement as to the original cost of the vessels, and what they were sold for. They cost very nearly £840,000 (sold for 800,000 dollars, being loss 600,000 dollars.)

It appears that at the twelve principal ports of the United Kingdom during the year 1858, there entered inwards 28,259 ships, 7,829,613 tonnage, and cleared outwards 25,550 ships, 7,481,325 tonnage. The total declared value of British and Irish produce and manufactures exported from the same twelve ports to foreign countries and British possessions in 1858 was £104,695,864.

It is said that the area of the hull of the *Great Eastern*, to be painted in accordance with the arrangements for the fittings and decorations now going on at Southampton, amounts to four acres. We do not know how near the truth this may be, but we are afraid this version of "our farm of four acres" will not allow much to be said of "the money we made by it."

The number of ships of war of all kinds—line-of-battle ships, frigates, corvettes, and sloops, surveying and small vessels, gunboats, tenders, &c., possessed by the various civilised nations of the world, is as follows:—England, 626; France, 448; Russia, 164; Sweden, 311 (principally small vessels); Norway, 143; Denmark, 120; the United States, 79; Holland, 139; Belgium, 7; Spain, 82; the Two Sicilies, 121; Austria, 135; Portugal, 37; Sardinia, 28; Prussia, 55; Greece, 26; Turkey, 49; Brazil, 27; Peru, 15; Chili, 5; Mexico, 9.

The *Orinoco*, a wooden steamship, built quite recently for the Royal Mail Steam Packet Company, has come to the ship breakers at a very early stage in her existence. It is strange that this large, expensive, and new steamer should so soon have run her course, but dry rot has rendered her useless; and Mr. Castle, the ship breaker, is now converting her huge hull into fire wood, at his yard close by Vauxhall Bridge. She was built by Mr. Pitcher at Northfleet, and is 266 feet long, by 44 feet broad, her register tonnage being 3,090 tons, and her real burden, 4,500. She was sold for something over L5,000. Surely there must have been something very far wrong that she ended thus.

Mr. W. C. Miller, of Toxteth Dock, Liverpool, has received an order from the Admiralty to build two gunboats of a similar class to those built by him during the Crimean war, and which are now doing service in the China Seas. The dimensions of the gun vessels are as follows:—Length between perpendiculars, 120 feet; length for tonnage, 105 feet 8 inches; breadth, extreme, 22 feet; breadth for tonnage, 21 feet 10 inches; breadth, moulded, 21 feet 4 inches; depth in hold, 9 feet; tonnage, builder's measure, 268 tons. The gun dispatch vessels, *Steady* and *Penguin*, now building by him, are rapidly approaching towards completion.

The London and Mediterranean Steam Navigation Company, is the title of a new sea-going steam-ship concern, proposed for organisation under the limited liability act. It starts with a capital of £50,000 in 5000 shares of £10. with power to increase the amount to £250,000. Its object is to start a new line of steamers between London and the large commercial cities of Italy and Sicily, such as Genoa, Leghorn, Naples, Messina, and Palermo. The directors propose that the first vessels to be built for the new line, are to be fitted with Rowan's expansive steam engines, and in this they ground a claim for securing great economy of fuel, and, consequently, of working expenses. We shall be glad to know wherein this great economy arises.

The introduction of iron screw colliers, for the conveyance of coal from Newcastle to London, has turned out most advantageously for London coal consumers; or, in other words, for every London resident. During the whole of the recent stormy weather, those vessels, with scarcely any interval, have maintained a tolerably good supply of coals in the London market, which sailing vessels would have otherwise failed to do, and have kept freights at about 7s. per ton. Mr. Hugh Taylor, M.P., in a letter he has published this week, states that some years ago he had eighteen sailing colliers employed in the London coal trade. These ships carried on an average an aggregate of 54,000 tons annually. But the same amount of tonnage can now, and actually is, carried by two steam colliers of 800 tons each.

Messrs. J. and G. Thomson, of the Clyde Bank Iron Ship Yard, Glasgow, have laid the keel and begun the frame of the *Giraffe*, for Messrs. J. & G. Burns' Glasgow and Belfast station. She is to be a passenger ship, and is the craft to which we have before referred as guaranteed to have a speed of 22 miles an hour, and to beat everything else afloat. The *Giraffe* is to be 278 feet long over all; 25 feet 8 inches beam; 13 feet 6 inches moulded; tonnage, builders' measurement, 750 tons. Her engines are to be oscillators, 75 inch cylinders, and 3 feet 6 inches stroke; diameter of paddle wheels, 25 feet 4 inches, with feathering floats. She will have four tubular boilers. Her passenger accommodation will be equal to eighty of the first-class. We shall have more to say about this fine vessel hereafter. Her model, which we have seen, certainly gives promise of speed, as far as her hull is concerned.

Mr. Williams, the member for Lambeth, rendered the state some service the other day, by drawing the attention of his constituents to the waste which goes on in our government dockyards. He pointed out that the Russian government contracted with a large builder on the Thames to construct two ships of war, and the price paid for wages in that case was £2 12s. per ton; while in Woolwich Dockyard, near at hand, the cost of wages for the same sized vessel, containing the same number of guns, and similar in all respects, was £6 17s. 8d. And at Chatham the cost of building the same class of vessel was some 50 per cent. less. We dare say that if our public and private accounts for shipbuilding were looked into a little more closely, the country would be let into some information, which would lead in the end to a remedy, for what is at present a great abuse.

Since the last issue of the *Practical Mechanic's Journal*, we have lost one of our oldest, if not the oldest of scientific shipbuilders, Mr. John Fincham. He will be best remembered by the general public as for many years master shipwright of Portsmouth Dockyard, and more especially as the builder of the celebrated *Arrogant*, the first screw frigate possessed by this country, and still looked upon as one of the finest of her class. Much of his time and study was devoted to the introduction of the screw propeller into the British navy. For a long period he was superintendent of the School of Naval Architecture at Portsmouth. His *History of Naval Architecture*, *Outlines of Shipbuilding*, a *Treatise on Laying off Ships*, and on *Masting Ships*, are unequalled in the English language for the amount of research and professional knowledge they contain. Our older readers will remember many occasions on which we have taken note of Mr. Fincham's great attainments.

In the early part of last May the Royal Mail Company's steamship *Atrato* was coated on the starboard side with M'Innes's green copper soap, and on the port side with Peacock and Buchan's pink composition, for the purpose of practically testing the relative merits of the two articles in keeping the bottom of the ship clean. On docking the *Atrato* lately for examination, it was found that the starboard side was covered with coral pipe, shells, and barnacles, with a good deal of corrosion; while the port side was perfectly free from coraline incrustation or barnacles, having merely a thin slimy unctuous coating upon it. The result is considered as having incontestably proved that preparations of copper are of little value in preventing incrustations or fouling on the bottoms of iron ships, while their galvanic action must, sooner or later, prove injurious to the rivets and plates. The green composition is now being scraped off the *Atrato*.

Messrs. Pearce and Co., Stockton, have on the stocks for the Government an Indian river steamer of immense proportions. Her water line is 350 feet, over all 375, and breadth 46 feet. She is by far the largest river steamer in the world. Her engines are 200 horse power. She will be impelled with paddles, and will, it is expected, attain a speed of 13 miles an hour. She will be fitted with sleeping berths and every suitable sanitary arrangement for about 800 soldiers. Iron beds with galvanised bottoms are to be used, and the ventilation will be the same as that employed in the General Post Office. The decks are to be covered with teak, and an awning will be provided for the whole length of deck. The vessel will also have two houses, American steamer fashion, on the deck, each about 100 feet long, and there will in addition be two hospitals on board. She will be guided by two large patent steering blades, and is made to draw only two feet of water, even with all her stores, fuel, and 800 passengers on board. She is flatbottomed of course, and weighs about 370 tons. She will be completed in about a month, and will then be fitted up on the Thames in order to make an experimental trip.

The following notice has lately been issued by eight firms who are makers of "yellow metal" for ships' use:—We, the undersigned, manufacturers of yellow metal sheathing for ships, having been recently subjected to claims from shipowners in consequence of the bad condition of metal, and having ascertained that these failures have been caused in most instances by the action of waters strongly impregnated with sulphuretted hydrogen, arising from sewage, and other impurities in port, and not by any defects of the metal in its own nature; also considering that the merits of yellow metal are now well known, and its resistance to the action of sea water under ordinary circumstances sufficiently established, and that no guarantee is given as to the durability of copper sheathing, or with manufactured articles generally, do hereby give notice, that from henceforth no guarantee of its wear will be given by us, and that we will not hold ourselves in any way responsible for its durability.—G. F. Muntz; Vivian and Sons; Pasco Grenfell and Sons; Williams, Foster, and Co.; Sims, Willyams, Nevill and Co.; John Bibby, Sons and Co.; Mason and Elkington; Newton, Keates and Co. It is all very well for the proprietors of a most profitable manufacture to issue an announcement of this class, but it seems to us that it would be far better, and certainly more to the purpose, if they were to cast about for a practical remedy for the evil, now well known to be a widely spread one, of supplying an inferior article. They admit that the metal will not stand the action of sulphuretted hydrogen, a gas to be found in all ports and harbours to a greater or less extent. Then, let shipowners have a metal which *will* resist it.

The number of merchant steam vessels actually on the British register as on the 1st of January, 1859, is 1,854, with an aggregate tonnage of 682,433 tons, and 186,227 horses power. The only steam ships whose length exceed 300 feet are the following:—

	Length. Ft.	in.	Gross Tonnage.		Length. Ft.	in.	Gross Tonnage.
Atrato,	336	6	3,467	*Jura,*	313	8	2,241
Simla,	330	4	2,441	*Etna,*	304	9	2,215
Nemesis,	301	0	2,018	*Columbian,*	307	4	2,352
Great Eastern,	697	6	18,915	*European,*	305	0	2,360
Tasmanian,	346	0	2,253	*Edinburgh,*	300	5	2,197
Oneida,	306	8	2,285	*Persia,*	376	0	3,300
Ceylon,	306	1	2,021	*Australasian,*	331	7	2,761
City of Baltimore,	325	4	2,368	*Japan,*	320	6	2,667
Royal Charter,	306	2	2,720	*Parana,*	300	0	3,071
City of Washington,	319	0	2,381				

The *Great Britain*, though only 274 feet in length, built in 1840, still holds her position in the first rank as to tonnage. Steamers are now built longer than the *Great Britain*, but not so broad, or deep in proportion. The *Great Britain* registers 3,509 tons, and she is the largest steamer registered in the United Kingdom next to the *Great Eastern*. During the present year the Royal West India Mail Company have added two more ships exceeding 300 feet to their fleet—the *Paramatta* and *Shannon*, as our readers know, was lost on the Anegada Reef near St. Thomas's, but the latter is on her regular station. Many of the vessels included in the Parliamentary return have since been lost or broken up, but there has been an addition to our commercial steam power since, of 85 ships, amounting to 29,044 tons and 7,269 horse power.

The report of the skilled surveyors and ship trustees, Messrs. Bayley, Patterson, and Jordan, upon the condition of the *Great Eastern*, lets the public into the truth as regards the great deceptions practised in her construction and fittings. Here are the remarks educed by the survey:—

"*General Remarks on the Steamship* '*Great Eastern.*'

"*Deck Beams and Pillaring.*

"The decks are of very inferior quality, and some of the planks are shaky and defective, not well fastened nor of sufficient thickness for a ship of her magnitude.

"The openings in the decks are generally without sufficient combings, and hatches and skylights are without gratings. The beams are of great length, and in many parts wide spaced, and evidently not sufficiently supported by pillars and carlings, nor connected throughout with each other and the hull of the ship.

"Additional strength is required in the large cargo compartments forward and aft.

"*Deck Fittings.*

"Mooring bollards, leading chocks and blocks, pinracks, belaying pins, top sail bitts, ring and eye bolts, are generally insufficient in number, size, and fastenings. Mooring bollards and leading chocks are required on the sponsons. The stays to the sponsons require additional stays, about the middle of their length, to keep them stiff and in their place. Ports are required for stowing anchors. Ports for guns, properly fitted with ring and eye bolts for working the guns. Coaling and cargo ports, with proper fastenings; present ones being insufficient and not secure. The side lights all require refitting with India-rubber, and dead lights and drain pipes made good to carry water clear of the side, and proper scuppers throughout the ship to carry of the water from all the decks. The water-closet stools outside are insecure and dangerous.

"The iron decks throughout where the crew live should be covered with three inch deal, and the sides lined with wood next all the bedplaces throughout the ship.

"The arrangements for taking the water from the several compartments, and the spaces between the two skins, to be so completed that any one compartment can be cleared exclusive of others by the engines or by hand, if necessary, and all the valves and cocks to be so placed and fitted as to be opened and shut from the decks. The joiners' work, materials, furniture, and fittings, are generally of an inferior description, and very slight; not at all of a first-class character.

"*Capstan and Anchor Gear.*

"The shafting to fore capstan very slight for its extreme length, and the levers and shafts of the connecting and disconnecting gear of the capstan are already bent, and have given way through insufficiency.

"The riding bolts and deck stoppers are generally fitted upon small and insufficient and inferior timber; there are no hawse bucklers nor hawse plugs to any of the hawse holes forward or aft. The chain lockers require additional security. The steering gear is insufficient, and no spare tiller (of wood). Small rudder pendants must be fitted.

"There is no steam power for steering, as required in the contract, nor cargo winches at hatchways. There is no steam power for coaling purposes. The screw shaft is quite exposed, and when the hold is filled with cargo or stores will be quite inaccessible. A substantial protection should be made, so as to prevent danger when in motion.

"The five funnels require particular attention to have a sufficient 'clearance' at the decks and woodwork, to obviate the danger from fire to which they are liable.

"The waste steam and other pipes are not secured so as to be safe at sea.

"The funnels are only stayed to the combings, and are insecure and dangerous.

"There are no arrangements for sufficient ventilation and warming throughout the ship.

"These remarks are to be taken in connection with our report of this day's date, addressed to Messrs. Montague, Leverson, and Hawley.

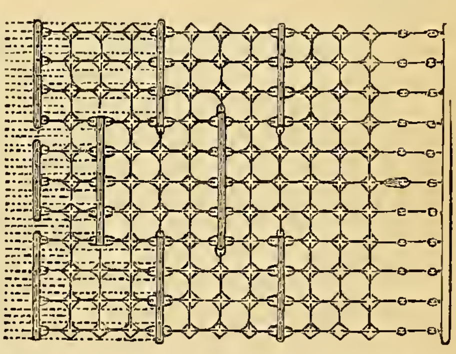
"GEORGE BAYLEY.
"WM. PATTERSON.
"JOHN JORDAN."

In the short report accompanying these remarks we find the following passage:—

"We may remark generally, that, with the exception of a few cabins, the accommodations are by no means equal to the requirements of a first-class passenger steamer, such as Cunard's line or the Royal West India Mail steamers, but are very inferior—materials, workmanship, and furniture. The accommodation for the officers and crew is by no means such as ought to have been provided and is required by the contract. The decks are not tight, and a great deal of inferior material and workmanship has been used in them. There is no heating apparatus for warming the cabins in winter."

What a commentary upon actual facts, after all the high flown imaginative views with which the public have been so long regaled, with reference to what we certainly think a gigantic error in marine architecture.

Munro's Improved Chain Harrow.—The accompanying engraving represents a plan of a chain harrow introduced by Mr. J. M. Munro, jun., of Clark Street, Bristol, agricultural implement maker. This harrow possesses many advantages over those of the ordinary kind. In the first place, the iron of which these harrows are constructed is specially manufactured or rolled for the purpose. In its preparation the iron is made of greater thickness than is ordinarily used, so that in forming the links, a greater substance of metal is left at the angles. The additional strength thus obtained increases the durability of the harrow in a corresponding ratio. Secondly, the arrangement of the rigid transverse bars keeps the harrow well opened or spread upon the ground, without in any way interfering with or preventing its



self adaptations or adjustment to the irregularities or undulations of the land. The arrangement of the rigid bars, in lieu of chains, admits of teeth or spikes being fitted therein, so that the harrow does double the ordinary amount of work in passing over the land. This gives the implement great superiority for harrowing grass lands, it being specially serviceable for tearing out moss, &c. Mr. Munro's improvement will, doubtless, be received with favour by the agricultural community.

Plumbago Crucibles.—England assists nearly the whole of the world in making its money more directly than is generally supposed, the Mints of France, Russia, Spain, Prussia, India, and the Colonies, being indebted to the Patent Plumbago Crucible Works, at Battersea, for the best means of economising their valuable ores. Yet, although the gold purchased by the Bank of England passes in and out of these peculiarly combined smelting pots, our mint, in many respects, adheres to the old system. The patent plumbago crucibles are great conductors of heat, and save a large proportion of coke. They are used by Messrs. Rothschilds for the melting of gold and silver; by the Enfield Government Small

Arm Works, and at the Royal Carriage Depanment at Woolwich, for melting brass; and at the Brest Imperial Works, and in Sheffield and elsewhere, for the more perfect fusion of steel. They are, indeed, now necessaries in the treatment and conversion of both the precious and baser metals, and their value is apparently being gradually found out. The brass and iron founder, the engineer and metal refiner, have found, from experience, that a considerable proportion of their difficulties and annoyances in the pursuit of their vocation may he traced to the variation and deficiency of the necessary qualities in their crucibles or melting pots. The results of days, labour, mental anxiety, were liable, at any moment, to be rendered nugatory by the fracture of the vessel containing the precious metal. It was for the purpose of effectually obviating this evil that, some three years since, the Patent Plumbago Crucible Company first inaugurated an invention which has since proved so invaluable and efficient an auxiliary in our metal manufactures. The advantages arising from the use of the patent plumbago crucible may be thus briefly summed up: The crucibles are capable of melting, on an average, from 35 to 40 pourings, are unaffected by change of temperature, never crack, can be used until they are thoroughly worn out, they require only one annealing for several day's work, and become heated much more rapidly than ordinary pots—thus effecting a direct saving of "more than fifty per cent" in time, labour, fuel, and waste. The company do not, however, confine their attention to the manufacture of plumbago crucibles—they also import and manufacture clay crucibles, muffles, portable furnaces, sublimate pans and covers, glass pots, all descriptions of fire-resisting apparatus, and every requisite for the assayer and dentist.

Comparative Purity of Town Waters.—The waters used in London during the past month have been analysed by Dr. Robert Dundas Thomson, F.R.S., of St. Thomas's Hospital. The Thames waters, which have for some years been derived from above Teddington Lock, exhibit comparatively a small amount of matter in solution, in consequence of the dryness of the season. The waters supplied by the other companies contain a somewhat greater amount of impurity. For the sake of comparison the water of Loch Katrine, which must for the future represent the type of a pure supply for towns, is added, together with the composition of an unhealthy metropolitan shallow well:—

	Total Impurity per gal. grs. or deg.	Organic Impurity per gal. grs. or deg.
Distilled water, ...	0·0	0·0
Loch Katrine Water, new supply to Glasgow,	2·14	0 8
Well, Grosvenor Cottages, Pimlico, ...	82·40	8·0
Thames Companies:—		
Chelsea, ...	15·96	1·0
Southwark, ...	14·76	0·96
Lambeth, ...	16·00	1·36
Grand Junction, ...	15·52	1·60
West Middlesex, ...	15·60	1·84
Other Companies:—		
East London, ...	18·76	1·16
New River, ...	17·32	1·16
Kent, ...	23·84	1·72

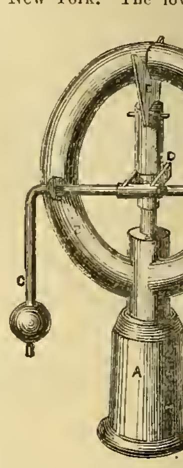
The table is read thus—Loch Katrine water contains in the gallon 2·14 deg. or grains of foreign matter in solution, of which ·8 deg. or grains are of vegetable or animal origin.

Glasgow may thus well be proud of her water works, which the Queen has recently nominally inaugurated.

Propelling and Manœuvring Ships.—Mr. W. Clark, the well-known marine painter of Greenock, has lately proposed the use of a manœuvring propeller in ships, vessels, and boats, for the purpose of propelling them to one side or the other; or for turning them round, as may be required, in different movements or evolutions. According to one plan, the propeller consists of a thin blade of an irregular triangular shape, and forming, when out of manœuvring use, a portion of the stern, bow, or cutwater of the ship. When the propeller is inert, as when the ship is sailing straight forward, the wide end of the propeller abuts against the under side of the head and knees, and is held in that position by a bolt or pin; whilst the narrow end is turned downwards, and tapers off to the foot of the stern, at or near the keel. The propeller is carried upon the forward end of a long horizontal shaft, set in bearings in the keel line of the ship, through the fore foot of which it is passed by means of a stuffing box. This shaft may either be turned by the engine or by hand, or in any other way. When set in motion, as the wide end of the blade comes round, it operates upon the water in such a manner as to bear over the bow of the ship to one side or the other, as may be required. The propeller may also be placed at the stern, or at any other convenient part of the ship, its form being modified to suit the position in which it is placed, and the build of the ship. In vessels with upright sterns, the propeller is made single, that is to say, it projects only on one side of the shaft; and it is so contrived that when not required for manœuvring, it is turned down to abut against a projection at the bottom of the stern, and thus virtually form a portion of the stern. Or instead of thus setting the blade, it may be drawn wholly inboard when out of use.

Iron Tramways for Streets.—At a recent meeting of the London City Sewers Commission, Mr. Redman, the civil engineer, laid before the Court a model of an iron wheelway, which he considered to be peculiarly adapted to meet the requirements of heavy street traffic, and requested permission to explain its cost and construction. He stated that, as engineer to the commercial road trust, he had for years past witnessed the advantages in wear and tear which a system of wheelways afforded over the general mode of street paving, as well as the saving which would result from substituting iron in the place of granite on the line of wheel traffic. He had found that in thirty years the wear and tear of granite on the Commercial Road East, had been four inches, and the wear and tear of iron plates at the Limehouse weigh-house, and another place on the same line, had been almost imperceptible, being at least eight to one in favour of iron over granite. His present proposal was, that tramways should be formed of iron boxes, with honeycombed or rather diagonally crossed grooved surfaces, laid upon sleepers embedded in concrete, and with a granite paving also laid upon concrete between the wheelways. With regard to cost he was, he said, prepared to lay down 600 boxes, each six feet long, for £500 by way of experiment; but the cost per mile would, he believed, not exceed £7000 per mile in iron, against £6000 per mile in granite; while the saving effected by this mode over the present system of street paving would amount to about £4000 in a period of forty-eight years, in addition to the advantages which the public would derive from escaping those frequent relayings of street pavements which are now necessary. Mr. Redman's models and his views thereon were examined and listened to with great interest by the Commissioners, and the proposal is now under consideration by the committee. There is no doubt that some such plan would be of immense advantage in crowded thoroughfares where there is heavy traffic, and the subject deserves more investigation than it has yet received.

New American Gas Burner.—Our engraving represents an elevation of a gas burner invented by Mr. John Stevens, of New York. The lower part, A, of the burner, is screwed on to the gas pillar or branch in the usual manner, from the cylindrical part above the foot, the gas passes round the segmental tubes, B, which form the gas way. The gas passes out and is ignited at the aperture which is made by the proximity of the tubes, B. The emission of the gas is regulated by the bent lever, C, which is carried in bearings projecting from the front of the tubes, B. At the centre of the horizontal part of the lever, C, is fitted a forked piece which gives motion to the tubular slide, D, that moves up and down the central stem. To the upper part of the slide, D, is fixed a metal plate, E, which slides between the contiguous ends of the tubes, B. By moving the pendent end of the lever, C, up or down, the sliding plate, E, is caused to close more or less the aperture between the tubes, B, and so regulate the emission of the gas. In this manner the full pressure of the gas is obtained when burning a small flame as when the gas way is fully open, and by varying the width of the aperture and thickness of the sliding plate, E, the burner may be readily adapted to the varying qualities of gas, so as to obtain the full illuminating power therefrom without waste.



London Architecture as affected by Hotels.—The magnificent and eminently well-conducted hostelries of New York, Washington, Philadelphia, Boston, and New Orleans, in the United States of America; the fine hotels of Switzerland and Germany; the Hotel du Louvre in Paris, and other grand continental undertakings of a similar class—which, by their architectural and decorative magnificence and admirable management, have attracted such universal attention, can only now be said to be bringing forth good fruit here. We have submitted too long to the dark, dingy, and expensive resting places for travellers, to which the people of our island have been compelled to resort, but a change must come at last.

The first really great and satisfactory project for the bringing about a new state of things in this way, was presented in the instance of the magnificent Great Western Hotel, in connection with the metropolitan station of the Great Western Railway at Paddington. This fine building—which actually forms the front of the London Station of one of our greatest railway lines, and which certainly is one of the most magnificent of the architectural features of the great city of the world—cost, with its furniture, £86,000. It has been most successful as a commercial speculation, and pays the shareholders we believe 35 per cent. for their money; so that, here we have practical proof that a fine, well regulated building of this class will pay. The Great Northern Railway Hotel Company at the London Station of the great line, which stretches across into far off Yorkshire and the north, pays equally well; and the Euston Square Hotel was lately sold to the London and North-Western Company, at a large premium. These successes led to a project for a similar, but more extensive undertaking, in or near Trafalgar Square. That scheme, however, has not been followed up; but we have got in its place, the Westminster Palace Hotel, now building under the shadow of the Houses of Parliament, at a cost of £60,000, and promising to add a wonderful amount of architectural improvement to the Westminster side of London.

Now we have a fresh project for the east end, namely, a London Bridge Hotel Company, for building a fine hotel on a site adjoining the Brighton Railway Station. It starts with a capital of £100,000, in £5 shares; and the building will contain 250 bed rooms, in addition to a proportionate number of public and private rooms, and a large hall for meetings. London may now well look to the hotel interest to beautify its architectural appearance.

Laidlaw's Improved Hat.—A great stride towards the attainment of a *bona fide* comfortable and easy fitting hat, has been recently made by Messrs. Westlands, Laidlaw & Co., in the introduction of their recently patented hat. The improvements are calculated to save the hat maker a considerable amount of time and labour in fitting, at the same time to insure an increased amount of comfort to the wearer. According to one modification of these improvements, the inner stiffened lining piece of the hat is made somewhat smaller than the internal size of the hat at the part where it fits the head, so as to leave a small annular space between the two. This lining piece is suspended from, or attached to, the body of the hat, by flexible slips of any suitable connecting material; or it may be attached in any other way, always, however, leaving the lining loose and free as regards the solid hat body. This inner lining piece carries the usual leather or other lining which fits to the head, and both linings are cut transversely through at one or more parts, and a piece of India-rubber fabric, or other elastic material is inserted to form the connection at each cut or division. A hat fitted up in this way fits the head with great comfort, as the expansible lining accommodates itself to the irregularities of the head, and at the same time, its power of expanding circumferentially enables different sized heads to wear the same size of hat; in other words, the hatter, in selecting a hat for a customer, can at once suit him as to size, without necessitating numerous trials of sizes, because a hat which will fit one size of head pleasantly, will also fit other sizes either larger or smaller, within a moderate range. According to another modification of these improvements, the loose hat lining has placed behind it, a lining of India-rubber, or other suitable elastic material, to afford a peculiarly pleasant, soft, and yielding fit to the head, such elastic lining being suspended from, or attached to, the other lining and to the body of the hat in any convenient manner. In order to do away with the unsightly appearance caused by the opening left between the outside of the lining and the interior of the hat body, a perforated shield or cover piece is fitted on, either to the lower edge of the lining, or to the angle of the hat where the brim joins the main body. Or, instead of a solid shield, a connection is formed between the edge of the lining and the hat, by inserting a strip of gimp, or other permeable elastic fabric, so as to cover up the openings, and yet allow a passage for air. This is certainly a step in the right direction, and one attended with advantage to both maker and buyer.

Manchester Association for the Prevention of Steam Boiler Explosions.—The report of the proceedings of this association presented at the last monthly meeting by Mr. H. W. Harman, C.E., the chief inspector, brings up the statement of the work done, and in hand, to the 21st of October. There are now under inspection 575 mills, collieries, and other works, and 1614 boilers, being an increase since the previous report of 1 mill and 3 boilers. The inspectors have made 221 visits, and examined 664 boilers and 521 engines; of these 5 visits have been special; 14 boilers specially, 23 thoroughly, and 21 internally examined; 200 diagrams have been taken from 107 cylinders; and of these 20 diagrams from 10 cylinders have been additional. The general defects may thus be enumerated:—Corrosion, 8 (1 dangerous); fracture, 3; safety valves out of order, 22; pressure gauges out of order, 3; water gauges out of order, 19; feed apparatus out of order, 6; blow-off cocks out of order, 5; furnaces out of shape, 8 (2 dangerous); over-pressure, 1 (dangerous); total, 75 (4 dangerous). Boilers without glass water gauges, 4; boiler blow-off cocks, 6; boiler back-pressure valves, 39; boiler pressure gauge, 1; fusible plugs placed wrong and coated with scale, 4. One safety valve was found with the cover of the box screwed down on the weight that loaded the valve, and so prevented its lifting at all. The remaining defects are such as are usually met with, and to which Mr. Harman has frequently alluded to in former reports; and as these have been published in the *Practical Mechanic's Journal*, and other leading periodicals, it is hoped that the observations which have been made from time to time, in reference thereto, have arrested the attention of those concerned, and that they may ultimately be not altogether barren of good results. It is, however, matter of regret, that since the last meeting, there has been an explosion of a two-flued circular boiler, from a collapse of one of the flues—it being of insufficient strength to withstand the working pressure, although the remaining flue is apparently uninjured. Full particulars of this casualty are given in the report, and it is only mentioned here for the purpose of enabling us to say that the officers of the association have not incurred any responsibility in this instance, and also, that this is the second explosion only which has occurred in the boilers of members since the formation of the association. Although Mr. Harman has no direct evidence beforehand, he is induced to think that a kind of feeling is springing up on the part of many mechanical engineers, who are called on to execute repairs and other works relating to the boilers, that because they are under our inspection, it is not therefore so incumbent upon them to exercise the same vigilance as to security which they otherwise would, but contenting themselves with the mere accomplishment of what is entrusted to them, and not giving the proprietors the benefit of those extended observations, which such repairs often, and exclusively, afford, and he feels that he is not overstepping the bounds of prudence, if he suggests to the members the propriety in future of obtaining from those whom they employ, a certificate of opinion as to the safety or otherwise of the work they have thus been engaged upon. No respectable party will refuse this, either as unreasonable or on the ground of declining co-operation with endeavours of the association to avoid future calamities.

The force of Mr. Harman's remarks will be at once felt by many proprietors and workers of boilers and boiler makers; and we may add our hope that some practical attention may be given to them. The mere execution of a piece of work is nothing; we must have an assurance that the work is up to its pretensions, and not merely a job accomplished so that the money may be paid.

Gas in the Metropolis.—At a recent meeting of the delegates of the Associated Vestries in London, a copy of the bill proposed to be introduced into Parliament during next session was produced, and elicited some discussion, principally on the 24th clause, which stood as follows:—"Any company may charge for gas, the illuminating power of which, from a five feet burner, does not exceed that of 18 sperm candles, each burning 120 grains per hour, any sum not exceeding 4s. 6d. per 1,000 cubic feet, and no more; provided that if any company shall supply gas of a higher illuminating power than as last aforesaid, they may charge for the same any sum not exceeding 6s. per 1,000 cubic feet, but the company shall not be entitled to make such higher charge without giving first to the consumer three months' notice of their intention to do so." After a desultory discussion, in which it was urged that the prices herein stated were over-remunerative, and that at present gas companies, such as the Phœnix and Surrey, were allowing 7 and 8 per cent., it was ultimately moved, and carried by a majority of 21, that the clause be amended by the substitution of 4s. and 5s. per 1,000 cubic feet, instead of 4s. 6d. and 6s.

Safety for the Miner.—An accident occurred at one of the pits belonging to Earl Granville, at Star Green, Hanley Potteries, by which ten men were killed and other ten severely injured. At half-past two a "cage" containing fourteen men was being drawn up the shaft of the "big pit," while another cage with six or seven men in it was going down at the same time. As the ascending cage drew near the surface the signal bell in the engine room sounded as usual in order that the engine might be at once stopped. The engine tenter was, however, too late in attending to his signal, and the consequence was that one cage was drawn up beyond its proper point while the other went to the bottom of the shaft with a heavy shock. The ascending cage was drawn up till it reached the wheel over which the rope attached to it worked, and was being taken round, when the whole fourteen men, with one exception, were precipitated beneath. Six fell down the shaft and were dashed to pieces. Three fell on the pavement at the pit's mouth, and one on the iron pavement and was killed on the spot. Four who were thrown on the ground received fearful injuries. The occupants of the descending cage were all more or less injured by their fall, but none of them were killed. We have over and over again drawn the attention of mine proprietors and viewers to the imperative necessity of adopting means, now proved to be wholly effectual, for the prevention of lamentable accidents like this. Will colliery owners never listen to the pleading voice on behalf of the poor miners, which tells them that "over-winding" need never occur? In the present case of Earl Granville's pit, had such a disengaging catch and safety cage, as is shown in our plate 232, for December, 1858, been fitted up, the most careless engine-man could not have brought about any casualty whatever. The apparatus, to which we have referred, is that invented by Mr. R. Aytoun, of Kirkness House, Lochgelly, Fifeshire, and we quote it as being the most recent successful attempt at a safety cage.

National Gallery, British School, South Kensington.—The following regulations for the admission of the public have been arranged by the Committee of Council on Education, and the trustees of the National Gallery:—1. The separate entrance to the National Gallery, British School, provided at the request of the trustees of the National Gallery, will be open for the public on Mondays, Tuesdays, and Saturdays, and for students on Wednesdays, Thursdays, and Fridays, in the daytime only. 2. The public will be admitted to the National Gallery, British School, also through the museum every day, and on those nights when the museum is open, according to the regulations of the museum. On those nights the National Gallery, British School, will be lighted by the department. 3. Wednesday being a public day at the National Gallery, and a students' day at the South Kensington museum, will hereafter be a students' day at the National Gallery, British School, and the public admitted on payment (6d.) to the South Kensington museum will be admitted also to the National Gallery, British School, through the museum only, the National Gallery students being admissable by the separate entrance. 4. On Wednesdays, Thursdays, and Fridays, when only students are admitted to the National Gallery, British School, the public admitted by payment (6d.) to the South Kensington museum will be admitted to the National Gallery, British School, through the museum only. 5. The National Gallery, British School, was opened on Monday, 5th December.

Thomas De Quincey.—Thomas de Quincey is dead! In a periodical like ours, devoted to practical science, the death of a purely literary man may seem to be nothing to call for particular notice at our hands. But De Quincy was something more. He was not only a profound scholar in the departments he affected, but one of the greatest masters of English pure and undefiled who ever handled the pen. He was the absolute creator of a species of "impassioned prose" which he seemed born to introduce, and in which he had no prototype—no rival—and certainly has no successor. In the free exercise of his rare and peculiar genius he swept with eagle plume through spheres far too ethereal to sustain a common flight; yet he soared not vaguely, but as bearing with serene and steady eye towards the light of truth. When we say that we now chronicle the death of the author of "The Confessions of an English Opium Eater," we say, that with him has passed away the greatest master of our tongue in our time.

Traction Engines for Common Roads.—A very successful trial journey from Manchester to Oldham has just been made with a new traction engine, which has been manufactured by Messrs. Edward T. Bellhouse and Co. of Manchester, on Boydell's principle, to be sent out to Rio de Janeiro, for Messrs. Carruthers, de Castro & Co. The engine, weighing about fifteen tons, with a train of six waggons loaded each with three tons of iron, making on the whole a weight of forty-five tons, was taken from Zara Street, through the streets of the city to Oldham Road and on to Oldham. The engine performed its duty well, proceeding at the rate of two and three miles per hour, and turning sharp corners with facility and accuracy, answering to the will of the steersman with wonderful promptness. The steep hills at Oldham were ascended at a pace of above two miles an hour with the heavy load, and one of the inclines mounted was at a rise of seven inches in ten feet, or a gradient of about one in 17. Traction engines for the conveyance of great weights on common roads, are gradually growing into necessities of the times.

Crystal Palace at Amsterdam.—This building is to be completed and opened in the year 1861; it will be 400 feet in length by 200 feet in width, and the central dome will be 200 feet in height, at the junction of which will be a transept and the nave of the edifice. The structure is to be of iron and glass, but as Holland is not famous for iron it will be supplied by England. The contractors are Messrs. Van Heel and Holtzman, of Amsterdam, and Messrs. Smith and Sons, of Birmingham. The engineer is Mr. C. M. Moorish; the erection of the palace is entrusted to the superintendence of Mr. J. P. Ashton, whose practice and experience at the Hyde Park Crystal Palace of 1851, as well as at the Crystal Palace at Sydenham, is well known. The design of the palace is by Van C. Oudshoom.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When city or town is not mentioned, London is to be understood.

Recorded August 29.

1968. Robert Besley, Fann Street, Aldersgate Street—Improvements in machinery for printing and for numbering and perforating documents.—(Communication from William Shaw, Melbourne, Victoria, Australia.)

Recorded August 30.

1973. Thomas Eastman, Southsea, Hampshire — Improvements in screw propellers.—(Communication from James Shepard, Buffalo, U. S.)

Recorded September 13.

2084. William B Adams, 1 Adam Street, Adelphi—Improvements in the permanent way of railways.

Recorded September 21.

2146. George K. Geyelin, 462 Oxford Street—Improvements in machinery for making solid, hollow, and perforated bricks, also tiles, drain and socket pipes.
2150. George D. Robinson, 15 Church Street, Islington—Improvements in apparatus for regulating the pressure of gas and other fluids.

Recorded September 22.

2157. John Dales, 11 and 12 Gresham House, Old Broad Street—Improvements in purifying sewage and other impure waters, and in separating therefrom materials suitable as manure, and also the preparation of a substance to be employed for such purposes.
2158. Edward Jones, Russell's Hall Iron Works, Dudley, Worcestershire—An improvement or improvements in the manufacture of coke in open coke fires or heaps.

Recorded September 23.

2159. Leon Castlelain, 53 Newman Street, Oxford Street, and Charles F. Vasserot, 45 Essex Street, Strand—A novel application of a plant to the manufacture of pulp for paper and millboard, and in the method of treating the same when so applied.
2160. Charles J. Parry, Manchester—Improvements in certain apparatus applicable to sewing machines.
2161. Charles J. Parry, Manchester—Improvements in diamond shirt fronts.
2162. Thomas Bentley, Margate, Kent—Improvements in agricultural implements for gathering and destroying weeds and stubble.
2163. Jean J. Bonreart, Manchester—Improvements in machinery or apparatus for opening, cleaning, carding, and drawing cotton and other fibrous materials.
2164. Robert James, Manchester—Improvements in machinery or apparatus for covering crinoline, applicable also to braiding fancy patterns for other articles.

Recorded September 24.

2165. Alphonse R. la Mire Normandy, 67 Judd Street, Brunswick Square—Improvements in the application of steam for cooking food.
2166. John Gedge, 4 Wellington Street South, Strand—An improved stamp holder and cutter.—(Communication from Denis Nefflier and Pierre Blaudin, Dijon, France.)
2167. Charles Lambert, Sunk Island, Yorkshire—Improvements in machines or apparatuses for cutting and pulping food for cattle and for other like purposes.
2168. James Coey, Liverpool—Improvements in or applicable to packages for containing butter, lard, and other articles.
2169. Thomas Robinson, St. Helen's, Lancashire—Improvements in steam hammers.
2170. Thomas B. Daft, Tottenham—Improvements in coating metal conductors, suitable for electric telegraphs.
2171. Joseph T. Pope, Burslem, Staffordshire—Improvements in the manufacture of marbles.
2172. John Todd, Kent Iron Works, Greenwich, Kent—Improvements applicable to screw propellers in the propulsion of vessels.
2173. Joseph Opie, Tremer, Cornwall—Improvements in instruments or apparatus for charging holes in blasting operations, parts of which are also applicable for like purposes.

Recorded September 26.

2174. James Fernihough, Dukinfield, Cheshire—Improvements in pistons, plungers, and buckets.
2175. Robert W. Sievier, Hamburgh—Improvements in the means of creating a draught, so as to remove the gases which may be produced by combustion, or from places where gases may be generated where they may be detrimental to health.
2176. Richard Kay, Busby, Renfrewshire — Improvements in preparing and bleaching textile fabrics and materials, and in the machinery or apparatus employed therein.
2177. David White, 18 High Holborn—Increasing the illuminating and heating powers of gases, and regulating the flow of gases, and improvements in the material for gas meters, and improvements in glass and cylinder holders.
2179. Joseph V. Collignon and Louis George, 29 Boulevart St. Martin, Paris—Improvements in typography.

Recorded September 27.

2181. William Airey, Brighouse, and James Clayton, Golcar, Yorkshire—Improvements in machinery or apparatus for preparing silk, wool, cotton, flax, or other fibrous substances for spinning.
2182. Robert Coales, 53 Chancery Lane—An improved preparation or preparations for promoting the growth and otherwise improving the hair, and for the application of a certain material for like purposes.
2183. Thomas Birtwell and Richard Marshall, Padiham, Lancashire — An improved arrangement of apparatus to facilitate the putting on of boots to the feet.
2184. Charles Cowper, 20 Southampton Buildings, Chancery Lane — Improvements in mixing or combining and deodorizing oil made from gas tar and other oils.—(Communication from George W. Yapp, Paris.)
2185. John S. Parfitt, 60 Boulevart de Strasbourg, Paris—An improved machine for heading bolts, rivets, screws, and other similar articles requiring to be headed whilst hot.
2186. John R. Piednue, Royal Mint Refinery, Royal Mint Street—An improved apparatus for transmitting motive power.—(Communication from Alphons Cheron and Desire H. Sole, Paris.)
2187. Thomas Beards, Stowe, Bucks—Improvements in ploughing and cultivating land by steam power, and in machinery used for such purposes.
2188. Paschal J. L. Chnumont, 138 Faubourg Vivegnies, Liege—Improvements in fire-arms and ordnance, and in projectiles and cartridges to be used therewith.

Recorded September 28.

2189. William Maltby, De Crespigny Park, Camberwell, Surrey—An improved mode of producing starch-gum.
2190. William Collins, Salford, Manchester—Improvements in stand pipes for hydrants.
2191. Edward K. Dutton, Sale, Cheshire—Certain improvements in "governors," particularly adapted to steam engines.
2192. William J. Dorning, Manchester—Certain improvements in traction engines.
2193. Thomas Sutton, St. Brelade, Jersey—Improvements in the construction of apparatus for taking photographic pictures, consisting of and entitled "an improved panoramic lens for taking photographic pictures."
2194. Edmund S. Catbels and Samuel Splatt, Dover, Kent—Improvements in gas meters.
2195. William H. Phillips, Nunhead, Peckham, Surrey—Improvements in apparatus for generating and regulating heat, applicable to culinary and other purposes.
2196. John F. Stanford, 7 Denbigh Place, Pimlico—An improved apparatus for giving warmth to the lower extremities and members of invalids and others when travelling, or in churches, chapels, theatres, rooms, carriages, and other similar places, and on ship-board, and also for airing carriages.
2197. George Evans and Edward Huxley, 12 Old Cavendish Street, Cavendish Square—Improvements in the construction of hernial trusses and pads adapted to surgical purposes generally.
2199. Manuel L. J. Lavater, Strand—Improvements in apparatus known as injection bottles, and in pneumatic discs used in apparatus for adhering to glass and other impermeable substances.
2200. Patrick Robertson, Sun Court, Cornhill — Improvements in the manufacture of manure.
2201. David Stewart, Newcastle-on-Tyne, Northumberland — Improvements in presses used for pressing goods.

Recorded September 29.

2202. Charles Stevens, 1B Welbeck Street, Cavendish Square — An improved steam dredging boat.—(Communication from Yollet, Babin, and Gacbe Aine, Paris.)
2203. George G. Page, Whitehall, and Charles Lungley, Deptford, Kent—Improvements in gangways or step ladders, applicable to floating bodies and other useful purposes.
2204. Thomas Allan, Adelphi Terrace, Westminster—Improvemente in applying electricity for telegraphic purposes, and in apparatus employed therein.
2205. William Johnson, Horse Shoe Court—An improvement in purses.
2206. Edward H. Bentall, Heybridge, near Maldon, Essex—Improvements in screw presses.
2207. Clement Duplomb, 112 Rue de Rivoli, Paris—Improvements in presses for pressing or finishing textile fabrics.
2208. Alexander W. Williamson, University College, and Loftus Perkins, Francis Street, Gray's Inn Road—Improvements in steam boilers.
2209. William Kempe, Holbeck Mills, Leeds—Improvements in machinery for raising the pile of woollen and other cloths.
2210. Robert Oxland, Plymouth—Improvements in the treatment of saccharine matters.

Recorded September 30.

2211. James Wadsworth, Manchester—Improvements in instruments or apparatus for measuring the quantity, for regulating the pressure, and for controlling the flow or passage of gas used for purposes of illumination, and in the construction of gas burners.
2212. Theophile Guibal, Mons, Belgium—Modifying the installation and working of cables used in springing up mines.
2213. William Hartley, Bury, Lancashire—Certain improvements in steam engines.
2214. Edward Sonneborn, 39 Finsbury Square—An improvement in the manufacture of cement.
2215. Thomas Buckham, Gloucester—Improvements in the switches for railways.
2216. Job Smith, 18 Warwick Court, Gray's Inn—Improvements in the construction of children's carriages called "perambulators."
2217. Benjamin Atkinson, Rainham, Essex—Improvements in railway brakes.

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 19th November to 27th November, 1859.

Nov. 19th,	4214	Charles Henry Farrer, Solway House, Wigton, near Carlisle—"Self-acting apparatus for water and liquid manure tanks."
23rd,	4215	Bowley and Co., 53 Charing Cross, S.W.—"The knee-cap gaiter."
25th,	4216	John Stewart Margetson, Cheapside, E.C.—"Handle strap."
26th,	4217	Mesdames Burgess, 107 Strand, W.C.—"Bottle."
27th,	4218	Howell, James, and Co., Regent Street, St. James's, S.W.—"Blotting book."

TO READERS AND CORRESPONDENTS.

L. T. B.—See Richardson's and Knapp's "Technology," also Muspratt's "Cyclopædia of Chemistry."

B. T. L.—We are often asked for "best books." We really cannot spare time to find them, and as to their being the best when found, that is a matter of opinion. The subjects he mentions are so distinct, that they must be studied in separate works. As regards arithmetic, if he turns over our reviewing pages he can be at no loss to find the information for himself.

W. R. Abercarn.—Plain turning is so plain a matter that we do not see how a book could be written upon it. Our correspondent will learn more in a day, by the side of an intelligent practical turner, than from a book in a mouth.

Collapsing Strength of Iron Tubes.—Multiply the constant factor 806,300 by the square of the thickness of the plate in inches, and divide the product by the product obtained by multiplying the length of the flue in feet by its diameter in inches. The quotient is the collapsing pressure in pounds per square inch.

Non-Inflammable Fabrics.—Messrs. Versmann and Oppenheim, whose work we reviewed in December last, desire us to state that their processes for rendering woven fabrics non-inflammable, are patented.

STEAM CULTIVATION OF THE SOIL.

I.

Agriculturists, as a body, are the most practical men in this eminently practical country; and in addressing them on a subject of which they are very competent judges, it seems desirable to avoid all arguments and propositions which do not expressly tend to place the matter before them in a plain and undisguised form. Therefore, in attempting to explain our views as to the best mode of applying steam power to the cultivation of the soil, we shall not illustrate them by any mathematical deductions or abstruse theories, but strictly confine ourselves to practical remarks, based upon observations of the difficulties which, up to the present time, have arisen, and the success which has attended the numerous efforts to make steam subservient to the agriculturist.

In commencing, we would observe that the application of steam power to the culture of the soil, can only be truly useful, and become generally adopted, through being a very economical substitute for horse power and manual labour in the principal operations of the farm. To accomplish this, we must place in the hands of the agriculturist an engine which is not only powerful, simple, and easily managed, but one which will accomplish more than has yet been attempted; one which will plough, scarify, roll, and harrow his land, draw his reaping machine and heavily laden waggons, and thrash his corn. Starting with this as a desideratum, we shall endeavour to show how the land may be profitably cultivated by steam, and how that wonderful agent steam may be harnessed to be the "farmers' friend," as it has already proved itself to be the friend and servant of all those who have sought its aid.

In applying steam power to such purposes, there are two great principles only which can be adopted—the direct traction, and the indirect traction; the direct or locomotive, and the indirect or stationary engine, with a rope; and though there are many systems based upon these, considerable difference of opinion exists amongst our most eminent engineers and agriculturists as to which plan is the best, some advocating the stationary, others the locomotive system. May not both be right? may not some land present such natural obstacles as to render the use of a locomotive impossible, where the stationary engine and rope would succeed, and may there not be immense districts where a suitable locomotive would carry off the palm through its general utility, great power, and simplicity of action?

Two objections to the use of a locomotive, particularly on heavy soils, have been raised: the first is, that its great weight consolidates the land to its injury; and the second, that it loses so much of its own power whilst propelling itself, as to leave little to do work. Those urged against the stationary principle are more numerous: first, that the engine requires a team of eight horses to shift it from place to place, including the windlass, anchors, &c.; and secondly, that the loss of power is great, owing to the friction of the rope, the distance of the implement from the power, and the attraction exerted by the earth on the rope; thirdly, that it is extremely liable to derangement through its complexity, hence the cost for wear and tear is large; and fourthly, that it is not generally useful. In order to arrive at a conclusion as to the relative merits of the two principles, it may be well to see how the objections may be met, and to the first, viz., that a locomotive consolidates the land injuriously, it may be stated that land should be ploughed or tilled only when its surface is comparatively dry, the impression would then be small; and further, that any detrimental consolidation is entirely caused by having too little supporting surface in working contact. Supposing a locomotive weighing ten tons, supported either by wheels plain or shoed, or by a drum or drums, has a surface in contact with the earth of 600 square inches, every inch would support a pressure of thirty-seven lbs.; if the surface in contact is doubled, the pressure would be exactly one-half on each square inch; this is a matter of simple calculation; the weight of the engine is not to be feared—the fault lies in the supporting surface being too small.

Take the area of a horse's foot, say fifteen square inches, he has but sixty inches with which he supports his own weight of fifteen cwts., and as there are but two feet fairly on the ground while at work, he is pressing on every square inch with a force of 28 lbs., which is considerably more than would be caused by a properly constructed locomotive. Besides, one horse or a pair at plough, walks in the furrow, pressing the subsoil, which is vastly more injurious than the same pressure applied on the surface. This objection to the weight of a locomotive may at first sight appear conclusive, but when looked at in a proper light it will be found to be imaginary, for the weight of an engine does not cause mischief unless such weight is improperly thrown on too small a surface of the soil. The second obstacle brought forward is, that a locomotive absorbs so much of its own power whilst travelling over the land, as to leave but little with which to accomplish work.

To this statement we would remark, that a suitably constructed locomotive will exert double the tractive power of that of a horse, in proportion to its weight, on any thing like a level, and that this depends on three things—the construction, the power, and the speed of the engine over the land. There can be no doubt that a locomotive destined for farming purposes, should be built as light as possible, consistent with strength, safety, and in proportion to the work required of it.

This is, however, of secondary consideration; the principal point to be carried out is, to give a very large amount of surface for traction, so as to make the engine cover a large area of the soil, and hence it will press with comparative lightness on any part of it. The diameter of the supporting wheels or drum (which will be referred to hereafter) should be large, at least ten feet, for the greater the diameter the less the amount of power absorbed. We will take a familiar example. The timber carriages in Liverpool have wheels of nine or ten feet in diameter, and three horses can with ease, not only take along this carriage, but a load of ten tons of timber as well. If this weight were placed on a low three feet wheeled waggon, the same number of horses could not move it, and double the number would be required to move it at two miles an hour. If this principle is successfully applied to lessen the draught of carriages, it should be carried out in locomotives suitable for agricultural or road purposes.

We now come to the question of power; if the construction of an engine is correct, there is no limit to the power which may be brought to bear upon the work. An engine weighing ten tons will draw eight ploughs with greater ease than one weighing seven tons would draw four. The principle upon which this remark is based, has been satisfactorily settled by our locomotive engineers, and any one comparing the tractive force of a passenger engine going at the rate of 25 miles an hour with a train of carriages, with that of a goods engine travelling at the same speed with 300 tons of dead weight, will at once see how much the power of an engine increases in the ratio of its weight. The third point to be noticed is the speed; the slower the engine travels the more work will be accomplished in proportion, for if one engine, moving at four miles an hour, absorbs half its power, another one arranged to go two miles an hour will, whilst moving, lose but one quarter of its tractive energy; and hence, it will draw more than double the weight of the fast engine, provided there is sufficient surface in contact to prevent slipping. The absorption or loss of power by locomotion depends, therefore, on three things—the construction of the locomotive, the speed at which it travels, and its relative tractive power.

Having now considered the most serious objections urged against the use of a locomotive, we pass on to discuss the drawbacks of the stationary principle or indirect traction. It is clear to all, that an engine, though arranged to work a rope, should at all events be self-moving; and that although by its peculiar build, it may be unable to traverse a field and do work, yet it should be able to shift itself from place to place, or to any part of the farm where its services may be required; and until such is the case, one of the drawbacks remains in force. The next difficulty is, the great loss of power through frictional resistance, and it is to be feared that this difficulty will ever remain. The longer the rope the greater the friction; the further the implement is from its motive power the more difficult will it be to move. Some engineers affirm, that in propelling an implement by a wire rope, the whole energy of the engine is transmitted to the implement, less the friction and power required to move the rope; but this is a delusion—there is the gravitation of the rope in a horizontal position acting against it; most persons will deny this, but whatever is the cause, the fact cannot be questioned, that the waste of power is enormous. Let any one who is sceptical on this point, take a stout cord, 100 yards long, and place it in the middle of a smooth road, and he will move the cord with ease; let him then fasten a fifty-six lb. weight to its end, and he will not draw it a yard; but if he shortens his rope to twenty-five yards he will then move it. If he reduces the rope to two yards he will be able to pull along half-a-dozen fifty-six lb. weights with comparative ease. Are not the conditions of a stationary engine with rope and implement analogous? Will not the result be the same? The liability of the various windlasses, anchors, pulleys, and rope, to derangement, will always be considerable; but as the present arrangement can be much simplified, it will resolve itself into a small affair of a good per centage on the outlay over and above the expense incurred by stoppage to repair. The fourth objection to the stationary engine is, that it is not generally useful in tilling the soil; for although it might plough with economy, it cannot till the land, or crush clods, or harrow profitably, the expenses of shifting and arranging the tackle counterbalancing any advantage which it might gain whilst at work.

Before we proceed to offer any opinion as to the relative merits of the two principles of applying power, we must notice as briefly as possible the several implements which are supposed to be suitable for using with steam power; and first in order comes the plough. It has become the fashion during the last three or four years with certain enthusiastic and change-loving agriculturists, to decry their old friend the plough—to call it "an antiquated affair," "as old as the hills," &c., and to state broadly that it is a disgrace to the engineering genius of this country that an implement worked by steam has not been brought out to supersede it. These gentlemen seem to forget that the fact of the plough having stood the test of ages is the greatest proof of its value and eminent services. The form of the plough is mechanically correct—the wedge, which is one of the best of our mechanical agencies, is represented by the modern plough, only it is drawn forward instead of being driven onward, and is continually in action. What other implement, it may be asked, will turn up so good a seed bed in so short a time? By its aid a clean stubble, a clover ley, a pea ditch, or a bean fallow, may be ploughed in the morning, and the seed drilled in in the afternoon of the same day.

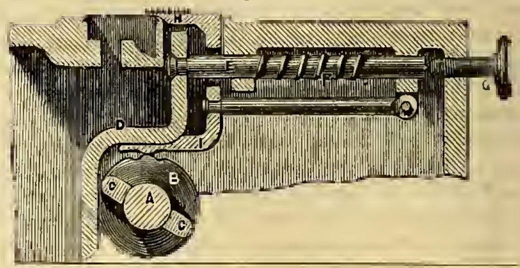
HISTORY OF THE SEWING MACHINE.

ARTICLE XXIII.

A PATENT was granted on the 27th of August, 1855, to Benjamin Moore, for improvements in sewing machines, communicated to him from abroad, which improvements comprise a new, or perhaps we ought to say, a *so-called* new feed, a means of taking up the slack of the thread on the downward passage of the needle, a peculiar combination of cams for moving from the back end of the machine the levers for actuating the needle and shuttle, (Mr. Moore's machine is a shuttle machine,) and taking up the slack of the needle thread, a self-acting apparatus for sewing or binding hats or similar articles, the use of certain peculiar binding gauges or guides, and lastly the use of a peculiar roller and spring foot pad for holding down the cloth to be sewed.

Fig. 160 represents a sectional view of Mr. Moore's feed apparatus, in connection with which there is an arrangement for obtaining a wide range of stitches. For this purpose the shaft, A, is fitted with a cam, B, which is cut out or notched in two diametrically opposite places, as shown in our illustration. In front of this cam are two other cams or tappets, C, which actuate the bent lever, D, the upper end of this lever being furnished with two rectangular notched or roughened plates. The guide rod, E, connected with the lever, D, draws this lever back by the action of the coiled spring, F, so soon as the cam ceases to act. The stroke or traverse of the roughened plates is regulated by means of the screw, G, by unscrewing or screwing which, longer or shorter stitches may be obtained. H, is a smooth plate or flat surface formed on the upper end of the crank lever, I, and upon this plate the fabric to be sewed is held by the downward pressure of a foot pad or presser plate, as is well-known. The object of this smooth plate is to prevent the fabric from being dragged back by the return motion of the notched or roughened feed plates. For this purpose, the lever, I, is raised by the cam, B, when the return motion of the feed plates takes place, and the fabric is thus held firmly by being gripped between the smooth plate, H, and the presser foot before referred to, but when the feed plates perform their forward motion, the smooth plate, H, descends out of contact with the fabric. It will thus be seen that Mr. Moore's feed mechanism is composed of a peculiar combination of two plates, the one being roughened and acting as a propeller of the fabric, the other smooth and acting in conjunction with the presser foot as a gripper or retainer of the fabric. We cannot help thinking this a most round about way of arriving at the object desired.

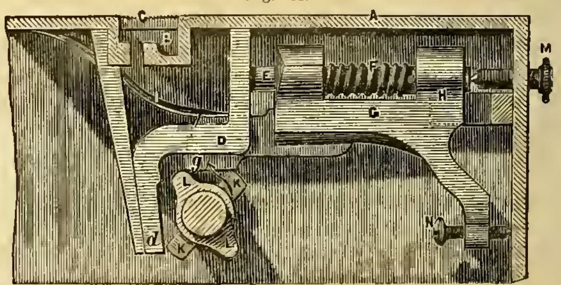
Fig. 160.



The inventor, whoever he may be, appears to have been of our opinion, for on reading further on in the specification we find, that "instead of the feed motion with a smooth and notched plate, as previously described, another feed motion may also be used in which the smooth plate is dispensed with, the notched plate alone being used and made to perform a compound motion, in such a manner as to rise above the platform of the machine, advance, then descend and recede back again below the level of the platform to its starting point." Excellent arrangement!! but, unluckily, only too late in the day. Did the ingenious inventor ever see a Grover and Baker machine we wonder? We at first did not intend giving a cut of this last feed motion, but on second thoughts we think our readers will be interested, perhaps, by a look at such a glaring case of re-patenting

Fig. 161 is a sectional elevation of this feed motion. A, is the framing of the machine; B, the shuttle race; C, a notched plate carried by the

Fig. 161.



bent bar, D, which is connected with the pin or stud, E. F, is a helical spring for bringing the notched bar home. The pin, E, is supported by the loose bracket, G, which turns on the centre, H. This bracket is held down by the blade spring, I, so as to bring it within range of the tappets, K, which elevate the bracket, O, and with it the bent bar, D, pin, E, and roughened plate, C, whilst the second pair of tappets, L, serve to push the bent bar and plate, C, forward, these last mentioned tappets being set so as to act upon the vertical tail, *d*, of the bent bar, a little after the tappets, K, have acted upon the horizontal tail, *g*, of the pivoted bracket, G. M, is a screw for regulating the horizontal throw of the plate, C, and producing different lengths of stitches, and N, is a screw which regulates the vertical throw, or rise and fall of the plate. In conjunction with this last described feed motion, the inventor proposes to use a peculiar guide for binding hats, which we give in elevation and plan in figs. 162 and 163 respectively. *a*, is the upper guide plate, which is straight, and *b*, the lower guide plate. These two plates are fixed to a solid piece of brass, *c*, and the three parts, *a*, *b*, *c*, serve to guide and maintain the riband or binding. *d* and *e*, are upper and lower hooks for guiding the

Fig. 162.

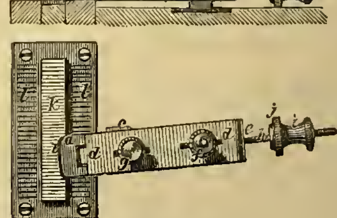
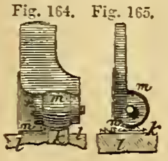


Fig. 163.

edge of the binding. These hooks are adjustable by hand, by means of the elbow bends at their back ends; *f*, is a nut for fixing the sliding hooks on the piece, *c*; and *g*, is a screw passing through a slot in each of the several pieces, and holding the whole down upon the bed-plate of the machine. The entire guide is adjusted by means of the screw, *h*, on the piece, *c*, and adjusting nut, *i*, the screw passing through the fixed fork piece, *j*.

Figs. 164 and 165 represent respectively a side and end elevation of an improved form of foot pad or presser plate. It consists of a roller or castor, *m*, which is free to turn at the end of the bar, and whose axis stands at right angles to the line of motion of the fabric, the latter being held between this roller and the moveable notched plate, *c*, (see also figs. 162 and 163,) which has a compound motion as described above. This roller may be used alone for causing the forward movement of the fabric, but for preventing a back motion, and in order to obtain a better effect, the inventor proposes to use one or two notched surfaces, *c*, (fig 163) in which case a flat spring, *n*, is fixed by the side of the roller; the under surface of this spring being below the level of the tangent plane of the roller, so that the fabric which is beneath the spring is more or less constantly pressed upon during the entire movements of the notched feed plate, *c*. This presser foot is applicable to any kind of work, but in our illustrations it is shown as arranged for the binding of hats. In this application the spring, *n*, is made to press upon the edge of the hat, in order to lay upon it closely the binding as it emerges from the guide, and so prevent it from curling or creasing.

Fig. 164. Fig. 165.



Mr. Moore describes other forms of guides for applying bindings, but all on the same principle as the one illustrated by us. The means employed for taking up the slack of, or tightening the needle thread, consists of a vertically vibrating arm, actuated at its lower extremity by a grooved cam on the main shaft, its upper end being formed with a guide eye for the passage of the thread on its way from the bobbin to the needle, suitable drag or friction being applied to the thread before entering the eye of the vibrating lever. In lieu of the eye in the lever, the spool or thread bobbin may be mounted on its upper or vibrating extremity, a pressing spring maintaining the proper amount of drag or friction. This vibrating lever which carries a guide eye or a bobbin, as the case may be, remains motionless during the greater part of the revolution of the driving shaft, and moves only when the needle begins to descend, whereupon the lever by backing, draws the thread and stitch tight, and only loosens the thread when the needle is in the fabric.

We may here briefly refer to a patent granted to Alfred Heaven, on the 3d of September, 1855, although it relates more especially to embroidering machines. This invention consists of a mode of working these machines, whereby the greater part of the embroidering thread is brought on to the face side of the fabric, and only a small quantity of the embroidering thread on the reverse side. Also, in the employment of a shuttle or other instrument for introducing a binding thread at the back of the fabric, for the purpose of locking or securing the embroidering thread. This looks very like a plagiarism of Fisher and Gibbon's, referred to by us in an early part of our history. Another part of Mr. Heaven's invention consists in providing each embroidering needle with a bobbin of its own, from which the embroidering thread is unwound as required, thereby effecting a great economy of time, by obviating the necessity for threading the needles as is usual in most embroidering machines.

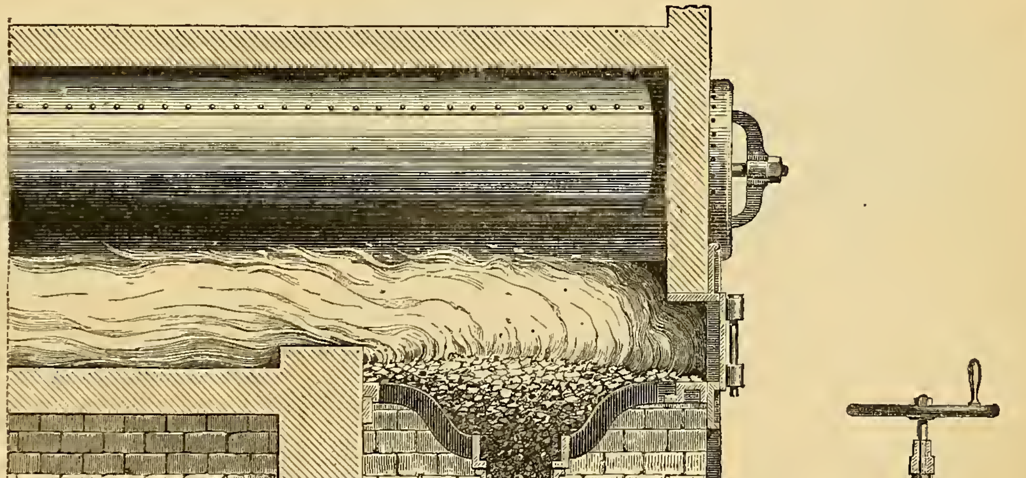
From the above short statement it would appear that this machine is in reality little more than a number of shuttle sewing machines combined together to form an embroidering machine.

SMOKE BURNING FURNACE AND FUEL DISTRIBUTOR.

M. George, an engineer of Paris, obtained a patent in France on the 28th of March, 1857, for a peculiar construction and arrangement of furnace for consuming smoke, and apparatus for distributing or supplying the fuel thereto. As we have recently been made acquainted with the introduction of furnaces and apparatus very similar to the principles of M. George's plan, which have been set forth as novelties, we consider it incumbent upon us to place this peculiar type of furnace and apparatus before our readers.

The cut illustrating this article represents a longitudinal vertical section of M. George's arrangement, as applied to a steam boiler furnace, when coal is employed as fuel. The entire system is comprised in two distinct parts, namely:—The *distributor*, which consists of a portable apparatus placed in the ash-pit beneath the grate, but is fitted up independently, both of the grate or of the furnace; and the *grate*, which latter is fixed, and forms a part of the interior of the furnace, and is provided with a central aperture for the introduction of the fuel.

The *distributor* is composed of three principal parts:—1st, A rotatory receptacle into which the fuel is first thrown; 2nd, A helix or screw turning with the receptacle, and serving to raise and force the fuel in a continuous manner on to the grate; 3d, A fixed hollow cylinder grooved inside, serving as a casing for the helix, and guide for the fuel in its ascent, preventing at the same time any rotatory motion being imparted to the fuel by the revolutions of the feeding helix. The lower portion of the casing and the bottom of the rotatory receptacle are provided



with blades, the crossing or passing of which, when the receptacle is rotated, causes the larger pieces of coal to be broken up into smaller fragments, capable of being readily elevated by the helix, and in a better state for combustion.

The mechanism for imparting motion to the distributor consists of a bevel pinion on one end of a horizontal shaft, gearing with corresponding teeth cast on the outside of the receptacle, the shaft being rotated by a vertical spindle and hand wheel, supported by a light frame or pillar in front of the ash-pit, a pair of bevil wheels serving to communicate the motion from the vertical spindle to the horizontal shaft above referred to. The entire distributing apparatus is carried in one frame, which is mounted on running wheels, and consequently easily moved away when the cleaning of the ash pit, or repairs to the furnace or working parts of the distributor itself, render its displacement necessary.

The grate is composed of two portions, the central part called the funnel or receiving grate, and the bars placed parallel to the receiving grate. The expanded or bell-mouthed form imparted to the grate in all directions above the opening for the supply of fuel, is intended to facilitate as much as possible the dispersion of the fuel over the entire surface of the grate. That portion of the fuel which rises up through the centre elevates the mass, which is thereby broken or divided, and falls down again in incandescent fragments, spreading themselves over the flat portions of the grate. The centre portion of the grate may be cast in one piece, or formed of a number of bars contained in a moveable frame, whilst the bars placed on each side to complete the grate may be of the ordinary construction.

SANATORY SCIENCE: PARIS' ENAMELLED IRONWARE.

The improvement of the sanatory condition of large towns, and the best and most economical means for effecting so desirable an object as the preservation of the public health, is a question for the grave attention of those to whom the interests and social comfort of the rate paying public are delegated. Various plans for conveying pure water from reservoirs through towns and into dwellings, have been tried with more or less success; but in no case has success been fully realised. Iron mains, liable to corrode and impregnate the water with rust and other impurities, and lead pipes conveying poisoned water into our houses, are, notwithstanding the many sad examples of poisoning by such polluted water, still in general use, because it would seem that no better substitute is prominently before the public. With the view to direct attention to an effectual remedy, we with pleasure notice an important invention which has been patented by a Mr. Paris, for the purpose of avoiding the evils arising from poison in water conducted through lead pipes; and the impurities which are constantly accumulating in iron ones; and also the frequent breakage to which earthenware tubes, otherwise desirable for this purpose, are liable.

The invention consists in the preparation of a fused glass or enamel, applied to the surface externally and internally, of iron tubes, which are thus effectually encased and rendered perfectly incorrodible, and securing absolute purity in the water transmitted. The enamel is fused and incorporated with the iron whilst at a nearly white heat, and this converts it into what may be termed a silicate of iron, rendering it incapable of being acted upon by the atmosphere, water, or even powerful acids. A bright, even, glassy surface is thus given to the iron, and this surface cannot be removed without using considerable force, and even when this is the case, the iron below is found to be far less liable to oxydation or corrosion than if the enamel had not been applied. These circumstances have induced Messrs. Allsopp & Sons, the great brewers, to adopt these enamelled tubes for conveying their water for brewing, throughout the whole of their new premises at Burton-on-Trent, in preference to the tinned copper pipes previously in use, and thereby effecting a saving of nearly 50 per cent. We have seen some of these enamelled pipes, which, after being ten years in constant use, exposed to the most severe tests, were removed for alterations, when they appeared as clean as on the day they were laid down.

The invention is also applied as a coating for the surface of vessels used for culinary and other domestic purposes. It is particularly valuable for the dairy, where cleanliness is so essentially desirable, the vessels of this material used therein being easily kept clean. The uses to which this invention may be successfully applied are innumerable. We have seen specimens of plates, cups and saucers, soup tureens, and almost every other class of ware for the table, made of iron, coated with enamel, bearing the appearance of earthenware, but, of course, much more durable. It is capable of being highly ornamented, and of being made to so nearly resemble earthenware, as to require a close inspection to distinguish the difference. As a substitute for earthenware for the use of prisons, public asylums, and workhouses, it must have an important value, and the same may be said as regards its use on board ship, and its employment by emigrants. The extensive works for the production of this article are carried on by the Patent Enamel Company at Birmingham, and we confidently recommend the invention to the notice of scientific and practical men, as well as to public water companies and other corporate bodies.

We have before us specimens of the productions of these works, in the shape of a water ewer and washing basin, enamelled to imitate blue and white veined marble. These utensils are extremely light, and yet substantial, and the enamelled surface is very beautiful. A sample of cast-iron tubing also shows how admirably the process is adapted for giving a most durable coating to such details, both inside and out.

GROOVED ROLLER CRUSHING MACHINE.

By E. O. Tindall, *Scarborough Iron Works, Yorkshire.*

(Illustrated by Plate 251.)

An even feed is of paramount importance in all crushing or reducing machines, and if, by obtaining this great requisite, we can also secure an increased working surface for operating upon the material to be crushed, we obviously compass a most important end. Both these advantages are laid hold of in Mr. Tindall's machine, which we here engrave.

Fig. 1, on plate 251, represents an elevation of the improved grooved roller crushing machine; fig. 2 is a corresponding sectional elevation of the upper part of the machine; fig. 3 is an end elevation looking on the delivery end of the shoot; and fig. 4 is a transverse or horizontal section taken just below the hopper.

As fitted up for crushing oats and barley, the whole of the working details of Mr. Tindall's machine are carried upon the top of an open cast-iron frame, in which are the bearings for a pair of parallel horizontal metal crushing rollers, these being surmounted by a stationary hopper or feeding receiver. Each crushing roller is grooved annularly along its entire surface, and when at work, the projections on one roller fit into the corresponding recesses or grooves in the other. The grooves and ridges may be of various forms or transverse sections, but they are by preference V shaped or triangular. The object of grooving the operating rollers is to present a large working surface to the grain, and at the same time to enable them to feed more evenly, and crush with a less expenditure of power and with greater rapidity than plain rollers. The rollers are geared together in the usual manner by spur pinions, and they are adjustable as regards mutual contiguity, by a pair of horizontal end screws, operating upon the bearings of one roller. This roller is situated directly beneath the centre of the hopper, and it thus acts itself as a feeder. The feed of the material to be crushed is regulated by a sliding diaphragm outside the hopper, worked by a screw, the lower edge of this diaphragm being thus capable of being set exactly at the necessary distance from the external roller, which is carried in stationary bearings. There are also attached to the hopper, two stationary clearer pieces, notched on their lower edges, to fit into the grooves of the rollers, and thus prevent them from clogging.

The driving of the improved crusher is effected by a winch handled fly-wheel, fast on the projecting end of the spindle of the external roller.

The arrangement of the machine ensures an effective, as well as powerful crushing action; at the same time all the parts are easy of access, so as to be readily taken asunder either for examination or for cleaning.

PRICE'S "NE-PLUS-ULTRA" LOCK.

Since the Great Exhibition of 1851, it has been universally admitted that the principle on which the picking of locks depends is, that whenever pressure can be applied to the bolt, in such a manner as to indicate the points of resistance to its withdrawal, such a lock can be picked.

Since this *tentative* method became generally understood and practised in this country, many inventions of a more or less complicated character have been patented to prevent it; but although most of them show that great ingenuity has been employed in their construction, yet from their complex movements, liability to derangement, unsuitableness for general purposes, and their expensiveness, nearly all have been abandoned by the respective patentees.

The security against picking by pressure obtained in the construction of the locks above referred to, has been by the addition of a number of "limbs" to the parts (the bolt, levers, and springs,) forming the essential mechanism of a lock, which has added, in corresponding proportion, to the complexity, liability to derangement, and cost.

In the specification of the "ne-plus-ultra" lock, Mr. Price claims four distinct improvements, which we shall describe *seriatim*. The first consists in the simple manner by which perfect security against picking by pressure is attained, and which is applicable to every description of lock, no matter whether large or small, or for what purpose required. The peculiarity of the principle of its construction will be easily understood from the following diagrams.

Fig. 1 represents an "iron rim dead lock," with the cap or top-plate open to show the works. A, is the case; B, the bolt; C, the safety-plate; D, the pin which carries the safety-plate upon the bolt; E, the levers; F, the pin on which the levers work, hence called the lever pin; G, the springs; H, the drill-pin on which the key fits; I, the talons of the bolt by which the bolt is locked out and in through the terminal step or nose of the key-bit coming in contact therewith; J, the main stump which is riveted into the safety-plate; K, the safety stump which is riveted to the back plate, and which in this lock answers the triple purpose of guide or runner-stump, safety-stump, and landing-stump for the levers to rest upon; L, the notch in the safety-plate; M, the racks in the levers.

GROOVED ROLLER CRUSHING MACHINE,

E. O. TINDALL, *SCARBOROUGH IRON WORKS*, YORKSHIRE,

PATENTEE.

Fig. 1.

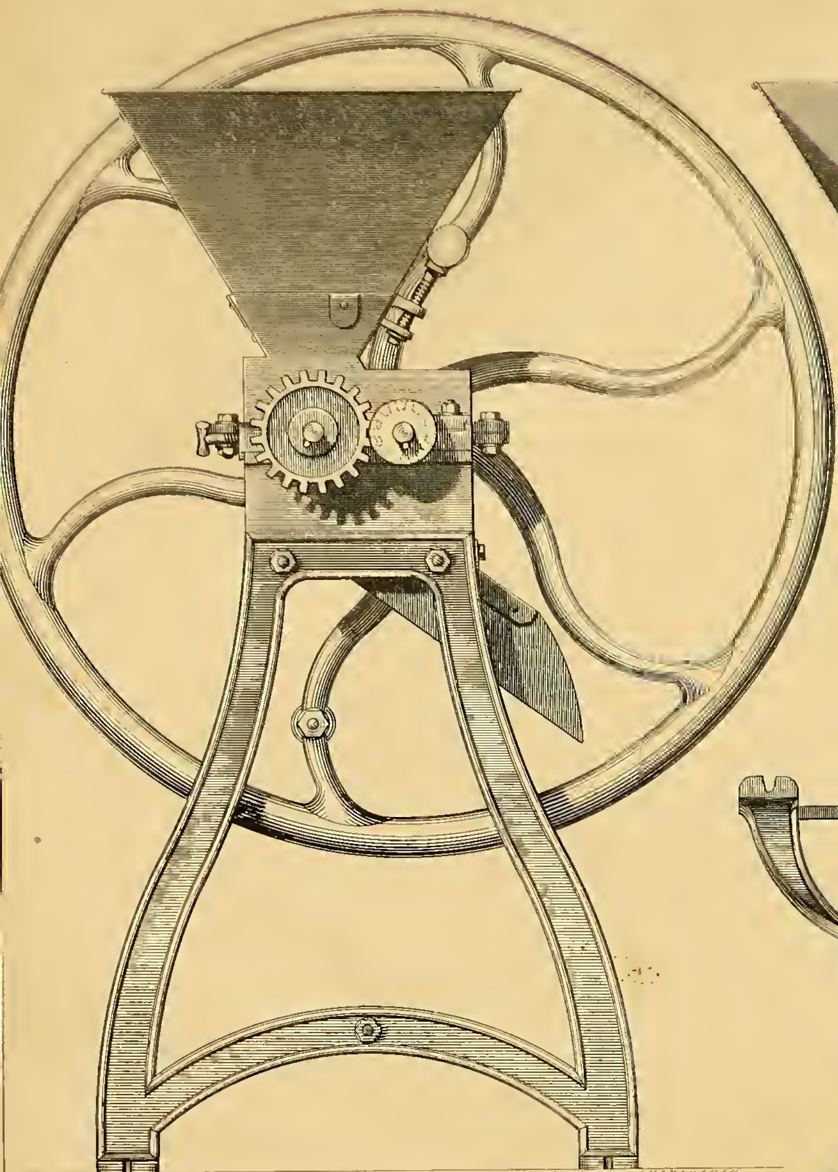


Fig. 2.

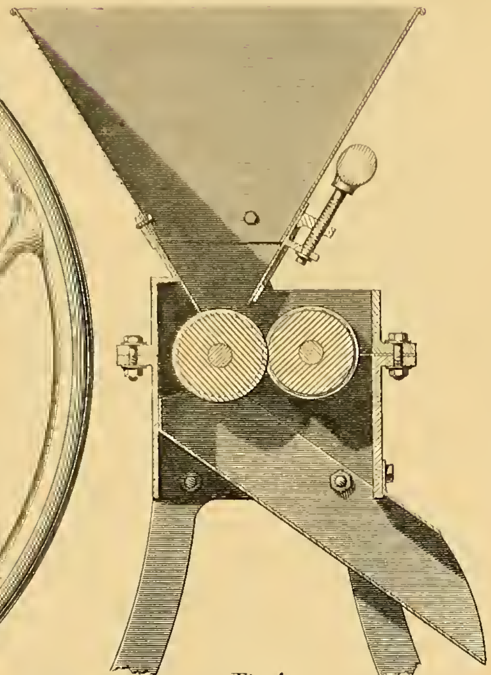


Fig. 3.

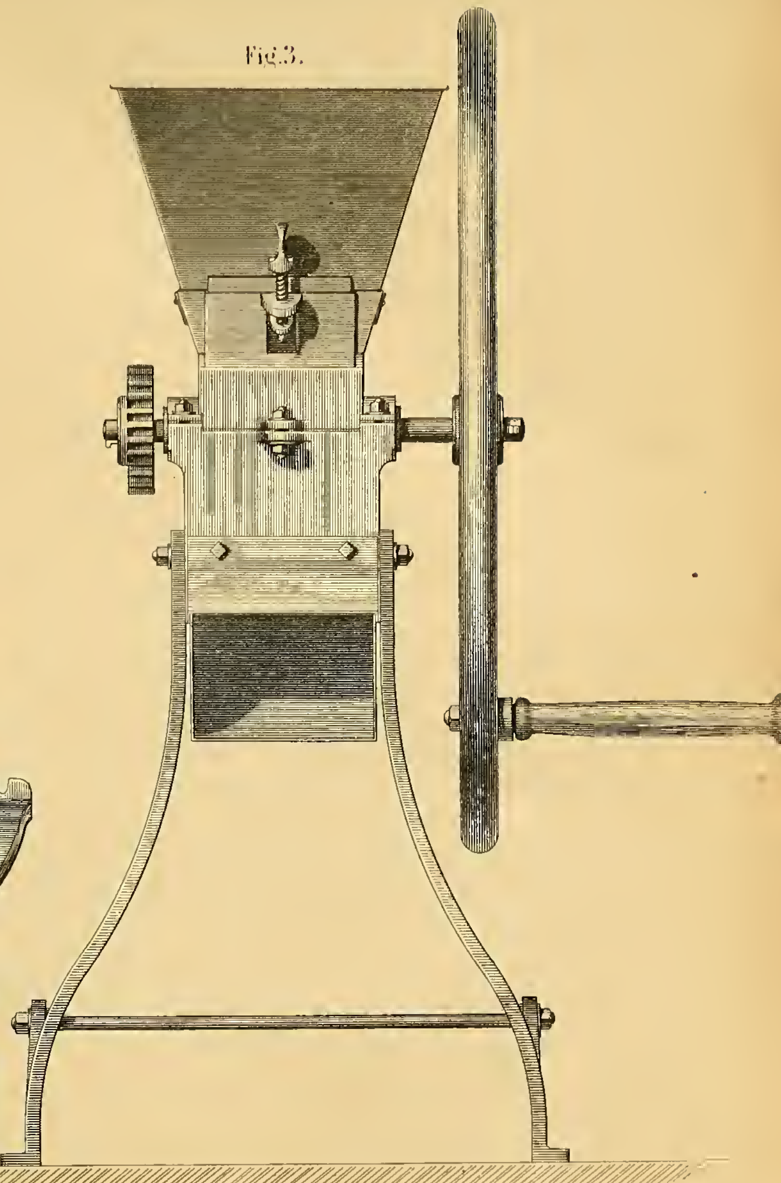
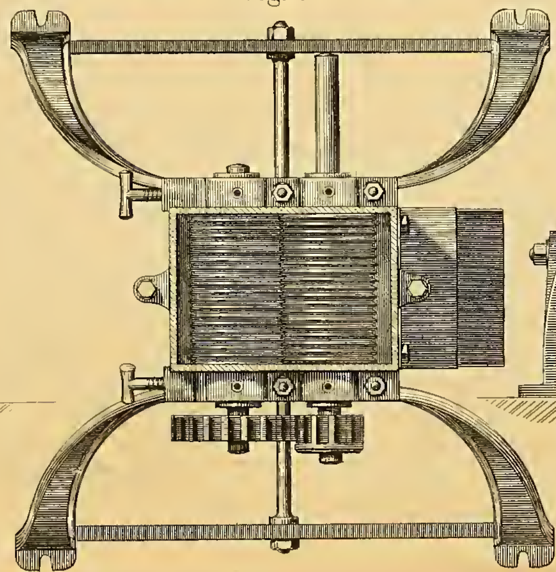


Fig. 4.



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It will thus be seen that this lock comprises the case, bolt, levers, and springs, of an ordinary lever lock, with the one additional "limb," which the patentee has designated the "safety-plate." The claim is for the peculiar and novel arrangement and position of the parts above referred to.

The peculiarity of its action may be explained thus:—The stump, J, the lever pin, F, and the guide-stud, K, of the bolt, are so placed as to form the three points of a triangle, F J K, and on pressure being applied to the bolt in any other way than by the proper key (see fig. 2), the notched part, L, of the safety-plate is thrown upon the guide-stud or runner-stump, K, when the triangle becomes distorted, or altered in shape, in such a manner as to lengthen the side or distance between the main-stump, J, and the lever-pin, F, as shown in fig. 2; the consequence of which is, that the faces of the front racks, M, of the levers recede from the stump, and are perfectly relieved from its pressure. This will be rendered more apparent by fig. 3, which represents the bolt and safety-plate only, in which the arrow, O, shows the line of action of the "racks" of the levers, and P, the line of action of the stump when pressure is applied to the bolt in any way, or by any other means than with the true key.

Fig. 1.

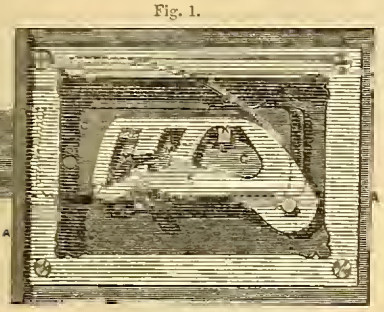
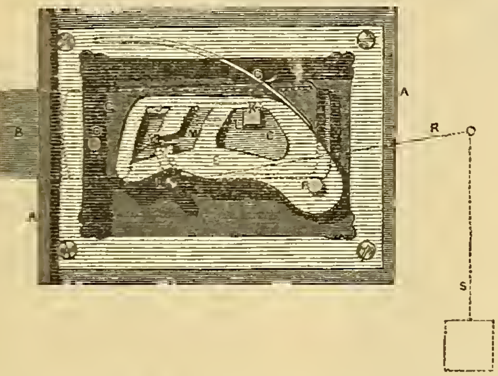
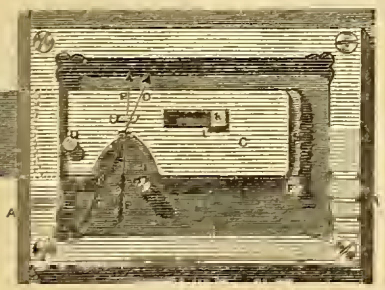


Fig. 2.



It will thus be seen that nothing but absolute violence can throw this lock out of action, and as its security against every known mode of picking is obtained, as before stated, by the addition of one "limb" only to the ordinary lever lock, the construction allows the whole of the parts to be made very strong, which renders it, in the same proportion, more durable than other locks of its class.

Fig. 3.



It may indeed be considered as a lock fully answering to the requirements proposed by the Society of Arts, when that institution offered a premium in 1852, for "a good and cheap lock, combining strength and great security from fraudulent attempts, cheapness, freedom from disarrangement by dirt, and requiring only a small key."

It will be noticed that this lock differs from Chubb's and many other similar locks, inasmuch as there are no false notches or serrated stump, barrel or curtain, or both combined, deep wheels or wards, guarded stump or guarded levers, or other such like contrivances. Those locks that combine in their construction one or other of these *secondary* security contrivances, show clearly that the inventors placed but little reliance upon the *primary* principle of security of their respective locks. Where the principle of construction gives perfect security, such questionable auxiliaries are altogether unnecessary. These false notches, etc., do not make the lock unpickable, they only increase the difficulty, or cause more time to be necessary in the manipulation. It is simply impossible to introduce any kind of instrument whatever, into the "ne-plus-ultra" lock, to prevent the proper action of the safety-plate. It will be remembered that Mr. Goater picked Hobbs' protector lock by "introducing a piece of watch spring, so as to fix the moveable stump or protector,"* whilst he applied pressure to the bolt, and by being thus enabled to feel the faces of the racks of the levers, opened the lock. Such a process becomes useless in the "ne-plus-ultra" lock, as it would throw the safety-plate into action. This lock is one that does not require Mr. Hobbs to operate upon to prove its security. Its construction and the geometric principle upon which it is made must prove to every one at a glance that it cannot be picked by applying pressure to the bolt. If proof of this were desired, it is only necessary to remove the springs altogether from the lock, and apply pressure to the bolt, when the levers will shake backwards and forwards, thus proving their perfect freedom.

Fig. 4 represents an elevation of a "ne-plus-ultra" lock, which is specially adapted for the doors of bankers' and commercial safes; the top plate of the lock is removed to show the internal arrangement of the parts. Fig. 5 is a side view of the lock, showing the parts, N, made thicker, so as to form a channel for the bolt; Q, is the hardened steel nozzle through which the key is passed from the front of the safe Fig. 6 is an end view, corresponding to fig. 5; and fig. 7 is a front view of the nozzle, G. The internal construction and arrangement of this lock are the same as the "rim" lock, figs. 1, 2, and 3, and the letters of reference refer to the same parts in each, the only addition being the powder guard round the path of the key, in accordance with Mr. Price's patent of 1855.

Fig. 4.

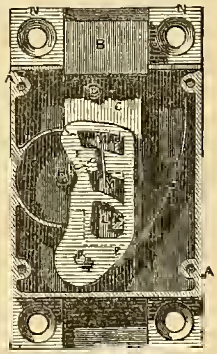
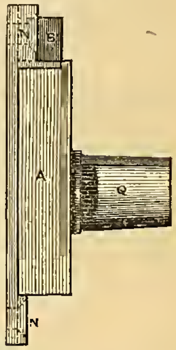


Fig. 5.



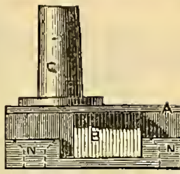


Fig. 6.

Fig. 7.

A "detector" could be added to the "ne-plus-ultra" lock, but Mr. Price has stated in his "treatise on fire and thief-proof depositories and locks and keys," that he attaches but little importance to its adoption. At page 379 he says:—"The ready manner of releasing the detector lessens considerably its value as an indicator of the lock having been tampered with, for on attempting to unlock the lock with its proper key, the hinderance would in most cases be thought to be accidental, or arising from some misplacement, and in a moment, without consideration or reflection, the key would be reversed, and the idea never occur that the detector had been thrown at all."

Mr. Granville Sharp, in his "prize essay on practical banking," is of the same opinion. He says:—"The detector, although possessing some advantages, is not without its evils, especially in locks where it is liable to be thrown, by the tumbler being very *slightly overlifted*, as in this case, the pressure commencing almost immediately upon the tumbler being raised to its *proper elevation* for allowing the bolt to pass, may indicate to the lock-picker the character of instrument to be used, and in such locks, when by long use the tumbler springs are considerably weakened, the detector may sometimes be started by a sharp movement of the *proper* key. Where there exists the remotest possibility of this occurring, the contrivance were far better absent, as the discovery of a detector being thrown is one of grave importance."

The Editor of "Hebert's Encyclopedia," in his remarks on the "detector" is also opposed to its application. He says:—"In Barron's and Bramah's the picker has no means of knowing whether the tumblers are lifted too high or not, but in Chubb's he has only to put the detector *hors de combat* in the first instance, by a correct thrust from the outside of the door, (which might be accurately measured,) so as to *fix* it fast in its place; the detector then becomes a stopper to the undue

* It was this defect in the original construction of the "protector lock" that caused Mr. Hobbs to add the "guard" to the main stump, to prevent the operation of the piece of watch-spring.

ascent of the tumblers, and the extent of their range is thereby correctly ascertained; thus it appears to us the *detector* might be converted into a *director* of the means of opening the lock."

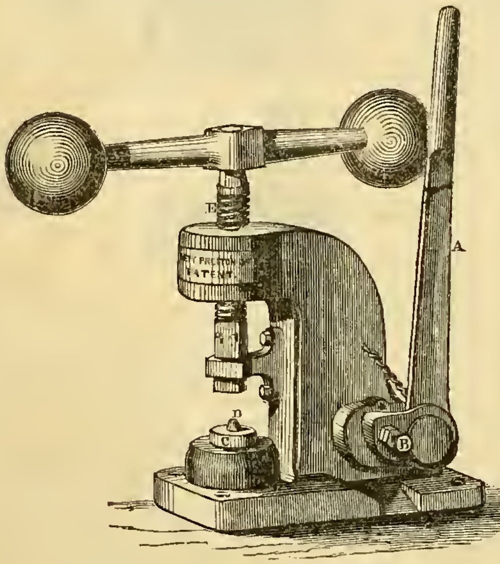
Mr. Price, at page 381 of his treatise, says further:—"Our *greatest* objection to the use of detectors is, that these locks frequently, from various causes, detect themselves, and the mischief which may be caused in an establishment under such circumstances is most distressing to contemplate. The detector is thrown, and the proprietor at once jumps to the conclusion that some one of those who had access to the apartment or depository has been tampering with the lock."

We understand that Mr. Price confines his manufacture to that of first-class locks only, and that the original lock of every size and kind has been made from drawings, and that each size bears in all its parts a due proportion to all the other sizes of the same kind. This, added to the circumstance of his doing a considerable proportion of the workmanship by the most approved steam machinery, will give him advantages which few in the trade can command.

From the thousands of six-lever locks that have been made during the last twenty years, there must of necessity be hundreds in use, the keys of which are alike. In order to obtain the greatest possible security in the "ne-plus-ultra" lock, the patentee and manufacturer has adopted, in all the important kinds, *seven* levers, thus obtaining, by the transposition of the steps of the key-bit alone, the large number of 5040 combinations, whilst six-levers give but 720.

FAUCETT AND PRESTON'S BULLET PRESS.

An exceedingly compact and effective press for moulding cylindro-conoidal bullets, has been recently introduced by Messrs. Fawcett, Preston, and Co., of Liverpool, for which they have obtained letters patent. In the accompanying illustration, we have shown the machine in perspective elevation. It stands about eighteen inches high. The lever and shear, A, is used to cut off plugs of lead of the required length and weight from a solid rod. The set screw, B, forms an adjusting stop for the lead, and regulates the exact length of the plug to be cut off. The hardened steel die, C, is divided and fitted accurately into a conical seat, which



keeps the parts of the die in close contact when under pressure. The plug, D, is made with an end formed to give the proper shape of the cavity in the rear of the bullet; this plug is acted upon by the vertical screw, E, which, when caused to descend quickly, compresses the lead into the die. A boy can make, with one of these presses, including time for cutting off the plugs of lead, about a hundred bullets per hour, and with the most ordinary care, the bullets turned out will not vary a grain in weight, and are, of course, perfectly solid and uniform in size. The number of bullets turned out by the machine may be considerably increased, by having the shear and the press separate, so that the two operations may be carried on simultaneously. According to this system of making the bullets, all waste of metal is avoided, the lead rod being readily obtained from any maker of the ordinary lead pipe.

The advantage of having solid and accurately formed bullets, instead of cast bullets varying considerably in weight, and always more or less unsound, needs no comment, and the cost of the machine being moderate, it is particularly adapted for the use of Volunteer Rifle Corps and private individuals.

RECENT PATENTS.

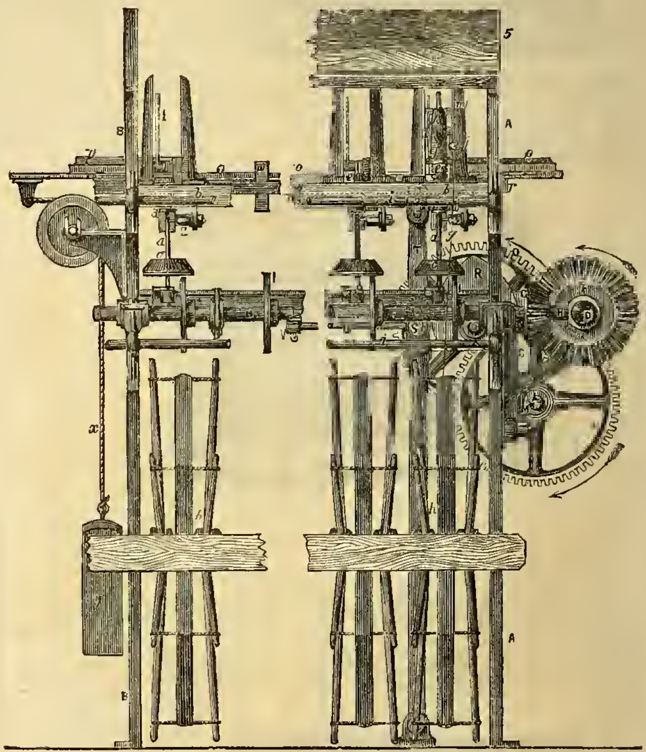
WINDING MACHINERY FOR YARNS OR THREAD.

William Robertson *and* J. G. Orchar, *Dundee.—Patent dated December* 2, 1858.

Messrs. Robertson and Orchar's present invention relates to various novel arrangements of winding machinery, such as is used in different branches of textile manufactures; and embracing in particular a superior mode of driving and varying the velocity of the winding spindles, and the accurate and rapid winding on of the yarn or thread in the cop or pirn form.

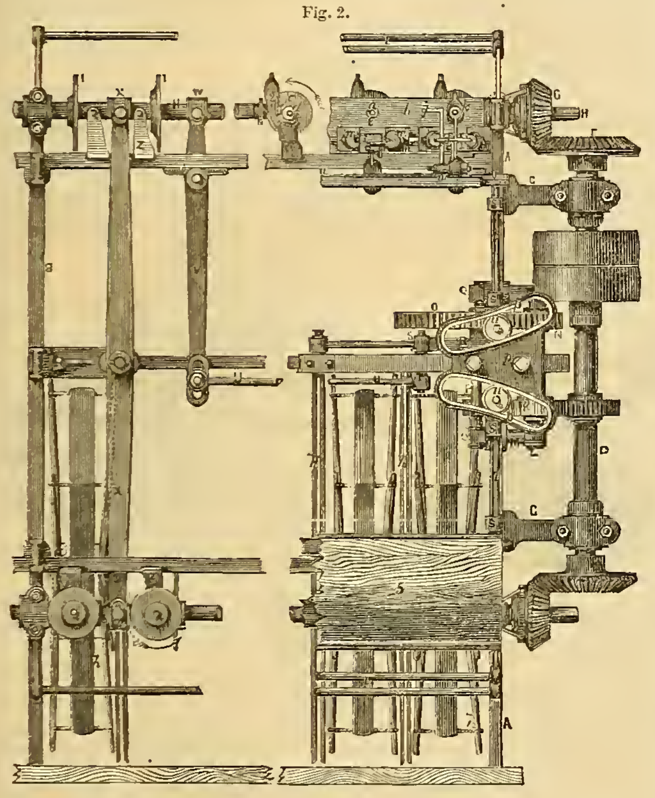
Fig. 1 is a front view or elevation of the two end portions of the machine, and fig. 2 is a plan partially in section corresponding to fig. 1; and fig. 3 is a partially sectional elevation showing the details of the

Fig. 1.



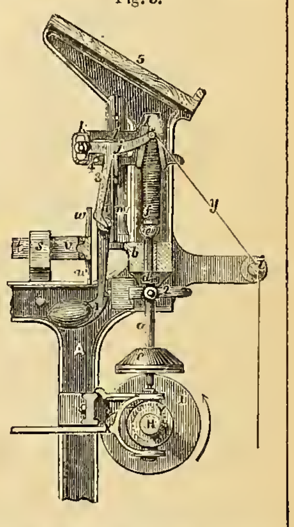
winding mechanism. The framing of the machine consists of the open rectangular end standards or gables, A, and the intermediate gables, B, which are connected with each other by transverse rails and tie rods. Two brackets, C, are bolted to one of the end standards, A, in which are fitted the bearings of the short horizontal shaft, D, this shaft carries the fast and loose pulleys, E, which are driven by means of an endless belt and pulley arrangement actuated by a steam engine or other prime mover. The shaft, D, has fast to each extremity a bevel wheel, F, which gears with a pinion, G, on the end of each of the horizontal shafts, H; there are two of these shafts, one on each side of the machine, and extending from end to end, the brackets which carry the bearings for the shaft being cast in the end standards or gables, A. The shafts, H, are fitted at regular intervals with a series of frictional pulleys, I, the number of these frictional pulleys corresponding to the number of spindles in the length of the machine. The shafts, H, are so arranged as to be capable of a certain amount of endlong or longitudinal traverse during the winding operations; to admit of this, the driving ends of the shafts are made with a feather, which slides in a corresponding groove in the pinions, G. The longitudinal traverse of the shafts, H, is simultaneous, that is to say, both shafts move together, but in opposite directions; this motion is derived from the shaft, D, which carries the pinion, J, this pinion gives motion to the wheel, K, on the short horizontal shaft, L; this shaft is carried in a pair of brackets, M, which are bolted to the outside of the end standard or gable, A; these brackets are fast to the two inner uprights of the standard, and arranged below the shaft, D. The shaft, L, also carries the pinion, x, which gears with the wheel, o, on the shaft, P, that is carried on a pair of brackets, Q, bolted to the inner face of the standard, A. The shaft, P, has fitted to it the heart or cam, R, the periphery of which is kept in contact with the pulley, s, that is carried on a stud working out through a slot in the vertical rocking lever, T. This lever is centred on a stud which projects laterally from a bracket fixed to the flooring, and to the stud which works in the lower slot of the lever is connected one end of the rod, U. The other extremity of the rod, U, is connected by a bolt to the horizontal lever, V, which bolt works in a slot made in the free extremity of the lever. The fulcrum of the lever, V, is a stud carried in a bracket which is bolted to one of the upper longitudinal rails of the framing. The short outer arm of the lever, V, is forked, the free extremities extending outwards round the contiguous shaft, H. Each of the forked ends of the lever, V, is likewise bifurcated, so as to embrace the vertically projecting studs of the strap, W. With this arrangement, when the eccentric cam or heart, R, is moved round, as the apex of the longest part of the heart approaches the pulley, s, the lever, T, is moved away, and with it the lever, V. The motion of the lever, V, about its centre causes the contiguous shaft, H, to move in the contrary direction or towards the driving end of the machine. This motion of the shaft, H, is communicated to the opposite and corresponding shaft by means of the lever, X, the fulcrum of which is a stud car-

Fig. 2.



ried in a bracket, which is bolted to the contiguous standard or gable, B. The lever, X, is forked at both extremities, and is connected to the two shafts, H, by the couplings, Y, so that both shafts, H, move simultaneously and in unison with each other, but in different directions. The effect which this opposite traverse of the shafts, H, would have upon the spindles is counteracted by the arrangement of the frictional pulleys, and which will be presently adverted to. The longitudinal rail which extends along the machine immediately above the shafts, H, has projecting from its outer face a series of small brackets, Z, which are either cast with the rail or are bolted thereto. The number of these brackets corresponds to the number of the spindles, a, in the "hank" or series, each bracket being arranged contiguous to one of the frictional discs, I, on the shaft, H. Each spindle, a, is carried at the lower extremity in a small footstep fitted in its bracket, Z, the upper part of the spindle being steadied in a collar bearing, which is fitted in the fixed rail, b. Each spindle, a, is in one piece throughout, and it has near the lower part a weighted face plate, c, the face or lower surface of which is covered with leather or other suitable frictional material riveted to the plate. The weighted face plate, c, rests upon its contiguous frictional pulley, I, and is driven thereby, the requisite variable velocity of the spindle being obtained by causing the frictional pulley to move to or from the centre of the weighted face plate. Each spindle, a, has formed upon it a shoulder, d, the use of which will be hereinafter explained, and at the upper part is a small driver, e, which has a transverse feather formed on its upper surface. The end of the pirn, f, fits a short spindle which projects above the face of the driver, e, and the feather fits into a cross slit made in the head of the pirn, so that both rotate together. The yarn, g, is primarily wound upon the reel, h; there is a series of these reels corresponding to the number of spindles arranged parallel with each other upon spindles, carried upon frames, h^1, extending across the machine, and carried by the longitudinal wooden rails fitted in the centre and laterally projecting parts of the framing. The yarn to be wound on each spindle passes off from the reel, h, in front of the tensional bars, i, to the thread guide or laying on finger, j. This thread guide consists of a short bell crank lever, which is carried loosely upon a laterally projecting stud, fitted in a vertical slot formed in the back part of the moveable cone apparatus, k. The yarn, g, passes between two laterally projecting fingers, which are cast on the outer extremity of the horizontal arm of the bell crank lever, j, and as the finger lays the yarn upon the pirn, f, the weight of the cone causes it to be wound tightly and smoothly thereon. The cone apparatus, k, consists of the open cone which fits over the pirn, f, the inner surface of this conical part is made smooth, and of the figure it is desired to give the upper part of the cop when wound. On the back part of the cone are cast two cross pieces, which connect the cone to the vertical slide, l; and extending backwards beyond this slide the cross pieces terminate in the vertical slot which carries the stud of the bell crank lever or laying on finger, j. The flat sliding part, l, of the cone, k, works up and down in the grooves which are made for the purpose in the fixed guides, m. These vertical guides, m, are arranged in pairs behind each spindle, and are carried upon the rail, b; the slide, l, of the cone rises in the vertical grooves as the yarn is wound upon the pirns. The laying on of the yarn causes the cone, k, to rise of itself, that is to say, as the pirn increases in diameter by the laying on of the thread, the cone is thereby raised, and when it reaches the top and the pirn is filled, the motion of the spindle is stopped. But during this winding on of the yarn the motion of the spindle is variable in velocity, being caused to move at a reduced speed as the lower part of the cop is completed, and at an increased velocity as the upper part of the pirn is wound. This variable speed of the spindles is derived from the rotatory motion of the eccentric cam or heart, R, when the apex of this eccentric is on the pulley, s, the frictional pulleys, I, are close up to the spindles, a, and the weighted face plates, c, are driven at the greatest velocity. As the heart, R, moves round, and the lever, V, is moved inwards, the frictional pulleys, I, are carried towards the periphery of the weighted face plates, and the speed becomes reduced in proportion. The weighted face plates, c, are driven on both sides of the machine at a corresponding speed, although the shafts, H, traverse in opposite directions when the lever, V, is moved. The differential action of the shafts is avoided by fitting the frictional pulleys, I, on opposite sides of the spindles, a; by this arrangement both series of frictional pulleys move out from, or towards the centre of, the weighted face plates in unison.

Fig. 3.



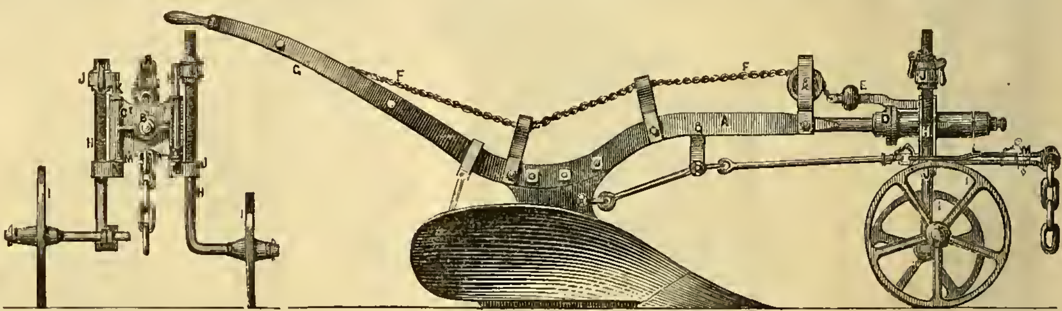
The eccentric cam or heart, R, also gives motion through the rocking lever, T, to the mechanical arrangement for forming the conical part of the cop, and stopping the winding action when the pirn is filled. In the upper extremity of the lever, T, is a slot, in which is carried a stud having attached to it the link, n, the other extremity of this link is secured to a stud which projects laterally from a pendent bracket on the under side of the bar, o. The flat metal bar, o, extends the whole length of the machine, and at intervals, corresponding to the distance between each gable, there is bolted to the bar a duplex differential guide piece, p. This differential guide piece, p, is of a triangular figure, the base or broader part being towards the driving end of the machine; a slightly curved slot, q, is formed at each side of the guide piece, extending from end to end of the plate. The bar, o, is supported in brackets, r, cast on the upper edges of the gables, A and B, and it moves to and fro in the recesses made for the purpose in the brackets. Affixed to the upper edges of the gables are the guides, s, in which the bars, t, move; these bars have at their inner ends a vertical stud carrying the pulley, u, each of these pulleys are fitted to work in the contiguous slot, q, of the guide piece, p. The outer end of each of the bars, t, is fast to the longitudinal bar, v, which is made wider, or with vertically projecting parts, *w*, opposite to each of the pendent arms of the bell crank levers, *j*. The projecting part at the lower end of the arm of each bell crank lever rests against the wider part, *w*, of the bar, *v*, the position of each of the bars, *v*, being determined by the motion of the bar, *o*, and the differential guide pieces, *p*. For supposing the bar, *o*, to be moved so that the guides, *q*, cause the pulleys, *u*, and the bars, *t* and *v*, to move gradually outwards, the first portion of the guide's traverse slowly raises the thread guide, *j*, so that the yarn is laid evenly upon the cylindrical portion of the cop. The last portion of the guide's traverse, or that in which the pulleys, *u*, are moved outwards from a medium position to the full extent of their outward traverse, causes the thread guide, *j*, to be raised more rapidly, and effects the formation of the conical part of the cop. The bar, *o*, has connected to it by the chain, *x*, a counterweight, *y*, the chain is passed over the pulley, *z*, which is carried upon a stud in a bracket projecting laterally from the framing; the drag of the chain causes the bar, *o*, to move to the extent of its traverse towards the driving end of the machine, unless counteracted by the heart, R. The weight, *y*, serves also to keep the pulley, S, on the lever, T, constantly in contact with the periphery of the heart, R. In the accompanying engraving, fig. 1, the heart, R, is shown in a medium or vertical position, the lever, T, being vertical, and the levers, V and X, at right angles to the gables, A and B. In this disposition of the parts, the frictional pulleys, I, are midway in their traverse from the centres to the peripheries of the weighted face-plates, *c*, and the thread guides, *j*, have been raised sufficiently to form the cylindrical portion of the cop. In the enlarged view of the details, fig. 3, the pulleys, *u*, are shown at the wider extremity of the guide piece, *p*, and the bars, *t*, moved out to the extent of their lateral traverse. In this figure the cone apparatus, *k*, is delineated as having just completed the winding of the cop, the thread guide, *j*, being raised to its extreme elevation by the outward movement of the bar, *t*, and the pressure of the projection, *v*, on the lower part of the bell crank lever. When the winding of the cop is completed, the rotatory movement of the spindle is stopped by means of a self-acting mechanical arrangement. A weighted vertical lever, 1, is centred upon a stud that projects from one of the guides, *m*; at the lower part of this lever, just above the weight, is a notch which serves to support the inner end of the short horizontal lever, 2. The lever, 2, is carried upon a lateral stud, fitted in the small pendent brackets on the under side of the rail, *b*; the lever is weighted at the back part, and it has a small nib or projection on its upper edge, at the part which comes under the shoulder, *d*, on the spindle, *a*. The front end of the lever, 2, extends outwards in front of the spindle, where it forms a handle by which the weight at the backward end may be raised when required. The upper extremity of the lever, 2, is made with a projecting part, 3, which comes in contact with a stud, 4, that projects laterally from the back part of the cone apparatus, *k*. As the cone apparatus rises up during the formation of the cop, the stud, 4, moves the lever, 1, away from it as it presses against the inclined part, 3, and when the cone reaches the extremity of the cop the notch of the lever, 1, is released from the backward end of the lever, 2. The weight on the lever, 2, causes it to fall, and this motion about its centre brings the higher part of the nib or projection under the shoulder, *d*, so that it raises the spindle, *a*, and the weighted face plate, *c*; being thus lifted off the frictional pulley, I, the rotatory motion of the spindle ceases. The cone apparatus, *k*, has a curved projecting nose piece, k^1, extending outwards in front of the cone, this part enables the attendant to raise the cone in order to remove the full pirn and replace it with an empty one, a supply of which is kept on the angular shelf, 5, above; this shelf serves also to place the full pirns on, as they are removed from the spindles. When the empty pirn is put on the spindle, the attendant depresses the front end of the lever, 2, this brings the weighted end of the lever, 1, under its backward extremity, the spindle, *a*, sinks, and the weighted face plate, *c*, being again in contact with the frictional pulley, I, the winding operation is resumed. Upon the breaking of one or more of the yarns or threads, the respective spindles may be instantly stopped by the attendant drawing the upper curved end of the lever, 1, belonging to each spindle, towards the front of the machine, so as to release the lever, 2, and thus raise the weighted face plate of the spindle off the frictional pulley. With these improvements in winding machinery or apparatus, the yarns or threads are wound evenly and firmly upon the pirns, and the work is accomplished in a highly effective and superior manner. The particular arrangement of the longitudinal traversing shafts, H, with their frictional pulleys, I, and the weighted face plates, *c*, may also with slight and unimportant modifications be adapted to winding machinery or apparatus, in which the motion of the spindles is not uniform on both sides of the machine.

PLOUGHS.

WILLIAM TASKER, JUN., *Andover.—Patent dated January* 24, 1859.

MR. TASKER'S improvements have reference to the arrangement and construction of the parts of ploughs known as fixed-headed ploughs, in connection with the front end of the beam and head gear, whereby the plough may be turned at the headlands without having to be carried round by the ploughman. In carrying out this invention the patentee employs a casting made with a tube or hollow cylinder, which fits loosely over a round portion of the front end of the beam, so as to be capable of turning thereon. A collar or flange is formed at the back end of the tube, and a corresponding collar is fixed on to the beam; the two collars being notched at one part for the entrance therein of a key or catch, which has the effect, when in its place, of locking the tube and the beam rigidly together; but when this key is elevated by the ploughman by any convenient means, the beam is free to be turned inside the tube in either direction, so as to bring one of the plough handles, when turning at the headlands, in contact with the ground; a skid or slide being fitted to one of the handles for it to slide upon. Having turned the headland, the ploughman has simply to bring the handles back again into a proper position for work, when the beam and tube will become locked again.

The annexed engraving represents a side elevation of a plough fitted with the patentee's improvements. A, is the plough beam, the front end of which is made round, and fits into the corresponding tube or hollow cylinder, B, cast in one piece with the vertical frame, C, and fitting loosely upon the rounded front portion of the plough beam, so as to be capable of turning freely thereon. The collar and pin at D, serve to keep the end of the beam from slipping out of its place. A flange, E, is cast upon the back end of the tube, B, which fits against a similar



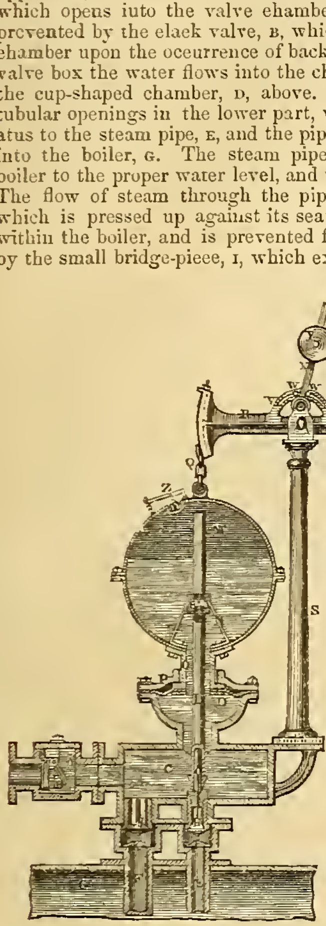
collar, F, fast on the beam itself. These two collars are notched, so as to receive the weighted forked lever or catch, G, which plays freely in holes made in the casting, and is retained therein by collars. When this catch is dropped into the corresponding notches in the two flanges or collars, the plough beam will be locked or prevented from turning in its tubular socket; but when the catch is elevated out of the notches, which may be effected by the ploughman pulling the chain or cord, H, or by any other simple contrivance, the beam will be unlocked, and may then be turned over to one side, so as to bring one of the handles, I, on to the ground, and, consequently, raise the ploughshare, in which position the whole may be readily turned at the headlands. A skid or other convenient rest may be bolted on to one of the handles, for the purpose of supporting them when on the ground. The headland being turned, the ploughman readjusts the beam, when the weighted catch, G, drops into the notches in the respective flanges, E, F, and locks the beam in its proper position for work. J, are adjustable stumps for carrying the running wheels, K; these stumps pass through the overhanging lugs, L, formed at the top and bottom of each of the round spindles, M, which are contained in the vertical sockets, N, of the cast-iron frame, C, and are free to turn therein, thereby enabling the stump of each wheel to swivel or lock round when turning the plough, as shown by the dotted lines in the figure. O, are two bars rigidly fixed to the lower ends of the spindles, M, and connected at their front ends by a cross bar, P, which is provided with a number of holes for the purpose of regulating the line of draught.

FURNACES AND BOILERS.

DAVID AULD, *Glasgow.—Patent dated October*, 17, 1859.

MR. AULD'S present improvements relate, to a certain extent, to an invention of improvements in working furnaces and steam boilers, and in apparatus connected therewith, for which British letters patent were granted to the present patentee, on the 29th of April, 1858; and it consists of an automatic mechanical arrangement, for the effecient supplying of steam boilers with water, so as to insure both a plentiful supply and certainty of action.

The accompanying engraving is a partially sectional elevation of one modification of Mr. Auld's improved apparatus for supplying steam boilers with water in a regular manner, and by self-acting means. The water for the supply of the boiler flows into the apparatus, from an elevated tank or reservoir, through the feed pipe, which opens into the valve chamber, A, the efflux of the water being prevented by the clack valve, B, which closes the entrance to the valve chamber upon the occurrence of back pressure on the water. From the valve box the water flows into the chamber, C, and thence upwards into the cup-shaped chamber, D, above. The chamber, C, has two flanged tubular openings in the lower part, which serve to connect the apparatus to the steam pipe, E, and the pipe, F, through which the water flows into the boiler, G. The steam pipe, E, is carried downwards into the boiler to the proper water level, and the water pipe nearly to the bottom. The flow of steam through the pipe, E, is controlled by the valve, H, which is pressed up against its seating by the pressure of the steam within the boiler, and is prevented from falling away too far therefrom by the small bridge-piece, I, which extends across the steam pipe. The inlet to the pipe, F, is in like manner controlled by the valve, J, which rests upon the bridge-piece, K, during the time that the water is flowing into the boiler. The tubular seating of the valve, H, is made conical at the upper part, to receive the lower extremity of the tube, L, which passes up through the chambers, C and D, and enters the copper globe, M, terminating near its upper part. The tube, L, is fixed in position by the angular stays, N, the lower bent extremities of which are bolted to the globe, M, the bolts serving also to connect the globe to the short flanged pipe, O, which slides loosely in the opening of the cap, P, of the chamber, D. This cap is bolted to the flange of the chamber, D, a diaphragm of India-rubber or other suitable flexible material being interposed between the faces of the flanges. The inner part of this diaphragm is held between the flanges of the pipe, O. With this arrangement the water cannot escape; at the same time, the pipe, O, carrying the globe, M, is free to slide up and down in the opening in the cap, P. The globe, M, is formed in two parts, which are bolted together, and at the upper part there is an eye, by means of which it is attached to the chain, Q, which is secured by a nut to the upper extremity of the segmental part of the balanced lever, R. The segmental part of this lever is hollowed out like a grooved pulley, and, at the central part of the lever, there are laterally projecting knife edges, similar to those of a scale beam. These knife edges rest upon a hardened steel plate, which is supported in slots made in the forked extremity of the pillar, S; this pillar is carried upon an overhanging bracket cast on the side of the chamber, C. To the outer part of the rocking lever, R, is fitted an adjustable counterweight, T, which is fixed at the proper distance from the centre by the set screw, U. Arching over the centre of the lever, R, and its supporting pillar, is a bridge-piece, V, which is bolted to the lever, R; this bridge-piece has a segmental slot made in it, in which are fitted two adjustable sliding stops, W. These stops serve to check the lateral motion of the vertical swinging rod, X; the lower end of which is carried on a stud, fixed in one of the upwardly projecting ends of the pillar, S; at the upper part of the rod is fixed the weight, Y, which is fastened thereto by a set screw. The weight, T, is fixed at such part of the lever, R, so that it counterbalances the weight of the globe, M, and its appurtenances,



together with a certain quantity of water in the globe; the upholding action being assisted by the overhanging weight, Y, on the rod, X. As the water flows in from the supply pipe, and up into the globe, M, when it reaches a predetermined height therein, the accumulated weight overcomes the gravity of the weight, T, so that the lever, R, turns upon its centre, and the weight, Y, is thrown forward against the right hand stop, W. This action facilitates the descent of the globe, M, the short pipe, O, descending into the cup-shaped chamber, D; at the same time, the transverse pin at the lower part of the tube, L, comes in contact with the upper end of the spindle of the valve, H, and the end of the tube enters the conical part of the tubular valve seating. The depression of the valve allows the steam to pass up the tube, L, into the globe, M, its pressure causing the air valve, Z, which is otherwise kept open for the egress of the air as the water flows up into the globe, to shut. The pressure of the steam on the surface of the water in the globe, causes the valve, J, to open, and the water flows down the pipe, F, into the boiler, the steam pressure serving also to close the valve, B, which prevents the water being forced back through the feed pipe. The inflowing of the water into the boiler continues until the globe, M, is so far reduced in weight that the counterpoise, T, is sufficient to overcome its gravity, and that of the weight, Y, in its overhanging position to the right of the centre of the lever, R. When this takes place, the globe, M, is raised by the motion of the lever, R; the valves, H and K, are closed by the pressure of steam in the boiler, and the apparatus is again restored to its normal position. In this manner the due and effective feeding of the boiler is kept up with unerring certainty, the filling or partial filling of the globe, and the discharge of its contents into the boiler, being regulated according to the evaporative power of the boiler.

In another modification, the water from the overhead tank or reservoir flows through a vertical feed pipe, the lower part of which is closed by a valve, which opens into a cast-iron water chamber. This chamber has fitted in the upper part a cock, for the discharge of air from the chamber, as the water flows into it from the feed pipe. The lower part of the chamber is cast with two flanged tubular openings, by which the apparatus is attached to the steam and feed pipes, which project out above the boiler. The steam and feed pipes are fitted with two valves, which, when open, rest on bridge pieces, in manner similar to the arrangement of the corresponding parts in the figure. The spindle of one valve is prolonged upwards, so as to enter the lower extremity of the tube which is fitted in the centre of the cylindrical vessel; the upper part of the tube being held in position by transverse stays. The cylindrical vessel is, by preference, made of copper, and it has at the lower part a valve, by means of which the contents escape into the outer chamber when the valve spindle comes in contact with the bottom of the chamber. The inner vessel is connected by means of a bridge-piece and rod, to a chain which is attached to the segmental extremity of a rocking lever. The arrangement of this lever, and the parts connected therewith, are in all respects similar to the corresponding parts delineated in the engraving. The water from the tank or reservoir flows through the supply pipe, and falls into the inner vessel, which, when nearly filled, descends, the descent causing the two valves to open. The steam having now free ingress to the chamber through the vertical tube, its pressure closes one valve, and acting upon the surface of the water the other valve is opened, and the water flows into the boiler through the feed pipe. The flow of water continues until the weight of the inner vessel is sufficiently reduced to admit of its being raised by the counterweight, and thus restored to its normal position. The upward motion of the inner vessel is followed by the opening of the supply valve, and the closing of the steam and feed valves, and the self-acting operation of refilling the vessel again goes on. By means of either of these modifications of Mr. Auld's improved automatic feed apparatus, the due supply of water to boilers is most efficiently provided for; at the same time, the simple arrangement of the several parts almost preclude the possibility of derangement.

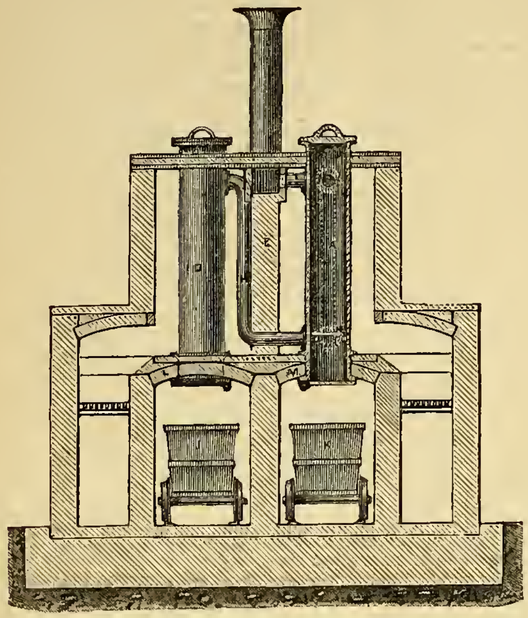
MANUFACTURE OF PRUSSIATE OF POTASSIUM.

J. H. Johnson, *London and Glasgow*, (J. V. Lucas, *Paris.*)—*Patent dated April* 9, 1859.

In carrying out this invention for the manufacture of the prussiate of potash, it is proposed to melt the carbonate of potash in a cast-iron vessel, with water, and then to add thereto a sufficient quantity of wood, charcoal, or coke, to completely imbibe the solution of carbonate of potash. The proportions which have been found to give the best results are: 65 parts in weight of carbonate of potash, 115 parts in weight of wood, charcoal, or coke, and 65 parts in weight of ordinary water. The whole is now heated until the charcoal or coke becomes thoroughly dry. The carbonate of potash will then be found distributed in the porous and spongy mass. This mass, with an addition of five parts in weight of iron filings, is introduced into two retorts, placed vertically within a suitable furnace.

Fig. 1, of the subjoined engravings, represents a vertical section of the furnace the patentee prefers to employ in carrying out the invention, and fig. 2 is a sectional plan of the same. A B, are the two retorts into which the spongy mass of charcoal and potash with the iron filings is

Fig. 1.



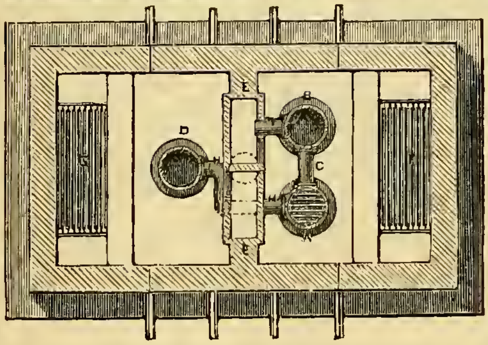


Fig. 2.

introduced; these retorts are of cast-iron, or other suitable material, and of a cylindrical or other convenient form. They are placed vertically side by side in a furnace, or in any other suitably constructed furnace. These two retorts, A B, communicate the one with the other by the pipe, C, which extends from the upper part of the retort, A, to the lower portion of the retort, B. The retorts, A B, are heated to a white heat, to entirely expel any remaining moisture or humidity which may be contained in the charcoal or coke, and also to reduce the carbonate of potash to the state of peroxide of potassium. Having effected the transformation, it is simply requisite, in order to obtain the prussiate of potash, to maintain the two retorts at a white heat, and to cause a stream of ammoniacal gas, obtained in any convenient manner, to pass through the interior of the retorts in contact with the charcoal and coke and iron filings contained therein. The mode preferred to be adopted in producing the ammoniacal gas, consists in mixing together equal parts in weight of sulphate of ammonia and quick lime, which is then poured into the cast-iron, or other retort, D, placed vertically in the same furnace, or in a suitable reverberatory furnace. Care must, however, be taken that the retort, D, be not subjected to a greater temperature than is requisite to disengage the ammoniacal gas. For this purpose, the patentee constructs in the furnace a partition wall, E, which allows the retorts, A B, to be heated to a white heat by the fire-place, F, whilst the fire-place, G, supplys the amount of heat required for the retort, D. One common chimney serves for the two fire-places, F and G, and for the final escape of the ammoniacal gas, after it has first passed by the pipe, H, to the bottom of the first retort, A, and permeated the mass contained therein, and thence passed by the pipe, C, to the base of the second retort, B, through which it also passes, when it finally escapes at the top, by the pipe, I, leading to the chimney. The whole of these connecting pipes may be furnished with step valves, for the purpose of regulating or intercepting at pleasure, the passage of the gas. On the completion of the process, the retort, D, is emptied into the waggon, J, which serves to remove the residuum. The contents of the retorts, A B, is emptied into an "etonfoir," or charcoal box, placed in the waggon, K, the two waggons, J and K, running along the rails laid beneath the arches, L and M, which receive the bottoms of the retorts, A B, and D. After the contents of the retorts, A and B, have been cooled down, the ordinary lixiviation and crystalisation of the yellow prussiate of potash contained in the mass is proceeded with. So soon as the retorts are empty, they are again charged with a fresh supply of the ingredients, and the process is repeated. The grating, N, in the retorts, A B, should be so disposed as to admit of easy removal and replacement at pleasure. The cyanide of potassium is obtained in precisely the same manner as the prussiate, by simply omitting the iron filings.

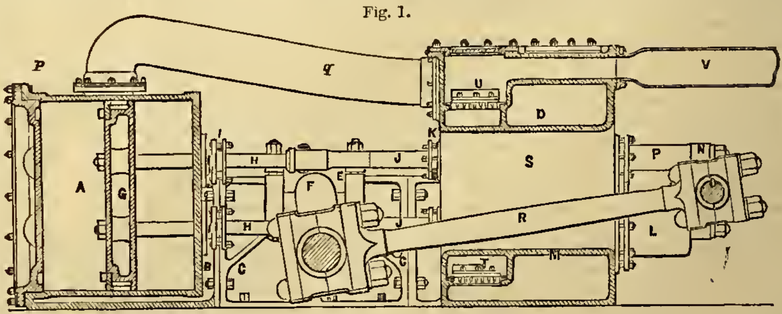
MARINE STEAM ENGINES.

William Todd, *Glasgow.—Patent dated April* 1, 1859.

The patentee's improvements relate to the arrangement and construction of a compact and effective form of marine engines, especially intended for screw propulsion, and suitable for war purposes, in as far as they are entirely beneath the water line of the vessel in which they are fitted, and thus out of the reach of the enemy's shot.

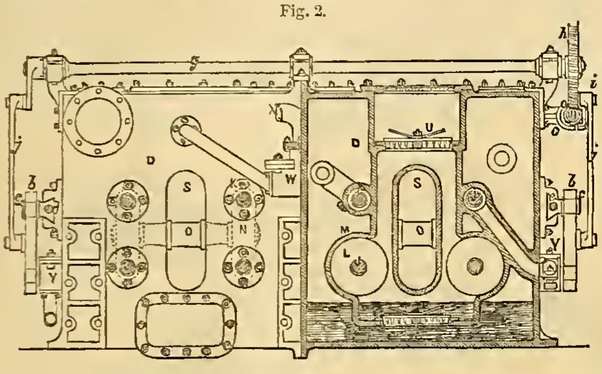
Fig. 1, of the accompanying engravings, is a longitudinal section of a pair of direct-acting engines, arranged according to one modification of the patentee's improvements. Fig. 2 is an end view of one of the condensers, and a sectional view of the contiguous condenser. In arranging engines according to this modification the pair of horizontal cylinders, A, are cast with three radially projecting flanged parts, B, two of which form a base on the lower side to admit of the cylinders being bolted to the transverse beams of the vessel, which beams form the foundation for the engines. The two cylinders are arranged parallel to each other on one side of the keel line of the ship, the axial line of each cylinder being at right angles thereto, and they are bolted to each other through the vertical parts of the radial flanges, B. The cylinders are bolted at their front ends to the transverse horizontal main framing, C, the opposite end of which framing is in like manner attached to the condensers, D, in which are arranged the air pumps, as well as the bilge and feed pumps. The main transverse framing, C, is arranged to receive the bearing, E, of the main crank or screw propeller shaft, F. The piston, G, of each steam cylinder, A, is fitted with four piston rods, H, which are disposed in pairs parallel to each other, and arranged at a sufficient distance asunder to admit of the rotatory movement of the crank or main screw propeller shaft, F. The piston rods, H, work out through the stuffing boxes, I, fitted to the front covers of the cylinders, A; and their outer ends are connected by means of cotters to the rods, J, which are passed through the stuffing boxes, K, in front of the condensers. The two lower rods, J, pass through the tubular plungers, L, which are made either of brass or gun metal, each fitting its corresponding air pump, M, in the condenser. The two air pumps in each condenser are arranged parallel to one another at the lower part of the condenser; the rods, J, pass right through the plungers,

Fig. 1.



L, and the end pieces, N, of the cross head, O, to which the rods are fastened by nuts. The end pieces, N, serve to connect the plungers, L, of the air pumps, with the plungers, P, of the upper and smaller pair of pumps, Q, which are worked by the rods, J, these rods forming the continuation of the upper pair of piston rods, H. The plungers, L and P, work out through stuffing boxes of corresponding size, fitted in the back or outer faces of the condensers; this arrangement of the pumps serving as an effective guide to preserve the parallelism of the piston rods. The connecting rod, R, which imparts its motion to the propeller shaft, is jointed at its outer end to the cross head, O, and at its inner extremity to the crank shaft, P, in the usual manner. In order to allow of the connecting rod passing inwards, from the outer side of the condenser, a vertical opening, S, is made right through the condenser from back to front, which opening is made sufficiently deep to allow ample space for the reciprocatory movement of the connecting rod. It is in the internal space of the condenser, below the opening, S, that the foot valve, T, which takes the water and vapour from the lower part of the condenser, is fitted. A corresponding delivery valve, U, arranged in the space above the opening, S, affords egress for the water and vapour either to the hot well or elsewhere, the water passing off by the eduction pipe, V. The feed pump, P, on the left of the half sectional view, fig. 2, communicates with the valve chamber, W, and the feed pipe, X, whilst the bilge pump, Q, to the right of the opening, S, is connected with the valve chamber, Y, the induction and discharge pipes of which are shown in the elevation. The steam cylinders, A, are each fitted with a slide valve, extending along the side of the cylinder, the slides being arranged to work with vertical faces. The slides are

Fig. 2.



actuated by the eccentrics, which are fitted on the crank shaft in the ordinary manner. The free extremities of the eccentric rods extend across nearly to the outer sides of the condensers, and at this part the eccentric rods of each slide are connected to the segmental link, *b*, the stud pin, *c*, of which is fast to a sliding piece formed on the end of the rod, *d*. The end of this rod slides to and fro in a guide, which is bolted to the face of the condenser; the opposite extremity of the rod, is cottered to the slide valve spindle. The valves are adjusted by means of the horizontal shaft, *g*, which extends across the condensers, and is carried in bearings arranged thereon. On one end of this shaft is a short lever, which is jointed to a descending connecting rod, the lower extremity of which is connected to the link at the side of the condenser. The other extremity of the shaft, *g*, has fast to it the segmental worm toothed wheel, *h*, in the face of which is fixed the laterally projecting stud pin, *i*, to which the upper end of the link, *j*, is jointed, its lower end being attached to the link, *b*. It is by means of the segmental wheel, *h*, that the necessary expansive, stopping, and reversing adjustments are obtained—the movement of the segmental wheel being obtained through a hand wheel. This wheel is carried upon a short horizontal shaft which is carried by the condenser; the shaft has fast to it a bevel pinion, which is in gear with a bevel wheel on the extremity of a shaft, the bearings of which are bolted to the side of the condenser. This shaft has upon its outer extremity a worm, which is in gear with the segmental worm wheel, *h*, so that by turning the hand wheel, the slide valves can be set, and their expansive action adjusted, as required. The steam from the boilers enters the slide valve chest of each cylinder through a main steam pipe, and the exhaust steam passes off by a pipe which extends upwards from the top of the valve chest, and passes over the propeller shaft and enters the condenser at the front. The general compactness of engines arranged in this manner, and the little height they occupy above the sole plate, render them particularly well adapted for vessels of war, in addition to which they afford peculiar facilities for getting at all the working parts either for the purposes of inspection or repair. The patentee has also shown his improvements as applied to a pair of geared marine engines arranged for working the shaft of a screw propeller. In this modification the superstructure of the engines is carried upon a sole plate or foundation, which is disposed at right angles to the keel line of the vessel, the cylinders being on one side of the keel and the condensers on the other, so that the weight is evenly distributed across the vessel. The pistons of the steam cylinders are fitted with two piston rods, arranged in a horizontal line and working out through stuffing boxes fitted at the inner or front ends of the cylinders. The extremities of the piston rods are connected to the end pieces of a cross head, and these end pieces of the cross head are attached by nuts to the rods, which pass through and are attached to the plungers of the air pumps, and those of the feed and bilge pumps. These pumps are arranged inside the condensers in the manner before described, and by means of the cross head connections the four pumps in each condenser work in concert, and serve also as guides for the piston rods. To the central part of each cross head is attached the inner end of the connecting rod, which passes through the vertical opening in its contiguous condenser, the extremity of each rod being connected to the cranks of a transverse horizontal shaft. To this horizontal shaft is keyed a spur wheel which gears with a pinion fast to the propeller shaft, to which it gives motion. The slide valve chest is cast on the inner side of each cylinder, and the slide valves are actuated by eccentrics on the horizontal shaft. The rod of one of the eccentrics is joined to the link movement, the stud pin of which works in a segmental guide, in which it is set so as to regulate the expansion by means of a vertical rod, which is fitted to screw up and down by turning a cross head. The lower end of this rod works through a bracket piece, the raising or lowering of which adjusts the position of the stud pin in the link The outer eccentric is joined to the spindle of the slide valve, the stud pin at the joint serving also to connect the valve spindle to the stopping and reversing movement, which is actuated by means of the moveable hand lever. The steam after it has performed its duty passes away by the exhaust pipes to the condensers, in which are arranged the foot and delivery valves, the waste water of condensation and vapour passing off by an eduction pipe. The other parts of the engines are similar to those in ordinary use, and therefore do not require particular description. Direct-acting geared engines arranged in this manner are compact, effective in action, well balanced, easy of access to their several parts, and the main working details are guided in a very superior manner.

MACHINERY FOR COMBING WOOL.

J. H. Johnson, *London and Glasgow*, (Cullen Whipple, *Providence, U.S.*)—*Patent dated April* 26, 1859.

These improvements relate to a peculiar construction, arrangement, and combination of machinery or apparatus for combing wool and other fibrous substances, whereby greater productive powers in machines of this class is obtained; whilst, from the simplicity of its construction, the machine may be worked at a considerably higher speed than usual.

Fig. 1 of our engravings represents a side elevation of the patentee's improved wool combing machine. Fig. 2 is a plan corresponding to fig. 1. A, represents the main framing of the machine, and the thin lines show the lap of wool passing between the two delivering rollers, B and C, which conduct it on to the top of the hot chest, D. This chest may be heated by the aid of steam or other convenient means, it is provided on its upper surface or lid with a series of upright plates, E, arranged regularly at such distance apart as will admit of a row of gill combs, F, being placed and moving freely in a vertical direction in each of the intervening spaces between the plates. In front of the hot chest, D, but in close proximity thereto, are arranged two or more rows of fine screen combs, G, which are capable of rising above and falling below the top surface of the hot chest, nearly simultaneously with the gill combs. Supposing the lap of wool to be drawn over the surface of the hot chest, and the gill combs, F, and when the screen combs, G, are in their lowest position, the jaw, H, descends, and holds the end of the lap firmly against the top plate of the hot chest, D. This descent of the jaw is effected by means of the cam, I, on the main shaft, J, of the machine, which depresses the lever, K, and as this lever is connected by a rod with the moveable jaw, H, it follows that the descent of that jaw will be effected. The rotatory comb, L, carried by the vibrating arms, M, is now made to rise, when the protruding end of the lap projecting beyond the jaw, H, is combed by the revolving comb, L. This comb obtains its motion from a spur wheel, carried by the shaft, N, which also forms the working centre of the arms, M, and this wheel gears with a pinion fast on the shaft of the comb, L. This arrangement enables the pinion to be kept in gear with the wheel in whatever position the arms, M, may be placed. The rising and falling motion of the rotatory comb, L, is obtained from the crank, O, on the main shaft, J, of the machine, which transmits motion by means of a connecting rod to the vertical arm of a bell crank lever, P, fast on a shaft working in bearings attached to the lower part of the main framing, A, having its horizontal arm connected by means of the rods, Q, with the vibrating arms, M. A pair of nippers, R, mounted on a cross head which slides between the guides, V, in the same plane as the top of the hot chest, or in a plane parallel thereto, now approach, and at the same time the arms, M, descend, and bring the rotatory comber, L, to its lowest position. In the mean time suitable cams fast on the main shaft, J, by acting upon the levers, S, T, respectively connected by the rods, U, V, to the gill combs, F, and screen combs, G, elevate their combs and raising them up above the plates on the hot chest, forces them both through the lap, whereupon the pressure on the lap is relaxed by the raising of the jaw, H. The nippers, R, have by this time arrived within reach of the protruding end of the lap, which has already been combed by the circular comb, L, and seizing it, they commence to recede from the hot chest, drawing the lap through the heated gill combs and fine screen combs, O, until in their course they draw out or separate a portion of the lap from the reel, which detached portion they carry along and deliver upon an endless apron of card clothing, W, arranged underneath the nippers. The opening and closing of these nippers, R, at the proper periods of time is effected by means of the cam, X, on the main shaft, J. This cam acts upon the vertical lever, Y, fast on a transverse rocking shaft, Z, which shaft also carries a horizontal arm connected by the rod, *a*, to the lever arm, *b*. This arm, *b*, is fast on a spindle, *c*, also provided with an arm, *d*, which, by acting upon the tail, *e*, of the moveable jaw of the nippers, R, closes them, a spring keeping them open when not acted upon by the arm, *d*. The travelling motion of these nippers is obtained from the crank, O, and vertical arm of the bell crank lever, P, in describing the motion of the rotatory comb; the free end of the vertical arm, P, working in a recess in the underside of the sliding frame which carries the nippers. It is thus obvious that the motions of the nippers and rotatory comb will be simultaneous, but as the nippers are connected with the long vertical arm of the bell crank, their course is horizontal, and of a greater range than the travel of the comb, L, which being connected with the short and horizontal arm, has a vertical travel of less extent than the nippers. *f*, is a brush for brushing down and insuring the deposit of the fibrous material on to the endless card apron, so soon as the jaws of the nippers are relaxed. Whilst the nippers are engaged in deposit-

Fig. 1.

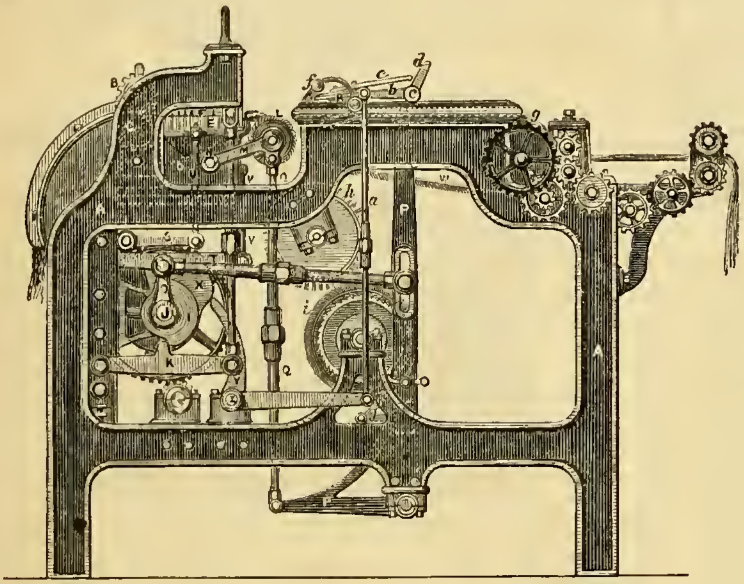
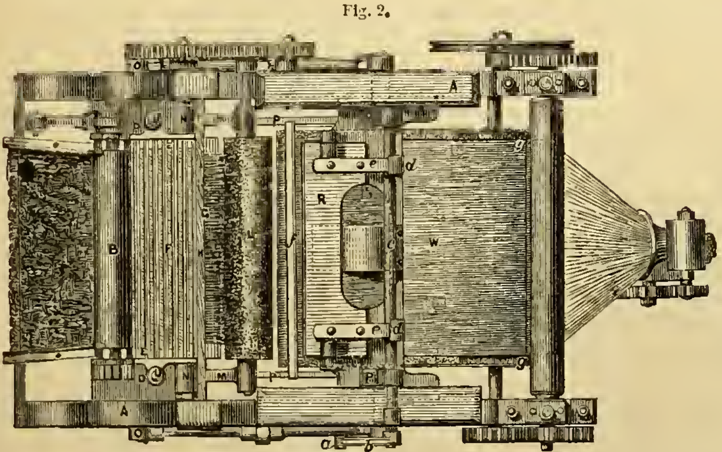


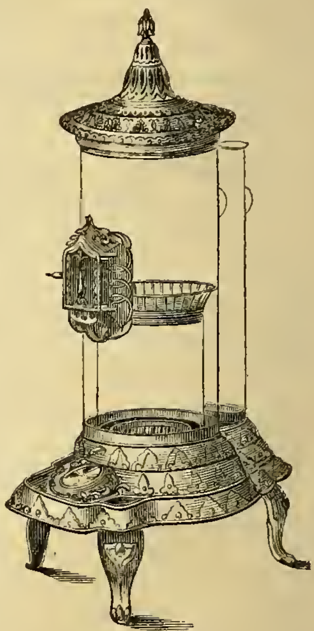
Fig. 2.



ing the fibrous material that has been combed upon the apron, as just described, the revolving comb, L, is at work upon the protruding end of the lap, close to the fine screen combs, O. As the nippers again approach, the revolving comb falls below their path, and the operation previously described is again repeated. A sliver is thus formed upon the endless apron, and is carried along by it until it reaches the delivery rolls, *g*, where it is passed between them in one continuous sliver, and deposited where desired. As the revolving comb, L, descends to its lowest position, it comes in contact with the revolving cylindrical brush, *h*, by which the dirt and noil are removed from it. The cylinder, *i*, which is covered with card clothing, takes up the refuse so collected upon its surface, whence by means of the single comb, *j*, attached to the vibrating arms of the bell crank, P, it is taken off and dropped into the receptacle for the noils.

LAW REPORTS OF PATENT CASES.

GAS STOVES: IN THE MATTER OF THE INTERFERENCE BETWEEN THE APPLICATIONS OF MESSRS. ABBOTT & LAWRENCE AND JAMES SPEAR, FOR AN AMERICAN PATENT.—This was an argument before the Hon. W. D. Bishop, the Commissioner of Patents for the United States, as to the respective rights of Messrs. Abbott & Lawrence and Mr. James Spear, to an invention of air-tight gas burning stoves. Mr. H. Howson, formerly a practitioner in Manchester, being counsel for Messrs. Abbott and Lawrence.



The invention relates to an improvement in what are commonly termed cylinder stoves, to be used for heating purposes, the fuel employed being anthracite coal. These stoves generally consist of a base, sometimes of sheet and sometimes of cast-iron, a grate, a sheet-iron cylinder or body, with a fire-pot (termed by the witnesses, in some instances, a clay or brick cylinder) in the interior for containing the fuel, a door and door frame, usually made of cast-iron, a cap, and a branch pipe communicating with the chimney. Two kinds of cylinder stoves are alluded to in the testimony, radiating and non-radiating. The term radiating is applied in Philadelphia to those stoves which have a diving flue within the sheet-iron cylinder, and between the latter and the fire-top, this diving flue communicating with an exterior tube leading to the branch pipe. The non-radiating cylinder stoves are those in which the products of combustion pass directly upwards, within the cylinder or body, and thence through the branch pipe to the chimney.

Our engraving represents the radiating stove, with the cylinder in outline, to show the essential features of the arrangement more clearly. It is the central portion of the stove which was claimed by both parties. The essential feature of the new arrangements, was the effective consumption of the gaseous products of combustion, by the injection of jets of heated air upon the ignited fuel.

In both the arrangements the under side of the door frame below the door is perforated, so as to communicate with the ring in the interior of the stove body. The ring being perforated also, the air thus heated in the ring passes to the fuel. After a very long investigation and most copious evidence, involving many peculiarities of legal system as compared with our procedure, the Commissioner of Patents decided in favour of the priority of Messrs. Abbott and Lawrence's claims.

The counsel for Spear appealed from this decision, and filed several reasons to the following effect:—That the testimony of Lawrence and Bell—certain witnesses — was not rebutting evidence, and therefore ought to be excluded; that Spear was the original and first inventor, and that it had not been shown that he pirated it from Abbott and Lawrence; that these gentlemen had no slide on the door when it was made, and did not apply for it until they had seen Spear's patent; and that a long time had intervened from the time that Abbott & Lawrence made the invention until they applied for a patent.

An answer to these reasons of appeal was filed by Messrs. Abbott and Lawrence, whose counsel contended that the rules of the courts in taking testimony did not apply to interference cases; that the testimony of Lawrence and Bell fully proved that Messrs. Abbott & Lawrence made the invention in July, 1857, whereas, Spear could not show even by the worthless testimony taken on his behalf, that he made the invention earlier than August, 1858, and probably not before January, 1859; that if it had not been fully proved that Spear pirated the invention, the suspicion that he had done so was very strong, as he had oppportunities of seeing the drawings, &c., of Abbott & Lawrence, before he, Spear, filed his caveat; that a slide on the door was premeditated as far back as July, 1857, by Messrs. Abbott & Lawrence, who took steps to apply for a patent long before the date of that issued to Spear, and that Messrs. Abbott & Lawrence applied for their patent within two years from the date of the invention.

The Hon. J. Dunlop, Chief Judge of the U. S. District Court, District of Columbia, overruled the objections of the counsel for Spear, and by his decision of September 21st, affirmed the judgment of the Commissioner of Patents.

Beating Eggs: Griffiths v. Turner.—This was an action in the Court of Queen's Bench before Lord Chief Justice Cockburn and Justices Wightman, Crompton, and Hill, and it was brought to recover damages for the infringement of the plaintiff's patent for "improvements in apparatus for beating eggs and other fluids and matters." At the trial, reported by us in August last, a verdict was entered for the plaintiff, subject to a motion to enter the verdict for the defendant, which now came on to be argued. The plaintiff's patent was granted on the 27th of May, 1857, and in his specification he thus describes his invention:—

"This invention has for its object improvements in apparatus for beating the whites of eggs and other fluids and matters. For these purposes a suitable frame is constructed to fix on the upper part of a saucepan or other vessel in such manner as to be readily removed when the beating of the contents of the vessel has been accomplished. This frame carries an axis, with a crank handle, to enable the user to give a quick rotatory motion to the axis. The axis gives motion by suitable gearing to two frames, which are caused to rotate within the vessel in opposite directions; the frames are furnished with projections, which are interspaced so that in their rotation in opposite directions the projections of one frame pass between the projections of the other frame. The forms of the frames, and the manner of giving motion thereto, may be varied, so long as they are formed with projections, and the projections of the different frames are arranged to pass each other."

The question for the Court was, as to the novelty of the invention, it being contended that it was anticipated by Follett and Eastwood's patent, and by Hicke's, No. 2.

After hearing Mr. Bovill at some length for the plaintiff,

The Court, without calling upon the defendant's counsel, made the rule absolute to enter the verdict for the defendant upon the issues as to the novelty of the plaintiff's invention.

Copyright of the Title of a Serial: Photographic Journals of London and Liverpool.—The Photographic Society (London) publishes a journal of its proceedings; this journal, up to the close of last year, appeared under the title of the *Journal of the Photographic Society;* though it advertised itself in the newspapers, and was generally known in the trade, by the briefer designation of the *Photographic Journal.* At the opening of the new year, a Lancashire publisher, who owned a local periodical, entitled the *Liverpool and Manchester Photographic Journal,* wishing to take broader ground for his periodical, proposed to change its name to the *Photographic Journal,* with a sub-line explanatory of its local character and antecedents. The Photographic Society objected; and to guard their right, they put their familiar title on their front page and on their head-lines, and registered their corrected name in the usual way. This act set them on strong legal, as well as moral, ground. The Lancashire proprietor complained of this; and, in spite of the precautions taken, brought out his journal. Confusion arose at the post-office, in the trade, and in the editorial departments of the two papers. Law for a time threatened both sides with loss; but good sense at length prevailed so far that the rival editors and proprietors submitted their several claims to the arbitration of Mr. H. G. Bohn.

This is the decision:—

"*Re the Photographic Journal.*—After reading over all the allegations and replies in this matter, and duly examining and weighing them in connection with the exhibits, I have arrived at the following conclusion, namely,—That the proprietors of what in 1854-1856 was published at Liverpool under the title of the *Liverpool Photographic Journal,* and 1857-1858 as the *Liverpool and Manchester Photographic Journal,* were not justified, either morally or equitably, in changing their title in January, 1859, to that of the *Photographic Journal,* this being the familiar title of the concurrent *Journal of the Photographic Society of London,* which, since its commencement in 1853, has uniformly and officially been superscribed by their own binder as the *Photographic Journal;* and under this condensed name is generally recognized, as well by its proprietors, editors, and correspondents, as by the book trade at large. I am further of opinion that the said title, the *Photographic Journal,* as adopted by the Liverpool proprietors, is in no way altered or qualified by the small lines of type beneath it, which really form no part of the title, and might at any convenient time be omitted. I have no hesitation in deeming the title, though so printed, an infringement on that claimed by the Photographic Society of London, and likely to mislead the public and occasion damage to the plaintiffs. The *Liverpool and Manchester Photographic Journal* is not known to London publishers under any shorter title than the *Liverpool Photographic,* and is never named without its Liverpool prefix, whatever it may be in its own immediate locality. I think the copyright entry of the title the *Photographic Journal,* made by the Photographic Society of London in December, 1858, with the object of securing a title belonging to them, and which they saw was about to be invaded, a justifiable precaution. Finally, I hold that the Liverpool publishers are bound to relinquish the title they have assumed, substituting for it any other which will leave no room for misapprehension as to the distinctness of the two journals.

"Henry G. Bohn.

"*York Street, Covent Garden.*"

This is very satisfactory. Copyright titles are veritable "trade marks" and must be respected.

MECHANIC'S LIBRARY.

Chemistry of the Non-Metallic Elements, fcap. 8vo, 10s. 6d. Griffin.
Micrographic Dictionary, second edition, 8vo, 45s. Griffin & Henfrey.
Inventional Geometry, crown 8vo, 1s., cloth sewed. Spencer.
Builders' Prices, 1860, 8vo. 4s. 6d., cloth. Skyring.
Builders' and Contractors' Price Book for 1860, 12mo, 4s., cloth.
Gas Consumer's Manual, 12mo, 2s., cloth sewed. Marriott.
Peaks, Passes, and Glaciers, edited by Ball, fourth edition, post 8vo, 21s., cloth.
Rifle, and How to Use it, fifth edition, fcap. 8vo, 2s. 6d., half bound. Busk.
Hydrostatics, Elementary Treatise on, 8vo, 7s. 6d., cloth. Potter.
Stars and the Telescope, 12mo, 1s., sewed. Slugg.

REGISTERED DESIGNS.

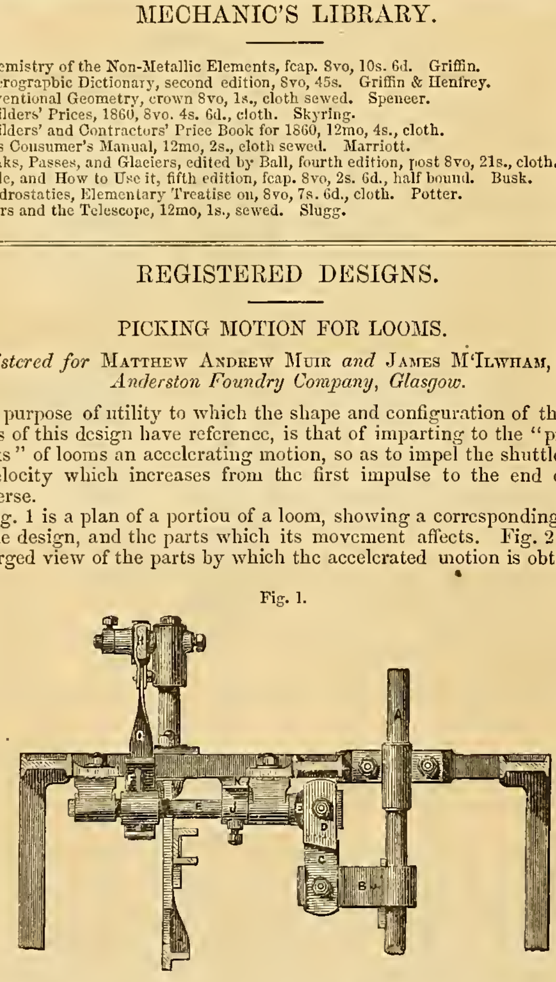
PICKING MOTION FOR LOOMS.

Registered for Matthew Andrew Muir *and* James M'Ilwham, *of the Anderston Foundry Company, Glasgow.*

The purpose of utility to which the shape and configuration of the new parts of this design have reference, is that of imparting to the "picking sticks" of looms an accelerating motion, so as to impel the shuttle with a velocity which increases from the first impulse to the end of the traverse.

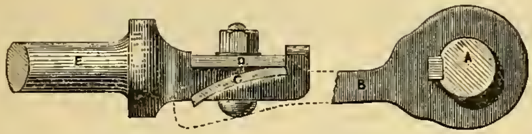
Fig. 1 is a plan of a portion of a loom, showing a corresponding view of the design, and the parts which its movement affects. Fig. 2 is an enlarged view of the parts by which the accelerated motion is obtained.

Fig. 1.



The tappet shaft, A, has keyed to it the laterally projecting arm, B, which is carried round with the rotatory movement of the shaft. The arm, B, has bolted to it a curved plate of metal, C, the slot in which admits of its accurate adjustment, the plate extends outwards towards the end standard of the framing, and its face is curved downwards, as shown in fig. 2, which represents the parts, B and C, in an inverted position, to show more clearly the configuration of the curved part, and the inclination at which the plate is set on the arm. The free extremity of the plate, C, is cut off obliquely, and in its rotation it comes into contact with the corresponding extremity of the plate, D, which is bolted to the flattened extremity of the shaft, E, shown in fig. 2. The shorter

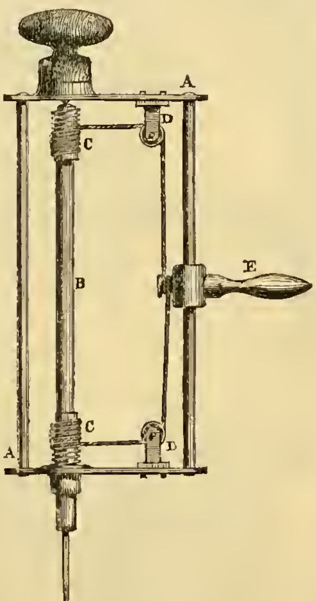
Fig. 2.



side of the plate, B, first comes in contact with the longer side of the plate, D, as shown in the plan, fig. 1. The shaft, E, has keyed to it the segmental arm, F, to which the strap, G, of the picking stick, H, is attached. As the plate on the arm, B, comes in contact with the plate, D, the curved surface of the plate, C, causes the picking stick to come gently against the end of the shuttle, the velocity of the motion increasing as the plate, D, glides rapidly over the plate, C. After impelling the shuttle, the picking stick is brought back to its former position by the spring, I; and to prevent oscillation of the moving parts, a metal boss, J, having a flat surface, is fixed to the shaft, E; the face of this boss comes up against the spring, K, after the picking stick has completed its stroke, and by its pressure quickly restores the parts to their normal position. A corresponding arrangement is fitted on the opposite side of the loom, so as to operate the picking sticks alternately.

QUICK ACTION DRILL STOCK.

Registered for Mr. William Press, *of Walburgh Street, Cannon Street Road, London.*



This improved drill stock is arranged for drilling holes in metals and other substances with greater ease and rapidity than is attainable by the use of any description of drill stock hitherto made. In the accompanying engraving, A is the frame of the drill stock; B is the spindle, carrying the drill. Each end of the spindle, B, has a spiral external thread, as shown at C. On the frame are fixed two small pullies, D. A handle, E, is attached to the frame, so that it may slide from end to end upon it. To the inner side of the handle is fastened a gut or string, which passes over the pullies, D, from thence around the spiral threads, where its ends are fastened. By working the handle, E, from end to end on the vertical bar of the frame, a very quick motion is imparted to the spindle and drill by means of the gut or string passing over the pullies and in the grooves or spiral guides, which may be large or small in diameter according to the kind of work for which the drill is required.

REVIEWS OF NEW BOOKS.

Stories of Inventors and Discoverers in Science and the Useful Arts: A Book for Old and Young. By John Timbs. 8vo. Pp. 344. Wood Engravings. London: Kent & Co. 1860.

Those readers of the present year who are athirst for scientific information under an attractive form, will find very agreeable matter in Mr. Timbs' volume of "Stories of Inventors," and they will discover it to be a very particularly apt sequel to the author's "Things not generally known," reviewed by us in January, 1859. The sciences of mechanics and chemistry, have furnished by far the greater proportion of these stories, and the work is therefore peculiarly well-fitted for notice in our columns. It embodies sixty different narratives, ranging from Archimedes to Brunel, and is illustrated by twenty-six engravings. We shall quote from the author's preface:—

"The *antiquities* of such subjects are curious, and interesting to a large class of readers: as in the cases of Printing and Gunpowder; the Art of Navigating the Air and Living under Water; the marvels of Automata; and a host of 'Secret Inventions' besides those of John Napier.

"Occasionally it has been but justice to set in their proper light the merits of old workers—as in 'The True History of Friar Bacon,' who was a reformer of science centuries before his more illustrious namesake, Francis Lord Bacon. In the 'Story of Paracelsus' too, a proper estimate is attempted of his discoveries, which have been, in some instances, obscured by his quackery.

"To the next group of Inventors—of the times of the Civil War and the Restoration—a sort of romantic interest attaches: whether in the philosophical pursuits of Prince Rupert beside his forge in the keep of Windsor Castle, or in importing 'Rupert's Drops;' in the recreations of Sir Samuel Morland, 'Master of Mechanics' to Charles II.; or in the *Century of Inventions* by the Marquis of Worcester, who by this rational means beguiled the captivity in the Tower of London to which his loyalty had consigned him. His 'Water-commanding Engine' is believed to have been one of the results of that period.

"In 'the separate, simultaneous, and yet mutually dependent progress of industry' in the latter half of last century, several instances have been gathered; at the head of which is that of 'Watt, who, poo in worldly wealth, but possessed of mental riches vouchsafed to few, was then wishing to realise an idea destined to effect more surprising results in the history of Britain than the wars, alliances, and legislation of centuries.' Then, what a series of sufferings and conflicts with jealousy and ignorance can be traced in the progress of the Cotton Manufacture, consummated by Watt's great invention!

"To a somewhat earlier period belongs the perils of John Lombe in his furtive journey to Piedmont, to bring over Silk-throwing machinery; and the story of Lee's invention of the Stocking-frame, traceable to the tenderest feeling of man—his sympathy for 'the sole part of all his joys.'

"In another group of narratives we see how brilliant was the success of Davy's Safety-Lamp, and how miserable the fate of poor Carcel; and how hard was the battle which the projectors of Gas-lighting had to fight with parliament-men and men of science, ere the new light broke forth upon the world.

"Next we have the Era of engineering, in which our country was improved by Canals, Lighthouses, and Harbours, Bridges, Breakwaters, and Docks,—by Brindley, Smeaton, Telford, and Rennie, whose fortunes, as here narrated, are so many cheering lessons to striving genius.

"The Steam-boat yields a long and interesting chapter,—from the records of nearly four centuries since to the fate of Symington, whose invention led to the earlier accomplishment of Steam Navigation in another country.

"The Railway proved, however, a more secure success through the genius of George Stephenson, 'once a locomotive stoker in the north of England, and afterwards one of the most distinguished engineers of modern times,' succeeded by his not less distinguished son, Robert Stephenson, whose genius matured the system which his father had originated. To this group also belong the Brunels, father and son, the latter famed for his Railway Works and Iron Shipbuilding.

"The arch-chemic art of Photography, aided by the science of the Stereoscope, forms the next chapter; and the work concludes with an account of the Electric Telegraph, its anticipation and consummation, which is crowded with incident."

We have read the volume through with great pleasure. The labour which the author has bestowed upon it has evidently been a pure labour of love, and well has he carried it through. It is indeed a volume well suited for all who

"Do noble things, not dream them all day long."

A Manual of Scientific Enquiry: Prepared for the use of Officers in H. M. Navy, and Travellers in general. Originally edited by Sir J. F. Herschel, Bart. Third edition. Superintended by the Rev. Robert Main. London: Murray. 1859.

This volume should be the abiding companion of every traveller who takes an interest in science, and who wishes to turn what he sees to account. Here will be found papers of instruction how to, and what to observe, under the heads of—astronomy, hydrography, tides, terrestrial magnetism, meteorology, atmospheric waves, geography, statistics, medical statistics, ethnology, geology, mineralogy, earthquake phenomena, zoology, and botany. Originally composed by men who stand in the first rank in their respective sciences; they have been carefully revised for the present edition, and in some instances rewritten. They do not profess to teach the sciences to which they relate, that would be impossible in a volume of the dimensions of this; but they are confined to the giving of instruction to travellers unversed in the details of science, how they may usefully employ themselves in collecting materials that will be valued by philosophers at home—materials that may be employed by them as data for evolving new truths or for confirming the old. The papers are of different lengths, and of different values. Some form a very complete summary of advice, with full directions for prosecuting a branch of enquiry with profit and effect. Of this class we may instance Sir John Herschel's paper on meteorology;

and Dr. R. Owen's on zoology. Others are short and far from being so perfect as they might have been made. For example, the traveller who intends to devote his spare time to a study of the vegetable kingdom, must frequently find the want of fuller instructions than those given him under the head of botany. On the whole, however, the volume is a very valuable one, and must aid in propagating a spirit of enquiry, and, therefore, in advancing science to no inconsiderable degree. We would throw out the suggestion that a supplementary volume should be prepared to contain the tables of figures, formulæ, &c., so often required by those who observe and note.

THE BOYS' PLAY-BOOK OF SCIENCE. By John Henry Pepper. Routledge: London. 1860.

MR. PEPPER, formerly so well known, and deservedly esteemed, as the popular lecturer at the Polytechnic Institution, and now and lately more widely known—and still more deserving to be esteemed—for his very superior discourses at the Crystal Palace, has, in this volume, furnished a desideratum which will be appreciated in many homes. The book includes a clear and concise explanation of the various manifestations and arrangements of chemical and philosophical apparatus required for the successful performance of scientific experiments, in illustration of the elementary branches of chemistry and natural philosophy, and is illustrated with many hundreds of engravings on wood, chiefly executed by the clever and careful hand of Mr. H. G. Hine. An intelligent boy or girl (for really we do not see why this should not be called a girl's book as well as a boy's) goes to "The Polytechnic," or the Crystal Palace, or perhaps even to that aristocratic assembly at the Royal Institution, and hears Faraday, or some other of the notables, teach great and important truths so simply, that the resolution is then and there made to go home and teach the same things to the brothers and sisters there. Home is reached, preparations are made; but something is imperfect. Nothing succeeds. A pleasant hope has given way to disappointment, and disappointment to dispair. The idea is reluctantly abandoned, and the thoughts, happily, in youth, are not long in finding some other object. And yet, some how or other, we cannot help thinking that *many* an embryo philosopher and benefactor to the world has been thus stopped in his career just at the setting out. If we had stumbled upon such a book in our younger years! Ah, surely one philosopher was nipped in the bud! It is long since we have been compelled to circumscribe our sphere of action, and we are supremely happy if now and then we point out some little improvement in mechanism, or introduce it to the comparatively small republic of the mechanical world. But so it is; and we must not complain, if our youngsters are observed daily to be acquiring knowledge beyond, or better distilled than our own.

The book is dedicated to the children of Professor Lyon Playfair. Such a dedication in itself shows conscious worth, which the contents of the volume fully bear out. We have 446 large crowded pages, detailing many mysteries, as the following list will prove:—The properties of matter—impenetrability; centrifugal force; astronomy; centre of gravity; specific gravity; attraction of cohesion; adhesive attraction; capillary attraction; crystallisation; chemistry; chlorine; iodine; bromine; fluorine; carbon; boron; silicon; selenium; sulphur; phosphorus; frictional electricity; voltaic electricity; magnetism and electro-magnetism; electro-magnetic machines; the electric telegraph; Ruhmkorff's, Hearder's, and Bentley's coil apparatus; magnets; electricity; dia-magnetism; light, optics, and optical instruments; the refraction of light; the inflection or diffraction of light; the polarisation of light; heat; the steam engine. Surely here is enough at once, but not enough if done so well.

Mr. Pepper, after this, must anticipate that the intelligent public will expect many more such volumes from him, and we shall be delighted to welcome them. In the meantime, we shall do no bad service in strongly recommending the volume to all parents, teachers, and friends, as a present at this or any season of the year, to the youngsters around them who display a taste for scientific pursuits. We may add that the price (six shillings) for so handsomely "got up" a volume is surprisingly cheap.

OUR MILITARY ENGINEERS: being an Inquiry into the Present State of Efficiency of the Corps of Royal Engineers. 8vo. Pp. 8. London: Judd & Glass. 1859.

AFTER a long peaceful slumber, we have just awakened, for the first time it may be said within the limits of our generation, into a state of military fever. It is to this sudden start, we presume, that we owe the production of the present considerations upon "Our Military Engineers." "Strange as it may seem," says the author, "it is nevertheless a fact, that the army at the present moment, is without an efficient corps of engineers." We certainly hear this for the first time; but then, apart from the purely scientific questions bearing upon this arm of the service, we naturally do not concern ourselves much with military affairs. The author brings forward, by way of presumptive proof of the soundness of what he urges—the recent disastrous Peiho affair—and he then proceeds to show that we are all wrong in our system of educating our military engineers. We cordially agree with him in his view that men cannot be found to perform both civil and military duties, as is the present practice. He proposes to separate these, and the following are his ideas upon the matter:—

"Having in view the difficulty which might be supposed to arise in the separation of the civil and military duties of the corps of royal engineers, I believe that all difficulties may be got over by confining the corps to the practice of military duties—which would include the construction of works of fortification, the practice of military bridges, pontooning, siege operations, light infantry manœuvres, &c., being under the control of the Commander-in-Chief.

"That the exclusively civil duties which they are now supposed to perform, and consisting of the designing, executing, and repairing barrack buildings, storehouses, the management of War Office lands, &c., be handed over to a civil corps analogous to the Military Store Department, and subject to the Secretary of War.

"This corps would be available in time of war as a substitute for the late Army Works Corps, and could be made to perform the professional duties required in connection with Quarter-Master-General's Department, thereby permitting the employment of the corps of Royal Engineers solely in the military operations of a siege.

"The civil corps to be composed of men who, previous to their appointment, have received a practical training in architecture, civil engineering, building, &c.

"This corps could also render much service to the military engineer, whose training in the building operations must of necessity be less practical; where, for instance, in conducting works of fortification, which frequently include barracks for the troops and other buildings, the military engineer might receive the assistance of one or more of the civil corps to take part in the superintendence—which would obviate the necessity of his launching into the wide field of study and research consequent on the practice of the civil profession, and permit him to devote his energies to the more legitimate study of military science."

This is all very sensible, and the writer evidently understands his subject, and proposes a remedy which goes to the root of the matter, and with which all thinking people will agree.

A NEW CATALOGUE OF PAPER MILLS IN ENGLAND, IRELAND, AND SCOTLAND. Small 8vo. Pp. 14. Edinburgh: Macfarlane & Son, Stead's Place, Leith Walk. 1860.

THIS very prettily got up catalogue may be said to belong to a class of books, the publication of which we have always strongly advocated, and which we are glad to say is greatly on the increase—we refer to the now numerous illustrated catalogues of mechanical engineering productions. Messrs. Macfarlane's book, however (as its title indicates), is not a catalogue of positive productions, but it is to the full as valuable as the books of that class—perhaps more so—because it is of wider general utility. It furnishes in four distinct columns the government numbers of the mills, in progressive order, the names of the owners, the specific titles of the mills, and the exact localities where they are situated. The English, Scotch, and Irish mills, are given in separate lists, thus greatly facilitating the references to them. The English mills run from number 4 up to 694, but of course there are many gaps from disused works, the actual number of mills in operation being 333. The Scotch mills number from 1 to 79, the real number at work being 54. In this list the qualities of paper made are given with each mill—a very important addition to the information, which we should have been glad to find appended to the English and Irish lists. The Irish mills number from 1 to 70, the actual number being but 27.

Kent and Devon are the principal seats of the English paper manufacture, the number in Kent being in overwhelming majority; but the mills are also very widely scattered over the length and breadth of the country. In Scotland, the counties of Lanark, Mid-Lothian, and Aberdeen, are the most prolific in paper mills; and in Ireland, Dublin is the great centre. All business men are frequently in want of the names and addresses of the representatives of specific manufactures and trades. Messrs. Macfarlane have made good provision for the foundation of a good system of the kind, and we shall be glad to see it followed out in other directions.

THE ENGINEER'S, ARCHITECT'S, AND CONTRACTOR'S POCKET-BOOK FOR THE YEAR 1860. 8vo. Pp. 454. Plates and Wood Engravings. London: Lockwood & Co. 1860.

THIS most useful pocket volume of practical reference, originally conceived by, and so long in the hands of, Mr. Weale, has now changed publishers, as we have noted above. We are glad to be able to say that it does not suffer in the hands of Messrs. Lockwood, for it has increased in bulk, and displays considerable accessions of modern matter such as modern engineers, architects, and contractors must have in an easily accessible form for use in their daily avocations—leading off with the "Ephemerides of the Planets for Greenwich Mean Time," and the usual calendared information; we are next introduced to a novelty in the shape of a "Gas Engineers' Calendar," embodying tables for calculating the periods of lighting and extinguishing gas lights, and other reference details of great practical use. Another addition is the "Memorandum Book of Mr. Telford," the publication of which here is a very happy idea, conveying as it does a vast amount of condensed information on points ever recurring in practice—information, too, of a truly standard and unchangeable kind—culled not only from the practice of the pre-eminently great man whose name the "Memorandum Book" bears, but also from the attainments of contemporary and earlier engineers, whose deductions are equally trustworthy.

The next important section is the "Epitome of Mensuration," which is so arranged as to be what it is styled—a complete instructor in little, in the art of mensuration, or the calculation of contents and dimensions.

Our drainage system being now one of the leading topics of discussion amongst the men of action of our time, we very properly have here a chapter on "Sewers," giving the theory of construction and the cost of such ducts.

The "mechanical properties of metals;" weights and strengths of various structures in metal; strengths of iron; cast-iron girders; flooring; roofs; pitch of wheels; Bessemer's manufacture of iron and steel; synopsis of British copper mines; hydrodynamics; boilers, furnaces, and chimneys; economic values of different coals, &c.; pumping water by steam power; marine screw propulsion; railway calculations; railway and building contractors' prices; and a mass of tabulated matter, swell up the bulk of the volume. We recommend it to every engineer, architect, and contractor, as one of the best pocket companions he can have; and we are satisfied that there are many readers of the *Practical Mechanic's Journal* belonging to none of these professions who would be none the worse of adding it to their stock of printed learning.

URE'S DICTIONARY OF ARTS, MANUFACTURES, AND MINES. New Edition, chiefly re-written and greatly enlarged. Edited by Robert Hunt, F.R.S. 8vo. Monthly Parts, I. to III. Pp. each 192. Wood engravings. Longmans, London. 1860.

WHEN Dr. Andrew Ure produced his origiual dictionary he certainly accomplished well what no other man had attempted. He gave us a book which, under the modest title of "Dictionary," told us far more than any other book of anything like a similar compass had ever done before; and it may be said that no man of scientific knowledge in our time exerted himself so industriously as did Dr. Ure, when he resolutely sat down to prepare what we may with justice call his industrial encyclopædia. To this day there is no book to which we should more readily turn for general information on the industrial details of scientific practice than to that of Dr. Ure. Still, as years roll by, the workshop and laboratory continually reveal to us facts and discoveries which must be stored up. The practice of one year is ignored in the next; and whilst we must always fall back upon a certain standard of hard won knowledge, we are necessarily compelled to lay hold of every accession to our accumulated gains in the great field of human investigation. In taking Dr. Ure's great work as a text-book, Mr. Robert Hunt has well performed his part in bringing up our vast arrears of practical knowledge. In doing this he has apparently gone very laboriously to work, and, in connection with no fewer than forty-three eminent contributors, has entirely re-written more than two-thirds of the original volume.

We must at present judge of the merits of the new edition from an examination of but three parts out of the fourteen which are to make up the work; but in this section we can pretty clearly discover the aim and compass of this mended collection of scientific facts and theories. So far as the parts show, great care has apparently been bestowed upon the main elements of the book; but there are some divisions of it which might very properly have been subjected to a more severe excision. For instance, the first line in the second edition of the volume is this: "Abb-wool. Among clothiers this term signifies the woof or weft." The corresponding line in the new edition is: "Aba—A woollen stuff manufactured in Turkey." Now, here is an alteration certainly, but it puzzles us to know what addition to our information has been gained by the alteration. We hope that the future parts will exhibit somewhat greater attention to a proper revision of antiquated and useless matter.

CORRESPONDENCE.

LUNAR MOTION.

IN the last two numbers of *The Practical Mechanic's Journal*, Mr. Bertram Mitford, and Mr. E. Hill, have endeavoured to show,—the first, that the moon has no axial rotation, the second that she has this rotation. Professor Airy's letter, published in Mr. Symon's pamphlet of 1856, points out very clearly the absolute motions which the moon really possesses. There is no dispute as to the facts that the moon revolves round the earth, and performs in the same time, what may be called, a cosmical rotation.

Now, as it appears to me, the ground of the dispute is this;—whether is this cosmical rotation of the moon a rotation on the moon's axis, or on the axis of the radius vector of the moon's geocentric orbit? Mr. Mitford, and those who take the view which he takes, endeavoured to prove, that the moon's cosmical rotation—her turning round in absolute space, or in relation to the fixed stars—is nothing more than simply the outcome of her revolution about the earth. Mr Hill, and those who take the view he takes, endeavoured to show, what, probably no one denies, that the moon has a monthly cosmical rotation.

The question has all along been treated as if it were a geometrical problem, and could be solved by geometrical conceptions. But it is in reality a question of physics, and involves other questions of causation, which science cannot yet answer.

The idea of a body rotating on its own axis, is clearly a different idea from that of a body rotating on the axis of another body, or another force. And those ideas undoubtedly embody different mechanical facts. Thus, a wheel or a planet rotates on its own axis; but a body fixed to the surface of a planet, rotates, not on its own axis, but on the axis of the planet. The two cases are different. The two rotations are brought about by different means. The rotation of the planet arises simply from its turning on its own centre: the rotation of the object on its surface arises by the medium of the rotation of another body.

Now, has any one shown, or endeavoured to show, to which of these two classes the rotation of the moon belongs? The geometrical portion of the question is plain enough. The moon constantly presents the same face to the earth, and therefore she possesses cosmical rotation. But this term is generic; and to which of the species, axial or radial, does the rotation of the moon belong? To the true answer to this question, neither geometry nor mechanical contrivances can afford the ultimate clue, because that answer presupposes the *cause* of the lunar rotation.

To show that the solution of this question refers to the *cause* of the lunar motions, take this example. Place a compass on a railway turn-table. Turn the table once round. Here the needle has performed a revolution without rotation. For although the author of "An examination of the Astronomical Doctrine of the Moon's Rotation," who is approvingly quoted in Mr. Symon's pamphlet, endeavours to prove this phenomenon a retrograde rotation of the needle, the untenableness of such a position may be evidenced, by placing a dozen other needles beyond the table, to which the one upon the table will stand constantly parallel. Again. Screw up the needle. Turn the table once round. In this case the needle has performed a revolution, and a radial rotation, that is, a rotation upon a rotating ray of the table. But it has not performed axial rotation, or what is commonly understood as rotation upon a body's "own" axis. But it has performed this radial rotation, through the medium of a *cause* or force acting upon it from beyond itself, and not acting upon it immediately. Again. Unscrew the compass needle. Turn the table once round; and while the table is turning, turn the needle round with the hand in the same time. Here the needle has performed a revolution, and an axial rotation—a rotation on its own axis. And it has performed this rotation, because the *cause* of it was independent of the rotation of the table. For the same *cause* acting upon the needle would have made it to rotate, without any revolution round the table. Whereas in the case of radial rotation, the revolution and rotation proceed or cease by inseparable connection—the rotation being *caused* by the revolution.

It will be perceived then, that the question which it is of any value for science to answer, is, whether the rotation of the moon and other secondary planets is axial or radial? The rotation of a man walking round a turn-table at rest, is axial rotation, notwithstanding his simply keeping one side always towards the centre; because the cause of his motions has reference directly to himself. The rotation of a man at *rest*, carried round by a turn-table, is radial rotation, because his motion is only part of the motion of a wider mechanism, of which it is an effect. The rotation of a stone in a sling, and of all peripheral portions of rotating masses—regarded as integral unities—is also, what I take the liberty of calling, radial rotation. Can the question then, here proposed, be answered?

The Astronomer Royal, in the letter referred to, lays down that "the moon is not compelled by any material connection to accompany the earth." It seems of little importance whether the "connection" be called "material" or not; since some force acting upon matter this connection undoubtedly is. Now in the case of a stone whirled round in a sling, and attached to its centre of motion by a "connection" of strings, the rotation of the stone is radial, being caused by the rotation of the strings; the rotation is in the same direction as the revolution, and is likewise necessarily performed in the same time. But the connection of gravitation between the earth and moon, is as veritable a connection as the strings of a sling. If, as has been conjectured by Professor Hansen, the further hemisphere of the moon be the denser, this will ensure the permanency of the moon's positions in respect of the *cord* of gravitation joining the earth. And so the motion of the earth in a circular orbit, may be shown to be capable, in virtue of gravitation, of bestowing the moon's revolution; so this revolution seems also capable —in view of our analogy—of bestowing radial rotation. The moon is the stone in the sling; gravitation is the strings; and the earth moving round its orbit is the hand which swings the whole round.

It is not at all insisted upon here that this is the true explanation of the phenomena. But if the causes are admitted to be "sufficient" causes, we shall have these results:—that the moon revolves in the same direction as the earth, not from arbitrary disposition or primary impulse, but because all bodies move in the same direction as that which causes their motion: that the moon rotates in the same time and direction as she revolves, not by inexplicable primary impulse, but by the simple mechanical necessity of radial rotation. If we may affirm, that the connection between the earth and moon is the cause of keeping the same lunar face towards the earth, then may we affirm that the lunar rotation is radial, and not axial. But the mere geometrical reference of a permanent face, will not warrant this affirmation; because for anything known to the contrary, the rotation of the moon may be caused by a force acting quite independently of gravity and the moon's geocentric revolution; and may therefore be axial rotation.

The probability, however, speaks emphatically from the other side. On that side we have clear mechanical conceptions, divested of those scientific superstitions which are lions in the paths of inquiry. We there get beyond those remarkable "primary impulses,"—the names which "devout astronomers" put upon their own ignorance. We come somewhat more into the presence of logical satisfaction. The system of nature yields its secret to the manipulation of reason. And we begin to feel that everything by which we are surrounded, has an intelligible history. Regarding the rotation of satellites as an isolated phenomenon, Professor Nichol cannot doubt that "an arrangement so singular rests on some great, though yet unknown ordinance of nature." But when we look upon this rotation as being radial rotation,—as being an inseparable component of satellitary phenomena, our blind wonder gives place to a nobler admiration. We see that in creation, better counsel has been followed than could have been given by King Alfonso. For even with the first faint glimmerings of truth, there comes a foretaste of the day breaking beyond; the smile of a hope which constitutes the poetry of science, and opens new eyes in reason, which the old mysteries had covered with despair.

Alex. Stephen Wilson.

Aberdeen, January, 1860.

THE AXES OF CELESTIAL BODIES.

In reply to the letter from Mr. Mitford, of Cheltenham, in your December *Journal*, I beg to offer the following remarks:—

Instead of taking the illustration of motion by walking round a stick, always with the face towards the stick, given in a former number of your periodical, and pulling it to pieces into separate and unconnected sentences, I believe a rational mind looking at the spirit of the whole statement would not fail to draw the conclusion intended to be conveyed by it, viz., that for a body moving in an orbit about another body, but having no material connection with the latter, to constantly preserve the same face towards the central body, it is necessary for the moving body to have a revolution about the axis of its mass, in the same time as it completes its orbital revolution. This illustration shows the rotation of the moon about the axis of her mass, in the same time as she completes her orbital revolution, and that such rotation is necessary in order that she may constantly preserve the same face towards the earth.

The discussion which occurred in 1856 (in which Mr. Jelinger Symons, B.A. one of Her Majesty's Inspectors of Schools, Mr. Evan Hopkins the geologist, Captain Share, R.N., Mr. Perigal, a mathematician, and many others, asserted, and to their own satisfaction proved, that the cause of the moon's constantly keeping the same face to the earth was not owing to the equality of the two above-mentioned motions, but because she did not rotate on her axis at all,) bears immediately on the subject of your correspondent's letter; I beg therefore to refer him to the result of that discussion, but will besides endeavour to put the matter in a light conformable to the ideas broached in his communication.

The definition of motion round a centre is given by Desaguliers, in his "Course of Experimental Philosophy," vol. 1, page 51, as follows: —"The centre of motion is that point round which a body or a machine moves, or endeavours to move, when it cannot or does not turn quite round; and in that case, all the points of the body describe circles, or arcs of circles, about the centre of motion. This centre may be taken anywhere according to the make of the engine." This definition bears upon rotation generally, whether axial (round the axis of the mass of the body) or orbital, and from it alone the fact of the moon's axial rotation can be deduced, since, with respect to a body external to the orbit of the moon, and infinitely distant, all the points of the moon describe circles about the centre of the mass of the moon.

The idea of exhibiting the motions of the planets by means of mechanical contrivances is hinted at by Kepler, who says, that the planets are moved round by the sun, and that this is done by sending forth a magnetic virtue, and that the sun-beams are like the teeth of a wheel taking hold of the planets; Ross sarcastically remarks that these "are senseless crotchets fitter for a wheeler or a miller than a philosopher." (See "The New Planet no Planet, or the Earth no wandering star, except in the wandering heads of Galileans." London: 1646.) Since that time, Graham, in 1720, or thereabouts, constructed a model of the motion of the earth, sun, and moon, which laid the foundation for the orrery, as at present constructed. (See Desaguliers' Experimental Philosophy, vol. 1, pages 448, 449.)

These mechanical imitations of the motions of the sun, moon, and planets, which motions are caused by the action of natural forces upon those bodies, are very useful so long as they are confined to the illustration of those forces with which the mechanical construction itself does not interfere, such as the revolutions of the planets and satellites in their orbits, but are positively false in their representations as usually applied to the exemplification of lunar motion. This arises from the fact of the mechanical analogues of the moon and the earth being connected by a rigid bar, thereby imposing on the moon's axis a motion which in nature results from axial rotation. If this inconvenience is removed by suitable means, it will be perceived that the orbital motion alone does not cause the moon always to present the same face to the earth, and that when the effect upon the moon's axial rotation induced by the treacherous rigid bar is removed, it will be absolutely necessary to give the ball representing the moon one revolution round her axis in the same time as she makes an orbital revolution, to oblige her to present the same face always to the ball representing the earth.

Since a poised magnetic needle always preserves the same direction, (practically speaking so far as can sensibly influence this experiment) in relation to the position of the earth's axis, it may be effectually applied to neutralise the interfering effect of the fixing the moon and its axis to the rigid bar in the above described mechanical arrangement, or in any arrangements for showing the true motions which the moon has, including those set forth in your correspondent's letter. For this purpose a sphere of paper or other light body is made to surround the needle and is attached to it, the needle being fixed in an equatorial diameter of the sphere; an aperture is then made concentric with the axis of the paper sphere, to freely admit the stem, on the point of which the needle is suspended. With this arrangement, on moving the rigid bar round its fixed centre, in which the earth is placed, it will be found that the paper sphere representing the moon does not turn the same face constantly to the earth, but that during one orbital revolution all the points of the moon's surface are successively turned towards the earth, and that to enable the same side of the moon to be constantly turned towards the earth, it is necessary to turn it round its axis once for every complete orbital revolution it makes.

In reference to the statement of your correspondent, that all axes of rotation or of revolution are "imaginary," its truth or its falsity certainly depends upon the definition he gives to the word "imaginary." If by imaginary he means unreal with respect to the subject treated of, viz., rotary motion, the conclusion is certainly wrong, for every motion of circular rotation must have a centre round which that rotation takes place; if a point moves in a circular path, it has a point in the same plane as the circular path, and equally distant from it, within the circumference, for its centre of rotation; if a solid body, it has an axis of rotation which is the locus of all the points, round which all the points in the body form concentric circles. If, however, by "imaginary" is meant a line which can be seen, or which involves some change in the matter composing the rotating body, then your correspondent is certainly right, for no visible change marks the axis of rotation any more than it does the equator, meridian, or parallels of latitude on the face of the earth. The consideration of the axis of rotation being limited to the forces impressed on the rotating body, and their directions, this axis is as real as any other entity.

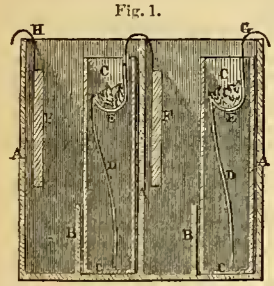
In dealing with astronomical subjects, the definitions of terms, in my humble opinion, to be employed in preference, are those of the strictest kind and derived solely from a mathematical and physical view of the subject. The word "axis" and "imaginary" as used by your correspondent are very well as applied to ordinary things, and those generally referred to in a dictionary (which, for instance, contains no other definition of the word "sine" than "a line in geometry"); but, to subserve the purposes of reasoning upon the noblest and most exact of all applied sciences, viz., astronomy, all definitions should be of the most exact nature, describing the thing defined accurately and so as to perfectly individualise it. The conclusion that your correspondent arrives at, that the rotation of celestial bodies, under the circumstances which he points out, are "imaginary," is, as has been shown above, as fallacious as that axes of rotation are imaginary. I hope that he will see that the difference between Messrs. Symons & Co.'s idea of the lunar motion, and the idea of it entertained by the ablest philosophers of the day, is, that the former refer the axial motion to the centre of the orbital motion, the latter to a point exterior to the orbit and infinitely distant; in the first case the appearance of axial rotation no longer exists, in the second case it exists in its full development. Astronomers wisely determine to take that definition of axial rotation which gives the absolute and abstract view of the case.

London, January, 1860. W. H. Walenn.

DANIELL'S BATTERY IMPROVED.

Will you allow me to introduce to your notice an improvement on Daniell's Sulphate Battery which I have recently made and registered? The annexed diagrams will show the alterations which I propose. Fig. 1 is a vertical section of the new battery, and fig. 2 is a plan of it. A, is a porcelain chamber with a division, B, between which and the end of the chamber is inserted a porous cell, C, the latter being supported in an upright position by the division, B. Five of these chambers, of the two cells each, form a very suitable battery for telegraphic or other purposes.

Fig. 1.



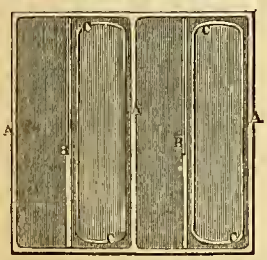


Fig. 2.

The merit of this battery is of a two-fold character. 1st. Its great durability, notwithstanding its constant use. By placing the copper plates in the porous cells, as I propose, not in the usual way—straight—but bent to form a shelf to support the crystals of sulphate of copper near the top of the porous cells, the sulphate is rendered more easily soluble, and it is kept from becoming a hard mass at the bottom of the cell, which otherwise would be the case.

The division, B, as besides keeping the porous cell upright, protects it from the nitrogeneous matter precipitated from the zinc plate, which, if allowed to come in contact with it, would cause metallic copper from sulphate prematurely to deposit thereon, diminishing the porous surface, and consequently the power of the battery.

2d. The trifling expense at which the trough can be renovated, when compared with the old form of sulphated battery lined with marine glue, and having slate or glass and porous divisions. Mine merely requires to be washed out, and those porous cells coated with copper replaced with new ones: whilst the latter in most cases requires to be completely renewed, the porous plates, slates, and marine glue, being damaged by removal and rendered unfit for further use. I have no hesitation in saying that this battery will be found by far the most suitable for telegraphic purposes, especially in warm climates, such as India, where marine glue cannot be depended upon to insulate the elements from the wooden trough. A trial will do more than I can say, towards testifying to its superiority over any thing of the kind hitherto used.

John Muirhead.

Gloucester Road North, Regent's Park, London, December, 1859.

THE ROTATION OF BODIES ON THEIR AXES.

In my former communication, I inadvertently omitted the heading of my paper, which I intended to be—The rotation of bodies on their axes. I am therefore indebted to you for the "celestial" part of that title. My intention in that paper was to keep to the mechanical question—the balls being called earth and moon, or by any other term, will not in any way alter the question at issue.

If Mr. Hill had not placed my illustration in the foreground of his communication, I should have looked upon his paper as an independent article in regard to his own astronomical notions.

My object in writing on this subject is, if possible, to reconcile the difference of opinion on this matter, on purely mechanical principles, and not with any intention of settling the exact motions of the moon, which, as far as I am concerned, may be in a dozen different ways; or if it is to be judged by the antics played by a ball, acted upon by a number of different impulses, and then thrown into the air under a system of cohesion, which will vary in the hands of every manipulator—may be a thousand in fact. When Mr. Hill raises his ball from the table he leaves the point at issue, and his argument becomes ariel; the apparatus beneath resolving itself into nothing more than a rotary catapulta.

I have in my former paper kept as close as possible, both in text and illustration, to the object I had in view. The only question, as Mr. Hill states it, is to show the fifth rotation, this being (as I consider the original feature in my paper), as asserted to take place by those who hold the same opinion with Sir John Herschel and Mr. Hill.

If Mr. Hill fairly takes up my proposition, he has no right to alter my machine (represented by illustration No. 2, in my paper of Dec. '59), upon which my proposition depends, neither has he any right to substitute any other machine of his own construction.

The machine in question has been selected from a number of ideas as containing the pure elements of the question at issue. The ball representing the moon, rotates in free space upon an axis, and not an axle. The frame is only a substitute for the natural attractive force which holds the moon to its orbit, whether the orbit be square, circular, or elliptical; the wheels are a fit representative of that invisible power, who, with unerring precision, causes the planets to revolve. Another feature in this machine is, that its external form should be as free as possible from all external rotating axles, on which an operator like Mr. Hill could with any consistency hang his hat.

Now, the handle of this machine being no more than a peg on the outside of the frame, having no connection with the ball representing the moon, may be cut away, leaving the machine in its full integrity. Under these circumstances Mr. Hill's hat and argument fall to the ground.

Now, I am willing to allow Mr. H. to attach his tape to the top of the peg, in his own way. I also will allow he has produced a twist (right or wrong). I also will allow this twist to be an indication of a revolution—but here we must part company. If Mr. Hill is not mechanic enough to see by this time how he has deceived himself, let him call in the first watchmaker's apprentice.

Mr. Hill calls this the fifth indication, I call it the first. Now, let Mr. Hill show the other four by the same indicator. Not to pass over the remaining part of Mr. Hill's paper with some little notice, I look upon it only as a recapitulation of former discussions with which I have nothing to do at present.

Bertram Mitford.

Northumberland Lodge, Cheltenham, January, 1860.

ROSIN GAS.

In resuming the subject of the manufacture of gas for illuminating purposes from rosin, which had been adverted to in the *Practical Mechanic's Journal* for December last, and which will be found at page 245 of that part, I take up my pen for that purpose. But, I think, by the way of fully showing the improvements I have introduced in the apparatus, and the mode adopted for the complete decomposition of the rosin to be converted into gas, I ought, in the first place, to advert to its original adoption. To do this, and to render the thing more clear, I must beg to make a short digression. About the year 1818, Messrs. John and Philip Taylers took out a patent for the manufacture of gas from oil. In 1819 the Messrs. Taylers and Martineau erected one of their patent oil gas apparatus at the Apothecaries' Hall, London, which is illustrated by engravings, and fully explained at page 120, vol. viii., in the *Quarterly Journal of Science, Literature, and the Arts,* edited, I believe, by Mr. Brand, of the Royal Institution of Great Britain. Many private as well as public establishments, with towns and cities, both in England and on the Continent, were lighted by this mode. But the great fluctuation in the prices of oil, varying as much as from twenty-five to fifty per cent. per ton, became a series drawback to this mode of gas making, that, in spite of its superior illuminating powers, it was obliged to give way.

About this time, J. F. Daniell, Esq., whose chemical and philosophical knowledge and discoveries are well known and appreciated, conceived an idea that, if rosin could be reduced to a fluid state, it might supersede the use of oil in the manufacture of gas. He succeeded by dissolving the rosin in turpentine, and found the gas produced therefrom, was, in every respect, equal in illuminating powers with oil gas, and at a cost of less than one third that of oil. At the commencement of manufacturing the rosin gas, the old oil gas apparatus of Messrs. Taylers and Co. was used, but was found in practice not to answer, as the inlets for conveying the rosin oil into the retort soon became choked with a hard carbonaceous incrustation, that required the utmost exertions with a hard steel tool to remove. Experience soon taught the manufacturer that the old oil gas apparatus would not answer for making rosin gas. Mr. Daniell, with the assistance of Mr. Martineau, constructed a new apparatus on a different principle, which Mr. Daniell secured by a patent, both for England and some countries on the Continent, as well as the manufacture of gas from rosin. This apparatus did not accomplish the end contemplated. A second apparatus was constructed by the same parties, differing in many respects from the former, but not in the important and principal parts. It was found by experience that, by the use of either of the apparatuses which had been constructed, the production of gas from a given quantity of rosin, say 112 lbs., would not average for the month more than from 350 to 400 cubic feet, in spite of the most strenuous exertions. After some trouble, and by remodelling the apparatus altogether, I succeeded in producing an apparatus which yielded, on an average, for twelve months, from 1200 to 1400 cubic feet of gas per 112 lbs. of rosin used, whose illuminating power and specific gravity was just equal to the gas whose produce was but 350 or 400 feet per

112 lbs., and the whole of the turpentine used as a solvent for the rosin was brought back to be re-used as a solvent for a further portion. I have many times used the turpentine as a solvent twice in the twenty-four hours; in fact, after the supply of turpentine for the first melting, the rosin itself will keep up an ample supply for all subsequent purposes.

In my improved apparatus, with a production of gas at the rate of from 1200 to 1400 cubic feet per 112 lbs. rosin, and the rosin costing from 5s. 4d. to 6s. per cwt., the gas cost for 1000 cubic feet, including rosin, coal for heating the retorts, coke used in the retorts, and manual labour in producing, from 5s. 10½d. to 6s. 6d. Taking into consideration the superior illuminating power of rosin gas over that of coal gas, it will be found but little, if at all, more expensive to the consumer than coal gas, as 500 cubic feet of rosin gas is equal to the consumption of 1000 cubic feet of coal gas. Of course this is, to a certain extent, guided by the price of the raw material (rosin). But in America, Spain, and the south of France, where rosin is produced in large quantities, it is not likely to be subjected to the same fluctuations in price as in countries where the raw material has to be imported. Besides, rosin gas, from its purity, not being combined with sulphurous gas, which all coal gases are in a larger or smaller degree, can be used in places where coal gas cannot be used on account of its tarnishing properties. The record of the production and cost was particularly kept. A station master registered the quantity made. The foreman of the works weighed every cask of rosin handed over to the melter; he also saw every furnace debited with the coals for heating the retorts, so that the statistical account of the production of gas for 112 lbs. of rosin, and the cost per 1000 cubic feet, may be relied on.

January, 1860. E. G.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

MEETING OF THE BRITISH ASSOCIATION AT ABERDEEN, 1859.

Section E.—Geography and Ethnology.

"Report on the crania of the tribes of Nepaul," by Prof. Owen.

"Geographical remarks upon the Yang-tse-Keang, with observations upon its future commerce," by Capt. Sherard Osborne.

"On the relation of the domesticated animals to civilization," by Mr. J. Craufurd.

"On Gebel Haurân, its adjacent districts and the eastern desert of Syria, with remarks on their geography and geology," by Mr. J. Hogg.

"On some curious discoveries concerning the settlement of the seed of Abraham in Syria and Arabia," by Major Phillips.

"On the vitrified fort in Aberdeen," by Sir A. L. Hay.

"Notes on Japan," by Mr. Laurence Oliphant.

"On the effects of the recent gold discoveries," by Mr. J. Craufurd.

"Notes on a nugget from Victoria, &c.," by Prof. Tennant.

"On the aboriginals of Australia," by the Hon. T. M'Combie.

"On the native inhabitants of Formosa," by Dr. M'Gowan.

"Exploration of the White Nile," by Consul Petherie.

"Discovery of Lake Nyanza in Central Africa," by Capt. Speke, R.N.

"The Russian trade in Central Asia," by Mr. T. Mitchell.

"On the aboriginal tribes of the province of Nagpore, Central India," by the Rev. S. Hislop.

"On the country to the west of the Caspian Sea," by Baron de Bode.

"On the sculptured stones of Scotland," by Mr. J. Stuart.

"On the ethnology and hieroglyphics of the Caledonians," by Col. J. Forbes.

"Notes on the geography of Eastern Africa," by Mr. J. L. M'Leod.

"On the Karaite Jews," by Mr. J. Hogg.

Mr. R. Cull exhibited two axe-heads brought by Mr. P. O. Callaghan.

"Notes on the Lower Danube," by Mr. J. Stokes.

"Memorandum of earthquake at Erzeroum," by Consul Dalyell.

"Description of Ghadamès," by Consul S. Freeman.

"Notes from the Zambesi expedition under Dr. Livingstone," by Dr. Kirk and Capt. Beddingfield.

"Description of passes through the Rocky Mountains," by Dr. Hector.

"Rapid communication between the Atlantic and the Pacific, *via* British North America," by Major Synge.

"Notes on the proposed railway communications between the Atlantic and Pacific Oceans, *via* the United States of America," by Dr. Shaw.—The paper contained a large amount of geographical and statistical information, and showed that the Americans strongly recommend the adoption of the route of the thirty-second parallel by Capts. Pope and Parke in 1853, from Preston to Pimas villages; by Major Emory, from Pimas villages to the mouth of the Gila, in 1848; by Lieut. Williamson, in California, in 1853.

"On the geography of Southern Peru," by Mr. W. Bollaert.

"On the geometrical projection of two-thirds of the sphere, and its application to the representation of the stars," by Col. James.

"On the Roman camp at Ardoch, and the military works near it," by Col. James.

"On the commercial resources of Zanzibar, on the east coast of Africa," by Capt. Speke.

"On the native inhabitants of the Taraï of the Sub-Himâlaya," by Mr. J. B. Davies.

"On the Arabic-speaking population of the world," by Mr. A. Ameuney (a Syrian).

"On Chinese genealogical tables," by Dr. M'Gowan.

"On meteorology, with reference to travelling, and the measurement of the height of mountains," by Admiral Fitzroy.

"On the laws of consanguinity and descent of the Iroquois," by Dr. W. Camps.

Section F.—Economic Science and Statistics.

"On church-building in Glasgow, showing the number, size, and cost of the various places of worship erected there during the last twenty years, through voluntary effort," by Mr. J. Strang.

"Statistics of small-pox and vaccination in the United Kingdom," by Dr. W. Moore.

"Statistics of the trade and progress of the colony of Victoria, Australia," by the Hon. T. M'Combie.

"On the trade and commerce of India," by Mr. J. T. Mackenzie.

"On the Aberdeen industrial feeding schools," by Mr. A. Thomson.

There are now four schools, each (with one exception) having premises of their own, unencumbered, and the attendance being now from 350 to 400, male and female. The feeding of the children was the keystone of the system. There has been a gradual reduction of juvenile commitments to prison—namely, from 50 to 6, in the course of about ten years. He denounced the hospital system, and referred eloquently to the value of the family relation, which had been kept up in connection with the schools with good results.

"On the effects of the influx of the precious metals which followed the discovery of America," by Mr. J. Craufurd.

"On the social and economical influence of the new gold," by Mr. H. Fawcett.

"On the statistics of the agriculture of Aberdeenshire," by Mr. A. Harvey.

"On the manufactures and trade of Aberdeen," by Mr. G. B. Bothwell.

"Results of the Society of Arts examinations," by Mr. J. Pope Hennessy.

"Some statistics on colour-blindness," by Prof. G. Wilson, M.D.

"On popular investments," by Sir J. S. Forbes.

"On the trade currency of China (with specimens of the coinage)," by Dr. M'Gowan.

"On decimal coinage," by Col. Shortrede.

"Notes on the vital and economic statistics of Aberdeen," by Mr. J. Valentine.

"On the British trade with India," by Mr. R. Valpy.

"On the progress of public opinion with respect to the evils produced by the traffic in intoxicating drink, as at present regulated by law," by the Rev. W. Caine.

"On the arts of camp life," by Col. Sir. J. Alexander.

"Notes on illegitimacy in the city of Aberdeen compared with the principal towns in Scotland," by Mr. J. Valentine.

"On some questions relating to the incidence of taxation," by Mr. J. Pope Hennessy.

"On decimal coinage," by Mr. R. L. Johnson.

"Statistics of the whale fishery at Peterhead," by Mr. C. W. Peach.

Section G.—Mechanical Science.

Report of Committee "On steam-ship performance."

This Committee has occupied itself in collecting a large amount of information in reference to a variety of details respecting the form and capacity of steam-ships, their engines, paddles, and screw-propellers, &c.; and for this purpose the Committee issued a form of model log, so as to insure uniformity in the returns made to the Committee. These logs are being used not only on board our merchant ships, but also in the ships of the Royal Navy. A large amount of information has already been collected, and is tabulated in the appendices to the report; and the Committee seek to be re-appointed in order to continue their labours over a series of years.

Admiral Moorsom pointed out the great importance of such a collection of authentic data.

Mr. W. Fairbairn believed that if this Committee proceeded with its work a mass of information would be got together, which would exercise an important influence in improving our naval architecture generally. He was glad to find that the Lords of the Admiralty were willing to assist the Committee in their labours; and, in his opinion, the object in view was of so much national importance, that not only should a grant of money be made from the funds of the association, but that the Government should afford some pecuniary aid to enable this Committe effectually to proceed with its inquiries.

"Report on the progress of steam navigation in Hull," by Mr. J. Oldham.

The report notes that during the last two years steam has been brought into use in the service of the whale fishery, which had been previously all but abandoned. Several screw-steamers are now employed in the trade. Experience seems in favour of wooden vessels in preference to iron. By the aid of steam the vessels are enabled to make a voyage first to Greenland, and afterwards to Davis Straits. It appears that benefit has accrued by the lengthening of several steamers belonging to the port of Hull, and several vessels have been, with success, converted from the paddle to the screw. The author records the building of many new fine steam-ships in Hull, and many are now in progress both for English and foreign service. Considerable advance has been made in London and other ports; but in Hull the progress has been slow. Considerable attention has been paid to smoke consumption in steam-vessels with great success and saving of fuel. He then refers to the use of Silver's marine governor for steam-engines on board ships, which has been applied to a large number of vessels belonging to Hull. They are stated to be so sensitive in their action that the slightest pitching motion is at once indicated, and the steam admitted or excluded as the case may require. The author concludes his report by giving a brief statement of the tonnage, &c., of steam-vessels belonging to, or trading to, the port of Hull. 1. Sea-going steamers belonging to the port, 22,290 tons register; horse-power, 5,823. 2. River steamers, 1,050 tons register; horse-power, 450. 3. Sea-going steamers trading to Hull, but belonging to other ports, about 21,200 tons register; horse-power, 5,300. 4. River steamers, 2,450 tons register; horse-power, 1,200. The number and tonnage of sea-going vessels belonging to Hull, and also of the river steamers have increased; and the same observation applies to the sea-going and river boats belonging to other places.

Mr. A. Henderson, in reference to Silver's steam governor, which had been mentioned by Mr. Oldham, said he believed it to be a most valuable invention, and, in connection with Luntley's steering apparatus, which had been fitted to the *Great Eastern*, would place the control of a steam-ship directly in the hands of the captain.

Mr. Oldham, in reply to a question from Mr. Eddison, stated that there was a decided economy in fuel arising from the consumption of smoke, but, even if there were not, it was worth all the trouble to get rid of the dense clouds of smoke at sea, which frequently led to collisions, and were worse than fogs.

Mr. W. Fairbairn had paid great attention, for many years past, to the subject of smoke consumption. The principles on which this depended were now well known, and there were an infinite number of contrivances by which the object could be attained, but in all cases their efficiency depended on the care of the stokers. He believed that it must be made the interest of the stokers to get rid of the smoke; let there be premiums for them when there was no smoke, and fines when smoke was made; and he saw no difficulty in getting rid of the nuisance entirely. With reference to Silver's governor, it was an extremely ingenious invention, and he had no doubt of its efficiency and its value on board ship. On land there was nothing equal to the revolving valves originally invented by Watt, but these were not applicable to marine engines.

Mr. Oldham, in reply to a question from Admiral Moorsom, in reference to Griffith's screw-propeller, said that so far as his experience went there was nothing equal to Smith's original propeller in form, though a third thread was now used which increased its efficiency.

"On mercantile steam transport economy as affected by the consumption of coal," by Mr. C. Atherton, Chief Engineer of the Royal Dockyard, Woolwich.—This is the third and concluding paper on this subject.

Mr. T. Webster pointed out that in Mr. Atherton's first paper on this subject he had taken the consumption of coal in marine engines at 4 lb. per indicated horse-power per mile, while in his present paper it was taken as low as 2½ lb. This was a gratifying fact, showing the progress which had been made. He believed it was due mainly to the use of superheated steam and the increased adoption of the principle of expansion. He thought the public were indebted to Mr. Atherton for his labours, which he trusted would result in the establishment of a unit of displacement and horse-power, in lieu of the tonnage measurement at present adopted.

Mr. W. Fairbairn bore testimony to the great value of Mr. Atherton's labours; he recollected when from 7 lb. to 10 lb. per indicated horse-power was the general rate, that had been reduced to 4 lb., and it was now from 2 lb. to 2½ lb. Superheated steam had doubtless been the cause of this economy.

Mr. M'Connell considered that superheated steam was in reality dry steam.

"A condensed abstract of experiments by Messrs. R. Napier & Sons, on the strength of wrought-iron and steel," communicated by Dr. J. M. Rankine.

"On harbours of refuge," by Mr. D. Bain.

"On the performance of steam-vessels," by Vice-Admiral Moorsom.

The report entered into and discussed the particulars of the performance of the *Erminia*, a yacht belonging to Lord Dufferin, as well as of the *Undine*, belonging to the Duke of Sutherland: the investigation of the details being undertaken with a view to determine the relations between the *direct* thrust of the screw and its *resultant*, and between that and the form of the vessel. Such investigations, in the opinion of the author, ought to be undertaken by Government, as representing the nation, and having the amplest means at command.

"Report of the patent committee."

This committee, which was appointed at Leeds last year, states that it appears by the annual report of the Commissioners of Patents just issued, that above 3,000 applications are made annually for patents; that of these 1,000 are dropped at the first stage, leaving only 2,000 to be completed as patents: that the £50 payment at the end of the third year, in order to keep the privilege on foot for seven years more, causes 1,500 of the 2,000 patents to drop at the end of the third year, leaving 500 only remaining, and that of this 500 the Commissioners of Patents estimate that in consequence of the required payment of £100 at the end of the seventh year, 100 only will survive to complete the term of fourteen years. The committee's report points out that the large estimated surplus, amounting to £100,000 annually, was properly suggested by the Commissioners as applicable to the building and maintaining suitable offices for the Commission, including a free library and a museum of inventions. The committee recommends that, after carrying out these objects, the fees received from patentees should be reduced to an amount not more than sufficient to defray the expenses of the office; but that if such a course was not adopted, then that the sums received from inventors should be carried to an "Inventors' Fee Fund," to be applied for the benefit and promotion of science and industry.

"On experiments to determine the efficacy of continuous and self-acting brakes for railway trains," by Mr. W. Fairbairn.

Of late years, Mr. Fairbairn remarked, the improvements introduced to diminish the danger of railway travelling have been specially directed to increasing the retarding power of various kinds of brakes. The importance has been felt of reducing the momentum of trains with ease and rapidity, that is, in the least time and in the shortest distance. On this subject a most important communication had been made to the railway department of the Board of Trade by Col. Yolland, who had experimented with brakes which were improvements on the ordinary brakes. The brakes used were the steam brake of M'Connell, the continuous brake of Fay, the self-acting brake of Newall, and the self-acting buffer brake of Guerin. Col. Yolland had reported in favour of Newall's brake for heavy traffic, and also in favour of that of Guerin under certain circumstances. Similar experiments had been carried out by Mr Fairbairn on the Lancashire and Yorkshire Railways. The brakes he used were those of Fay and Newall, and consisted of brake blocks, acting on every wheel of the carriages of the whole train—the brake blocks being suspended on flaps or placed on side-bars under the carriages. Powerful springs had also been applied under each carriage, by means of which the brakes were made to act instantaneously throughout the whole train by the act of one guard only, and this was one of the most important features of these brakes. The trains passed over a measured distance by the action of gravity. The trains employed consisted of three weighted carriages each. They were started by removing a stop. Having descended a previously measured distance with a uniformly accelerating velocity, they passed over a detonating signal which gave notice to the guard to put on the brake. On making experiments at Southport, a retarding force per ton weight was gained of 382·6 lb. for Newall's brake and 406·4 lb. for Fay's. The general result of the whole experiment showed that a train could be stopped by these brakes at a velocity of 20 miles an hour in 23·4 yards; 40 miles an hour in 93·8 yards, 50 miles an hour in 146·8, and 60 miles an hour in 211·5 yards. This clearly showed the advantage of these brakes in power.

"Description of the Glasgow waterworks," by Mr. J. F. Bateman.

The author pointed out the general arrangements for conveying the water, which was derived principally from Loch Katrine, a distance of thirty-four miles. The water was remarkably free from organic matter. But though pure, it had a peculiar effect on the lead pipes, which it was said, in the first instance, would render its use injurious. However, though the water had an effect on the lead in the first instance, yet the pipes became almost immediately coated with a white deposit, which protected the lead from any further action of the water. The result had been that, instead of any injury being caused, the sanitary condition of the town had been improved.

"On a safety-cage for mines," by Mr. R. Aytoun.

"On the rivers 'Dee,' forming the ports of Aberdeen and Chester," by Mr. J. Abernethy.

"On the result of boring for water in the new red sandstone, near Shiffnal, in the county of Salop," by Mr. J. F. Bateman.

"On a patent chain propeller," by Mr. W. Robertson.

This propeller consists of an endless chain running over pulleys at each end of the vessel, a loose portion lying on the bed of the river; and the vessel is propelled by the hauling the chain in at the stern, and laying down an equal portion at the bow, the friction on the bed of the river serving as an anchor, against which the hauling power is exerted. The object sought by the invention was a means of propulsion which should not injure the banks of the canal.

Mr. G. Rennie pointed out that this was the revival of an old invention, by a Capt. Brown, some years since, which had been given up, not being found to answer.

"On the manœuvring of screw vessels," by Admiral Paris.

The author showed how vessels furnished with the screw propeller could, whether making way or not, be guided and manœuvred; and expressed his opinion that the *Great Eastern*, furnished, as she was, with paddles and the screw, would be the most handy vessel ever yet built. The paper contained a vast amount of technical details, which could only be understood by nautical men.

"On the true action of what are called heat diffusers," by Mr. A. Taylor.

"On a boat-lowering apparatus," by Mr. A. Batten.

"On a mode for suspending, disconnecting, and hoisting boats attached to sailing ships and steamers at sea," by Mr. E. A. Wood.

"On smokeless coal-burning locomotive engines," by Mr. D. K. Clark.

This arrangement cannot be effectually described without reference to diagrams; but it may be stated that a perfect combustion is obtained by means of several steam jets, which cause a strong blast of air to be brought into contact with the burning fuel.

In the discussion, it was stated that the arrangement was in successful use, and with economy in consumption of fuel.

"On a new gas-burner, and a method of producing an illuminating gas cheaply from the decomposition of water," by the Abbé Moigno.

"On an automatic injector for feeding boilers," by Mr. Giffard.

"On a helico-meter, an instrument for measuring the thrust of the screw-propeller," by the Abbé Moigno.

"On an application of the moving power arising from tides to manufacturing, agricultural, and other purposes, and specially adapted to obviate the Thames nuisance," by Dr. Seguin.

"Description of the granite quarries of Aberdeen and Kincardineshire," by Mr. A. Gibb.

"On a new gas-meter, with a description of an improved mode of obtaining a true liquid level," by Mr. A. Allan.

"On the comparative value of propellers, with a description of a direct-acting propeller," by Mr. J. Robb.

An experimental illustration of the gyroscope was given by Mr. A. Gerard, who endeavoured to explain its action by reference to more elementary principles of mechanics than were usually assumed for the purpose.

"Experimental researches to determine the density of steam at various temperatures," by Mr. W. Fairbairn.

The object of these experiments was to verify or correct the theoretical formulæ and speculations in regard to the relation between the specific volume and temperature of steam. The experiments were conducted on a novel and original principle, applicable to any temperatures and pressures, capable of being sustained by glass vessels. The determinations were made at pressures varying from ten to fifty atmospheres. They uniformly show a decided deviation from the law for perfect gases, and in the direction anticipated by Prof. Thomson, the density being uniformly greater than that indicated by the theoretical formula of Gay-Lussac or Dalton, Dumas, and others. The author hopes at the next meeting of the Association to lay before the Section results which will determine the value of superheated steam, its density and volume, as compared with the pressure, at all pressures varying from that of the atmosphere to 500 pounds on the square inch.

Prof. Macqnorne-Rankine and Dr. Joule expressed their opinion of the great value of Mr. Fairbairn's researches, and trusted that he would continue them.

"On the steam machinery of the *Callao*, *Bogota*, and *Lima*," by Mr. J Elder.

"On surface condensation," by Dr. J. P. Joule.

The author described the experiments he had made on this important subject. A peculiar arrangement he had introduced gave a very increased effect to a given surface. In this arrangement a copper spiral was placed in the water spaces. The spiral had the effect of giving the water a rotatory motion, which was thus compelled to travel over a larger surface than it would otherwise. He also pointed out that he had succeeded in producing a better vacuum than the temperature of the condensing and condensed water appeared to warrant, and that thus a fresh and unexpected advantage was proved to belong to the system of surface condensation.

"On a submarine lamp," by Mr. Rettie.

Mr. C. Barnett explained the arrangement of his lamp for the same purpose.

"On the advantages of the 40-inch metre as a measure of length," by Mr. G. Johnstone Stoney.

The author showed that if a 40-inch metre was adopted it could readily be decimalised and the inch retained, and thus all difficulty in the comparison of the old and new measure would be avoided. The tenth would be 4 inches, which he would call a hand, the hundredth he would call a nail, and the one-thousandth he would call a line. The old yard would thus be nine hands, a foot would be three hands, and one inch would equal twenty-five lines.

"On gas carriages, for lighting railway carriages with coal gas instead of oil," by Mr. G. Hart.

"On coal pit accidents," by Capt. J. Addison.

"On a deep sea pressure gauge," by Mr. H. Johnson.

Sir E. Belcher explained an instrument constructed under his direction some years since for ascertaining the depth of water by compression, and also the temperature and the quality. He pointed out the difficulties to be got over in the construction of such instruments, and how he had succeeded in obviating them. His (Sir E. Belcher's) instrument had been tested to 1,200 fathoms, and proved successful.

"On a patent disc pan for evaporating saccharine solutions and other liquids at a low temperature," by Mr. Davis.

Mr. A. Topp described various models of fire-escapes, boats, &c.

"On Indian river steamers and tow-boats, giving an account of their improved construction for light draft, capability for cargo, and fittings conducive to manageability in shallow rapid rivers, &c., and of the practical value of the dynamometer in showing the resistance of vessels in tow, at different speeds and loads, with the result of test-trials made in England," by Mr. A. Henderson.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

November 29, 1859.

A letter from Mr. Dyer was read, relative to Mr. Jevons's paper. Mr. Dyer is led to conclude from the facts which have been ascertained respecting the distribution of gold, that that metal forms a great part of the material of the earth's crust now in an incandescent state.

Mr. F. O. Ward laid before the society an instrument termed a *pseudo-diascope*, and a paper setting forth its construction and use, and the principle it is designed to illustrate.

By means of this instrument an aperture transmitting light is made to produce on one eye an isolated impression, while the other eye is directed to an opaque body, such as the hand held before it. The image of the aperture is then found to be transposed, and its perception ceases to be assigned to the eye by which it is really seen; the effect being that a perforation appears in the opaque body, through which the light seems to shine upon the eye by which this is viewed. The principle illustrated by this instrument, according to the author's view, is the essentially goniometrical and deductive nature of the visual act, whenever the distances of bodies are perceived, and their relative positions in space assigned. A pseudo-diascope was presented to the society by the author, and the singular illusion produced by it was verified by the members present.

Mr. F. O. Ward subsequently laid before the society a plan of his for diminishing the liability of powder mills to explosion, and referred to a correspondence between himself and Dr. Faraday on the subject.

The plan in question consists in supplying to those portions of powder mills in which the powder is treated dry, an atmosphere incapable of supporting combustion—preferably carbonic acid gas—so as to obviate the danger of explosion, so far as it arises from chances of ignition *ab extra*—as by the spark from a workman's pipe, of which an example was cited. The danger of explosions from the liberation of oxygen from the powder itself, by friction or otherwise, would of course remain; but this, the author inclines to believe, is a less frequent cause of explosion than ignition *ab extra* occasioned by the carelessness of workmen, rendered indifferent to risk by long habit, and emboldened by impunity. Dr. Faraday, in his comments on this plan, approves it as adapted to cut off one class of risks, and so to remove the point of danger further off, and also as not likely to deteriorate the quality of the powder immersed in the protective atmosphere. He points out, however, as a source of danger usually unsuspected, the possibility of the ignition of the gunpowder dust which collects on the beams of powder mills, and by which, he believes, explosions may be originated, as well as by the beating of the grains actually under trituration in the mill. Mr. Ward, in reply to Dr. Faraday, recognises the partial nature of the security afforded by the proposed plan, but lays stress on the fact that it appears adapted to eliminate all the risks of the manufacture, except those which are inherent in the nature of the material operated on, and, therefore, essentially incurable.

"On supplementary researches in the higher algebra," by Mr. James Cockle.

"On experiments on the total heat of steam," by Dr. J. P. Joule.

The author showed that what is called the total heat of steam, or the quantity liberated when steam is condensed into water of 0° centigrade, consists of, 1st, The true heat of evaporation; 2d, The heat due to the work done on the steam during the condensation; and 3d, The heat liberated by cooling the water from the temperature of condensation to the freezing point. The determination of the total heat of steam had been made the object of a very careful and elaborate research by Regnault, but it appeared to the author that independent experiments, conducted in a different and more direct manner, would not be without interest. The following is a summary of the results obtained by him, compared with those of Regnault.

Total Pressure of Steam in Inches.	Total Heat in Degrees Centigrade. Author.	Regnault.
37·25	638·43	638·77
57·52	644·77	642·87
111·58	655·45	639·06

"On a method of testing the strength of steam boilers," by Dr. Joule.

The plan which had been adopted by the author for two years past, with perfect success, was free from the objections which applied to the above, and is as follows:—The boiler is entirely filled with water. Then a brisk fire is made in or under it. When the water has thereby been warmed a little, say to 70° or 90° Fahrenheit, the safety valve is loaded to the pressure up to which the boiler is to be tested. Bourdon's or other pressure indicator is then constantly observed, and if the pressure, occasioned by the expansion of the water, increases continuously up to the testing pressure without sudden stoppage or diminution, it may be safely inferred that the boiler has stood it without strain or incipient rupture.

In the trials made by the author, the pressure rose from zero to 62 lbs. on the square inch in five minutes. The facility of proving a boiler by this method was so great that he trusted that owners would be induced to make those periodical tests, without which fatal experience had shown that no boiler should be trusted.

December 13, 1859.

"Some experimental researches on the efficiency of continuous and self-acting railway brakes," by W. Fairbairn, Esq., F.R.S., President.

January 10, 1860.

"Suggestions for a new form of floating lightship, and a mode of estimating the distances of lighthouses," by Mr. Alfred Fryer.

MICROSCOPICAL SECTION.

November 21, 1859.

Messrs. J. G. Lynde and A. Brothers exhibited the process of photographing microscopic objects, as used by them, and which from the specimens produced, appears very excellent.

The first experiment was the photographing of a thin section of the spine of the *Æchinus*; a ⅔ds inch object glass of Messrs. Smith and Beck being used, with the focussing glass at a distance of three feet six inches. The object was illuminated with an argand gas lamp; the image being received on an ordinary collodion plate, and exposed for fifteen minutes. The plate was then removed, and presented a beautiful picture of the object, magnified about sixty-five diameters. The results of the experiments altogether, justify the strongest anticipations of future success.

Mr. Parry described a simple form of camera which he had used, and in which he dispensed altogether with the use of the microscope body; simply inserting the object glass into the lens aperture, and fixing a suitable stage to support the object.

Mathematical and Physical Section.

December 8, 1859.

"On the rotation of Jupiter," by Mr. Baxendell.

"On the Sun's orbit plane," by Mr. Thomas Carrick.

January 5, 1860.

"On a new variable star," by Mr. Baxendell.

Mr. Heelis communicated to the section a notice of an old work on the "Origin and nature of wind," by R. Bohun, of New College, Oxon, published at Oxford in 1671, and which contains a statement of various points in the law of storms, such as their vortical motion, calm centre, change of currents, and action upon the barometer, twenty-seven years earlier than the earliest account hitherto noticed, which is that of Captain Langford, in the Philosophical Transactions for 1698.

Mr. Long exhibted some sketches of the appearances lately presented by the disc of Jupiter, and stated that during the present apparition of the planet he had not observed any dark spots similar to those which were visible last winter.

ROYAL SOCIETY.

DECEMBER 8, 1859.

"On the analytical theory of the attraction of solids," by Professor Donkin.

Supplement—"On the thermodynamic theory of steam engines with dry saturated steam, &c.," by Professor Rankine.

"On the effects produced on human blood corpuscles by sherry wine," by Dr. W. Addison.

Supplement—"On the influence of white light, &c., on the growth and nutrition of animals," by Mr. H. Dobell.

"Researches on the phosphorous bases, No. 7," by Dr. Hofmann.

DECEMBER 15, 1859.

The Right Hon. Edward Lord Stanley was elected a fellow. The following papers were read:—

"On the repair of tendons after their subcutaneous division," by B. Brodhurst, Esq.

"On the curvature of the Indian Arc," by Archdeacon Pratt.

"Comparison of some recently determined refractive indices with theory," by the Rev. B. Powell.

DECEMBER 22, 1859.

B. Woodcroft, Esq., was admitted a fellow of the society. The following papers were read:—

"On the electro-conducting power of alloys," and "On the specific gravity of alloys," by Mr. A. Matthiessen.

"On the structure of the chorda dorsalis of the plagiostomes and some other fishes," by Professor Kölliker.

"On an extended form of the index, the index symbol in the calculus of operations," by W. Spottiswoode, Esq.

Admiral Fitzroy, superintendent of the Meteorological Department of the Board of Trade, gave an oral account of the late storms of the 25th and 26th of October and the 1st of November.

HIGHLAND AND AGRICULTURAL SOCIETY OF SCOTLAND.

JANUARY 18, 1860.

This was the half-yearly meeting, when the large number of 153 candidates for membership were ballotted for and admitted. After the usual routine business, Mr. Forbes Irvine stated that the following awards had been made during the year for reports:—1. The gold medal to James Duncan, Old Manse, Denholm, Hawick, for report on the natural history of the turnip fly. 2. The gold medal to Jas. Fulton, Temple, Maryhill, Glasgow, for a report on the cultivation of Italian ryegrass. 3. The gold medal to James Porter, Monymusk, Aberdeenshire, for a report on top-dressing pasture. 4. The gold medal to Robert Scott Skirving, Camptoun, East Lothian, for a report on the cultivation of mangold wurzel. 5. The medium gold medal to Patrick Sheriff, for a report on the new variety of wheat.

INSTITUTION OF CIVIL ENGINEERS.

DECEMBER 13, 1859.

This was the annual general meeting. The report of the Council for the past session was read, in accordance with the usual practice, some of the works in progress, or which had been completed during the preceding twelve months were noticed.

JANUARY 10, 1860.

The whole of the evening was occupied by the reception of an address from the president, Mr. G. P. Bidder, on taking the chair for the first time since his election. This very able discourse has been printed, and is probably already in he hands of the great mass of our readers.

Discussion on Mr. Grantham's paper "On arterial drainage and outfalls."

SOCIETY OF ARTS.

DECEMBER 14, 1859.

On "the *Great Eastern*," by Mr. William Hawes.

DECEMBER 21, 1859.

"On starches, the purposes to which they are applied, and improvements in their manufacture," by Mr. F. Crace Calvert.

PHILOSOPHICAL SOCIETY OF GLASGOW.

NOVEMBER 2, 1859.

THIS was the opening night of the fifty-eighth session. The President, Dr. Thomas Anderson, delivered an address.

"On the einephantic colour top," by Mr. E. Hunt.

NOVEMBER 30, 1859.

"Notes of a visit to Iceland," by Mr. D. Mackinlay.

ASSOCIATION OF FOREMEN ENGINEERS.

DECEMBER 4, 1859.

Mr. C. F. Hayes read his concluding paper "On the manufactnre of the Enfield rifle."

JANUARY 7, 1860.

"On the instruments used at the Royal Observatory, Kew," by Mr. Beckley.

GEOLOGISTS' ASSOCIATION.

DECEMBER 5, 1859.

The usual monthly meeting was held. The Rev. Thomas Wiltshire, M.A., F.G.S., in the chair. Professor Tennant, F.G.S., gave a lecture "On siliceous nodules."

SOCIETY OF ENGINEERS.

DECEMBER 8, 1859.

THIS was the annual dinner—H. P. Stephenson, Esq., in the chair. The Secretary gave a good account of the prosperity of the Society, and stated that it now numbered above 150 members.

CHEMICAL SOCIETY.

DECEMBER 1, 1859.

"On the action of pentachloride of phosphorus upon tartaric acid," by Messrs. Perkins and Duppa.

MONTHLY NOTES.

MARINE MEMORANDA.

Messrs. Palmer, of Jarrow, have in hand the large express steamers, guaranteed to attain 20 miles an hour, for the Atlantic Mail Steam Company.

Messrs. William Denny & Brothers, of Dumbarton, have contracted to build a screw steamer to be employed in the surveying service in the Gulf of St. Lawrence. The engines for this vessel are to be made by Messrs. Tulloch & Denny, of the same place, who have also contracted to make two pairs of screw boat engines for the Tuscan Government.

The harbours of Greenock appear to have become too small for the commerce of the port; and a new harbour is contemplated, covering upwards of ten acres of ground, and involving an expenditure of nearly a quarter of a million of money, the plans of which have been prepared by Messrs. Bell & Miller, the engineers of the trust, and a new Act has been applied for.

The Forth and Clyde canal in Scotland is now regularly peopled with screw steamers which are rapidly taking the place of the old horse track boats. By far the greater part of the traffic on this canal, which, as its name imports, is the great heavy goods junction between the great northern estuaries, is now carried on by screw steamers. As colliers, these boats carry from 60 to 80 tons of coal, at a rate of about five miles an hour, and they get round the sharp ends of the canal with great ease.

Mr. York, of Glasgow, best known perhaps as the builder of the handsome Victoria Bridge over the Clyde, has just finished a large undertaking at Greenock, in the formation of a new entrance to Messrs. John Scott & Sons' graving-Dock, which has been executed from the designs of Messrs. Bell & Miller, civil engineers of Glasgow. The original entrance of the dock has been completely removed, and a new entrance formed nearer the river, thus giving increased length. This dock, which is one of the oldest, if not the oldest in Greenock, has now the widest and deepest entrance of any in the port, and when some further contemplated improvements are effected in lengthening, widening, and deepening the dock throughout, it will rank next in point of size, to Messrs. Tod & M'Gregor's great dock at Partick, near Glasgow.

The entrance is 45 feet wide, with a depth of upwards of 15 feet of water at the sill, and is built entirely of solid stone founded on concrete. The work was commenced early last June, and completed by the middle of November—an unprecedentedly short time for a work of such a magnitude. The gates were hung and the coffer dam removed so far as to allow a ship to enter in the beginning of last month, and the dock is now again in full operation, and bids fair to keep up the name it has long held of being one of the most useful public works in Greenock.

During the year which has just closed, the lifeboats of the National Lifeboat Institution have been instrumental in saving 218 lives, from the following wrecked vessels on our coast:—schooner Betsey, of Sunderland, 4; schooner Clifton, of Glocester, 2; schooner E.D., of Salcombe, 5; schooner Viscaya, of Spain, helped into port; brigantine Gonsalve, of Nantes, 7; helped the schooner Scotia, of Carnarvon, into port; schooner Caroline, of Fowey, 6; schooner Frederick William, of Ipswich, 5; Culercoats fishing boat, 4; brig Velocity, of

Sunderland, 8; sloop Liberal, of Wisbeach, 1; bark Alecto, of Frederickstadt, 9; brigantine Opresiugen, of Arundel, 3; brig Eagle, of Sunderland, 6; brig Lucinde, of Memel, 11; smack Endeavour, of Portmadoc, 4; sloop George and Mary, of Hull, 3; schooner Majestic, of Dundee, 5; schooner Oriental, of Lancaster, 6; schooner Lord Douglas, of Dundee, 5; schooner Silva, of Glasgow, 4; steamer Shamrock, of Dublin, 14; smack Bruce, of Milford, 3; brig North Eske, of Sunderland, 6; schooner Anton, of Denmark, 6; steamer Enchantress, of Hull, 14; brig New Astley, of Aberdeen, 6; bark Ohio, of Stettin, 4; brig Cuba, of Whitby, 1; brig Henry Morton, of Sunderland, 8; ship Somnauth, of Liverpool, 4; sloop Sibyll, of Goole, 3; brigantine Robert and Henry, of Dundalk, 6; schooner Olive Branch, of Colchester, 7; brigantine Hannah Jane, of London, 7; ship Britannia, of Bath, United States, 14; brig Fortuna, of Memel, 11; coble Isabella, of Hartlepool, 2; and the schooner Ferona, of Exeter, 5; making a total of 218 lives saved by the Institution's lifeboats frem 59 shipwrecks during the past year. On 28 occasions it also happened that when the lifeboats had put off, in reply to signals of distress, the vessels had either got out of danger or their crews been rescued by some other means. Lifeboats' crews also assembled several times to give assistance, but were not required to put off to sea. On these occasions and on those of quarterly exercise the lifeboats were manned, probably by no less than 4,000 persons. Nearly all the services took place in stormy weather and heavy seas, and often in the dark hours of night. During the same period the expenses incurred by the Institution on additional stations, replacement of old boats, transporting carriages, and boathouses, in various localities on our coasts, have amounted to a total of £10,940. Moreover, grants and rewards to the extent of £1,108 15s. 3d., besides one gold and 20 silver medals for rescuing 498 persons from vessels wrecked during the last 12 months, have been made. In carrying out its humane objects, however, the society we learn, has incurred liabilities to the amount of £3,834. Such practical proofs as these of the great value of the Royal National Lifeboat Institution, in a maritime country like ours, cannot possibly be overrated. It has now 96 lifeboat stations under its management. On an average each station requires £30 a year to maintain it in a thorough state of efficiency. This good work can, therefore, only be perpetuated by permanent endowments and the continued support of the public to the National Lifeboat Institution.

None but an eye-witness can form any proper conception of the magnificence of the larger class of American steam-boats. The *New World*, originally 376 feet long, has been lengthened to 468 feet over all. With a breadth of beam of 50 feet, the main deck is extended by means of platforms, or "guards," projecting over the water to the full width across the paddle-boxes, 85 feet, being thus wider than the main deck of our own *Great Eastern*. Yet the vessel, which is flat-bottomed, with bilges nearly or quite square, draws only 5½ feet of water, the whole displacement being about 2500 tons, and the immersed midsection 275 square feet. The boilers, weighing, with water, 75 tons each, are placed upon the "guards" outside the hull, and of course, several feet above the load line. To make the whole as rigid as a tubular girder, two enormous arched trusses, placed one over each side of the hull, extend over nearly 350 feet of the length of the boat. These great bows, like the arches of a bow-string bridge, are connected to king posts and queen posts, and strapped and fastened, so that the whole is as stiff as a man-of-war. Then there are four or five large king posts, or masts, stepped upon the keel, and carrying the weight of the projecting "guards" by long diagonal tension rods. These masts carry no spars, booms, or rigging of any kind, all of which would be so much top hamper worse than useless, at a speed of 20 miles an hour. These posts like nearly all the rest of the wood work, are painted a dazzling white, and surmounted by gilded balls. The lines of the hull are very sharp, and at 22 statute miles an hour, a speed not unfrequently attained, there is only a thin spurt of water breaking into spray to mark the keen entrance of the cutwater. The *New World* has more than 400 sleeping berths, and her great saloon is nearly 300 feet long, the whole being fitted up with dazzling magnificence.

The steam machinery for the sloop-of-war squadron last ordered by the United States Congress, has been built by contract in different places, by various builders, and for prices as follows:—

Machinery of 1,000 Ind. Horse Power:

		Dols.
Mohican,	Woodruff & Beach, Hartford,	125,000
Iroquois,	Jas. Murphy & Co., New York,	130,000
Wyoming,	Merrick & Sons, Philadelphia,	102,000
Dacotah,	Murry & Hazelhurst, Baltimore,	131,000

Machinery of 750 Ind. Horse Power:

Narragansett,	Locomotive Works, Boston,	104,000
Seminole,	Morgan Iron Works, New York,	120,000

Machinery of 1,100 Ind. Horse Power:

Pawnee,	Reany, Neafie & Co., Philadelphia,	139,000

All the engines are direct-acting, and the boilers are of the variety known as Martin's patent. The propellers of all, except the *Pawnee* are single, and hoist out of water when required; the *Pawnee* has two propellers—fixed one in each run. The proper performance of this machinery is guaranteed by contractors for three months, and all repairs found necessary during that time, on account of defective material or workmanship, are chargeable to them in each case.

The speed of the *Pawnee* is to be 16 miles an hour, that of the *Dacotah* 14 miles, and of all the others, 12 knots an hour—if possible to attain it.

Shipbuilding on the Wear in 1859.—Sunderland.—The annual return of vessels built in this, the largest shipbuilding port in the world, during 1859, has just been completed, and shows, as was generally expected, a considerable falling off, even as compared with 1858, when it was thought the lowest point had been reached in ship production. Last year the number of vessels built was 100, with a total tonnage of 36,184. In 1858 the number built was 110, with a total tonnage of 42,003. In 1853, when the Australian gold discoveries had stimulated the trade to an extraordinary extent, the number of vessels built was 152, representing an aggregate tonnage of 68,479. The average then was 454 tons per ship, while last year the average had decreased to 361 tons. In 1853, London purchased 40 sail; last year, only 16. As a natural consequence of this state of things, prices have gone down to a corresponding extent. In 1853, a ship classed for ten years, with East Indian outfit, could not be purchased for less than £15 per ton; at present, such a vessel may be had for £12 per ton. The following table will show the state of trade during the last seven years:—

Year.	No. of Ships built.	Total Tons.	Average Tons.
1853	152	68,479	454
1854	151	66,929	443
1855	151	61,159	405
1856	154	63,049	409
1857	143	54,780	383
1858	110	42,003	381
1859	100	36,184	361

The number of vessels building on the first instant was 72 (including five iron ships), with an aggregate tonnage of 27,210. Of these 18 are sold, and 54 unsold. On the same date last year there were 78 vessels building, with an aggregate tonnage of 32,789, showing a decrease of six vessels, or 5,579 tons this year.

Metallic Packing for Stuffing Boxes.—The very ingenious and simple metallic packing for stuffing boxes, invented by Mr. Robert Anderson, of Blackbraes, near Falkirk, and fully engraved and noticed by us at page 41 of present volume of the *Practical Mechanic's Journal*, has now an extended trial in various quarters with perfect success. It is now in use at the extensive Scotch iron works of Kinniel, Gartsherrie, Glengarnock, and Carnbroe, where all the enormous stuffing boxes of their blowing engines are packed with it. This is a pretty severe test, for ten-inch piston rods are not uncommon in blowing engines. For fast work it is in use in locomotives on the Monkland, Caledonian, and Edinburgh and Glasgow railways. A stuffing box which will stand well without cutting the rod, or allowing of a steam escape with small rods, running at the high rates now kept up on railways, must be good. Our readers will recollect from our engravings, that the plan involves nothing more than a set of segmental metal packing pieces, set in layers round the piston rod, and so cut at the ends as to wear uniformly all throughout the depth of the metal, whilst the elastic pressure inwards upon the piston rod is most efficiently kept up, simply by a lapping of wire, which gives a steady easy action, without being too strong with new segments, or too weak with worn ones.

Machine Brick-Making.—The brick-making machine of Mr. Henry Clayton, of the Atlas Works, London, engraved by us in plate 192, in our vol. I., second series, has steadily worked its way into general use. Its simple and effective character has lately attracted the notice of the able engineer of the South-Eastern Railway Company, and the directors of which have now had erected a set of Clayton's patent brick-making machinery, on their premises adjoining the railway station at Folkstone, for the manufacture of bricks for the use of the company. The engineers of the Indian, Turkish, and Russian Railways, and many eminent contractors, have also selected Mr. Clayton's machine for their use. It works with a remarkably small expenditure of power, making from 20,000 to 25,000 of capital bricks per day, with the attendance of two men and four boys.

Purification of Foul Water.—Mr. Thomas Spencer, of Liverpool, the veritable father of electrotypic science, has apparently hit upon a grandly important secret of nature, in as far as her treatment of water in purifying it by filtration through the earth's strata, is concerned. He has also developed something new with reference to ozone, in connection with his discovery; but the great point is, that he has experimentally ascertained that the magnetic oxide of iron, which abounds in rocky strata, and in sands, attracts oxygen, whether it exists in water or in air, and polarises it—that this polarised oxygen is the saluhrifying ozone — that this ozone, so formed, destroys all discolouring and polluting organic solutions in water, and converts them into the sparkling and refreshing carbonic acid of the healthful spring. Even sewage water can be thus almost instantaneously purified. Moreover, Mr. Spencer has discovered that the apparently mechanical process of filtration is itself magnetical, and it is now known that all substances are constitutionally more or less subject to magnetic influence: thus all extraneous matters suspended in water may be rapidly attracted in filtration, and so separated; and this may be done whether on a great scale or a small, either by the magnetic oxide, or black sand of iron, by a mixture of this with ordinary sand, or by various other means; and Mr. Spencer has discovered a solid porous combination of carbon with magnetic oxide, prepared from Cumberland hæmatite, which is said to have very great filtering power. We give these particulars as they have been detailed to us; time will show what value the theories involved really possess.

Manchester Association for the Prevention of Steam Boiler Explosions.—At the monthly meeting of the executive committee, held on the 20th ultimo, Mr. H. W. Harman, C.E., presented his report, of which the following are extracts:—We have under inspection 578 mills, collieries, and other works, and 1618 boilers. We have made 179 visits, examined 562 boilers, and 402 engines; of these 2 visits have been special; 2 boilers specially, 15 thoroughly, 8 internally examined; 33 diagrams have been taken from 19 cylinders. The general defects have been as follows:—Corrosion, 5; fracture, 6; safety valves out of order, 20; pressure guages out of order, 2; water guages out of order, 10; feed apparatus, 4; blow-off cocks, 7; furnaces out of shape, 14 (2 dangerous); fusible plugs placed wrongly, 2. Boilers without back-pressure valves, 87; boiler blow-off cocks, 5; boiler pressure guages, 19; boiler water guages, 9. Other defects of a minor character need not be particularized. We have a large number of internal furnaces out of shape, and as I consider all plates injured by over-heating, and that have lost their true form as unequal to sustain with safety the pressure previously borne, I advise in all such cases their immediate removal, the restoration of the circular form and the replacing the defective parts with the best material and workmanship; any negligence in these particulars must ultimately entail either accident or disaster, or both, and no amount of inspection can effect more than this requisition thus made, to have the remedies pointed out carried into effect without delay.

Mica Plates for Photographic Pictures.—That curious elastically laminated mineral mica, has lately been tried as a medium for the reception of photographic images, with considerable success. Mica sheets are thin, light, transparent, and flexible, and from twenty to thirty sheets of it can be packed within the space occupied by the thickness of a single photographic glass plate. As a surface, however, although it is superior to paper, it is inferior to glass, as it is full of minute scratches. For certain purposes, however, it may be useful to the photographer. "Illuminated mica letters" are now being made by Messrs. Squire, of London. They are intended for fixing externally upon windows, lamps, and other surfaces where attractive notices are desirable. Being so thin, they cannot be rubbed off; and yet, when properly relieved in colour, they afford all the prominent effect of relief letters. The idea promises we think, to turn out in a most successful way.

Umbrella and Walking-Stick Handles.—Mr. Smith, of the well-known box works, Mauchline, Ayrshire, has lately introduced a simple and most effective means of strengthening the cross or transverse grained portions of wooden and other articles of various kinds, so as to enable the articles or details so strengthened, capable of withstanding severe strains across or at right angles to, the line of the grain of the wood or other material so treated. The process or operation, is most peculiarly suited for strengthening the handles of umbrellas, parasols, and walking-sticks; but it may also be employed in strengthening the cross or angularly grained portions of the stocks of fire arms. In a walking stick handle, where the short horizontal, transverse, angular, or lateral portion grasped by the hand is cut out of the solid wood forming the main body of the stick, such short portion is necessarily weak and liable to break across, owing to the fibres of the wood running across, or at right angles to the axis of that portion. According to the present invention, failure at this portion is prevented by the insertion of a "dowell" of wood or other material of straight or right line grain, into a groove or bored hole in the side or centre of such weak part, so as to supply it with a strong, straight grained support. The grain of the inserted "dowell" or piece being set into the weakened part, so that its fibres run as nearly as may be at right angles with those of that part, it is clear that such part practically becomes a straight grained one; and hence a great power of resistance to transverse strains is secured. This mode of strengthening is suitable for a great variety of articles and details, and its principle may be carried out in many ways, the object always being the giving a straight, or right-lined grain to cross or transverse grained portions or details.

Squaring the Circle.—We have before said that we never could see what was to be gained by "squaring the circle; but as the question does still attract the attention of ingenious calculators, we present the following recently proposed approximate plan:—Describe the given circle, and let A B be a diameter. From A set off the quadrant A C, and from C set off in the same direction an arc A C $= 60°$. Bisect the chord A C in E; and from A draw A E, and prolong it until it meets the circumference in F. Then will A F be the side of a square whose area is approximately equal to that of the circle.

The difference of the areas is about $\frac{1}{3747}$

Multi-Colour Printing.—A new system of multi-colour printing has recently been introduced by Messrs. J. and F. Muir, of Glasgow and Paisley, for the purpose of securing very superior effects, with a comparatively few number of printing impressions. According to this process, supposing there to be five colours in the design, the first two are, or may be, printed or laid on the fabric or surface to be printed, by corresponding blocks in the usual way. The other three colours are put on from a single sieve or colour box, that is to say, from a sieve on which the three several colours to be printed are laid in stripes, at predetermined positions. In this way, as the block is laid upon the sieve, it takes up the three colours on the predetermined portions of the figure, and when applied to the cloth or surface to be printed, it deposits its three several colours so as to form actual integral or detail portions of the pattern. This system of printing, whilst it economises the process, also provides for a "rain-bowing" effect to a certain extent, and it enriches the pattern correspondingly. Of course the sequence of actions may be modified in practice in various ways. The different colours may be conveniently applied to the sieve or colour box by means of a cellular feeder, which is a rectangular chamber formed into a series of colour cells open at the top. The bottom of this cellular feeder is fitted with two parallel loose running rollers, to which the several colours find access to these rollers through suitable conducting holes, so as to render the rollers instrumental in delivering the colours to the sieve or colour box. For rain-bowing, the rollers are themselves covered with sieve cloth, so that they are thus enabled to distribute the colours upon the sieve surface with a due rain bouring or blending effect. When not used for rain-bowing, the rollers are grooved or cut into annularly at each part which receives colour, and thus the colours are distributed evenly and sharply for the purposes hereinbefore described. This system of multi-colour printing may be carried out without the use of single colour printing at all, the different colours being laid on by means of one or more multi-colour blocks or surfaces. These multi-colour blocks are arranged in such manner that two or more colours may be taken off from one sieve surface, and other colours forming a portion of the pattern may be arranged on corresponding blocks, so as to fill up the blank spaces or parts left imprinted by the first blocks, these secondary colours being taken from another sieve surface arranged in conjunction with the improved apparatus.

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When city or town is not mentioned, London is to be understood.

Recorded August 12.

1861. Louis A. Possoz, 37 Rue de Rivoli, Paris—Improvements in the manufacture and baking of sugars.

Recorded August 17.

1894. Alfred V. Newton, 66 Chancery Lane—Improvements in the construction of carriages, and in the apparatus for guiding or reining in carriage horses.—(Communication from Isaac M. Singer, New York, U. S.)

Recorded August 24.

1932. George Riley, Elm Tree Lodge, South Lambeth, Surrey—Improvements on helical refrigerators for cooling brewers' and distillers' worts.

Recorded August 31.

1982. Gilbert S. Fleming, 498 New Oxford Street—Improvements in candles for the purpose of indicating time, and the facility of lighting the same.

Recorded September 13.

2083. Anton B. Seithen, 6 Alpha Place, Caledonian Road—Improvements in apparatus for shaping cork stoppers, and in the manufacture of life buoys and buffers of cork.

Recorded September 19.

2132. Hubert J. Warlomont. Vieille Montagne Zinc Works, Liege, Belgium—Improvements in apparatus for the manufacture of zinc.

Recorded September 20.

2144. Leonard Mathews, 28 Fletcher Gate, Nottingham—Improvements in machinery to be employed in introducing plain or coloured wire upon lace or other fabrics, for the purpose of ornamenting the same, or for running on and stiffening cap borders, or for other similar purposes.

Recorded September 26.

2178. George Addenbrooke, Greenhill Wimbourn, Wolverhampton — Improvements in raising and lowering boats and other vessels from one water level to another, applicable in inland navigation.

Recorded September 28.

2198. Edward T. Simpson, Walton, near Wakefield, Yorkshire—Improvements in apparatus for condensing distilled fatty matters.

Recorded September 30.

2218. William H. Buckland, Maesteg Iron Works, Glamorganshire—Improvements in the preparation of peat.
2219. Herbert W. Hart, Fleet Street—Improvements in argand and other gas burners, partly applicable to oil and other lamps.
2220. William Clark, 53 Chancery Lane—Improvements in railway signal apparatus.—(Communication from Messrs. Leon Jucqueau and Auguste Desgoffe, 29 Boulevart St. Martin, Paris.)
2221. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in the construction of apparatus for reworking the waste steam of steam-engines.—(Communication from Messrs. Dalifol and Company, Paris.)
2222. Martin and Alexander Samuelson, Scott Street Foundry, Hull, Yorkshire—Improvements in planing, slotting, and grooving machines.
2223. Honourable W. E. Cochrane, Osnaburgh Terrace, Regent's Park—Improvements in chairs and apparatus for receiving and securing the ends of the rails of railways.
2224. William V. Edwards, Swindon, Wiltshire—Improvements in the construction of ways and apparatus to facilitate the conveyance of mails, goods, and passengers.

Recorded October 1.

2225. Seth Ward, 8 Stanley Place, Stanley Street, Pimlico—An apparatus to be used in the hardening of saws and steel plates generally.
2226. William Parkin, Sheffield, Yorkshire, James Bates, Hyde, Cheshire—Improvements in wedges for railway chairs.
2227. Charles Brown, Warwick Street, Pimlico—Improvements in inkstands and date indicator.
2229. Richard A. Brooman, 166 Fleet Street—Improvements in reverberatory puddling and other furnaces employed in the manufacture of iron.—(Communication from G. Dallemagne, of Sclessin, Belgium.)
2230. John Baugham, Pimlico—Improvements in the manufacture of soap.
2231. John Millar, Edinburgh—Improvements in reflectors for diffusing artificial light.
2232. Leopold Newton, Oldham, and John Greaves, Staleybridge, Lancashire—Improvements in cop tubes or spools, and in machinery for manufacturing the same.
2233. George Bridgett, Pilcher Gate, Nottingham—A new mode or method of manufacturing Shetland or other falls from the stocking frame.
2234. Joseph Wright, Teesdale Iron Works, South Stockton, Yorkshire—Improvements in apparatus for raising water and minerals from mines, which improvements are applicable to raising and hauling weights generally.

Recorded October 3.

2235. Edmund Morewood, Enfield—Improvements in coating metals.
2236. Richard A. Brooman, 166 Fleet Street—Improvements in treating clay, and in the manufacture of bricks, tiles, and other like articles, and in machinery employed therein.—(Communication from Jean M. Rabier, Paris.)
2237. Louis H. I. Lemaire, Stamford Street, Blackfriars—Improvements in the manufacture of chenile.
2238. William R. Earle and Edwin J. Barnes, Queen's Terrace, Queen's Head Lane, Islington—Improvements in photographic and other portraits.

Recorded October 4.

2239. George F. Greiner, 57 Wells Street, St. Marylebone—Improvements in the construction of pianofortes.

2240. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved coupling joint for pipes or tubes of soft metal, caoutchouc, gutta-percha, or other yielding matter.—(Communication from Louis J. Marie, Paris.)
2241. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved "porte-jupe," or apparatus for suspending dress-skirts and other objects.—(Communication from Louis A. Mangin, Paris.)
2242. John Loftus, Elton Fold, near Bury, Lancashire—Improvements in machinery for combining and carding cotton or silk and wool.
2243. Richard and William Hollis, High Coggs, Witney, Oxford—Improvements in the construction of apparatus for winnowing and dressing grain.
2244. Samuel R. English, Birmingham, Warwickshire—A machine or apparatus for taking copies of writing.
2245. Robert Brearly, the younger, Batley, Yorkshire—Improvements in means or apparatus for raising the nap or pile of cloths.
2246. William Backett, Old Kent Road, Surrey—Improved cleansing powders.
2247. William E. Newton, 66 Chancery Lane—Improved apparatus for generating steam.—(Communication from John M Carr, New York, U. S.)
2248. John M. Rose, Richard Carte, and William Pikesley, Westminster—Improvements in drums.
2249. James Rawlings, Carlton Hill East—An improved construction of boot tree.
2250. Thomas Cook, Coburg Road, Old Kent Road, Surrey—Improved tools for making screws.

Recorded October 5.

2251. John Thompson, Witton, and John Thompson, the younger, Castle, Northwich, Cheshire—The manufacture of salt by an improved and more economical mode.
2252. Frederick J. Dove, Studd Street, Islington—Iron clasped bonding plates for joists and other building purposes.
2253. Andrew Whytock, 12 Little St. Andrew Street, Upper St. Martin's Lane—A mode or method of applying joined sheets of metal for roofing and other purposes.
2255. John Shields, Perth, North Britain—Improvements in Jacquard looms or machinery for weaving.
2256. William G. S. Mockford, 67 Upper Thames Street—Improvements in the manufacture of starch.
2257. Jehoiada J. Eagleton, Birmingham, Warwickshire—An improvement or improvements in annealing furnaces.
2258. Robert Fisher, Westbourne Grove, and Charles Aspray, Newton Road, Westbourne Grove—Improvements in photographic stereoscope slides, and in the stereoscopes employed in viewing the same.
2259. George Davies, 1 Serle Street, Lincoln's Inn, and 28 St. Enoch Square, Glasgow—Improvements in the method of, and apparatus for, vaporising liquids and heating air.—(Communication from Messrs. Gargan and Co., Villette, France.)
2260. Thomas H. Dodd, Bessborough Place, Pimlico—Improvements in portable apparatuses for the use of smiths, carpenters, and other workmen.
2261. John Scott, Sunderland, Durham—Improvements in the manufacture of anchors.
2262. William E. Newton, 66 Chancery Lane—Improvements in blankets used for printing calicoes and other fabrics, and in the mode of washing or cleaning the same.—(Communication from Seth W. Baker, Providence, Rhode Island, U. S.)
2263. William E. Newton, 66 Chancery Lane—Improvements in revolving fire-arms.—(Communication from Messrs. Perrin and Delmas, Paris.)
2264. John Prichard, Esq., 8 Whitehall—Improvements in spurs.
2265. William L Earle, Alfred Place, Bedford Square—Improvements in apparatus for promoting the combustion of smoke and gases arising from fuel.
2266. James Webster, Birmingham, Warwickshire—An improved construction of spring for carriages and other purposes.
2267. John Macintosh, North Bank, Regent's Park—Improvements in the manufacture of flexible tubes.
2268. James Turpie, North Shields—Improvements in the fore and aft gaff and boom sails of ships.
2269. John Macintosh, North Bank, Regent's Park—Improvements in coating metallic conductors for electric telegraphs.
2270. George Long and James Archer, Landport, Hantsshire—Improvements in the manufacture of manure.

Recorded October 6.

2271. Gustavus A. Smith, Old Cavendish Street—Improvements in shot and shells, and other projectiles.
2272. John P. Scott and Edward Scott, Manchester—An improved instrument for boring and drilling.—(Communication from Constantin V. Longinoff, St. Petersburgh, Russia.)
2273. William Hopkins, Birmingham, Warwickshire—A new or improved steam engine.
2274. Edward O'Connell, Bury, Lancashire—Improvements in apparatus for supplying liquid nourishment to infants, invalids, and others, and for warming or heating the same.
2275. George Freeman and James Royle, Unsworth, near Bury, Lancashire—Improvements in looms.
2276. Enoch O Tindall, Scarborough, Yorkshire—Improvements in machinery or apparatus for crushing or reducing grain, seeds, and other substances.
2277. Walter Macfarlane, Glasgow—Improvements in machinery or apparatus for drawing off or discharging liquids, and in fountains, baths, and similar receptacles for liquids.
2278. Alexander M. Ferry, Edinburgh—Improvements in the manufacture or production of oil, and in lamps for burning the same.
2279. William Benson, Fourstones, near Hexham, Northumberland—Improvements in projectiles for muzzle loading rifled ordnance.
2280. Andrew Hind, 60 High Street, Poplar, and Julius Lowenthal, 16 Little Tower Street—Improvements in the manufacture of pottery and china wares.—(Communication from Gustav Gumpel, 1 Stobenstrasse, Brunswick, Germany.)
2281. William Barron, Elvaston, Derby—Improvements in boilers applicable to beating and steam generating purposes.
2282. Robert Warry, Brompton Barracks, Kent—Improvements in breech-loading ordnance, and in projectiles for the same.
2283. William E. Newton, 66 Chancery Lane—Improvements in the construction and manufacture of casks, barrels, and such like vessels, and in the machinery or apparatus to be employed for such manufacture.—(Communication from Jean de Lihatcheff, Yaroslawl, Russia.)
2284. George Gibson and James Gibson, Southall—Improved machinery for raising and removing soil or earth from sewer and other excavations.

Recorded October 7.

2285. George L. Lee, 49 Holborn Hill—Improvements in producing printing surfaces.
2286. William Brookes, 73 Chancery Lane—Improvements in securing the tyres of railway carriage and engine wheels.—(Communication from Robert S. Kirkpatrick, Brussels, Belgium.)
2287. George P. Dodge, 44 St. Paul's Church Yard—Improvements in apparatus for preserving life, applicable to garments.—(Communication from Holman J. Hall, New York, U. S.)
2288. John Dixon, Newcastle-upon-Tyne—Improvements in apparatus for supplying water to water-closets.
2289. David M'Callum, Plymouth—Improvements in electric telegraphs.

Recorded October 8.

2290. William Dawson, Blackburn, and Thomas Singleton, Over Darwen, Lancashire—Improvements in apparatus applicable to looms for weaving.
2291. William Irlam, Newton Heath, near Manchester—Improvements in the construction of railway turntables and cranes.
2292. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in the treatment of fatty matter.—(Communication from Joseph E. Lhonore, Paris.)
2293. John Brough, Birmingham, Warwickshire—An improved waterproof dress for protecting and saving life at sea or in other situations where a waterproof dress may be required, as also in the apparatus to be attached to or used with the same, for assisting the wearer to hoist or make signals, by night or by day, and to inflate, propel, and guide or direct himself as desired, the waterproofing principle of which being also applicable to other useful purposes.
2294. Patrick Robertson, Sun Court, Cornhill—Improvements in preparing, boiling, and fermenting worts, and in maturing beer, spirits, and cider.
2295. James Childs, Windsor House, Putney, Surrey—Improvements in the manufacture of artificial gums.
2296. Henry Monument, Myrtle Street, Dalston, and George Berry, Buttesland Street, Shoreditch—Improvements in apparatus for raising and moving earth, and other matters and bodies.

Recorded October 10.

2297. John S. Parfitt, 60 Boulevart de Strasbourg, Paris—A registering nautical velocimiter, for measuring the speed of ships, and also of currents of water.
2298. Joseph Bentley and Herman J. Sillem, Liverpool—Improvements in breech-loading fire-arms, and the machinery for manufacturing projectiles for small arms.
2299 Charles A. Shaw, Biddeford, Maine, U. S.—Improvements in machinery for shaping or bending tinned sheet iron, and other sheet metal.—(Communication from William Burton, Cazenovia, Madison, New York.)
2300. Thomas Knowles and James Knowles, Manchester, and Arthur Rigg, Chester—Improvements in machinery or apparatus for shaping, cutting, punching, and drilling metals, which improvements are also applicable to presses.
2301. George White, 34 Dowgate Hill, Cannon Street—Improvements in frames for spinning and twisting yarn of any description of textile materials.—(Communication from Mr. Charles Leyherr, Leval, France.)
2302. George Davies, 1 Serle Street, Lincoln's Inn, and 28 St. Enoch Square, Glasgow—Improvements in the manufacture of paper pasteboard and cardboard.—(Communication from Messrs. Jules, Lagosse and Sons, and Frederick Quentin, Paris.)
2303. Samuel B. Parker, Deptford, Kent—A method of, and apparatus for, revivifying oxide of iron, and other agents, for purifying gas containing metallic particles.
2304. William Martin, jun., Dundee—An improved method of damping linen and other textile fabrics.

Recorded October 11.

2305. Louis J. Jenning, Pontarlier, France—A new system of pumps.
2306. Charles F. Beyer, Gorton Foundry, near Manchester—Improvements in machinery for boring and drilling.
2307. Joseph L. Tenting, Paris—Improvements in the construction of buffers for railway and other carriages, also applicable to other purposes where springs are employed.
2308. Joseph L. Tenting, Paris—Improvements in the construction of the axles of railway and other carriages.
2309. John Earl, Melbourne, Derby—Improvements in arranging and applying harness to the draft of carriages.
2310. William D. Hart, Edinburgh—Improvements in pressure regulating apparatus for gas burners.
2311. John Smith, Oldham, Lancashire—Improvements in breech-loading fire-arms and ordnance.
2312. Patrick G. Cunningham, Salisbury, Wiltshire—Improvements in the construction of artificial teeth and gums.
2313. Andrew Whytock, 12 Little St. Andrew Street, Upper St. Martin's Lane—Improvements in coating sheets of metal with other metals and other substances.
2314. Alfred V. Newton, 66 Chancery Lane—An improved mode of clarifying and defecating saccharine solutions and juices.—(Communication from Horatio N. Fryatt, New York, U. S.)
2315. Franz A. Lohage, Unna, Westphalia, Prussia—An improved construction of water wheel.—(Communication from Mr. Scharschmidt, Arusberg, Westphalia, Prussia.)

Recorded October 12.

2316. Joseph Skertchly, Ashby-de-la-Zouch, Leicester—Improvements in the manufacture of mosaic and other ornamental tiles and slabs, and in apparatus connected therewith.
2317. George Scott, 3 Priory Cottages, Peckham, Surrey—Improvements in generating elastic fluids and in the apparatus for that purpose.
2318. William Day, Burton Latimer, near Wellingborough, Northampton—A direct-action rotary steam engine.
2319. Alfred A. de R. Hely, 2 Park Village West, Regent's Park—Certain improvements in the manufacture of tobacco for smoking purposes.
2320. James Carrick, Glasgow—Improvements in commodes, water-closets, and other sanitary appliances.
2321. Zaccheus Nuttal, Stockport, Chestershire—Improvements in looms for weaving.
2322. James Thomson, Notting Hill—An improved form of hydraulic valve and apparatus to be used in the manufacture of gas.
2323. Thomas Rothwell, Manchester—Improvements applicable to warehouses and other buildings in which "well holes" are constructed for the purpose of light and ventilation.
2324. Edward H. Baron and James Wheater, Lee Mill, near Bacup, and Lambert Tatley, Crawshaw Booth, Lancashire—Certain improvements in carding engines for carding cotton, wool, or other fibrous materials.
2325. James Tangye, Birmingham, Warwickshire—A new or improved method of actuating certain kinds of motive power engines, and in the distribution of motive power.
2326. Edward H. Taylor, Rubicon Works, Saltney, Chestershire—Improvements in apparatus applicable to the permanent way of railways.
2327. Charles H. Southall, Blackburn, Lancashire—An improved apparatus for making and finishing boots and shoes.
2328. Charles P. Moody, Corton Denham, Somersetshire—A method of, and apparatus for, raising grass and other crops on to stacks, which apparatus is also applicable to raising and transferring weights.
2329. Thomas B. Daft, Tottenham—Improvements in flexible valves.

2330. Henry Bright, Sandwich Street, Burton Crescent—Improvements in machinery or apparatus for navigating the air.
2331. Thomas Twells, Nottingham—Improvements in machinery and apparatus connected therewith for embroidering or ornamenting woven, looped, or lace fabrics.

Recorded October 13.

2332. Abraham Holden, North End, near Stalybridge, and James Holden, Micklehurst, Chestershire—Improvements in machinery used in washing, dyeing, sizing, and drying yarn and thread.
2333. Jonathan Rhone, Leman Street, Whitechapel—An indicating meter tap.
2334. William Prosser, 24 Dorset Place, Dorset Square—Improvements in apparatus employed in the production of light.
2335. James Hunter, Kilmahumaig, Argyleshire—Improvements in machinery or apparatus for ploughing or cultivating land.
2336. William Burgess, Newgate Street—Improvements in reaping and mowing machines.
2337. Louis H. Rousseau, 29 Boulevart St. Martin, Paris—Improvements in steam engines.

Recorded October 14.

2339. Charles Collins, Lower Road, Islington—Improvements in the manufacture of grease for lubricating the axles of railway and other carriages, the journals of machinery, and for other like purposes.—(Communication from P. G. Fisse, Alicante, Spain.)
2340. Jean F. Conscience, 8 St. John Street Road, Clerkenwell—A new and improved process of making bread, and certain machinery connected with it.
2341. Frederick Levick, Blaina Cwm Celyn and Coalbrook Vale Iron Works, Monmouthshire—An improvement or improvements in the manufacture of iron.
2342. John P. Henderson, Summerford House, Stirlingshire—Improvements in stopcocks or valves.
2343. George Price, Wolverhampton, Staffordshire—Improvements in locks.
2344. John Varley, Radcliffe, Lancashire, and Jeremiah Crowther, Bradford, York—Improvements in steam engines and boilers.
2345. James Jack, Liverpool—Certain improvements in steam engines and boilers for marine and land purposes.
2346. George Goldsmith, Leicester—Improvements in gas meters.
2347. Thomas Robinson, St. Helen's, Lancashire—Improvements in annealing or softening wire.
2348. Henry W. C. Wise, Titchfield, Hampshire—An improved domestic apparatus for making tea, coffee, and other such like beverages.

Recorded October 15.

2349. William E. Newton, 66 Chancery Lane—An improvement in the mode of applying India-rubber, gutta-percha, or other elastic substances to give elasticity between the tyres or outer rims, and the hubs or naves of railway or other wheels, and between other metallic bodies.—(Communication from Edward Crane, Dorchester, Norfolk County, Massachusetts, U. S.)
2350. Henry Chapman, Battlebarrow Appleby, Westmoreland—An improved self-acting safety railway brake.
2351. Frederick A. Leigh, Manchester—Improvements in machinery or apparatus for the manufacture of screws, bolts, and nuts.—(Communication from Richard Hartmann, Chemintz, Saxony.)
2352. James Fernihough, Duckinfield, Chestershire—Improvements in the construction of steam boilers and apparatus connected therewith.
2353. Ralph Bates, Castle Mills, Stalybridge, Lancashire—Improvements in engines for carding cotton and other fibrous substances.—(Communication from John Robinson, New York, U. S.)
2354. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in machinery or apparatus for breaking stones.—(Communication from Monsieur Bac, Paris.)
2355. Joseph Echard, Paris—Improvements in machines and apparatus for ploughing and sowing.—(Communication from Mr. Estlimbaum, 54 Rue de Bondy, Paris.)
2356. Michael Henry, 84 Fleet Street—An apparatus for washing hanks, skeins, threads, and yarns of silk and other fibrous materials.—(Communication from Jean B. Berthand, the younger, 33 Boulevard St. Martin, Paris.)
2357. John H. Brown, Abbey Mill House, Romsey, Hantsshire—Improvements in the preparation of gunpowder for loading ordnance and fire-arms.
2358. Napoleon Montanari, Charles Street, Soho Square—An improved apparatus for aiding children in learning to walk.
2359. Robert Smith, Islington, Finsbury—The purification of water and other fluids.
2360. John Elder, Glasgow—Improvements in steam and other engines.

Recorded October 17.

2361. George Berry, 19 Buttesland Street—Improvements in the construction of glass and earthenware vessels for containing fluids, particularly such vessels as are intended to contain fluids which may exert dynamic force on the stoppers of such vessels.
2362. William K. Hall, 39 Cannon Street—Improvements in apparatus for manufacturing cotton wadding.—(Communication from John Smith, New York, U. S.)
2363. Lucien Vidie, Paris—Improvements in transmitting the motion of steam engines.
2364. Samuel Newberry and Henry Moore, Burnley, Lancashire—Certain improvements in looms for weaving.
2365. George W. Reynolds and Enoch Dance, Birmingham—A new or improved manufacture of baskets and other articles usually made of wicker work, and new or improved machinery to be employed in the said manufacture.
2366. William E. Newton, 66 Chancery Lane—Improvements in rotary steam engines.—(Communication from Charles S. Hathaway, Athol, Thomas H. Witherby, and Luke B. Witherby, Worcester, and Jonathan H. Nelson, Shrewsbury, Worcester, Massachusetts, U. S.)
2367. William E. Newton, 66 Chancery Lane—Improvements in preserving and disinfecting organic substances.—(Communication from Vincent M. Feraud, Leonard Laureau, and Felix Richard, Paris.)
2368. William Norton, Hollybank, Cavan—Improvements in kilns for drying grain.
2369. Julian Bernard, Albany, Piccadilly—Improvements in the manufacture or production of boots and shoes, and other coverings for the feet, and in the machinery, apparatus, and means connected with such manufacture.
2370. James Thom and Angus Kennedy, Glasgow—Improvements in looms for weaving.
2371. David Jones, Bassaleg, Monmouthshire—Improvements in self-acting brakes to be used on railways.
2372. Richard A. Brooman, 166 Fleet Street—Improvements in electro-magnetic engines, and in apparatus connected therewith.—(Communication from Messrs. J. S. Rousselot and Company, Paris.)
2373. Walter Hall and Arthur Wells, Erith, Kentshire—Improvements in the manufacture of ropes and cords.
2374. William Tillie, Londonderry—Improvements in sewing machines.

Recorded October 18.

2375. Germain Canonil, 93 Curtain Road, Shoreditch—Cartridges's paper, chemically prepared for percussion fire-arms.
2377. Joseph Reynolds, 21 Bull and Mouth Street—Improvements in the manufacture of wrought nails.—(Communication from Henry Coggshall, Providence, Rhode Island, U. S.)
2378. Alexander W. Williamson, University College—Improvements in obtaining extracts from poppies.
2379. George T. Bousfield, Loughborough Park, Brixton, Surrey—Improvements in machinery for steering vessels.—(Communication from Edward N. Dickerson, Park Row, New York, U. S.)
2380. James Higgins and Thomas S. Whitworth, Salford, Lancashire—Improvements in machinery or apparatus for preparing and spinning cotton and other fibrous materials.
2381. Caleb Hill, Cheddar, Somersetshire—An improved fastening for stays and other purposes.
2382. William E. Newton, 66 Chancery Lane—Improvements in machinery used for preparing for spinning silk, wool, or other fibrous substances.—(Communication from Charles de Jongh, Guebwiller, France.)
2383. William E. Newton, 66 Chancery Lane—An improved method of making combs or gills employed in the preparation of fibrous substances.—(Communication from Charles de Jongh, Guebwiller, France.)
2384. Hermann Hirsch, Berlin, Prussia—A new propeller for ships.
2385. Auguste S. Rott, Thann, France—The preparation of certain substances for fixing colours in dyeing, and printing, and for other purposes.

Recorded October 19.

2386. John H. Banks, Mediæval Works, Radnor Street, Manchester—Improvements in machinery for boring, cutting, moulding, and carving wood, stone, and other materials.
2387. George Worssam, 3 Oakeley Crescent, City Road—An improvement in non-condensing steam engines.
2388. George Gregg, Sheffield, Yorkshire—An improved method of dyeing leather black.
2389. John Gordon, 3 Railway Place, Fenchurch Street—Improvements in machinery or apparatus for pulping coffee.
2391. Thomas Spencer, 192 Euston Road, Euston Square—Improvements in the manufacture of carbonate of soda.
2392. Charles Seton, Edinburgh—Improvements applicable to the wheels of carriages generally for the purpose of reducing the draught thereof.
2393. Charles Cowper, 20 Southampton Buildings, Chancery Lane—Improvements in photographing on uneven surfaces, and in apparatus for that purpose.—(Communication from John H. Pein, New York, U. S.)
2394. George Hart, 6 Chapel Street West, May Fair—Improvements in the manufacture of hats.
2395. John J. Bowen, 136 Great Dover Street, Southwark, Surrey—Improvements in manufacturing the pots for containing liquids used by publicans and others.
2396. John Bruckshaw, Longslow, and Henry Bruckshaw, Hinstock, and William S. Underhill, Newport, Salopshire—Improvements in machinery for elevating grain and other similar substances.
2397. William Warne, James A. Jacques, and John A. Fanshawe, Tottenham—Improvements in the manufacture of elastic hoops or bands and other analogous elastic articles, applicable to various parts of ladies' and gentlemen's wearing apparel, and in the machinery employed in such manufacture.
2398. Richard Hobson, Leeds, Yorkshire—Improvements in producing ornamental devices in glass or other transparent substances for decorative or other purposes.
2399. Joseph R. Palmer, Newport Cottage, Old Ford, Bow—Improvements in the manufacture of printing ink and paints and varnishes, and also in the manufacture of lacquers, japans, and blacking.

Recorded October 20.

2400. Edward T. Hughes, 123 Chancery Lane—Improvements in machinery or apparatus for compressing and making caps for cartridges.—(Communication from Henri Mennig, Molenbeck St. Jean, Belgium.)
2401. Richard A. Brooman, 166 Fleet Street—A cryptographic machine or apparatus for carrying on secret correspondence.—(Communication from Jules F. V. Mouilleron, Paris.)
2402. Peter A. Godefroy, King's Mead Cottages, New North Road, Islington—Improvements in the construction of submarine cables.
2403. François Nivelle, Paris—Improvements in sewing machines.
2404. James Hodgson, Liverpool—Improvements in building ships and vessels.
2405. Charles Hanson, Tottenham Court Road—Improvements in fire-arms and ordnance.

Recorded October 21.

2406. James Musgrave, Globe Iron Works, Bolton-le-Moors, Lancashire—Certain improvements in steam boilers.
2407. Jonathan H. Green, Christiansberg, Wapello, Iowa, U. S.—A composition for coating metals and other substances for various purposes.
2408. John T. Pitman, 67 Gracechurch Street—An improved mode of converting cast-iron into soft malleable iron without change of form.—(Communication from J. A. K. Eaton, New York, U. S.)
2410. George T. Bousfield, Loughborough Park, Brixton, Surrey—Improvements in apparatus for steering vessels.—(Communication from E. N. Dickerson, Park Row, New York, U. S.)
2411. Thomas S. Prideaux, Willow House, Hampstead, and 32 Charing Cross—Improvements in the construction of ships and rafts.
2412. William Maltby, De Crespigny Park, Camberwell, Surrey—Improvements in refining oil.

Recorded October 22.

2413. John Avery, Essex Street—Improvements in railroad weigh-locks and other platform scales.—(Communication from E. Sampson, and Dennison S. Wheeler, Troy, U. S.)
2414. Peter Jones, Manchester—Improvements in machinery or apparatus for suspending, carrying, and laying down paper, woven fabrics, paper-hangings, and all kinds of flexible materials during and after the process of drying, and also for giving a continuous positive motion to the suspending rods or spindles.
2415. George B. Mill, Toronto, Canada West—Improvements in pressure regulating apparatus for gas burners.
2416. William Fox, Amiens, France, and James Willis, Little Britain—Improvements in the manufacture of umbrellas and parasols, part of which improvements is applicable to other purposes.
2417. Richard A. Brooman, 166 Fleet Street—A method of preparing inoxidizable oils and fats to be employed as lubricating substances.—(Communication from Jules Roth, Mullhouse, France.)

2418. William Brookes, 73 Chancery Lane—Improvements in machinery or apparatus for preparing wool and other fibrous materials.—(Communication from Messrs. Dombret and Dugnolle, Valenciennes, and Potez Aine, St. Mande, near Paris.)
2419. Septimus Beardmore, 27 Albion Street, Hyde Park—Improvements in electric telegraphs.
2420. William Thorold, Norwich—Improvements in apparatus applied to locomotive engines for condensing steam.
2421. Julius Dahlke, Providence Row, Finsbury—Improvements in the preparation of charcoal, and its application to the purification of water and the preservation of organic matters, and in apparatus connected therewith.
2422. Francis Wrightson, Birmingham, Warwickshire—Improvements in purifying coal gas, and in utilising compounds obtained in purifying coal gas.
2423. Francis N. Clerk and Charles Thomas, Birmingham, Warwickshire—Improvements in cleavers or choppers.

Recorded October 24.

2424. Andrew L. Dowie, Glasgow—Improvements in gas burners, and in pressure regulating apparatus for the same.
2425. George Holden, Preston, Lancashire—Improvements in machinery for spinning cotton and other fibrous substances.
2427. Auguste C. Bertrand, Paris—Improvements in the manufacture of herbal cigarettes.
2428. Richard A. Brooman, 166 Fleet Street—Improvements in daylight and other reflectors, and in the method of supporting lamp reflectors.—(Communication from Jean Boy, Paris.)
2429. Mathew Fitzpatrick, 29 Boulevart St. Martin, Paris—Apparatus to be applied to the prevention of accidents on railways, called "paracboc."
2430. Robert Seager, Peter Street, Ipswich—Improvements in compounds of India-rubber and gutta-percha.
2431. William E. Newton, 66 Chancery Lane—Improvements in the construction of ships or vessels.—(Communication from Rollin Germain, Buffalo, U. S.)
2432. William E. Newton, 66 Chancery Lane—Improvements in paddle wheels.—(Communication from Rollin Germain, Buffalo, U. S.)

Recorded October 25.

2433. Henry S. Rosser, 17 Upper Philimore Gardens, Kensington—Improvements in electric telegraph cables, and in the mode of obtaining signals.
2435. Germain Canouil, 93 Curtain Road, Shoreditch—New machinery for priming percussion caps without danger of explosion, also a new fulminate not hitherto employed.
2436. William C. Day, Strand—Improvements in stockings and drawers, and other articles of under clothing.
2437. William A. Matthews, Sheffield, Yorkshire—Improvements in springs.
2438. James M. Napier, York Road, Lambeth—Improvements in printing machines.
2439. Edwin Ellis, St. Ann's Wells Road, Nottingham—Improvements in the manufacture of lace, and in apparatus employed therein.
2440. Henry C. Hurry, Worcester—Improved apparatus for applying or using magnetism or electro-magnetism as a motive power.
2441. Edward S. Tebbutt, Leicester—An improved manufacture of elastic fabrics.

Recorded October 26.

2442. Alexander M'Glashan, Coal Yard, Drury Lane—Improvements in refrigerators for cooling worts and other liquors.
2443. William Clark, 53 Chancery Lane—Improvements in the preparation and application of baths or bathing media, and in apparatus employed therein.—(Communication from Emile Muller, Paris.)
2444. Jean J. Bonrcert, Manchester—Improvements in mules for spinning.
2445. John Z. Kay, Dundee, Forfarshire—Improvements in gas meters, and in apparatus for maintaining or preserving the levels of liquids.
2446. William W. Kennedy, Glasgow—Improvements in shirts.
2447. James H. Paterson, Glasgow—Improvements in shirting cloths and in shirts.
2448. John W. Hackworth, Priestgate Engine Works, Darlington—Improvements in dynamic valve gear, applicable to locomotive marine and other engines.
2450. John Armour, Perceton Fire Clay Works, Kilmarnock, North Britain—Improvements in apparatus for measuring and for regulating supplies of solid and fluid substances in the preparation of mixtures or compounds.
2451. Charles E. Wilson and Henry G. Hacker, Monkwell Street—Improvements in machinery for the manufacture of chenile.
2452. Richard Christy, the younger, Weston, Hertsshire—Improvements in means or apparatus for securing the closing of doors.
2453. Timothy Whitby, Millbank Street, and William Dempsey, Great George Street, Westminster—Improvements in ordnance and fire-arms.

Recorded October 27.

2454. Ignazio Zacheroni, Liverpool—Improvements in electric telegraphic cables for submarine and subterranean uses, and in submerging the same.
2455. Charles Stevens, 1B Welbeck Street, Cavendish Square—A machine for scouring and polishing floors and decks of ships.—(Communication from Jean J. Monnie, Paris.)
2456. Philo D. Mickles, Syracuse, New York, U. S.—An automatic railroad switch.—(Communication from Danforth Johnson, Chicago, Illinois, U. S.)
2457. Eugene H. Rascol, 4 Brydges Street, Covent Garden—A new implement for cleansing of the plates, dishes, and other table or kitchen utensils.—(Communication from Johanna Perry, 51 Rue Darean, Gentilly, near Paris.)
2458. Paul R. Hodge, 16 Chalcot Crescent, near Primrose Hill—Improvements in the process of brewing fermented liquors, and in apparatus connected therewith, and in preparing and separating the materials, and the manner of using them in producing fermented liquors.
2459. Rowland M. Ordish, 18 Great George Street, Westminster—Improvements in railway fastenings.
2460. Henry Phillips, Penhoe, and James Bannehr, Exeter, Devonshire—Improvements in the manufacture of manure.
2461. Richard A. Brooman, 166 Fleet Street—Improvements in the preparation of red colouring matters or dyes.—(Communication from Messrs. Renard, Lyons.)
2462. Richard A. Brooman, 166 Fleet Street—Improved threads for weaving, and a machine for making the same, which is also applicable to the winding or coating of one thread with another.—(Communication from Alphonse Loiseau, Bernay, France.)
2463. Henry Cowan, Boileau Lodge, Barnes, Surrey—An improvement in waistcoats, and certain other articles of wearing apparel.

Recorded October 28.

2464. Aurelius B. Mitchell, Birmingham, Warwickshire—A new or improved penholder.
2465. Joseph Plantier, Paris—Improvements in brushes and brooms.
2467. Deile Dillies, Roubaix, France—Innovations in weaving looms.
2469. James F. Cole, Devonshire Street—Improvements in time-keepers.
2470. Jean J. Baranowski, Paris—Improvements in railway signal apparatuses.

Recorded October 29.

2471. Gustave Ghesquiere, 11 Quai Conti, Paris—A process to render gold and silver malleable and ductile.
2472. Joseph Mascord, Joseph Bonner, and Frederick Viner, Banbury, Oxford—Improved machinery or apparatus for cutting up and pulping or reducing vegetable and animal substances.
2473. Samuel C. Lister, Manningham, and James Warburton, Addingham—Improvements in dyeing silk, cotton, and china grass, and similar vegetable fibre, and in preparing and spinning coloured and mixed coloured yarns from such fibres.
2474. Charles Stannet, New Street, Covent Garden—Improvements in apparatus used in the manufacture of boots and shoes or other coverings for the feet.
2475. John S. Margetson, Cheapside—Improvements in collars for gentlemen's, ladies', or children's wear.

Recorded October 31.

2477. James A. Turner, Manchester—Improvements in rendering paper waterproof.
2479. Thomas C. Newby, Welbeck Street, and Jules A. Raine, Wells Street, Gray's-Inn-Road—Improvements in portable bedsteads and spring mattresses.
2480. John Ingham and George Collier, Halifax, Yorkshire—Improvements in the manufacture of fabric, of the character of that technically called "camlet," also in the winding of yarn employed in the production of such fabric, part of which improvements is applicable to other weavings.
2481. John Bolton, Halifax, Yorkshire—Improvements in means or apparatus for winding thread or yarn on to shuttle bobbins or pirns, which improvements are also applicable in winding on to other bobbins, or spools, or tubes.
2483. Richard A. Brooman, 166 Fleet Street—Certain plastic compositions to be employed for building and decorative purposes, and in lieu of marble, stone, brick, and cement.—(Communication from Lippmann Schneckenburger and Co., Paris.)
2484. Roman Cicbowski, Linow, Poland—Improvements in ploughs.
2485. Joseph Holmes, Pleystowe Capel, Surrey—An improved halter-block for stable purposes.
2487. Ludwig Pohl, Offenbach, Germany—Improvements in fastenings for bags, purses, and similar purposes.

Recorded November 1.

2488. Charles Reid, Birmingham, and Isaac A. Read, Smethwick, near Birmingham, Warwickshire—A new or improved tap or stop cock.
2489. William Spence, 50 Chancery Lane—An instrument for taking and registering deep sea soundings.—(Communication from Thomas P. Howe, Broadway, New York.)
2490. Alfred V. Newton, 66 Chancery Lane—An improved mode of and apparatus for condensing and cooling vapour and fluids.—(Communication from Ananias Smith, Niagara Falls, U. S.)
2491. Josiah Jones, jun., Liverpool—Improvements in ship building.
2492. William H. Perkin, King David Fort, St. George's-in-the-East—Improvements in the manufacture of colouring matters.
2493. Robert de Bary, Finsbury Square—Improvements in machinery for the manufacture of cigars.—(Communication from Julius de Bary, Offenbach.)

Recorded November 2.

2494. Benjamin Browne, 52 King William Street—A self-heating ironing apparatus.—(Communication from Charles J. E. B. Cailloue, Paris.)
2495. John L. Budden, 48 Fenchurch Street—Improvements in forming and driving piles for the construction of piers, jetties, viaducts, bridges, or other works where piles are usually employed.—(Communication from Woodford Pilkington, Cape of Good Hope.)
2496. Richard H. Hess, Newton Street, Hoxton—Improvements in gas burners.

Recorded November 3.

2497. James A. Turner, Manchester—Improvements in rendering paper waterproof.
2498. James Leeming and John C. Ramsden, Bradford, Yorkshire—Improvements in looms for weaving.
2499. Isidore F. Delavier, Paris—Improvements in coffee pots, tea pots, and other culinary or pharmaceutical vessels of the same nature.
2501. Charles Bacon, Edgeware Road—Improvements in globes and shades for gas lights and oil or other lamps.
2502. William Wilson, Newcastle-upon-Tyne—Improvements in machinery for the manufacture of felted fabrics, suitable for the bodies of hats, caps, and bonnets.
2503. Charles W. Siemens, Great George Street, Westminster—Improvements in insulating electric telegraphic conductors and in battery arrangements connected therewith.—(Communication from Werner Siemens, Berlin, Prussia.)
2504. John Howard, Fenchurch Street—Improved machinery for moulding hollow bricks and tubular articles.—(Communication from M. Becherer and C. Kesseler, Greisswald, Prussia.)
2505. George Wemyss, Springwood Park, Roxburghshire—Improvements in ventilators.

Recorded November 4.

2506. Aspull Binckes, Corubury Place, Old Kent Road, Surrey—Improvements in optical instruments.
2507. Etienne Juzet, 29 Boulevart St. Martin, Paris—Improvements in lubricating apparatus.
2508. George N. Bullier, 28 Bartlett's Buildings, Holborn—An improved mode or method of ornamenting articles composed wholly or partially of jet.
2509. August P. Boothby, Dean Street, Soho—Improvements in travelling and such like bags.
2510. Joseph A. Maxwell, 53 Chancery Lane—Improvements in hydraulic engines to act either alone or in combination with steam and steam engines.
2511. Louis Koch, New York, U. S.—A moving tread power.
2512. Frederick H. Holmes, Northfleet, Kentshire—Improvements in apparatus for transmitting light.
2513. Charles Brook, jun., Meltham Mill, Huddersfield, Yorkshire—Improved arrangements and apparatus for folding, tieing, and labelling hanks of yarn or thread.
2514. Alfred V. Newton, 66 Chancery Lane—Improvements in type setting and distributing apparatus.—(Communication from Thomas W. Gilmer, Virginia, U. S.)
2515. William Clarke, Nottingham, and Joseph Gee, Lenton, Nottingham—Improvements in the manufacture of looped fabrics.
2516. William Hill, Coombe Haye, near Bath, Somersetshire—Improvements in lightning conductors.
2517. Richard A. Brooman, 166 Fleet Street—Improvements in breech-loading ordnance and other fire-arms, and in projectiles to be used therewith.—(Communication from John W. Cochran, New York.)

2518. James Chesterman, Sheffield, Yorkshire—New and Improved methods of and furnace for heating, hardening, and tempering clock springs, watch springs, hand saws, steel for dresses, such as crinoline steel, and other like purposes.

Recorded November 5.

2520. Colin Mackenzie, Stornoway, Ross-shire—Improvements in machinery or apparatus for cutting and dressing staves for casks, barrels, and other wooden vessels.
2521. David Joy, Strangeways Iron Works, Manchester—Improvements in machinery for the manufacture of telegraphic cables.—(Communication from Charles de Bergue, Barcelona, Spain.)
2522. Francis Pichler, 162 Great Portland Street, Oxford Street, and Henry J. Wigley, 5 Gloucester Place, Gloucester Gate, Regent's Park—The arrangement and construction of wheeled carriages or other vehicles or machines, in such manner that the occupant or occupants thereof may propel the same by alternating the weight of the person or persons riding.
2523. Emile A. Cuche, 29 Boulevart St. Martin, Paris—Improvements in galvanising metallic wires.
2524. George T. Bousfield, Loughborough Park, Brixton, Surrey—Improvements in machinery for grinding and polishing sheets of plate and other glass.—(Communication from J. J. Greenough, Wall Street, New York.)
2525. Thomas W. M'Callum, Belper, Derbyshire, and Luke Woodward, Nottingham—Improvements in framework knitting machinery.
2526. William Mannix, M.D., Wolverhampton—Improvements in the manufacture of manure.

Recorded November 7.

2527. Peter Dictens, Brussels, Belgium—A system of letter-paper, letter-invoices, letter-circulars, prices-currents, memorandums, and other missives.
2528. Andrew L. Dowie, Glasgow—Improvements in effecting communications or signalling between distant or distinct parts of railway trains.
2529. John A. Clarke, Long Sutton, Lincolnshire—Improvements in extracting seeds or stones from foot.
2530. George Pacey, 2 Waterloo Street and Upper Priory, Birmingham—A rein handle and holder applicable for riding or driving, either for single, double, or team reins.
2531. Henry Charlton, Blackfriars, Manchester—Certain improvements in the method of navigating steam ships or vessels, and in the apparatus connected therewith.
2532. Henry Barker, Hastings, Sussex—An improvement in clay, meerschaum, and other pipes.
2533. George Meline, Lay St. Christhope, Meurthe, France—Improvements in mills of whatever kind.
2535. William E. Newton, 66 Chancery Lane—Improvements in promoting or accelerating combustion in furnaces or fireplaces.—(Communication from Charles J. L. Maire and Jean B. F. J. Vallée, Tours, France.)
2536. Archibald Templeton, 7 Skinner Street, and John Lawson, Glasgow—Improvements in the manufacture of chenile or like fabrics, suitable to be used in woven and other ornamental piled fabrics.

Recorded November 8.

2537. Henry B. Powell, Foxleize Park, Lyndhurst, Hants—The protection and prevention of fouling or injuring by foreign matters the screws, paddles, rudders, and stern posts of steam ships or other vessels.
2539. Charles Greed, Birmingham—Improvements in the manufacture of tubes suitable for locomotives and other steam boilers.
2540. John Thomson, Dundee, Forfarshire—Improvements in the manufacture or production of Brussels and velvet pile carpet fabrics and hearth rugs.
2541. John H. Johnson, 47 Lincoln's Inn Field's, and 166 Buchanan Street, Glasgow—Improvements in "passe-partouts," or mounts for pictures.—(Communication from Auguste Finard, Paris.)
2542. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in watches or timekeepers.—(Communication from Merrick Price, Philadelphia, U. S.)
2543. George Hadfield, Carlisle, Cumberland—Improved machinery for cutting staves for casks and barrels.
2544. Thomas S. Bottom, Park Terrace, Old Ford—Improvements in the manufacture of chenile.
2545. William Clark, 53 Chancery Lane—A compound applicable for the manufacture of manure, the preservation and disinfection of organic matters, and for other purposes.—(Communication from Victor Corne, Boulevart St. Martin, Paris.)

Recorded November 9.

2546. Job Hamer, Longsight, Manchester—An improved material for insulating the wires of electric telegraphs, for lining articles of dress, for covering clothing, casing or lining steam boilers, pipes, cylinders, and other vessels, conduits, or chambers, and for other similar purposes, to which the said material is or may be applicable as a non-conductor, for preventing or diminishing the transmission of heat or of the electric fluid.
2547. George White, 34 Dowgate Hill, Cannon Street—Improvements in the manufacture of endless leather bands, straps, or belts for driving machinery, and in apparatus for effecting the same.—(Communication from Eugène Scellos, Rue Popincourt, Paris.)
2548. David Fulton, Glasgow—Improvements in cylinders or rollers for printing and other purposes.
2549. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—An improved means of destroying insects in grain and other organic matters.—(Communication from Louis Poret, Mans, France.)
2550. George Spill and Daniel Spill, Stepney Green—An improvement in the manufacture of bands for driving machinery, and for various other purposes.
2551. John Dales, 11 and 12 Gresham House, Old Broad Street—Improvements in applying deodorising fluids to sewers and other receptacles of sewage.
2552. William Clark, 53 Chancery Lane—Improvements in the construction and application of electric telegraph wires or conductors.—(Communication from Mr. E. D. Rozencrantz, New York, U. S.)

Recorded November 10.

2553. Edward T. Hughes, 123 Chancery Lane—Improvements in railway brakes, also applicable for arresting the rotatory motion of wheels and cylindrical bodies in general.—(Communication from Jules Clément, 17 Rue Tronchet, Paris.)
2554. John Edwards, 77 Aldermanbury, and John S. Wright, Birmingham, Warwickshire—Improvements in the manufacture of buttons.
2555. Richard A. Brooman, 166 Fleet Street—Improvements in mills or apparatuses for extracting oil from seeds, and for other purposes.—(Communication from C. S. Francis, Calcutta.)
2556. John Fenwick, Clarendon Street, Albion Foundry, Portsmouth, Hampshire—Improvements in the construction of street gutters.
2557. Arthur J. Melhuish, Holborn Bars and Bowater Place, Blackheath—Improvements in the construction of cameras for obtaining photographic pictures.
2559. George Seymour, 116 Fenchurch Street—Improvements in insulating and protecting electric telegraph conductors.
2560. William Fletcher, Kilburn, Derby—Improvements in machinery for making looped fabrics.
2561. William Day, Burton Latimer, near Wellingborough, Northamptonshire—Certain Improvements in propelling vessels, which said invention is also applicable for converting the force of the wind into a motive power to be used in any convenient way, either for stationary or moveable purposes.

Recorded November 11.

2562. Frederick D. Jones, 29 Tavistock Street, Covent Garden—A weaver's loom with combs opened at the summit, and with moveable floating chains.—(Communication from Paul Gadrat, 48 Rue Basse du Rempart, Paris.)
2563. Thomas Blinkhorn, Spalding, Lincolnshire—Improvements in pumps.
2564. Richard A. Brooman, 166 Fleet Street—The preparation of a salt, and means of combining, mixing, or applying the same to render fabrics, pulp, wood, oil, and other substances uninflammable.—(Communication from Messieurs Demangeot and Co., Paris.)
2565. Richard A. Brooman, 166 Fleet Street—An improved method of preparing plates and cylinders for printing from.—(Communication from Jules M. I. Melotte and Charles J. Thiesset, Paris.)
2566. Augustin Jacquelain, Paris—Improvements in the manufacture of carbon, and in apparatus employed therein.

Recorded November 12.

2567. Richard Lansdale, Pendleton, near Manchester—Improvements in machinery or apparatus for washing and cleansing fabrics, which improvements are also applicable to churning.
2569. William Burgess, Newgate Street—An improvement in mowing and reaping machines.
2569. John Scott, Sunderland, Durham—An improvement in anchors.
2570. Archibald Viears, Bristol—A method of opening and shutting two or four gates or doors simultaneously, and for fastening the same when either open or shut, applicable to railway crossings, and other purposes.
2571. Charles Norrington, Green Bank, Plymouth—Improvements in the protection of ships or vessels, forts or batteries, from cannon shot, shell, or any other projectile.
2573. Elizabeth A. S. B. Burgess, 107 Strand—Improvements in the preparation of anchovies.

Recorded November 14.

2574. Marc A. F. Mennons, 39 Rue de l'Echiquier, Paris—Improved apparatuses for the concentration, distribution, and application of the heat evolved by gas, oil, and other lamps.—(Communication from Henri A. D'Arbel, sen., Paris.)
2575. Peter Graham, Oxford Street—Improvements in machinery or apparatus for cutting wood.
2576. Augustus Applegarth, Dartford, Kent—Improvements in surface block printing.
2577. John Madin, Fitzwilliam Street, Sheffield—Improvements in furnaces and appliances connected therewith, for hardening and tempering crinoline or sheet steel, and measuring the same.
2578. James Walworth and Robert Harrowby, Bradford, Yorkshire—Improvements in smut machines or corn screens.
2579. Joseph and Gustav Goldberg, Manchester—Certain improvements in the construction of purses or "portemonnaies," and in an improved lock or fastening applicable to purses, bags, and other similar receptacles.
2580. Alexander R. Arrott, Saint Helens, Lancashire—Improvements in the manufacture of carbonate of soda.
2581. Charles H. Brooks, Great George Street, Westminster—Improvements in apparatus for paying out and hauling in telegraphic cables.
2582. James Holgate, 33 Great Dover Street, Surrey, and John Henderson, Ramsgate, Kent—Improvements in locomotive engines, partly applicable to other steam engines.

Recorded November 15.

2585. William H. Ward, Auburn, Cayuga, New York, U.S.—An improved turn-table for railways and other purposes.
2586. Edward Borlaise, Allenheads, Haydon Bridge, Northumberland—Improved apparatus for separating metals and metallic ores, when mingled with other substances in the state of slime.
2587. James Donald and Peter Smith, Johnstone, Renfrewshire—Improvements in apparatus for raising and for extracting liquids.
2588. Charles Chalmers, Merchiston, Castle Bank, Morningside, Edinburgh—Improvements in gas stoves for heating buildings, apartments, and other similar places.
2589. William Elliott, Norwich, Norfolk—An improved method of raising water and other liquids.

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 1st December, 1859, to 6th January, 1860.

Dec.	1st,	4219	James Fairley, Stechford, Worcestershire—"Perforated iron or steel plates for mashing cooked bulbous roots."
	6th,	4220	John Seton, Forest Lodge, Gowran, Co., Kilkenny—"Rotating harrow."
	20th,	4221	Isaac Atkins and Arthur Maxfield, Nottingham—"A self-acting draught preventor, to be affixed to doors or windows."
	22nd,	4222	James Brooks, 16 Vere Street, Oxford Street, W.—"Design for dressing, jewel, and such like cases."
	26th,	4223	Matthew A. Muir and James M'Ilwham, Anderston Foundry, Glasgow—"Picking motion for power looms."
Jan.	6th,	4224	S. J. Watts & Co., Manchester—"A glove."

TO READERS AND CORRESPONDENTS.

Incrustations in Domestic Range Boilers.—An old correspondent asks us if we can furnish him with satisfactory information as to preventing the formation of incrustations in kitchen range boilers. Can any of our readers help us?

A Brick Manufacturer, Wrexham.—A note addressed to "Humphrey Chamberlain, Esq., Sandford Works, Wareham, Dorset," will insure him all the information he requires. Had we known our correspondent's address, we could have saved him some time.

L.A.S.—A patent cannot be obtained after registration. Let us have his address.

ON THE PRODUCTION OF ELECTRIC FORCE.

At a time such as the present, when *advance* is the order of the day, and when all are convinced that we are best working out the designs of Providence and promoting the general good by making *progress* our motto, the benefits that we have already derived from the applications of electric power force themselves upon our minds, and shape themselves into promises for advancement through the further applications of a force so little really known and understood, and that has done so much for us in so short a space of time. Nothing less prompt in its action than electricity could have thoroughly complied with the chief requirement of the telegraph, viz., speed, for electricity outstrips time itself, and sends messages in 1860 that are received in 1859; a force that would traverse from the earth to the moon in one second of time, and flies at nearly twice the speed of light itself, is the fit agent to drop the time ball at Charing Cross by means of regulating apparatus at Greenwich. No force less exact in its action upon matter would serve to reproduce the lines of the engraver, with sufficient accuracy to do justice to the Ordnance survey, or to defeat the forgery of bank notes. Electric force has furnished us with a means of chemical research, for the want of which, the metals of the alkaline earths, and all the discoveries and uses consequent thereon, might still have remained unknown and unapplied. In fact, our daily and even hourly requirements, and much of our enjoyment at home and safety abroad, depend upon the various applications of science to which electric force has led us either directly or indirectly.

Under these circumstances it becomes us to inquire most earnestly, what are the means of supplying a force of such eminently useful and practical capacities? On so doing we shall find that, although great and important discoveries have occurred within the present century, and even within the last thirty years, that have enabled us to use this wonderful agent for many useful purposes, (hitherto unattained or only imperfectly so,) the range of its application far exceeds the ability of its economic production. The object of this article is to investigate and show the avenues open to us in the search for a cheap method of producing electricity. This search so far differs from most others, that we are fully conscious that abundance of electric force is in existence, the question is not to find it, but to evolve it in a form under perfect control that can be practically applied.

To arrive at the unknown from known principles, we must review the various means at present in use, which it will be best to do under the following heads, and in the order of their discovery:—

Frictional Electricity.—This is much the oldest form under which electricity was known to the world, several hundred years before the Christian era, the phenomenon of electric attraction was noticed; it was not, however, until 1675 that Otto Guericke, invented the electric machine, which was afterwards improved by Hawksbee (A.D. 1709); Boze (A.D. 1741); Winkler (A.D. 1741); Gordon (A.D. 1742); Canton (A.D. 1751); Van Marum (A.D. 1785); and others.

From the high degree of tension under which this modification of the electric force is produced or developed, and the consequent dispersion, no application of any great importance has been made of it to practical purposes; in the analysis of gaseous mixtures, it is however sometimes employed to explode them in a "detonating eudiometer;" the shock and brush, or glow discharge, are occasionally employed to alleviate the diseases of the human frame, and of late years ozone has been obtained by means of this source of electric power.

Another reason why this kind of electricity is unfitted for many purposes is, that its small *quantity* precludes it from being used for the developement of chemical or magnetic forces; one of the most self-evident problems which thence necessarily arises, is to reduce the intensity, and at the same time augment the quantity of friction, so as to enlarge the sphere of its action by making it capable of easily producing magnetic chemical and calorific effects. Whether this can be done or not is to a great extent a matter for experiment; that it is not a very improbable result is shown by the fact of our being able to get the effects of static electricity from a galvanic series, either by employing a water battery and mica condenser, as Mr. Andrew Crosse did in 1836, or by means of a Ruhmkorff's coil and Fizeau's condenser; the most likely means of converting tension electricity into current electricity is by an inverse operation to that required to produce tension electricity from current electricity. For instance, the inverse of Crosse's experiment would be to charge the mica condenser from the frictional machine, and the water battery continuously from the condenser, the plates of the water battery, however, need not necessarily in this case be of different metals, and most likely a comparatively small number of cells would effect the purpose desired. The inverse of the experiment with Ruhmkorff's coil and Fizeau's condenser, would be to charge the condenser from the frictional machine, and the coil from the condenser; it would perhaps be difficult to avoid obtaining intermittent currents by this means. In the third place, a combination of these two methods might be used.

To enable tension electricity to be developed from the electrical machine in greater quantity and of less intensity than usual, it might be well to drive the plate slower, and to have an increased rubbing surface of amalgam in contact with the glass plate or other electric; this would be still further facilitated, if the collecting points metallically connected to the prime conductor were close to, and even slightly touching the plate, and if the plate itself were made rather more conducting than the usual electric, namely, glass, usually is, in this case greater speed might be required.

To reduce the intensity and increase the quantity of electricity from the Leyden jar, a large surface and gradual discharge might suffice; it would be advantageous to polarise both the coatings of the jar oppositely from separate machines at the same time, and not to trust merely to induction for charging one coating in this case.

Voltaic Electricity.—The present century may be said to have been ushered in by this important discovery, and to comprise its history; from "La couronne de Tasses," of Volta (A.D. 1800), it proceeded through the phases of Cruikshank's trough (A.D. 1800); Wollaston's battery of separate cells (A.D. 1815); Sturgeon's cast-iron and amalgamated zinc battery (A.D. 1830); Daniell's "constant" battery (A.D. 1836); and arrived at its present effulgence in Grove's nitric acid battery (A.D. 1839); Smee's "chemico-mechanical" battery (A.D. 1840); and Bunsen's coke battery.

The applications of this modification of electric force are the most extensive, and it may fairly be said to have been the most useful hitherto, both in research and in the world-wide importance of its practical results.

The quantity and intensity of this developement of electric force are just suited to most of the practical purposes to which the power is applied, the only problem that can therefore arise in reference to its production is, to excite it in a sufficiently economical manner, to enable its applications to be as extensively used as those of its congeneric force, heat. To feed a generator or producer of power with zinc and sulphuric acid, instead of with carbon and oxygen, necessarily implies a much greater expense, and the question naturally arises, can this kind of electric force be eliminated by means of any cheaper materials than zinc and sulphuric acid? As a substitute for the zinc, iron naturally suggests itself, for it is 1½d. per lb., and zinc is 2½ times that amount, viz., 3¾d. per lb.; the atomic weight of iron is 28, and that of zinc, 32, so that the solution of 28 lbs. of iron will give forth as much quantity of electricity as will result from the solution of 32 lbs. of zinc; this is a further advantage, and makes the use of iron nearly 3 times cheaper than zinc, in an electric point of view. For a substitute for sulphuric acid, which is 1d. per lb. one might look far and wide in vain, except perhaps the availability of sewage and other refuse liquids of towns and farms be admitted. This, however, is not a pleasant substitute, and there is much doubt of its applicability on account of its great dilution and variable composition. To prevent local action upon the iron, three methods are open for trial, viz., 1st, by means of mercury (applied from a solution of mercurial salt, or by electryolis); 2d, by means of the neutrality of the exciting solution; and 3d, by making the iron "passive" during the non-action of the battery.

To compensate for the expense of developing electricity by the conversion of a metal and a solvent into a salt or salts of the metal, it has already been proposed to use such a metal, and such liquids in the battery, as will, by the electrical and chemical forces called into play by the evolution of electric force, produce salts of a valuable character. Mr. Roberts in this way produced meta-stannic acid, (see patent No. 13,963 old law,) and Dr. Watson, the chromates of lead and other salts, (see patent No. 595, A.D. 1852.) The great objection to this mode of economising the production of electric force, even supposing that some really practical way of carrying it out could be found, is, that whatever the product, it will become a drug in the market, whenever its adoption is general; putting that on one side for the sake of argument, there are some combinations in organic chemistry, originally discovered by means of the decomposing power of galvanism, that have not yet been viewed as waste products of galvanic action, and it remains to be seen whether, as such they might not tend to cheapen electric power. The radicals *propyle*, *butyle*, and *amyle*, have been obtained in this manner.

Thermo-Electricity.—In 1822 or 1823, M. Seebeck discovered this method of eliminating current electricity by heat. This was followed about the same time by the results obtained by Cumming, Van Zuylen, Van Beek, and Moll. In 1832, Dr. Botto made a platinum and iron thermo-electric battery, and in 1837, Dr. Andrews constructed a thermo-electric battery of platinum wires and fused salts.

The only practical application of this form of electricity is to measure small variations of heat. Forbes, in 1835, employed a thermo-multiplier to measure the heat caused by the concentration of moonlight 3000 times; the result was, that no trace of heating was observed.

From the circumstance of all the elements in the electric circuit being good conductors, thermo-electricity is of very low tension; increasing the number of pairs, the intervention of coils, and other means, have been tried in order to render it available for electro-chemical and other purposes, which the galvanic battery completely accomplishes, but up to the present time, no practical result has been obtained that would supplant the galvanic arrangement. One method of increasing the tension which naturally suggests itself, is to use metals of so small a cross-sectional area, that they will not conduct the electric force developed so easily as those of larger size, also to have platinum and iron, or other infusible or partially conductible material, so that the alternate junctions of the wires may be heated to a white heat, the others being cooled by ice. In 1849, we obtained a powerful current for a limited time from a combination of mercury and iron, the mercury, however, at alternate junctions was soon dissipated, and the current ceased. It may be questioned whether the influence of the intervention of fused salts, and other partially conducting substances in a thermo-electric series, has received sufficient attention.

Magneto-Electricity.—Faraday (A.D. 1831); Pixii (A.D. 1832); Saxton (A.D. 1833); E. M. Clarke (A.D. 1834); Mr. Holmes (see patent No 573, A.D. 1856); and Henley (see patent No. 2769, A.D. 1856), have brought this method of inducing electricity to its present state of perfection, in which it bids fair to rival the voltaic current for practical purposes.

In all cases in which magnetic induction is used to obtain electric currents, some doubt may reasonably exist as to whether all the induced currents are collected, or whether there are not some that form completed circuits in the apparatus used, or are neutralised by secondary currents proceeding in opposite directions to those primarily induced in the helices. To collect all the induced currents, the iron cores of the armatures should have a radial longitudinal slit, the coils should have a thin sheet of soft iron between each layer, there should rather be a number of small armatures than a few large ones, and completed metallic circles concentric to the helix wires should be avoided. Where neutralising secondary currents are likely to arise, it is best to prevent the completion of their circuits.

Hydro-Electricity.—This is the name given to the electricity developed by effluent high pressure steam. It was successfully experimented upon in 1840, by Mr. Armstrong and Dr. Faraday.

If tension electricity is ever extensively used, either in the form in which it is first developed, or with its quantity increased and its intensity diminished as proposed above, this promises to be the preferable mode of excitement. The force is evolved in larger quantity than in the frictional machine, is more easily managed, and only requires the ordinary attention of a steam boiler, instead of steam or other power to revolve the glass plate in the frictional machine, or the helix wheels in the magneto-electric machine.

In 1857, Mr. Hoga proposed to use a mixture of mercury and sulphuret of mercury in the boiler of a hydro-electric machine instead of water (see patent No. 2346, A.D. 1857); we have not heard whether there has been any practical result. Other fluids, some boiling at high temperatures, and some even at ordinary temperatures, might eliminate electric force of various qualities from the hydro-electric machine, if used instead of water.

Considerations of this nature open out a vista of probable sources of electricity, fruitful in the extreme; it is entirely a matter of experiment as to whether the surmises herein expressed will be found correct. To avoid the trouble of constantly applying motive power to the ordinary frictional machine, it would be a very convenient circumstance if the opening of a vessel containing a compressed gas, or a compressed gas over a fluid would eliminate electric force until the expulsion of the gas or fluid was complete; we might, for instance, put a properly proportioned charge of gunpowder into a strong receiver, fire it by a fine wire, heated electrically, and keep it until electric power is required, when the necessary amount of gases would escape and yield a supply; an exhausted receiver might be used instead of one containing compressed gases.

Among the miscellaneous and less important means of obtaining electric force for practical purposes, that by means of a lightning rod, pyro-electricity, the electricity of sifted powders, and that of the separation of particles of bodies, present themselves for examination; that from a lightning rod is too little under control and too variable, and the other sources are of so little power that further mention of them is unnecessary.

A combination of the foregoing practical methods of obtaining electricity might be used occasionally with advantage; for instance, in a voltaic circuit thermo-electric elements, disposed so as to aid the voltaic current, would not mar the conductibility of the circuit, and in the case of an electric light, the heat of the light would be utilised.

In reducing to order any ideas upon this fertile subject, the following would seem a very safe definition of electricity:—"A motion of ultimate particles;" whether it is so or not can never perhaps be experimentally demonstrated; but all ideas are valuable that are pregnant with suggestions.

In conclusion, it may be necessary to state that the above are merely suggestions, and that they have not been worked out any further than is herein indicated.

MANUFACTURE OF CARBON ELEMENTS FOR BUNSEN BATTERIES.

Mr. John Young, of the Dalkeith Gas Works, has lately substituted the carbon found in the interior of gas retorts, for the platinum ordinarily used in the Bunsen battery.

Hitherto, the supply of prepared carbons for batteries has almost exclusively been furnished to this country from the Continent. The precariousness of a supply from this source, and the fact of its being dependent for its continuance upon an evil which gas engineers are trying all means to overcome, suggested the propriety of finding some compound, and mode of treating it, which would render us equally independent of foreign aid, and that period in the history of gas lighting when the engineer has attained his object.

The prescribed composition used by Professor Bunsen is "coke and coal in fine powder, heated together in an iron mould, thus forming a mass of solid carbon of the required form. To give greater solidity, they were plunged into a syrup of sugar, afterwards dried, and then submitted to an intense heat in covered vessels." These instructions are apparently plain enough, unencumbered by detail, and would indicate, by their brevity, that the *solid mass of carbon* was so sure of being obtained, that more minute instructions were totally unnecessary. In Mr. Young's experiments he employed the finest pieces of Newcastle coke in powder, and the finest English caking coal, and followed the recipe with great care. He used (1) cold moulds, afterwards heating them carefully; and (2) red-hot moulds, and packed in the composition in a fused state; and yet the four weeks in which he was so occupied, were characterised by one series of failures, during which he wasted large quantities of sugar, besides his valuable materials, without receiving a single hint that he was proceeding in the right direction; and not until a partially new process was entered upon did hopes arise that he would ever attain his object. The carbon elements so obtained were either loose and friable, or altogether in a state of powder, or so full of cracks and fissures, when an excess of coal was used, that in either case they were useless. Some of the best he endeavoured to finish; but after repeated soakings in the syrup of sugar, he could with difficulty produce them of sufficient density; and, when attainable, only at such expense as precluded competition in price with those already in the market.

Starting anew, and availing himself of the varieties of coke within reach, and trusting to his own observations for guidance, he entered upon a new series of experiments with different kinds of coke, mixed in various proportions, and differently treated. Among failures, he also had hints of success; and from noting the changes by which these favourable hints had been furnished, he was able to proceed under more cheering prospects. The results of these experiments were, that the coke from the Marquis of Lothian's parrot coal, as left in the gas-retort, was the best. What peculiarity in this coke should make it superior we cannot say, unless it be the small amount of ash that it contains; but when used, it was always covered by a peculiar glistening, silvery deposit of carbon from its own gas. The amount of ash in the coke was found to be less than seven per cent.

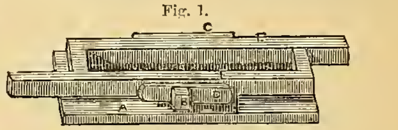
After many trials, the best results were obtained from the following mixture and mode of treatment—viz., sixty-four per cent. by weight of coke powder, and thirty-six per cent. of English caking coal in powder, well mixed, and moistened with a solution of sugar or starch, until the mass, when pressed in the hand, retained its form. When starch was used, it was in the form of mucilage; and when syrup of sugar was used it was composed of one part sugar to one and a-half of water. The prepared composition was pressed very hard into moulds of the required form, and when taken from the mould, the cakes were set aside to dry. The use of sugar or starch in the composition is to cause the adhesion of the particles of coke and coal powder, so that they retain the form of the mould, and, when dry, become a hard cake, that can be handled, and closely packed into the coking-mould. The part of the process referred to, is conducted precisely the same as in the manufacture of ordinary bricks; but the similarity of manufacture goes no further, as all air has to be excluded from the carbons, otherwise combustion ensues, and entirely destroys them. To prevent the action of the air, the coking is done inside a gas retort, into which a small quantity of coal had been introduced to expel the air. The box or mould in which the bricks were packed during the coking contained thirteen carbons at one time. The length of the box was equal to the thickness of the whole thirteen, including plates of iron of $\frac{1}{8}$ inch thickness, which were placed between them, to prevent the carbons from fusing together. The breadth of the box was equal to the length of the carbons, and the depth equal to the breadth of the carbons. The mould with its cover was so constructed, that the encased carbons could be closely clamped up and compressed between the plates while coking. The great tendency that the caking coal has to tumefy while in fusion, by the escape of the gas, made this precaution the more necessary; and unless attended to, the carbons would have been loose and porous. The box and its contents were in the retort for about one hour and a-half, at a bright cherry-red heat; and, when taken out, were covered over with dry dust until cold, to prevent the air from acting on the carbons through the chinks round the cover. When taken from the box, the carbons have a close surface, owing to the iron plates compressing the exuding fused coke. At this stage they have no electrical action, and are entirely dependent upon the subsequent parts of the process for the deposit of carbon to bestow this property.

From this point in the manufacture, Mr. Young's mode of treatment is new, and depends for the closing of the pores in the coke to the fixed carbon from a soaking of coal tar, and the carbonaceous deposit from gas during its liberation from the coal. The experiments upon sugar, as a source of cementing carbon, showed that at the best it would be expensive, and exceedingly slow in its action, from the low per centage of fixed carbon that it left. When the syrup used was composed of equal weights of sugar and water, the fixed carbon was only 13 per cent. of the liquid absorbed, or 26 per cent. of the sugar in the solution. At this rate, every ounce weight added to the carbons would cost 1¼d., with sugar at its present cheap rate, besides the additional trouble of having the carbons to dry after each soaking. In using coal tar as a substitute, it was first heated to a temperature of 300°, so as to drive off the naphtha hydro-carbons, which left it in a semi-pitched condition; and, while still hot, the coke bars were soaked in it till saturated, and sank to the bottom. The per centage of fixed carbon left in the coke after the soaking, and heated to redness, was 32·5 per cent. of the tar absorbed; or 2½ times the weight obtained from sugar, and secured at an infinitely less cost. Pure tar carbon is among the best yet tried for Bunsen batteries, and it was the success in some experiments with it, that led to the trial of it as a source of fixed carbon for the purpose now mentioned.

Three separate soakings in the tar, as described, and as many times heated to a high temperature, are necessary fully to close the pores of the coke. Before the last steeping, the carbons are ground upon a flat stone into the required shape. In grinding, a little water is used, but only so much as may form the abraded powder from the carbons into a pasty state; and as the carbons are still absorbent at this stage, they imbibe the water from the paste, and leave the particles of carbon deposited in the pores on the surface, thereby leaving the close surface shown in the finished state. The carbons are again soaked in tar, and charred at a high temperature, when the process is completed by the final smoothing on a flat stone.

Presuming that the mixture of "coke and coal," has been duly prepared ready for the process of moulding, the moulds are clamped up, as shown on fig. 1.; the two pieces, E E, sit at the proper point to form the carbon of the required length. The composition is then compactly beaten in, and, when full, smoothed off on the top. To remove it from the mould, the wedge, D, is first driven back, the carbon and pieces, E E, slid back from C; then, by a few slight taps, the pieces, E E, separate, and are lifted away, and the carbon is left to be transferred to a warm airy place to dry. When the composition is of the proper consistency, the moulded carbon has a considerable degree of cohesion and is slightly flexible; the latter circumstance making it necessary that they be laid upon a straight board, until they be sufficiently hardened for building into open order, so as to be thoroughly dried. In this stage the blocks have no cohesion but what is due to the syrup of sugar or starch, but when dry and hard and has a tinkling sound like porcelain. The next stage is the process of "coking." For this purpose they are packed into a box of the form, fig. 2; the box being of such breadth that the length of the carbons can fit in. Between each two carbons a plate of iron is placed for the purpose stated, and as shown on fig. 2. When the box is full with alternatum of carbons and plates of iron, the whole are dusted over on the surface with coal dust, and tapped with a hammer to cause it to fall into the interstices. The cover is then placed on the top, with the end, D, up against the last iron plate; a wedge, slightly pressed in between the end, D, and projecting piece, B, and the whole is ready for placing in the retort as described. The cover is so formed that the top is as wide as the breadth over the sides of the box; but the end, D, is made small enough to slip up *within* the sides so that the insertion of the wedge between B and D, will compress the carbons between the plates of iron.

Fig. 1.



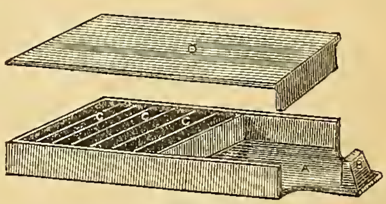


Fig. 2.

The manufacture of the carbons is conducted simultaneously with the process of gas-making; and thereby, with economy of heat, a considerable amount of carbon is deposited from the gas itself, in addition to the fixed carbon from the tar absorbed. For convenience of having them properly placed upon the coal in the retort, a long semi-circular trough of iron is prepared (similar to a water run for eaves of houses) to contain from twelve to twenty at one time, and after the charge of coal is introduced, and before closed up, the long trough and its contents are thrust in over the coals, close up to the roof of the retort, and allowed to remain till the charge of coal is wrought off—a period of nearly three and a-half hours. On being withdrawn, the carbons are scattered about, to cool as rapidly as possible, and prevent their burning away by the action of the air; and, when cold, they receive the slight rub to smooth them, which finishes the process.

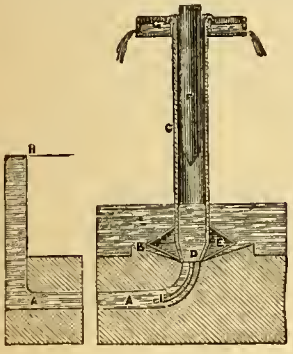
As to how far these carbons suit the purpose for which they are made, we shall only refer to two occasions, from among a number, in which they have been used. The first, to that on which the electric light was exhibited from St. Anthony's Chapel, by Mr. William Hart, philosophical instrument maker, Edinburgh, was on the arrival of Her Majesty from the north in the autumn of last year; and the second, to their use, in a lecture delivered by Professor George Wilson on "The Metals." On both of these occasions, the carbons worked satisfactorily.

Authoritative tests have clearly proved that Mr. Young's carbons are very powerfully electro-negative, that they are uniform in structure, and that they withstand well the corrosive action of nitric acid.

Mr. Young states that as to cost, he can compete witb most favourable terms with continental carbons, as he can produce them at about one-half the cost.

HYDRAULIC APPARATUS. BY M. CALIGNY.

The elevating apparatus invented by M. Caligny, and which, even so far back as the year 1837, he made known to various scientific societies, has for its object, by the sole effect of the water itself, to elevate that liquid to certain heights, and thus to operate as it were automatically, by utilising small falls of water, that is to say, under circumstances where the hydraulic ram would not work with regularity, and where pumps actuated by hydraulic mechanism do not give a sufficient effect. This apparatus may be very usefully and economically employed in the emptying of canal locks, by raising to the upper level the water of the lower basin. Its construction is of the most simple description, and it requires no repairs worth mentioning. It presents this peculiarity, moreover, that in its working, the transverse sections are never obstructed, and consequently, there is no fear of the fatal percussive action or blows which occur in other machines. Its special action is developed, in fact, by suction, and not by percussion as in the ram. The main portion of this apparatus may be made of wood, with a float of cork, and the seats covered with leather in order to obtain a water-tight junction or seating.



The annexed illustration represents this apparatus in action. To the upper reservoir or basin, H, is formed a cylindrical conduit, A, which terminates at the elbow bend in a species of shallow funnel mouth, B. Above the mouth of the conduit, A, is placed a vertical pipe or tube, C, of a larger diameter than the conduit, but made to assimilate thereto by the contracted orifice, D. The junction between the tube and the conduit is covered with leather. The vertical tube, C, is terminated by a lip or flange at its upper end, which turns over the edges of a central aperture made in the circular receptacle, G, placed at a certain determined height, for the better working of the apparatus. The tube, C, is thus made to slide in the opening of the receptacle, G (which serves as a guide), and in metal collars disposed at different heights above the funnel mouth, B. This same suction tube, C, is provided at its lower extremity with an annular float, E, of cork or wood, which is made to correspond partly in shape to the cavity of the funnel mouth, B. Lastly, inside the large tube, C, is fitted the closed tube or solid cylinder, F, of a determined diameter, but smaller than that of the tube, C. This cylinder, F, which may be generally made of wood, is fixed so as to remain stationary, and does not impede in any way the rising and falling movements of its working details. The following is the operation of the apparatus:—When the tube, C, is elevated, the water will flow into the lower basin, and when lowered it rests upon the seat at D, and forms a continuation of the conduit, A. When the water has attained a certain level in this tube, C, the equilibrium which maintains the depression of the tube, C, is broken, the float, E, causing the tube to rise. A rapid flow of water then occurs, and a species of eddy is formed on the funnel mouth, B, which acting upon the circular inclined sides of the float, E, this latter sinks, and brings down with it the tube, C. At this moment, by reason of the rapidity of the movement, a certain amount of suction is produced, which maintains the lower end, D, of the tube down on its seat, whence results the rising again of the water in the tube, C, and that when the tube rises, this column of water rises with it, and passes even the level of the opening above the basin if the tube has just descended; by the action of the eddy the tube redescending allows the column to escape, which flows into the reservoir, G. The effect of suction is again brought into play, and with it the descent and elevation of the tube. To prevent shocks in the bend of the conduit, A, a circular plate, I, is inserted at that part which, dividing the fluid, reduces to a sensible degree the shock which it gives. It might be advantageous to employ several blades where the bends are very acute.

PRICES "NE-PLUS-ULTRA" LOCK.

In our last number, at p. 284, we have given a descriptive article on Mr. Price's new arrangement of locks. The following additional particulars refer to the banker's and commercial safe lock which is illustrated in figs. 4 to 7 *ante* p. 285. These supplementary particulars also afford us the opportunity of giving an illustration of one of the keys of the lock.

The second and third improvements are more particularly applicable to the locks used on iron safes, and on the doors of bankers' strong rooms. Fig. 4 represents the "ne-plus-ultra" safe door lock, in which the reference letters are the same as in the other figures, and have reference to the same parts. It must be understood that many iron safes have been opened by applying a powerful lever to the knob or handle of the door, which causes the arm of the bolts of the *large* lock to press against the shut-out bolt of the *small* lock with such a thrust as to displace it, whereby the door is at once set free. On referring to fig. 4, it will be seen that the bolt of the "ne-plus-ultra" safe door lock works in a grooved channel, which construction effectually prevents any thrust from displacing the bolt, however the force may be applied. The other improvement is one of great importance, and consists in the application of a hardened steel nozzle keyhole to the lock, which comes right through, and is flush with the front of the door. It is well known that many safes have been opened by tapping the keyhole so as to insert the fulcrum of a powerful cutting and boring machine, which cuts out a piece of the door over the small lock, whilst others have been opened by enlarging the keyhole sufficiently for the operations of a tool that cuts out, bit by bit, the works of the lock, but the adoption of the hardened steel nozzle, Q, figs. 5, 6, and 7, such a liability is effectually provided against.

The fourth improvement is in the latch-bolt of door locks, and consists of a simplified arrangement for unlatching by either movement of the knob, without the use of a "follower" or any extra part whatever. This is effected by sloping both the top and bottom edges of the bolt, and causing it to work either upwards or downwards, and the striking plate is formed with two notches or openings, one over the other, with a strong stationary piece between them, and which is also bevilled or sloped on its top and bottom edges (outwards), and thus the bolt, in latching or unlatching, has two openings through which it can pass, in entering or leaving the striking plate or box.

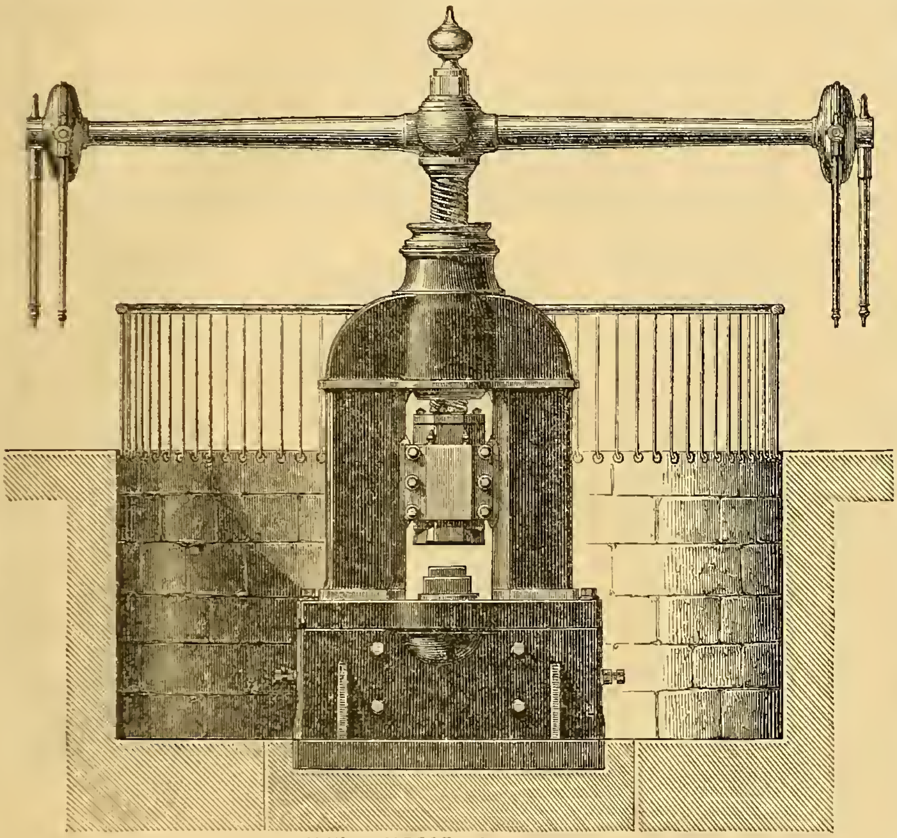
Another important improvement consists in the peculiar formation of the springs and the backs of the levers on which they work, by which the possibility of any of the springs getting on to the wrong levers, or working off their own, is effectually prevented. Their action, also, is smooth and regular.

MONSTER FLY PRESS.

In the stamping of large medals and the production of a proportionate amount of relief, great difficulty has been found in obtaining a machine of sufficient power, capable of being worked by a few men. This difficulty has been satisfactorily solved by Mons. Pinchou, of Paris, who, has had a fly press constructed, remarkable as well for its enormous proportions as for the elegance of its design. Our readers will be able to form a pretty good idea of the construction of the press from the illustration which accompanies our notice. It is drawn to a scale of 1-60th, or 1-5th of an inch to the foot. A considerable space being therefore necessary to its working, it is placed in a workshop of its own on a solid foundation of masonry, and enclosed by a wall and balustrade, the workman whose duty it is to attend to it descending by steps for that purpose. This press was erected for the stamping and raising of articles in metal, and has completely surpassed the expectations which had been raised. It is worked with the greatest ease by two or three men, and will at one blow complete a spoon, and produce the finest details of the matrices. Now it is well known that the ordinary machines employed in this manufacture are far from achieving such a result, but necessitate not only a repitition of powerful blows, but as a consequence, the piece requires to be submitted to a number of heatings, which involves a long and expensive process of finishing, polishing, &c., which is entirely obviated by the use of this more powerful machine.

The difficulties encountered in the manufacture of the above articles are greatly increased when medals of large size are to be struck, or the manufacture of steel dies or matrices for the same, to be accomplished by punches on raised dies of bold relief. In these exceptional cases, M. Ponchou's press, by reason of the enormous power which it exerts, works without necessitating the aid of a large number of men, as is required in ordinary presses, where 10, 12, or even 15 men, are hardly sufficient to put them in operation. With this press the powers of the workman are not put to any extraordinary test, it has the immense advantage of not requiring to be started or pushed off, but on the contrary, the attendants have merely to guide, as it were, the arms, which, when released, turn of themselves for a revolution and a half. The die having struck, the screw runs again one entire turn, so that the attendants have merely to impart a half turn to it to bring it full up. It will be readily perceived that a machine of this nature, constructed on the same principles, might be put to a vast number of uses in the arts and manufactures, particularly as its power may be varied at pleasure, acccording to the nature of the articles submitted to its action.

With the presses at present in use, the experiment of producing a medal, of say 6 inches diameter, even by the aid of hundreds of blows, and repeated heatings has signally failed. The above press has, however, admitted of this work being satisfactorily accomplished; its power has enabled the matrice of a figure 6 inches in length to be produced in a most perfect manner in a block of steel, the impression penetrating to



a depth of ⅞ of an inch. One peculiarity presented by this machine is, that it developes an enormous pressure with a very slow motion, in place of striking with great speed as in the ordinary presses which require an impulse.

It may not be uninteresting to our readers to have a few of the dimensions of this ponderous fly-press. The main standard or framing is nearly 12 feet high, by upwards of 6 feet in width at the base. The wrought iron screw is 9 inches in diameter, having about 6 feet of screw thread surface. The nut through which the screw works is made of gun metal, is 4 feet in length, and is nearly a ton in weight. The fly arms are nearly 20 feet in length, by 8 inches in thickness near the centre, and carry at each extremity a weight of 9 cwt., fitted with three wrought iron vertical rods for holding them by. The entire apparatus weighs upwards of 27 tons!

HISTORY OF THE SEWING MACHINE.

ARTICLE XXIV.

William Frederick Thomas obtained a patent on the 14th of September, 1855, for "improvements in sewing machines" The specification is divided into five heads, which we will give in the order in which they appear in that document.

The *first* improvement consists of a mode of stopping the traverse of the fabric on the breaking of the needle thread, and also when the second thread is not correctly passed through the loop of the needle thread. For this purpose a bent wire and instrument are applied in such a manner that when the needle thread is properly drawn off its bobbin, the working of the machine goes on and moves the fabric or work after each stitch; but when the thread is broken, or the second thread or instrument used to hold the loop on the other side of the fabric has not been passed correctly through the loop, then the wire and instrument move, and the apparatus for moving the fabric is no longer acted upon; but if at the next action of the needle, the second thread or instrument be correctly passed through the loop, the work goes on. The object of the improvement being not to stop the machine, but only that part of it which moves the fabric or work after each passage of the needle through it.

The *second* improvement consists in so arranging sewing machines, that the direction of the movement of the work or fabric may be changed, by simply changing the foot or pressing instrument, or by stopping the action of one of the instruments, by which the work or fabric is wound when the action of the machine is caused to be at right angles to the previous action, in consequence of the movement of the instrument acting on the fabric or work being in a different direction to the previous one.

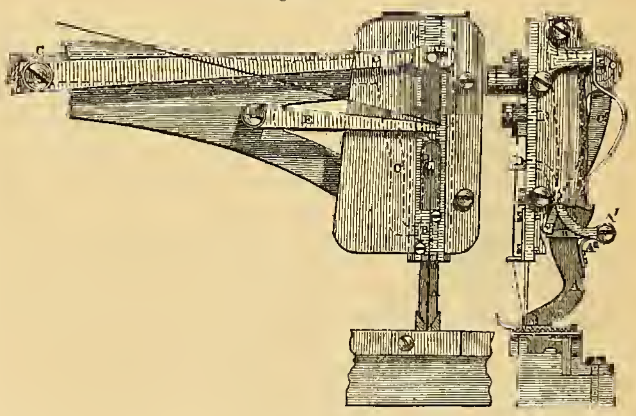
The *third* improvement consists of arranging or combining the parts of a sewing machine in such a manner that the fabric or work (or it might be the needle) in place of being moved continuously in one line, so that the stitches follow each other at a distance apart, the fabric is by the machine moved back a distance and then forward, so as to obtain a description of "back-stitch."

The *fourth* improvement consists of arranging or combining the parts of a sewing machine in such manner, that the fabric or work, in place of being moved constantly in one direction, so as to produce the stitches in a line one after the other, the work or fabric is moved constantly in one direction after each passage of the needle; but such motion is accompanied with a sideway or lateral motion, first in one direction and then in the other, by which the stitches follow each other in inclined directions, and make a zig-zag line of work.

The *fifth* improvement consists of making each stitch of sewing machines a fast stitch, by causing the needle thread to be bent with a loop, before it passes through the fabric or work, then the point of the needle is passed through such loop, in order to form a loop through the fabric, with its thread for the passage of the back or second thread; or the fastening may be made by the second or back thread being formed into a loop, and pressing the needle thread through such loop, and the second or back thread through the loop of the needle thread.

Figs. 166 and 167 represent respectively a side and front elevation of a sewing machine, fitted with the first part of Mr. Thomas' improvements. In these figures, A, represents the foot or instrument which gives the necessary movement to the work, having a projection, A^1, formed therein,

Fig. 166. Fig. 167.



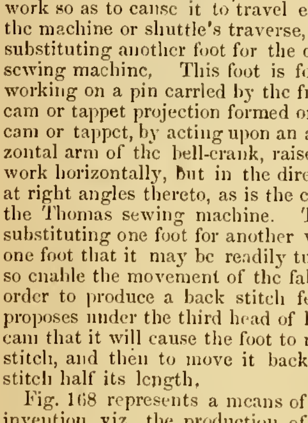
which carries a small lever, B, constantly pressed upwards by the spring, A^2, attached to the foot, A. C^1, is an arm or lever, extending downwards from the rocking shaft, C, which receives motion by means of an incline acting upon an adjustable screw, carried by another arm or lever attached to its other end. The lever, B, has a second lever, D, formed or fixed thereon, which extends upwards and passes through, and works in a slot or opening formed for it in the framing of the machine. E, is a lever working on a centre, E¹, carried by the framing; an eye or opening is formed in the free end of this lever, through which the needle thread from the bobbin passes on its way to the needle. When the shuttle passes through the loop formed by the needle thread, the tension of the thread thereby occasioned draws down the lever, E, which, acting on the arm, D, of the lever, B, overcomes the resistance of the spring, A², and causes the end of that lever to be acted on by the arm or lever, C¹, and gives a slight amount of motion to the foot, A, which carries forward the work. On the other hand, should the shuttle or other instrument fail in passing correctly through the loop of the needle thread, or the thread be broken, the levers, B and D, will not be brought down, but remain sustained by the spring, A², and the movement of the arm, C¹, will not influence the foot, A, since it will pass freely beneath the end of the lever, B, without coming in contact with it; consequently, the work will remain stationary until the thread supplied on the shuttle or other instrument *does* pass correctly through the loop, the needle, during such time of the stoppage of the fabric, entering the same hole in the work.

This is certainly a very simple and ingenious contrivance, but we should hardly think it of sufficient importance to pay Mr. Thomas a royalty for its application.

The means employed by Mr. Thomas for changing the direction of the work so as to cause it to travel either in the direction of the length of the machine or shuttle's traverse, or at right angles thereto, consists in substituting another foot for the ordinary one employed in the Thomas sewing machine. This foot is formed on a species of bell-crank lever, working on a pin carried by the framing or bracket, and actuated by a cam or tappet projection formed on the periphery of the fly-wheel. This cam or tappet, by acting upon an adjustable screw in the end of the horizontal arm of the bell-crank, raises that arm and moves the foot and work horizontally, but in the direction of the shuttle's course, and not at right angles thereto, as is the case with the foot ordinarily adopted in the Thomas sewing machine. The patentee, in place of changing or substituting one foot for another when requisite, proposes so to arrange one foot that it may be readily turned into the different positions, and so enable the movement of the fabric to be varied from time to time. In order to produce a back stitch feed motion of the fabric, the inventor proposes under the third head of his invention, to so construct the feed cam that it will cause the foot to move the work forward to form a long stitch, and then to move it backwards half such a distance to form a stitch half its length.

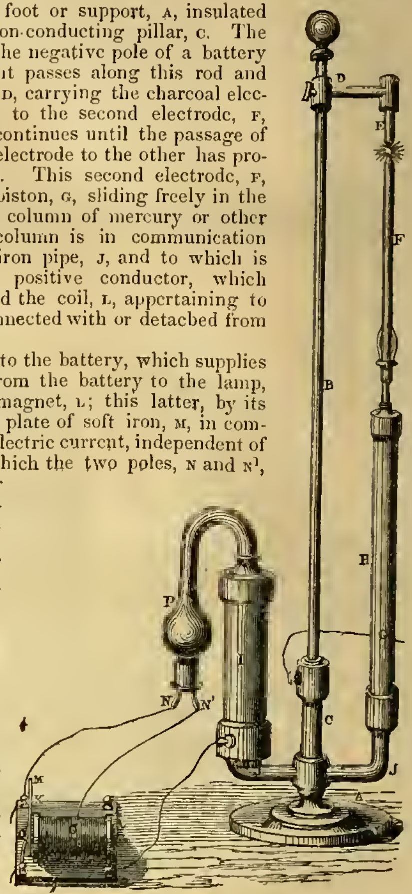
Fig. 168 represents a means of carrying out the fourth part of this invention, viz., the production of zig-zag stitching. For this purpose two feet, A and B, are used, both worked in the machine at one time, but by separate arms of their own, the foot, A, being moved first to traverse the work forward, and the foot, B, next, in order to move the work in the other direction. By this combination of feet, the work is continually moved forward, whilst at the same time it is also moved from side to side or laterally by the feet, B, by which the stitches are made zig-zag. By altering the throw of the cams, it is obvious that the nature of the zig-zag may be modified so as to produce an ornamental pattern. In carrying out the fifth head of this invention, it is preferred to make the loop in the second or shuttle thread, though it may be similarly done in respect to the middle thread. A small hook which moves on a horizontal axis is employed below the table of the machine, just before the needle descends; the hook in its partial rotation takes the second or shuttle thread just below the work, and coils it once round into a loop on the hook; the hook then descends, guided by the needle, through the loop just formed; the hook retires from the loop, leaving it on the needle; the shuttle, or second thread at the back of the work, passes, as heretofore, between the needle and the thread brought through the fabric and through the loop, the needle going back through the loop before-mentioned, and through the fabric.

Fig. 168.



ELECTRIC LAMP.

The accompanying illustration represents an elevation of an electric lamp, the invention of Mons. J. B. Pascal, of Lyons, the principal feature of which is an ingenious method of maintaining the electrodes at a proper distance apart during the burning of the light. This is accomplished by means of a certain pressure obtained from the gas, which is generated by the decomposition of water, such decomposition being interrupted when the electrodes are at the proper distance apart, and this interruption, moreover, is effected by the action of the current itself.



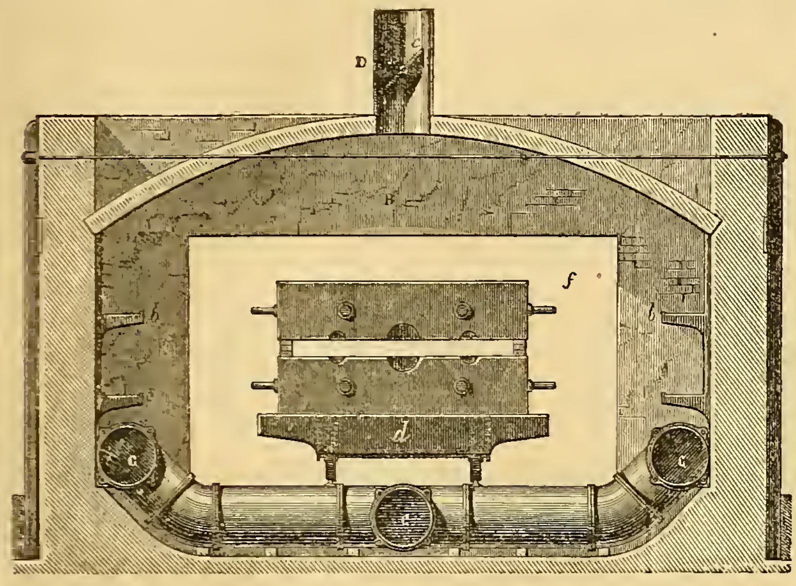
The lamp consists of a foot or support, A, insulated from the rod, B, by the non-conducting pillar, C. The rod, B, is connected with the negative pole of a battery by the wire, 1; the current passes along this rod and binding screw and socket, D, carrying the charcoal electrode, E, in juxtaposition to the second electrode, F, along which the current continues until the passage of the electric fluid from one electrode to the other has produced the luminous spark. This second electrode, F, is secured to the rod of a piston, G, sliding freely in the tube, H, and elevated by a column of mercury or other conducting fluid. This column is in communication with the tube, I, by the iron pipe, J, and to which is connected the second or positive conductor, which continues the current round the coil, L, appertaining to the electro-magnet, and connected with or detached from the lamp.

The electric current due to the battery, which supplies the light, passes directly from the battery to the lamp, by traversing the electro magnet, L; this latter, by its magnetic action, retains a plate of soft iron, M, in communication with a second electric current, independent of that of the lamp, and of which the two poles, N and N¹, project into a small reservoir of water, P, communicating with the pipe, I. This current is broken each time that the magnetic action of the electro-magnet, L, overcomes the tendency of the spring plate, M, to make contact with the conductor, S, and to close the second circuit, which tendency to make contact is regulated by well known mechanical means. If, by reason of the burning of the electrodes or by any other cause, the distance between their points becomes too great, the intensity of the current will be reduced as well as the magnetic action exerted upon the plate, M, which, acted upon by the antagonistic force, will form contact with the conductor, S, and will thereby establish the second current. This last mentioned current will now decompose certain molecules of the water contained in the reservoir, P. The gas thus produced will exert a pressure upon the surface of the mercury which will have the effect of bringing the two electrodes, E and F, nearer together, until the electric current becomes sufficiently strong to enable the magnet to draw the plate, M, out of contact with the conductor, S, and so break the circuit of the decomposing current. When the piston, G, has reached the end of its course, by the burning up of the electrodes, it is returned to its original position, by allowing the gas to escape from the pipe, I, either by a small cock, or by unscrewing the reservoir, P.

DRYING CORES AND MOULDS BY THE WASTE GASES OF BLAST FURNACES.

M. Mauclère, director of the Val d'Osne works, has recently patented and introduced at the works above referred to, a very simple and economical system of heating the ovens used for drying the moulds before casting, by the aid of the waste gases emitted from the blast furnaces. It is well known, that in effecting the gradual drying of the sand moulds used in foundries, it is requisite to be very careful that no deposit of dirt or other *debris* takes place on the moulded surface, which would be thereby seriously injured in their sharpness of contour, but under the ordinary plan of heating drying ovens, namely, by means of a fire-place in the oven itself, it is almost impossible not only to effect the gradual drying of the mould, but to prevent the deposit thereon of carbonaceous particles.

M. Mauclère's arrangement obviates these inconveniences, and effects the drying in a most economical manner. He places within the body of the oven a number of metallic pipes, C, through which the waste gases from the blast furnace are caused to traverse in a state of combustion, the radiation from the pipes supplying the required degree of heat to the oven. The gases emanating from the furnace are first conducted into a chamber in front of the stove, or oven, B, and are thence distributed by the pipes, C, fitted with suitable dampers, the gas being ignited at the entrance to the pipes, and by passing along therein in admixture with the requisite volume of atmospheric air, remains in a state of flame throughout the entire traverse of the pipes. Having traversed and re-



traversed the oven, the gases are finally conducted to a chimney, whence they pass into the open air. A series of supports, *b*, may be fitted to the inner walls of the oven, *f*, for the reception of ordinary moulds, which do not occupy much space, but for large and heavy moulds, a waggon, *d*, may be employed, running on rails laid on the floor of the oven. The heating pipes are carried by metal supports, and are formed at their extremities with a view to their ready cleaning. The oven itself is also provided with a chimney, D, and damper, *e*, for the free escape of the gas and vapours, resulting from the drying of the moulds.

STEAM CULTIVATION OF THE SOIL.

II.

Rotatory diggers, grubbers, or the new form of tined implement, falsely called a "plough," would leave a clover ley in such a state that it would have to be cross ploughed, or grubbed, harrowed, and rolled, and harrowed again. The stubble and roots of the plants, which, when buried, become manure, and, on heavy soils, tend to keep the land porous, have to be raked together and burnt, all occasioning great loss of valuable time, and increasing, very considerably, the amount of labour, which labour necessarily means money. An objection urged against the plough is, that the sole glazes the subsoil, and impedes drainage. This is very true of the ordinary plough; but it is not so with those adapted for steam power, which have no sole, and hence the land is left equally porous, while the extra speed given to the plough, when propelled by steam, so shakes and crumbles the soil, as to render the modern steam plough a more valuable implement than ever.

Again, how would the farmer on heavy land manage without his plough; his clover bottoms must be ploughed, that the roots may be buried; they are the manure he uses for his succeeding crop. Cultivators of all kinds would spoil clover bottoms, and render them unfit for an autumnal seeding, except an immense amount of labour was subsequently bestowed upon them. The like occurs with twitchy land; grubbers will never eradicate "twitch" * on heavy land. This insidious enemy must be turned up, and baked to death under the powerful rays of the sun; that portion remaining below, being covered by the earth, and deprived of its nourishment from the atmosphere will shortly die. No implement will accomplish so much work at so small a sacrifice of power, as a long thin wedged plough, the principles of action being perfect.

These farming incidents, though they do not affect the application of steam power to the culture of the soil, are noticed in order to show how useful and necessary an implement the plough is, and must ever remain; so that any adaptation of steam power ought to include the working of this implement; and the calculations which are to be made should, in fact, be based upon its requirements.

* Couch Grass.

Rotatory diggers—a class of implements worked by slow travelling locomotives—are favoured by the encomium of many of our leading agriculturists; and deservedly so, for they are highly ingenious, and in light soils, and land which has been previously broken up, will prove themselves more effective than any other instrument yet invented. They cannot, however, supersede the plough or the grubber, for this simple reason, that when the soil is hard—and that is the best time for cultivation—the tines will not penetrate the soil to a sufficient depth to make them effective. The action of the tines is such that power is lost; and, unless a very powerful engine is used, but little work can be accomplished.

We refer now to heavy lands, from which a crop has been taken. In light soils, revolving cylinders, armed with sharp tines, will dig the earth, turning up the weeds, and will render the soil firm and friable. Locomotives, which are adapted for the traction of ploughs, could easily be rendered available to work such implements — which should be constructed with long sharp steel tines, or teeth, as well as broad blunt ones;—when the soil is hard or stiff, the sharp thin tines should be used, but for light land a flat and blunt tine would be preferable. The "cultivator," or grubber, has many friends; no one will attempt to detract from its utility. But can it supersede the plough, as we are told it will do? Unquestionably it loosens the subsoil, and assists not only drainage, but allows the roots of the plant to penetrate lower than they would otherwise do. The cultivator can be worked with much less power than either the plough or revolving digging cylinder, but the benefit derived will be in proportion to the power expended.

The foregoing advocacy of the plough, as the *leading cultivator*, the sheet-anchor to which the farmer must hold on, if he would weather the storm of home and foreign competition, is based upon a well matured conviction, that it would be extreme folly so to ignore the plough, as to adapt steam power to the cultivation of land without its aid; though the soil, under certain conditions, may be well cultivated by cylindrical diggers or horizontally propelled tines of various forms, and in proceeding to inquire how the land may be profitably cultivated by the aid of steam, we regard the plough as the implement on the use of which all calculations should be based, and with its valuable assistance will be practically solved that all important problem,—will steam cultivation pay? It is necessary that we should now make some comparisons of what has been already accomplished, which, it is hoped, will not be considered invidious, seeing that the welfare of thousands, and the food of millions, are concerned in the present inquiry. When at the show of the Royal Agricultural Society, Chester, Messrs Boydell and Fowler worked during the public day in the same field. There was a good opportunity afforded of forming a pretty correct opinion (independent of any other circumstances) as to which of the two principles of applying power is the best, for both were subjected to the same conditions. Mr. Fowler's engine was a double cylinder, 12 horse, working with 60 lb. of steam. Mr. Boydell's the same, or nearly so; both of them were computed by competent judges to be working up to 20 horse power, if tested by the dynamometer. What was the result? Mr. Fowler's engine drew four ploughs, at three miles an hour, cutting furrows six inches deep, while his competitor worked six ploughs at the same speed, turning furrows to the depth of *eight* inches—which was considered double the work executed by Mr. Fowler's engine. If the engines were both working up to the same power, why did not Mr. Fowler do as much work as Mr. Boydell? For this simple reason, that Mr. Fowler's power was LOST by circumstances over which he had no possible control.

The traction engine, brought out by Mr. Boydell, may be unsuited to the farmer's use, it may be unmechanical even in its construction, but it is quite possible to judge, without prejudice, of the immense advantages that the direct traction method has over its complicated and expensive rival. Some may ask, why has not Mr. Boydell succeeded better, if the principle upon which he works is the correct one? Although Mr. Boydell may have proved it to be correct, he may have been unfortunate in his practical demonstrations, either through the peculiar build of his engines, or an improper adaptation of the principles of locomotion.

Another point in favour of locomotives of proper construction is, that they will work every day. Not so with stationary engines, for they require to be shifted, together with the anchors, implements, and gearing, at least once in four days, at a great cost for horse power, and labour, in fixing the anchors, &c., and adjusting the tackle, besides a loss of 20 per cent. of the valuable and seasonable time, in which their services are required, and are available.

BUENOS AYRES GAS WORKS.

(Illustrated by Plate 252.)

In a former number of the *Journal*,* we gave the first two of a series of plates of the apparatus for making gas for the City of Buenos Ayres—the retorts and condensers. Circumstances have arisen to prevent our continuation of the series until now, and we insert an engraving of the purifiers with the apparatus for lifting the covers, and the arrangement of the pipes and change-valves for the admission and egress of the gas to the purifiers.

Fig. 1, on our plate, No. 252, is a partially sectional elevation of the purifiers, and fig. 2, is a plan corresponding. The four purifiers are arranged equidistantly round the central chamber, into which the gas passes from the washer or condenser. The purifiers are supported on columns of brickwork to admit of the arrangement of the inlet and outlet pipes beneath. The covers of the purifiers are sealed in the usual manner by means of water joints. The covers are readily removed when required for the renewal of the lime or purifying agent, by means of the overhanging crane, which is carried upon a platform supported on columns which rest upon projecting brackets formed on the periphery of the central chamber. The direction of the gas as it passes through the inlet pipe is indicated by an arrow; from the central chamber the gas passes by the horizontal inlet pipes into the lower part of the purifiers, and after passing through the purifying agent is conveyed by the outlet pipes to the chamber, from whence it is conveyed away to the gasometer or holder, by the outlet pipe. In a future number we purpose giving an elevation and plan of the works so as to form a complete set of illustrations on the subject.

A good idea may be formed of the increase in the consumption of gas in Buenos Ayres, from the facts that, in the month of August 1856, three months after the first lighting of the city with gas, the consumption in private houses and street lamps amounted to 872,000 cubic feet, being at the rate of 10,266,720 cubic feet per year; and that in the month of December 1858, the entire consumption was at the rate of 32,300,000 cubic feet per annum. In looking at these figures it must be borne in mind that in this latitude the days are shorter in August than in December. The works have been considerably increased within the last year or two; 500 street lamps have been added to the original 1000;—a new 80 feet gas holder has been erected, in addition to the two 60 feet gas holders previously in use, and the retort benches have been increased in number, and other parts of the apparatus proportionately augmented in capacity. The works have for nearly two years been under the management of Mr. Simpson, a practical gas engineer who had obtained his experience at the Manchester Gas Works. The financial position of the enterprise has latterly assumed a far more satisfactory state than during the first two years. The profits on the working have been large, (in 1858 more than £12,000 we are informed) but, as the capital originally invested in the undertaking was too small in amount, the profits have been absorbed in the extension of works, and in providing capital for the advantageous working of the undertaking. The general management of the financial department has been entrusted to one of the directors of the company, Senr. Estrada, whose exertions seem to have been successful in result. The late siege and disturbed state of Buenos Ayres does not seem to have injuriously effected the enterprise, and it may be expected that the peace which has been concluded will cause the enterprise to continue prosperous.

IRON BUILDINGS.

By Messrs. E. T. Bellhouse and Co., *Manchester.*

(Illustrated by Plate 253.)

The greatly extended use of iron as a building material renders the subject an interesting one to engineers and all connected with the iron trade. We have frequently had occasion to notice important structures entirely made of iron, and adapted for the purposes of public buildings, railway stations, dwellings, and roofs for covering large areas. As it is a desideratum in most foreign countries to reduce the amount of labour necessary in erections, iron buildings, which can be completely fitted in England, and easily re-erected on their arrival at their destination, are in great demand for foreign railway stations. In Manchester some very extensive structures of this description have been manufactured for South America. An engine station for the Southern Railway of Chili, made from the designs of T. S. Pakenham, Esq., was in plan a polygon of 48 sides, 171 feet across, in the centre of which eight lines of railway met upon a central turntable, so that engine and tender could be shunted on to any of the radiating lines. This structure was very complete in all its arrangements, the framework being composed of cast-iron columns and spandrils, wrought iron principals of lattice construction, the whole covered on the exterior with galvanised tinned iron corrugated sheets (Morewood's Patent), and plate glass skylights. The entire weight was about three hundred and fifty tons, and the whole was erected complete in Manchester before being sent away. The engine station is now in the course of erection at Santiago, as well as a passenger station formed completely of iron, also a number of iron roofs adapted to brick buildings The passenger station alluded to is a building 200 feet in length in two spans of 40 feet each. The stations of the Cantagalla Railway near Rio de Janeiro are also of corrugated iron, and were manufactured in Manchester.

One of the illustrations of our present number, plate 253, is a design for a dwelling as constructed by the same firm, Messrs. E. T. Bellhouse and Co., of the Eagle Foundry, Manchester. The figures on our plate represent the front and end elevations of the dwelling as well as plans of the two floors. The external design of the dwelling is in good taste and cheerful in appearance, whilst the interior arrangement is commodious and well adapted for a thoroughly comfortable home. To the emigrant newly arrived on his land, as well as to the established colonist, these dwellings must be indeed a great boon, saving the new comer from a vast amount of discomfort and unforeseen expenses, and affording to the habitué all the comfort and elegance of a house in the "old country." A dwelling similar in style to that shown in our illustration may, we are informed, be constructed at a cost of from £450 to £500, according to style of finish.

* Vide Part 109, April, 1857.

RECENT PATENTS.

LUBRICATING WHEELS.

John Watkins & James Pugh, *of Aberdare, Glamorgan.—Patent dated July 5, 1859.*

In their present invention the patentees have introduced a simple and highly effective mode of lubrication, which is adapted for wheels, pulleys, or sheaves of all kinds, whether used as the travelling wheels of vehicles, or as simple sheaves or guide pulleys. The improvements consist in casting or forming a grease box or lubricating receptacle in one piece, with the boss or nave of the wheel itself, when the material of which the wheel is made is suitable for so doing, or the grease box may be cast or formed separately, and then fitted or secured to the boss or nave of the wheel. The interior of this grease box communicates with the axle journal or supporting spindle, by means of one or more holes or slits made in the bottom of the grease box, and a tight fitting lid of wood or other suitable material is adapted in slides or otherwise to the top of the box, for the purpose of preventing the escape of the

Fig. 1.

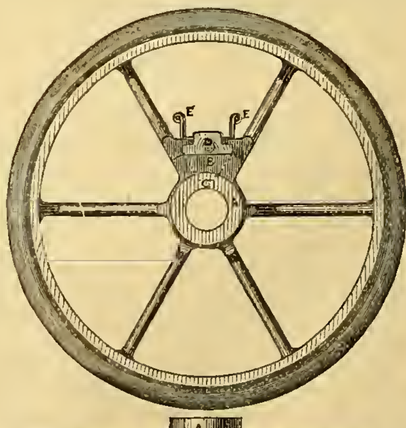


Fig. 2.

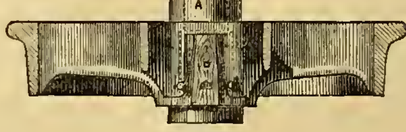


Fig. 3.

lubricant during the rotation of the wheel, and for excluding as much as possible the entrance of dust or grit therein. Springs, or other simple mechanical contrivance may be employed for preventing the accidental displacement of the lid, but in most cases such contrivances may be dispensed with, if the lid itself is made to fit sufficiently tight.

Fig. 1 of the subjoined engravings represents a side elevation of a cast iron railway wheel, constructed according to this invention, with its grease box cast in one piece therewith. Fig. 2 is a vertical section of

BUENOS AYRES GAS WORKS-PURIFIERS.

W. BRAGGE, ENGINEER.

E. T. BELLHOUSE & Co. MANCHESTER, CONTRACTORS.

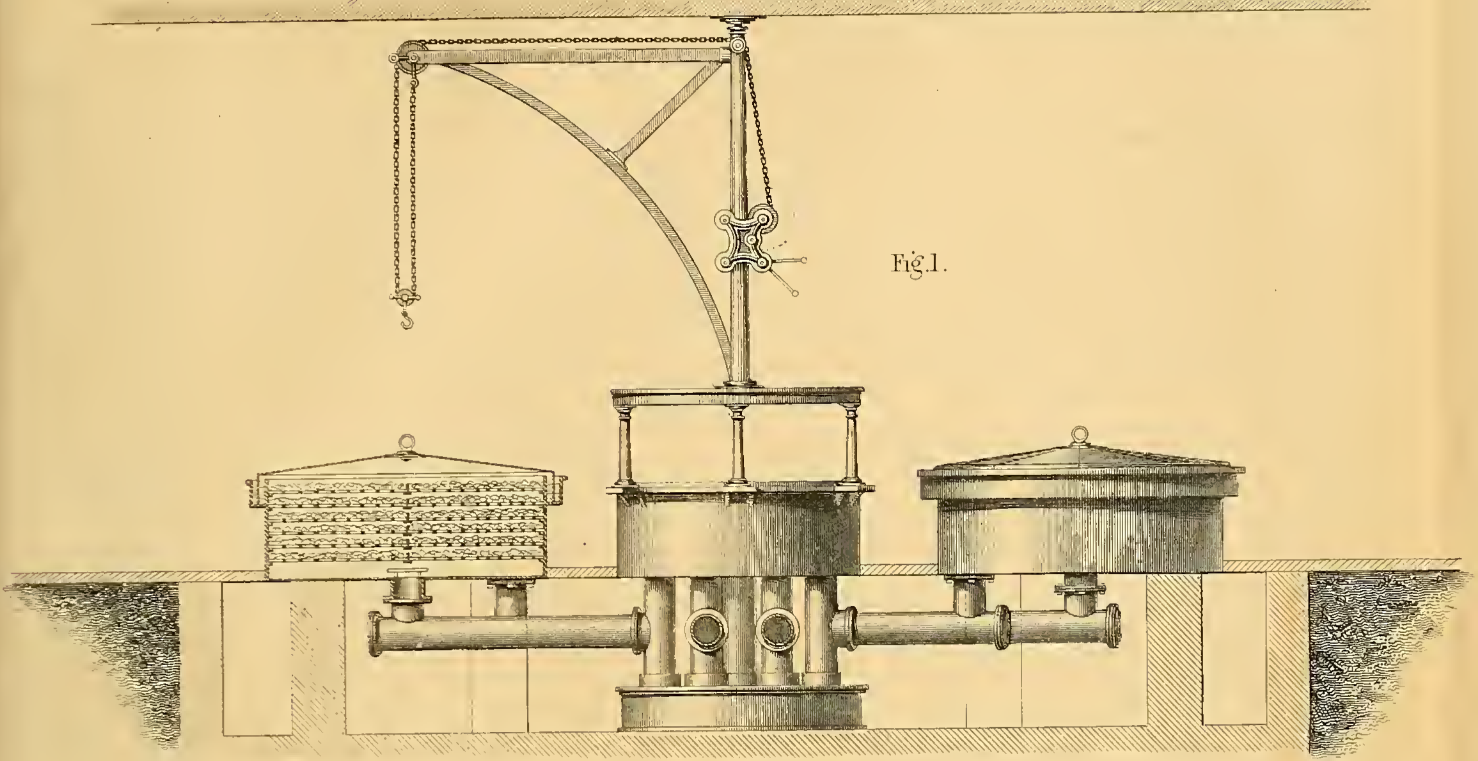


Fig. 1.

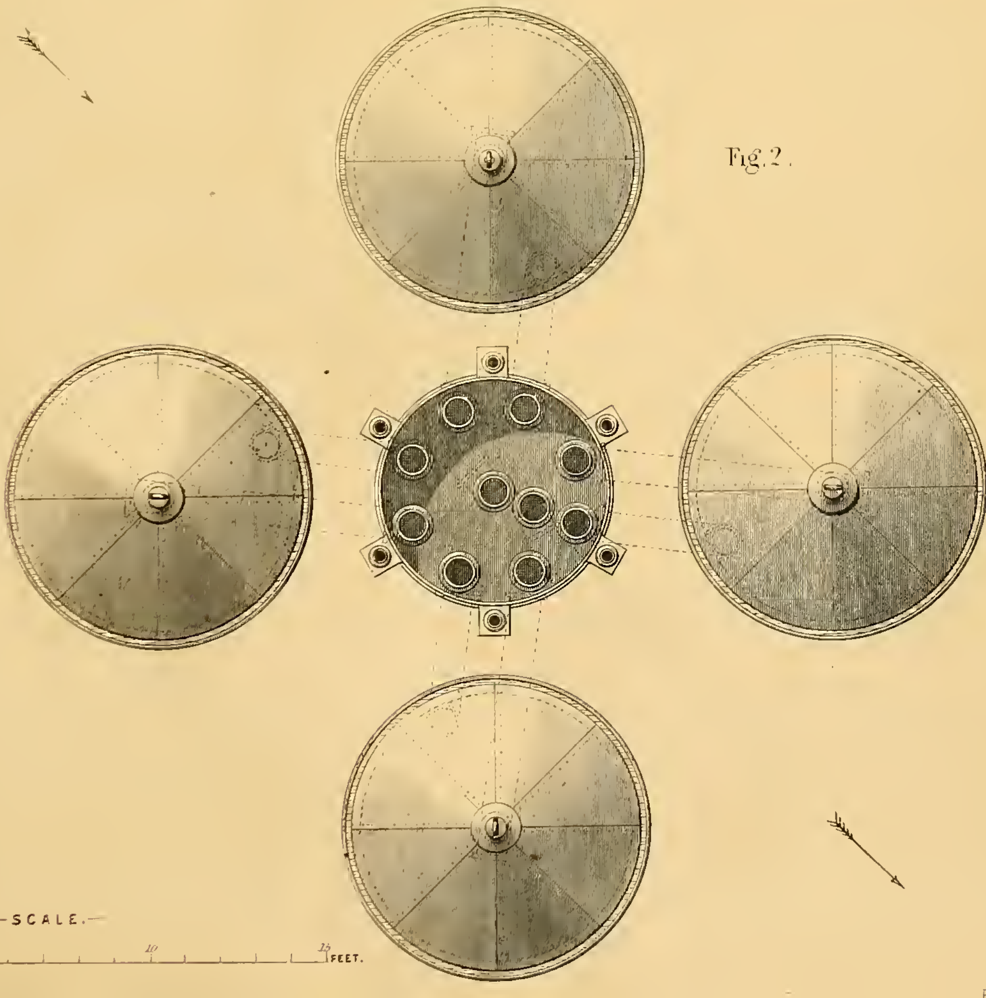


Fig. 2.

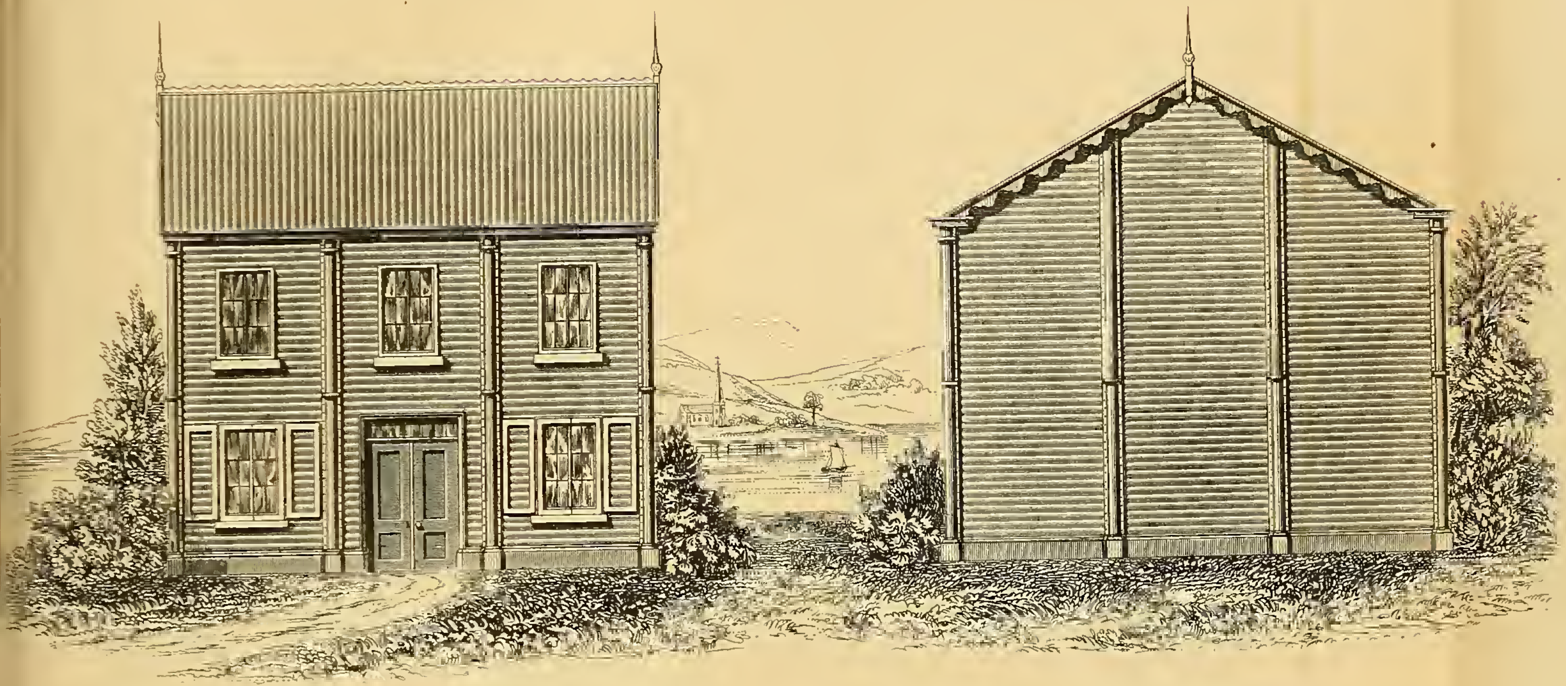
—SCALE.—

Plate. 253.

IRON DWELLING HOUSE.

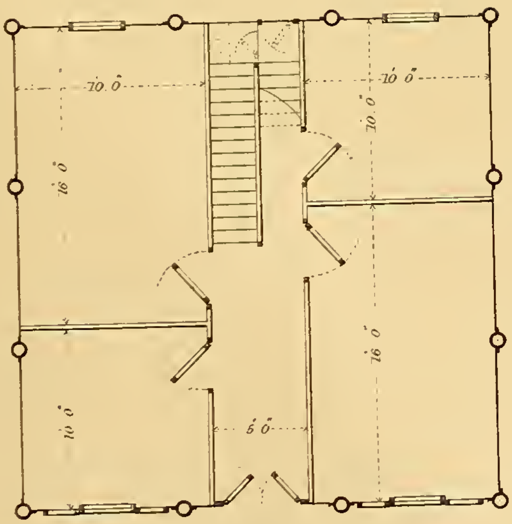
E. T. BELLHOUSE & Co. MANCHESTER,

MAKERS.

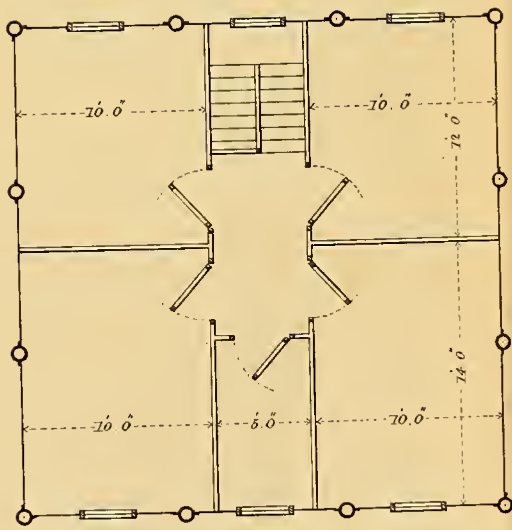


FRONT ELEVATION.

END ELEVATION.



PLAN OF LOWER STORY.



PLAN OF UPPER STORY.

— SCALE —

0 5 10 15 20 25 30 35 40 45 50 55 FEET.

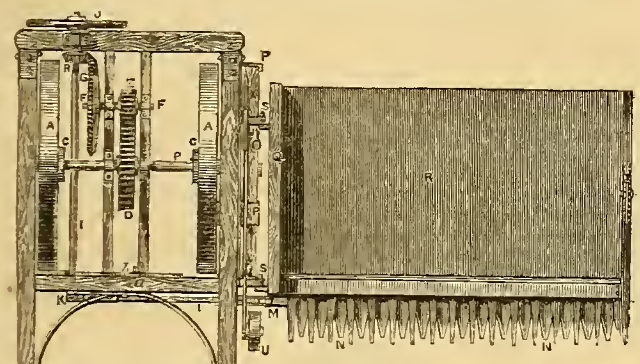
the wheel taken through the centre of the grease box; and fig. 3 is a horizontal section showing the lid or cover of the grease box, and mode of securing the same in its place. A, is the boss of the wheel, having a grease box, B, cast in one piece therewith, the interior of this grease box communicating with the axle journal, by means of the slit, C. A tight-fitting lid or cover, D, composed of wood or other suitable material, is adapted in grooves or otherwise to the top of the grease box, for the purpose of preventing the escape of the lubricant, and excluding grit and foreign matter. Two springs, E, if found desirable, may be fitted to the lid or cover, and take into the notches in the grease box, whereby the lid is prevented from becoming accidentally displaced. In the case of wooden wheels, the grease box is made separately, and is secured to the boss, hub, or nave, in any convenient manner, and in the case of wheels with arms of wood and boss, or hub of metal, the grease box may be cast or formed in one piece with the boss or hub; these grease boxes may also be cemented, riveted, or secured to the bosses of metal wheels or pulleys constructed in the ordinary manner.

REAPING MACHINES.

William Trotter, *Northumberland.—Patent dated January* 18, 1859.

The improvements introduced by Mr. Trotter consist of a peculiar arrangement and construction of certain parts of reaping machines, whereby such parts are capable of adjusting or accommodating themselves more readily to inequalities in the surface of the ground, and the machine requires less power to work it than reaping machines of the ordinary construction.

The subjoined engraving represents a plan of the improved reaping machine complete. The main framing and gearing of the machine is



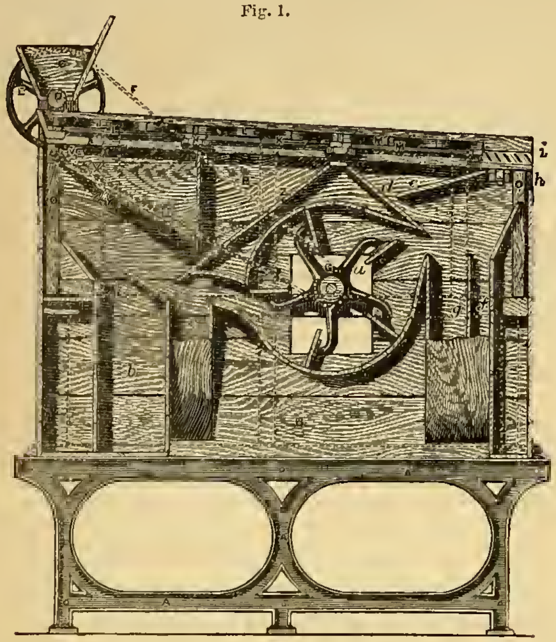
carried upon a pair of large ground supporting and driving wheels, A, which are loose on their axle, B, and connected thereto only by ratchet wheels and catches. Each wheel has along the inside of its boss or nave a ratchet wheel, C, keyed upon the axle, and the inner face of the wheel boss carries a hinged spring detent, the direction being such that as the wheels revolve in working, the ratchet catches take the axle round with them, whilst in backing, the wheels work entirely clear of the axle. The axle is supported in bearings set on the top of the longitudinal bars of the machine, and carries at its centre a spur wheel, D, which runs loose, but is thrown into gear with its shaft by an ordinary clutch when required to work the machine. This wheel is in gear with a spur pinion, E, fast on a back parallel shaft, F, which latter carries a bevel wheel, G, in gear with the bevel pinion, H; this pinion is fast on the after end of a longitudinal shaft, I, running in the end bearings on the framing, and carrying at its extreme after end a fly-wheel, J, whilst on its front end is a short crank, K, the pin of which is jointed to one end of a wooden connecting rod, L; the other end of this rod is joined at M to the cutter bar, N, which thus receives the necessary traverse for the cutting action. The joints of the connecting rod are both of the "universal" class, that is to say, they afford the means of free working at the junction points; however, the adjustment of the height of the cutters may be varied. The inner side of the reaper frame has attached to it a longitudinal wooden bar, O, resting upon a pivot or centre support projecting from the main frame directly below the centre of the main axle, and in a line coincident with the axis of the stud of the ground wheel, T; the ends of this bar have liberty to move freely up and down in clasps or holders, P. To this bar, O, the wooden cutter frame, Q, carrying the table, R, on which the cut corn falls, is attached by hinges, S. The outer end of the cutter frame and table is carried by the small ground wheel, T. In a line with the points of the cutters is a wheel or roller, U, carried by a stud on the forward end of a lever, which is centred on a stud carried by a standard or pillar at V, set on the bar, O; this lever extends back to a segmental bar or plate, W, also on the bar, O; this segmental plate being perforated, whilst the lever is fitted with a pin capable of being sprung into any desired hole in the plate. When the handle, X, at the back end of the lever is elevated, the forward wheel or plain pulley, U, is pressed down upon the ground, and this action consequently raises the front end of the bar, O, causing it to turn upon its centre in the frame, and hence the cutters are also elevated. In this way the attendant can at any time adjust the height of the cutters so as to reap high or low, as may be required, whilst the joints connected with the action of the crank, K, work equally well and freely without reference to this adjustment. The traction shafts, Y, by which the horse draws the reaper, are attached to the hind portion of the main frame by hinged joints, Z. Nearer the front, the shafts have a transverse bar, *a*, carrying a central stud pin capable of entering holes in the upper end of a perforated bar, *b*, supported on diverging legs carried by the front of the frame. This admits of the main frame being raised or lowered at pleasure; and this adjusting action can also be used for setting the height of the cutters. The hinges, S, by which the cutter frame and cut-corn platform or table are attached to the main frame, not only allow the ground wheel, T, to rise or fall according to the inequalities of the ground, but also permit the table to be raised to a vertical position, in which it can be retained by a stay. In this condition the reaper can be removed from field to field or elsewhere with great ease, as it can then pass through narrow gateways; by their means, too, the table can be detached from the reaper frame in a very expeditious manner. The board on which the attendant sits when the reaper is at work is placed across the frame. It will thus be understood that the cutters are at liberty to move up or down in a line parallel with an axial line drawn from the stud centre of the ground wheel, T, to the centre of the supporting pivot or stud of the bar, O, whilst they can rise and fall just as the ground wheel, T, rises and falls with the irregularities of the ground surface; and, further, that they can be set up altogether endwise upon the hinges, S, as a centre. The cutter knives, sixteen in number, are arranged on what is known as "Hussey's principle," but various forms of cutters may be used.

DRESSING AND SEPARATING GRAIN.

James Todd, *Castlemains, N.B.—Patent dated July* 21, 1859.

The improvements patented by Mr. Todd, relate to the so arranging and constructing dressing and separating machines, in such manner that whilst the dust and refuse is most effectually removed from the treated matters, the grain or seeds themselves are accurately separated and classed into various sizes and qualities. Fig. 1 of the accompanying engravings is a longitudinal sectional elevation of one modification of the patentee's improved dressing, cleaning, and separating apparatus; fig. 2 is a plan corresponding to fig. 1. The machine is supported on a rectangular cast-iron frame, A, consisting of two open side standards, which are connected to each other by transverse tie bars. On this framing is arranged the dressing machine which is enclosed by the casing, B; the upper part of the machine is made lower at one end than the other. Across the upper end of the machine is fitted the hopper, C, which has fitted at its lower part the grooved feed roller, D, the spindle of this roller is carried in pedestal bearings which are bolted to the upper part of the wooden framing. One extremity of the feed roller spindle is prolonged outwards, and has fitted to it the band pulley, E, over which is passed the endless belt, F, which derives its motion from a pulley, G, on the main horizontal shaft, H. The bearings of the shaft, H, are fitted on the central longitudinal stays of the wood framing, the shaft passing through rectangular apertures made opposite to each other in the casing, D. Motion is communicated to the shaft, H, from a steam engine or other suitable prime mover. The grain or seed to be dressed is fed into the hopper, C, either direct from a thrashing machine or other convenient source of supply, the rotatory movement of the roller, D, causing it to pass into the machine in a regular and uniform stream. The grain or seed falls firstly into a wire cloth sieve or screen, I, arranged immediately below the mouth of the hopper, C, which serves to separate the dust and the finer portion of the impurities from the grain. The sieve or screen, I, forms one of a series of three sieves or screens arranged contiguous to each other at the upper part of the machine, and extending nearly from end to end. The sieve, I, is formed either of wire cloth, or finely perforated zinc, nailed, or otherwise secured to a rectangular frame of wood; across the metallic bottom of the sieve or screen are arranged a series of slips of wood, J, which are disposed in angular positions. This arrangement of the slips of wood form a series of zig zag passages or channels extending across the tray in the direction of the length of the machine. The contiguous sieve or screen, K, is formed by preference of perforated zinc, and is furnished with slips of wood, L, arranged like those in the sieve, I, and forming a continuation of the same. The last sieve or screen, M, is made of zinc or other suitable metal, in which the perforations are larger than in the adjoining sieve, K, in this sieve the slips of wood, M[1], are precisely similar to those before described. The sieves or

Fig. 1.



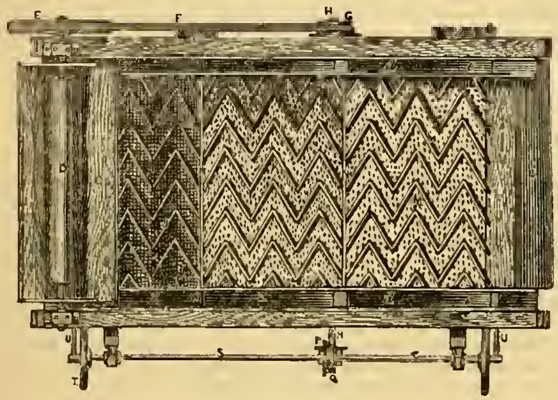


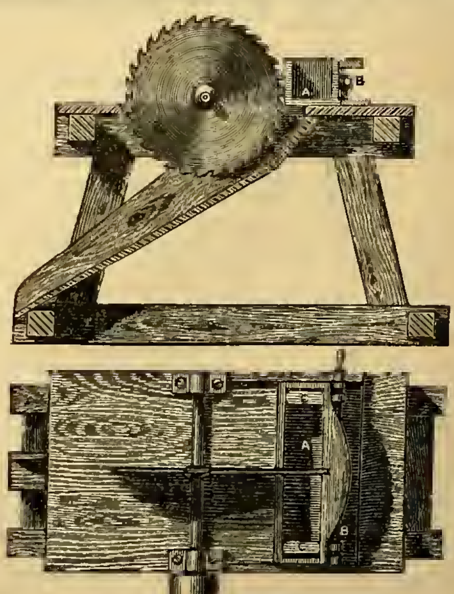
Fig. 2.

screens are made shorter than the breadth of the machine inside the framing, so as to admit of their being rapidly shaken to and fro, and they are fitted in transverse wooden bars, N, thus forming practically one sieve or screen of varying degrees of fineness. The sieve or screens are supported vertically by means of the strips of wood, O, which rest on the inner longitudinal rails of the framing, these uprights are sufficiently thin so as not to interfere with the lateral vibratory motion of the compound sieve or screen. Motion is communicated to the sieves from the main horizontal shaft, H, to one extremity of which is fitted the pulley, P, which by means of the endless belt, Q, gives motion to the pulley, R, on the shaft, S The bearings of this shaft are carried in brackets which are bolted to the side of the machine, and to each extremity of the shaft is keyed a small wheel, T. In the outer face of each of the wheels, T, there is fixed a crank pin to which is jointed the rod, U, the inner end of the rod being attached to pieces of wood, V, pendent from the under sides of the end sieves, I and M. Upon motion being given to the shaft, S, the dust and small foreign matters in the grain or seed fall on to the inclined plane, W, beneath this part of the machine is fitted the moveable board, X, which is fixed to the board, W, by means of the thumb screw, Y, so as to be readily shifted as required. The board, W, is furnished with handles to admit of its being taken out when necessary for the purpose of cleaning the machine. The lateral vibratory movement imparted to the compound sieve or screen causes the grain or seed to be shaken to and fro against the angularly arranged slips of wood, which serve to prevent its too rapid descent over the screen. Whilst the grain thus follows the zig-zag course of the angular partitions it becomes completely separated from all impurities, and divided into different qualities according to its weight. The grain which is small enough to pass through the interstices of the second compartment or division, K, of the compound sieve or screen falls on to the inclined plane, Z, and as it falls off from the lower part of this surface it is exposed to a current of air produced by the fanner, *a*. This fanner is fitted on the main shaft, H, and its rotatory motion causes the light particles of the descending stream of grain to be carried into the compartment, *b*, whilst the small grain falls into the compartment, *c*, which communicates with an opening in the side of the machine. The opening is fitted with a shoot for the convenience of filling sacks therefrom, and when not in use the opening is closed by a sliding door. As the grain passes over the third division, M, of the compound screen, the grain falls on to the inclined planes, *d* and *e*, descending from which it meets the current from the fanner, *a*, which carries the lighter or second quality of grain into the compartment, *f*, the heaviest and finest quality of grain falling into the compartment, *g*. Both the divisions, *f* and *g*, terminate in shoots outside the machine, to which sacks are hooked or otherwise attached when the machine is in operation. Any light particles that may pass through the sieve, M, with the grain, are blown off through the opening, *h*, at the upper part of the machine. Particles of straw or other matters too large to pass through the interstices of the sieves are shaken off at the end of the machine, and are carried away by the gutter or shoot, *i*. The patentee has also shown in his drawings a modification of the sieves or screens, in which arrangement the slips of wood are disposed in right lines across the sieve, one slip being placed opposite the opening between the ends of the two contiguous parallel slips. The slips of wood may be arranged in various ways so as to cause the grain or seed to pass along zig-zag or deviating passages or channels in passing over the sieves or screens, and thus accomplish the operations of dressing, cleansing, or separating grain, in a very superior and effective manner.

REDUCING SOLID SUBSTANCES.

J. H. Johnson, *London and Glasgow*, (W. J. Cantelo, *Burlington, U.S.*) —*Patent dated June* 3, 1859.

The object of this invention is the reducing to powder or coarse granular particles, articles of a tough or glutinous character, which resist the ordinary means used for grinding. This object is carried out in a rapid and effective manner, by means of the apparatus which we have illustrated in the accompanying figure. Our engraving represents a longitudinal vertical section and plan of a reducing machine, constructed



according to this invention. An ordinary circular saw is secured to a spindle, which turns in suitable bearings fitted to the opposite edges of the table or platform, which is supported by, and secured to, any suitable frame or pair of standards. On each edge of the platform is fitted a raised guide rail, between which guides, is fitted to slide freely the box or frame, A, its movement being in a line or parallel with the plane of the saw, without having any lateral play. A slot is cut transversely in the box, A, and this slot coincides with another one in the table or platform, within which the saw revolves freely. In order to counteract the weakness of the box which would result from the slot, it is proposed to strengthen it by securing two curved ribs to the back of the box. A longitudinal slot is made in the back of the box to admit the ends of the two slides, C, which slides fit into the box, and are moved along therein by the screw spindle, B, which works through the ends of the slides, and turns in bearings secured to the opposite ends of the box. One half of this screw spindle is formed with a right hand thread, and the other half with a left hand thread, but both threads should be of precisely the same pitch. It thus follows that on turning the screw spindle in one direction, the slides, C, will approach each other simultaneously, and on turning it in an opposite direction they will simultaneously recede from each other. It should be understood, however, that the materials, to the reduction of which this invention relates, are either of such a glutinous, fibrous, or in other respects, tough nature, as to prohibit the use of ordinary grinding mills. Amongst such substances may be classed the animal matter forming the residuum after the process of boiling tallow, and which is generally compressed into cakes, in which state it is known in the trade as "graves" or "crackling." The powder of this substance is extremely valuable for farm purposes, both as a manure and as food for live stock. This invention is equally applicable to the reduction of gutta-percha or of scraps of leather temporarily cemented together into masses or blocks, powdered leather being now extensively used in combination with other substances for many manufacturing purposes. This invention will also be found to be admirably adapted to the economic reduction of dye woods in substitution for the costly and cumbrous machinery now employed for that purpose. The following is the *modus operandi* of the improved reducing apparatus, claimed under the above, in part recited, letters patent. The slides, C, having been moved to the two opposite ends of the box, by turning the screw spindle, B, the block of material to be reduced is placed within the box, and the screw is then turned until the block is confined between the two opposite slides, C. The box, A, with its appendages, is now pushed forward by hand or otherwise, and the block is severed by the saw, after which the box is drawn back clear of the cutter; the screw, B, is again turned to an extent sufficient to bring the severed ends of the block into close contact with each other, and the box is again pushed forward, and the material acted upon by the saw as before, but in the exact line of junction of the two halves of the block. This is continued until the whole of the block has been reduced by the teeth of the saw, the resulting powder or sawdust passing down the shoot to the ground, or into a suitable receptacle to receive it. It will be observed that when the severed ends of the block are brought together after each cut, the point of contact must invariably be in line, midway between and parallel to the sides or edges of the saw. Not only, therefore, does the latter act as though cutting through an undivided block, but each severed half of the block furnishes its separate quota of powder removed by the saw.

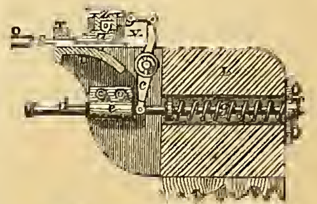
WEAVING PILED AND LOOPED FABRICS.

ANDREW PHILLIPS, *Glasgow.—Patent dated July* 18, 1859.

THIS invention relates more particularly to the manufacture of the class of carpeting known as "Kidderminster," or yard wide carpeting, so as to produce fabrics either with a piled or looped surface, similar to the Wilton and Brussels manufactures. According to this invention the piled and looped surface of the carpet is produced wholly by the weft, which is bound to the body warps by a secondary or binding weft.

Fig. 1 of the subjoined engravings is a partially sectional elevation showing one modification of the patentee's loop and pile forming mechanism; fig. 2 is a plan corresponding. As delineated in the subjoined engravings, the improvements are shown as applied to a hand loom of the ordinary kind. To the end pillars at the back of the loom are bolted the brackets, which carry the journals of the warp beam on which are wound the warps. These warps, which form the cloth body of the fabric, are passed through the eyes of the heddles, which are connected by cords to the actuating treadles, the downward movement of the heddles being obtained by weights which are suspended thereto. The warps pass through the dents of the reed, which is fitted in the lathe attached to the swords and rocking tree in the usual manner; the cloth, as it is woven, passes over the breast beam, L, below a rotatory beam, and thence on to the cloth beam. In manufacturing carpets or other generally similar fabrics, having a pile or velvet like face, according to this invention, the weft is caused to form a series of loops over wires extending to the back part of the loom. The loop wires, O, are formed in pieces twice the required length, the two ends being brought together they are each attached to a cord, which passes over a roller at the back of the loom, and has suspended to it a weight. The front end of each loop wire is held in proper position by passing through its looped end a piece of thin flat steel spring, S, the free ends of which are brought together and passed through a longitudinal slot or opening formed by bolting the bar, T, to the inwardly projecting piece, U, which forms a kind of secondary breast beam on which the operation of cutting the loops to form the pile is effected. The free ends of the springs, S, are brought forward and passed through a longitudinal opening in the bar, V, the springs being kept equidistantly apart by inserting small pieces of brass between them. The series of springs, S, are retained in position by passing a wire through holes made in the projecting ends, which extend out in front of the bar, V. In this manner the loop forming wires, O, are arranged parallel to each other, and are kept properly in tension by means of the weights at the back of the loom, the formation of the pattern being effected by passing the duplex wire of each loop former through the mails of pattern harness, W, the cords of which are attached to, and raised in the predetermined sequential order by the Jacquard apparatus above. The shed is formed in the ordinary manner by the depression of the treadles, a certain proportion of the wires, O, being also raised by the Jacquard machine to form one portion or thread of the pattern. The weft is now thrown in, and as the loops are wholly formed by the weft, it is necessary that there should be a considerable amount of slack or surplus, to admit of its being carried down on each side of the wires, O. This is provided for by an arrangement in connection with the lathe, the hand rail of which is centred on end pivots; this rail has secured to it two, three, or other convenient number of thin curved blades, which are made sufficiently long to extend a little below the wires, O. As the weaver pushes back the lathe to admit the passage of the shuttle through the shed, he turns the hand rail partially round by a simple movement of the wrist. This partial rotation of the rail causes the curved blades to sweep downwards and catch the weft, and so carry it backwards to the extent of the lathe's traverse. The raised series of wires, O, are now depressed; these wires as they descend, carry the weft down on each side of the horizontal wires, the weft thus forms a series of loops, the height of which loops is regulated by the distance between the upper and lower portion of each wire. The loops are bound in by depressing the upper series of body warps, and raising the lower ones; and these warps are woven together to form the cloth or body of the fabric, by throwing in a binding weft of linen or other suitable yarn. As the loops are formed in succession on the wires, O, the woven fabric is drawn off the wires by the action of the take-up motion, the loops passing off from the wires on to the holders, S. It is at this point that the loops are cut through to form the pile of the carpet or other fabric being manufactured. On the ends of the bracket piece or secondary breast beam, U, is fitted a sliding bar, Z, which forms a holder for the series of cutters, a reciprocatory motion being imparted to the holder, so that the knives may cut through one row or transverse series of loops at a time, and then be drawn back preparatory to repeating the operation. The cutters, *a*, are made with a projecting wedge shaped part in front, the inclined edge of which forms the cutters, the lower horizontal edge forming a smooth blunt surface, which traverses to and fro just above the surface of the woven fabric. The cutters, *a*, are made with a part which extends above the inclined cutting edge; this part fits into the longitudinal opening in the bar, Z, the lower part of the cutter passing down between the inner faces of the flat spring holders, S, which thus serves as a guide for the cutter, the cutting edge of the knife being exactly in a line with its contiguous wire, O. In this manner each wire is furnished with a cutter to sever the loops formed on it, the several knives being kept at a proper distance asunder by interposing pieces of brass between them, which the longitudinal opening in the bar, Z, affords facility for doing. The cutters are wedged up tightly by means of the screws, *b*, which pass through the ends of the bar, Z; by loosening these screws the cutters may be readily removed when they require to be sharpened. The bar, Z, is connected by a link to the lever, *c*, which is centred on a laterally projecting stud fixed in the bracket of the secondary breast beam, U. The lower extremity of the lever is jointed to the horizontal sliding rod, *d*, which is carried in the tubular guide, *e*; the front extremity of the rod, *d*, extends out through an aperture made for the purpose in the breast beam, and passes through a guide, *f*, which is bolted to the front of the beam. The other extremity of the rod, *d*, extends in a backward direction

Fig. 1.



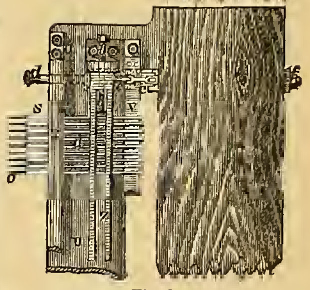


Fig. 2.

towards the lathe, and it is kept in this position when not otherwise acted upon, by means of the helical spring, *g*, one extremity of which is attached to the back of the guide, *f*, and the other to a flange formed on the rod, *d*. A corresponding arrangement of the rod, *d*, and its connected parts, is fitted up on the other side of the loom. As the weaver brings the lathe forward to beat up the weft, the lower rail of the lathe strikes against the projecting ends of the rods, *d*, which recede and so cause the levers, *c*, to partially turn upon their axes. This movement of the levers causes the cutters to advance with a sudden motion towards the loops, the pointed ends of which enter the loops and sever them. As the fabric is woven and the loops divided, the take-up motion draws the cloth forward beneath the cutters, and after passing over the breast beam and under the roller, it is wound on the cloth beam. Upon the lathe being moved back for the formation of a new shed, the springs, *g*, press back the rods, and the cutters are thus caused to recede in readiness for a repetition of the cutting operation. This arrangement of the cutters is greatly superior to that of stationary knives, as the severance of the loops is effected with much more facility, and the strain upon the cutting mechanism produced by the continuous pressure of the loops is avoided. Instead of arranging the warps on one beam, as shown in the accompanying engraving, the patentee prefers in some cases to wind them upon four rollers, arranged one behind the other at a slight angle, the journals of the rollers being carried in suitable brackets bolted to the back pillars of the loom framing. In weaving looped fabrics according to these improvements, the cutters and their connected parts are dispensed with, and in lieu of the arrangement of the wires, o, and their holders, s, a series of plain wires are attached to the weights, the front ends of which are made with a conical projection or swell, so as to prevent them from passing backwards through the dents of a secondary reed or regulator, which is arranged just behind the ends of the wires, and serves to keep them in position. The wire for these loop-formers is selected to suit the size of the predetermined loops, and it passes freely through the elliptical openings or dents in the secondary reed, so that whilst there is ample room for the passage of the loops through these openings, the swell or projecting part on each wire effectually prevents its recoil in a backward direction. In lieu of these stationary loop forming wires, stuffing chains may be used to cushion the loops on, which stuffing chains may be attached to the Jacquard machine, and so take the place of the wires. These improvements are applicable to the production of a variety of novel effects in the manufacture of pile and looped fabrics, and at a lower cost than has been accomplished hitherto.

LAWN MOWING MACHINES.

James Shanks, *Arbroath.—Patent dated July* 19, 1859.

Messrs. Shanks & Sons have acquired a high reputation for the excellence of their grass mowing machines; in the present invention they have introduced improvements which are calculated to make these useful machines still more effective in working. In constructing a mowing machine as adapted for horse power, the patentee prefers the following general arrangement of the parts. The main framing of the machine consists of two wrought or cast-iron side plates, which are connected by transverse tie bars forming a rectangular frame. To the back cross rail of the framing are attached two upwardly directed curved bars, the extremities of which form the guiding handles of the machine. Each of the side plates of the framing has fitted to it a pendent bearing arranged opposite to each other, and serving to carry the journals of the horizontal shaft on which the two driving rollers are carried. These driving rollers are broad, smooth, open ended iron cylinders, the two being equal to the length of the cutter, or nearly so, which is arranged immediately in front of them. The nave of each driving roller has either cast thereon, or fixed to it, a clutch or coupling, which is made to gear with a similar clutch on the shaft on which the driving rollers revolve loosely. The clutch of each driving roller may be arranged so as to be contiguous to each other, near the centre of the shaft, or they may be fitted out at the ends of the rollers, next the framing. On the horizontal shaft on which the driving rollers rotate, there are arranged two loose couplings, which slide to and fro on a feather formed on the shaft, so as to prevent them turning round except with the shaft. These couplings have fitted between them a helical spring of iron or steel wire, the extremities of which press against the couplings on the shaft, so as to keep them always in gear with the clutches of the driving rollers. The horizontal shaft of the driving rollers carries a spur wheel which is loose on the shaft; to this spur wheel is cast or fixed a coupling, which gears with a coupling made to slide to and fro in a feather formed on the shaft, so as to prevent it turning round except with the shaft, all fitted in the same manner as the two loose clutches which gear with the driving roller before described. To the loose clutch of the spur wheel a lever or rod is attached, for the purpose of throwing the working parts of the machine into and out of gear. This rod or lever extends from the clutch to the guiding handles of the machine, and has a socket, and moves backwards and forwards on a stud fixed to the back transverse rail of the machine, so that by a movement of the rod or lever to the right hand or to the left, the sliding clutch is put in and out of gear with the clutch fixed to the centre or nave of the spur driving wheel. The loose clutches which gear with the driving rollers are always kept in gear by the springs, and in turning the machine quickly the roller is in gear and drives the cutter, whilst the other roller is turning in a backward direction, and thus causing the clutch to slip, so that the machine is turned with great ease. If the driving roller clutches are preferred to be at the ends of the rollers, the couplings on the shaft are each kept in gear with the clutches of the driving rollers, by means of a helical or other suitable spring arranged between the coupling and the framing on either side of the machine, and in this case the main spur wheel and clutch for working it will be placed in the centre or between the two rollers. The horizontal shaft of the driving rollers carry a spur wheel which gears with a pinion on an intermediate shaft, which carries a spur wheel in gear with a pinion on the cutter shaft. On the intermediate shaft, which is arranged above the cutter shaft, is fitted, at the end opposite to the intermediate spur wheel, a small fly wheel, the object of which is to impart momentum to the cutter, and render the machine easier to work. The cutter is of the usual form used for grass mowing, and consists of a series of blades arranged helically upon a central shaft, to which a rapid rotatory movement is imparted by means of the spur gearing in connection with the shaft of the driving rollers. The grass as it is cut is thrown by the cutter on to an open box arranged in front of the machine, connected with which is an arrangement for readily emptying the box without stopping the machine. On the backward transverse rail of the framing is fixed a vertical stud, on which is centred a long rod extending forwards to the centre of the grass box in front, and backwards to within convenient reach of the person who guides the machine. The front extremity of the rod is jointed to a false end or transverse sliding partition, which by this means is caused to traverse from end to end of the grass box at the will of the operator. The front vertical edge of the false end of the grass box has fitted in it a bracket, into which two small pulleys with a flange on either side are fitted horizontally, three or four inches apart, and which pulleys are made to slide backwards and forwards on an iron rail, fixed to the front part of the box, and the after edge of the false end has a similar bracket and pulleys, which slide to and fro also on similar iron rail or a horizontal guide bar fitted across the back part of the grass box. The front end of the actuating rod is turned upwards, and has a vertical handle fitted thereto; by moving this handle either to the right or left hand side of the machine, the operator causes the false end to traverse to the opposite end of the grass box, and so deposit the cut grass in a heap at the side of the machine. And this operation of emptying the grass box may be repeated as often as necessary during the onward progress of the machine, and without in any way interfering with, or impeding the action of the mower. With these several novel arrangements, the management of mowing machines and their general operation is rendered easier and more effective in practice.

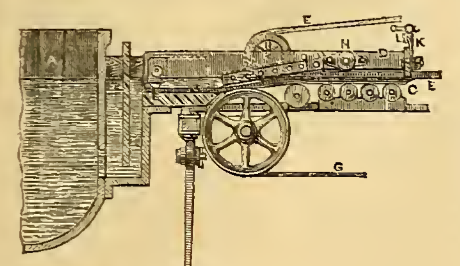
MANUFACTURE OF PAPER.

James Hollingworth, *Glasgow.—Patent dated July* 4, 1859.

The patentee's improvements relate to the arrangement and construction of that portion of paper-making machinery or apparatus, technically known as the "deckle" which prevents the stream of pulp from flowing away laterally, as it is carried over the endless web of wire cloth, and thus regulates the width of the continuous length of paper. The object of the invention is to so arrange the deckle bars that they may be readily moved simultaneously to or from each other, so that the width of the web of paper may be varied with facility, and without stopping the paper-making machine.

Fig. 1, of the subjoined engravings is a partially longitudinal section of a portion of a paper making machine having the patentee's improvements applied thereto; fig. 2, is a plan of the same. The prepared pulp flows from the vat, A, on to the apron, B, which is fastened down to the lip or overhanging part of the vat, by a metal band. The apron is formed of an elastic material, vulcanised India-rubber being preferred for the purpose; it is slightly stretched at the part where it is fastened to the lip of the vat, the sides of the India-rubber being turned upwards and then over forming a double layer on each side, and is fastened laterally by a screw and thumb nut which secures the end pieces of the metal band. The India-rubber apron, B, extends over the endless wire cloth, C, the apron is contracted at the sides to the width of the narrowest web of paper required, the surplus is folded over the lateral margins, and the India-rubber is attached by means of suitable plates to the longitudinal bars, D, which, with their connected parts form the improved adjustable deckle. A piece of wood is fitted under the folded part of the India-rubber on each side, so as to keep up the parts between the metal band and the deckle bars, D. The deckle straps, E, which prevent the pulp from flowing under the bars, D, are arranged in the ordinary manner; at the front part they pass over drums on the horizontal shaft, which is driven by an endless band. The principal feature of this invention is that the deckle may be instantly adjusted to make any required width of paper, without stopping the machine to effect the alteration. The simultaneous movement of the bars, D, and their connected parts is effected by means of a winch handle, which is fitted on the end of a horizontal shaft, which extends out beyond the framing on the opposite side of the machine. This shaft has keyed to it a bevel pinion, which gears with the bevel pinion on the lower extremity of an angularly arranged shaft, which is carried in overhanging bearings that are bolted to the framing of the machine. At the upper end of the shaft is keyed a pinion, which gears with a pinion, on the extremity of the horizontal shaft, F, this shaft extends parallel with the bars, D, and has formed on it two worms, which give motion to corresponding worm wheels. The worm wheels are fast to the ends of two horizontal screws, G, only one of these is shown in the engraving, these screws work through pedestal bearings on the contiguous bar, D. The ends of the screws, G, are each connected to, or form a continuation of, an iron bar, H, which is covered with brass; the opposite extremities of these bars are attached to the screws, I, which work out through the pedestal bearings of the opposite bar, D. To the inner face of each pedestal bearing is attached the end of a tube, J, which end forms a bush having an internal screw made therein to correspond to the screw passed through it; the several tubes, J, fit over the screws, and central bars, H, telescopically. The screws, G, on the one side of the machine, and the opposite ones, I, are made right and left handed, so that when the actuating handle is put in motion the rotatory movement of the screws in the bushes of the tubes, J, causes the bars, D, to be moved towards, or recede from one another, according to the direction in which the handle is moved.

Fig. 1.



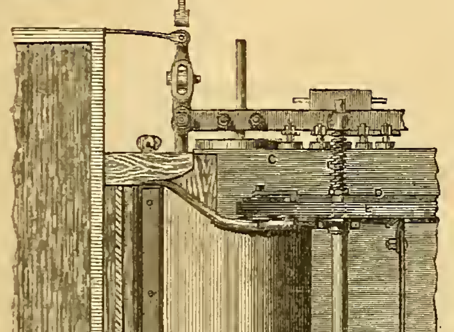


Fig. 2.

The drums are made sufficiently long to admit of the greatest traverse required in making the different widths of paper. Between the two screw shafts, G, there is fitted a transverse stay which passes through the pedestal bearings on the bars, D, and so serves to steady the central portion of the deckle. The depth or thickness of the stream of pulp, is regulated by an adjustable gauge or "slice," which consists of two plates, K, capable of longitudinal adjustment by means of two long slots, in which the retaining bolts slide to and fro as the plates move simultaneously with the bars, D. The plates, K, are fitted with two over-hanging arms, the free extremities of which extend outwards in a lateral direction; in the tubular ends of these arms are fitted the screws, L, the ends of which enter the bars, D. By turning these screws to the right or left the "slice" or gauge, K, is thereby raised or lowered, so as to regulate the thickness of the pulp and so produce an equal layer or film all over the wire cloth. A gauge is also fitted to the tubular part of the screw shaft, G, to indicate the space between the deckle; to the tube, J, is fixed a plate, the face of which is divided into inches and fractional parts thereof. On the bar, H, is a mark which shows the extent to which the deckle has been opened or contracted, a movement of an inch and a half as indicated on the gauge, being equal to double the space between the two bars, D. The primary shaft carries on its free extremity a wheel, which gives motion to two spare wheels, these wheels are keyed on screw shafts, the rotatory movement of which actuate the ends of the vacuum boxes. In this way as the deckle is adjusted in regard to width the same movement simultaneously regulates the width of the vacuum boxes so as to correspond to that of the deckle. With these improvements the paper maker is enabled to alter the size of the paper at a moment's notice without stopping the machine or incurring loss, either of time or material.

MECHANIC'S LIBRARY.

Agricultural Facts, Year Book of, edited by Burn, fcap. 8vo, 5s., cloth.
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Practical Tunnelling, 2nd ed., revised by Haskoll, 21s. Simms.
Science and Art, Year Book of Facts in, 1860, fcap. 8vo, 5s., cloth. Timbs.
Specifications, with Law of Contracts, by Glen, 2 vols., £4. Donaldson.
Swords, Marcy on, translated by Maxwell, "Weale's Rudimentary Series," 1s. Marcy.

LAW REPORTS OF PATENT CASES.

Coating Iron Ships: Beckford *v.* The Royal Mail Steam Company.—This was an action in the Court of Queen's Bench, for the infringement of a patent, tried before the Lord Chief Justice at the sittings for Middlesex after last term, when a verdict was returned for the plaintiff—damages £150.—The patent in question was for protecting the sides of ships from being corroded by animal or vegetable matter by a covering of asphalt applied with black varnish. At the time, the question for determination was, what was black varnish? and that the defendants used black varnish, or a composition of a different nature, which they styled black wash. The defendants were charged with having coated two of their vessels, namely, the *Oneida* and the *Shannon*, after the manner patented by the plaintiff. For the coating of the *Oneida* the plaintiff would have charged between £350. and £400; that of the sister ship would have come to £450.—Counsel now moved for a new trial on the ground of surprise, the verdict being aginst evidence; and likewise there being no proof of substantial damages, the verdict ought to have been only for nominal damages.—The court granted the rule on the ground of surprise, and to reduce the damages, because the evidence was insufficient to prove that the *Shannon* had been similarly coated as the *Oneida*, but refused it on the other ground, inasmuch as the inference of the plaintiff's damage was easily deducible from his evidence as to what he should have charged for coating the vessels.—Rule accordingly.

Type Founding: The Patent Type Founding Company *v.* Lloyd.—This was in the Court of Exchequer, at Westminster, before the Lord Chief-Baron, Mr. Baron Martin, Mr. Baron Watson, and Mr. Baron Channell An action was commenced in the case against the defendant, who is the proprietor of *Lloyd's Weekly Newspaper*, for the infringement of a patent granted to John Robert Johnson, and assigned to the plaintiffs. Counsel now applied on behalf of the plaintiffs for a rule *nisi* calling upon the defendant to show cause why he should not permit the plaintiffs and their witnesses to inspect the type used by him, and, if necessary, to take away specimens to be analysed, for the purpose of giving evidence at the trial of the cause of the component parts of the type, which the plaintiffs alleged was an infringement of their patent. The application was made under the Patent Law Amendment Act, sec. 42, and which, it was contended, gave the courts of common law the same power which courts of equity formerly exercised in granting injuntions, inspections, and accounts, and a case was cited in which that Court had made an order upon the defendants, compelling them to put their machinery to work in the presence of the plaintiff and his witnesses, and liberty was also given to the viewers to take away specimens of the work produced for the purpose of using them as evidence in a cause then pending.

This matter had previously been before Baron Bramwell at chambers. Their Lordships granted a rule *nisi*.

The Patent Type Founding Company *v.* Walter.—In this case, counsel applied for a similar rule against Mr. Walter, who is one of the proprietors of *The Times*. An order had been made for inspection, but nothing was said in it about specimens. The plaintiffs then gave notice of their intention to abandon the order and apply to the Court. A rule *nisi* was granted.

Atmospheric Holders: Walton *v.* Lavater.—This was an action in the Court of Common Pleas, at Westminster, before Lord Chief-Justice Erle, and Justices Williams and Willes, for the infringement of a patent holder which adheres to any flat surface by exhausting the air between it and that surface. It was originally brought out as a holder of photographic plates, and was subsequently sold as a peg or candlestick holder to affix against a wall. The plaintiff was assignee of a moiety of the patent, and the defendant the inventor; and the owner of the other moiety, and the defendant had caused the alleged infringements to be made in France, and sent over to this country. A verdict was found for the plaintiff at the trial before Mr. Justice Byles, at the Guildhall, at the last sittings.

A motion was now made for a new trial, or to enter the verdict for the defendant, on the ground that the plaintiff's right was a mere license to sell, and that he was bound to account with the defendant, who was the owner of the other moiety of the patent. Rule *nisi* granted.

Ventilating Coal Laden Ships: Tronson *v.* Potter and Others.—This was an action in the Court of Queen's Bench before Lord Chief-Justice Cockburn, and Justices Wightman, Crompton, and Hill, to recover damages for the infringement of the plaintiff's patent for "improvements in ventilating and preventing spontaneous combustion in ships and other vessels laden with coal, culm, or cinders." It appeared that the plaintiff's patent was granted to him on the 10th of September, 1853, and according to his specification it was the use of numerous perforated tubes arranged or fixed upright in the cargo, conducting the gases to the space above the cargo and below the deck, and conveying the gases away from such space, that constituted the peculiarity of his invention.

After counsel had been heard at some length in support of the plaintiff's claim,

The Court thought that there was no novelty in the plaintiff's invention, which could be the subject of a patent, and gave judgment for the defendants.

Fish Joints for Railways: Harwood and Others *v.* the Great Northern Railway Company.—This was a motion on behalf of the defendants, in the Court of Queen's Bench, at Westminster, before Lord Chief-Justice Cockburn, and Justices Wightman, Crompton, and Hill, for a rule to show cause why the verdict found for the plaintiff's, as reported by us in January, should not be set aside and entered for the defendants, pursuant to leave reserved at the trial. The action was brought to recover damages for the infringement of the plaintiff's patent for improvements in the manufacture of "fishes" for railways. The learned counsel suggested that the questions in dispute should be stated in the form of a special case.

Lord Chief-Justice Cockburn said the learned counsel might take a rule on the point reserved; but probably the parties might agree to raise both the points in dispute in the form of a special case.—Rule *nisi* granted.

India-Rubber Packing: Tuck *v.* Silver.—We reported the original proceedings in this case in June last. The present action—which was in the Court of Queen's Bench, before Lord Chief Justice Cockburn, and Justices Crompton and Blackburn—was for the infringement of the plaintiff's patent for improvements in the packing of pistons. It appeared at the trial, which took place before Mr. Justice Blackburn, at the sittings after last term, that the plaintiff's mode consisted in surrounding the piston with an elastic cord enclosed and wrapped round with canvas. The defendant had used a similar method, enclosing the cord with plaited hemp. The jury found a verdict for the defendant. The counsel for the plaintiff now contended that the learned judge had misdirected the jury, but after a somewhat lengthened discussion

The Court expressed an opinion that there had been no misdirection and refused a rule.—Rule refused.

Copyright: Kelly *v.* Blower.—This was a motion in the Vice-Chancellor's Court, before Vice-Chancellor Sir J. Stuart, when the counsel for the plaintiff, who is the proprietor of the *Post-office London Directory*, moved for an injunction to restrain the defendant from printing, publishing, or selling a work called *Blower's, Architects', Surveyor's, Engineers', and Builders' London and Provincial Directory for* 1860, on the ground that the work last mentioned was an infringement of the copyright in the plaintiff's work.

The defendant submitted to a perpetual injunction, as asked, and to deliver up the copies of the work complained of, and to pay the costs of the suit.

The Vice-Chancellor made a decree accordingly.

Zebra Fabrics: Macnee *v.* Nimmo.—This very long litigation respecting the manufacture of a fabric called "zebra" has at length been brought to a close in Chancery, before the Lords Justices of Appeal. Two trials at law have taken place. The result of the last verdict of the jury having established that the cloth used by the defendant, when printed, is an infringement of the plaintiff's patent, their Lordships affirmed the decree of Vice-Chancellor Wood, excepting as to the delivery up of the cloth in the gray or unprinted state, as to which the Court directed the decree to be varied, the plaintiff taking the deposit for his costs without any taxation

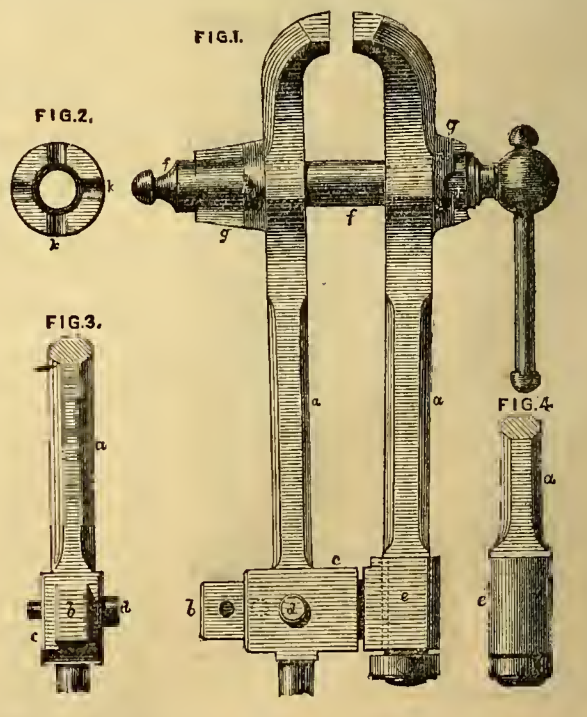
The defendant has been adjudicated bankrupt.

REGISTERED DESIGNS.

PARALLEL ADJUSTABLE VICE.

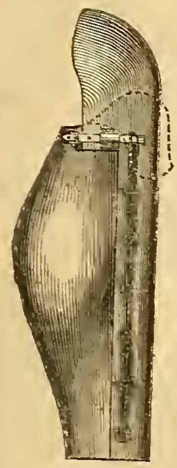
Registered for Messrs. E. & J. Turner, *Engineers' Tool Works, Harvest Lane and Mowbray Street, Sheffield.*

The purpose of utility to which the shape or configuration of this design for a vice has reference, is the simple mode of adjusting itself to any tapered objects in combination with increased strength of gripping.



In the above engraving, both legs or jaws of the vice are marked, *a*, one which is provided with a sliding-piece, *b*, which slides into a box, *c*, in the other leg. By means of the pin, *d*, the jaws may be regulated according to the size of the object they have to grip. Angular adjustment of the jaws is obtained by means of a socket, or universal joint, *e*, in which the front leg can be turned at pleasure, according to the taper of the object it has to grip. The screw box, *f*, and the turned washer, *h*, in front of the jaw, are both provided with lugs, *g*, which are respectively received by semicircular grooves, *k*, cut in the vice-jaw. By this arrangement an equalisation of pressure is obtained in the bearings, so that however tapered the object may be, the vice will hold it firm, and in gripping any parallel object, it is stated that it holds it firmer than any other kind of vice of the adjustable kind.

KNEE CAP GAITER.



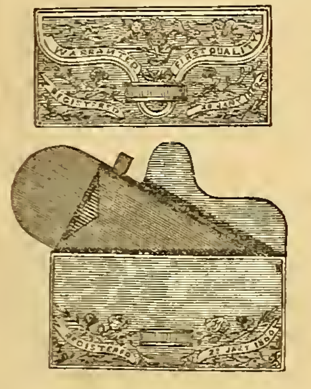
Registered for Messrs. Bowley & Co., 53 *Charing Cross, London.*

The subjoined engraving represents an improved form of knee cap gaiter introduced by the above eminent firm, and which is particularly adapted for the use of rifle corps. The gaiter is made with a knee cap to protect the knee of the wearer when kneeling for shooting, or other purposes. The dotted line indicates the position of the cap turned down, as worn when standing or walking. This gaiter is adapted for wear either with trowsers, breeches, or to form a part of the Knickerbocker costume.

The ordinary regulation knee cap, from its not adapting itself to the shape of the knee when most wanted.—*i. e* , when kneeling, is of little practical use, the wet and dirt either lodging in, or becoming scooped up by it as the wearer rises from the ground. The improvement appears to be well adapted to obviate the evil complained of.

THE CORONET NEEDLE CASE.

Registered for Messrs. S. Allcott & Co., *Unicorn Works, Redditch.*

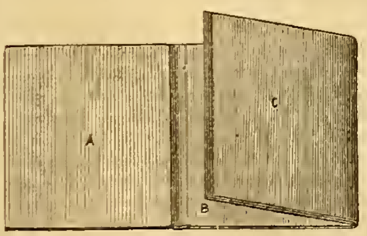


This is a very neat and tasteful design for a needle case. It is so arranged as to enable the user to take out a needle without touching the others in the wrapper, and so avoid their becoming rusty by the dampness of the fingers. Our illustrative figures represent the needle case closed and opened. The outer ornamental case is made like a pocket book, in which is an inner wrapper containing the needles arranged in a single row, so that one can be readily removed without touching the rest. The needles enclosed in the sample packet forwarded to us are of very fine quality and finish.

BLOTTING BOOK.

Registered for Messrs. Howell, James, & Co., 9 *Regent Street, London.*

This blotting book has been produced to meet a difficulty which has always hindered the sale of these books with ornamental and *raised* covers, viz. :—their liability to injure every surface with which they come in contact, besides being injured themselves from the same cause. In the registered improvement this is entirely obviated, rendering such books as easy of use as the ordinary leather ones.



Our engraving shows the book partially opened. The leaf, c, is turned over on the hinges or fastening, by which it is joined to the back or lower cover, b; when the leaf lies flat it forms a pad for writing upon. The upper cover, a, is then closed upon the back, b.

REVIEWS OF NEW BOOKS.

Architectural Economics: comprising Tables of Convenient Form, and Designs for Details, with Examples, &c., for Assistance in Estimating all the Chief Items in Projecting Buildings, or in Reducing or Enlarging the Expenditure as circumstances require. By the Rev. G. Scratton. 8vo. Pp. 42. Plates. London: Longmans. 1857.

The idea of shortening the process of making estimates of buildings, by means of certain tables, induced the author to go into the matter and prepare a considerable portion of the materials from which these tables have been constructed several years ago. Latterly he has resumed the subject, and here we have the book so worked up as to deserve the title which it now bears rather than that of mere tables.

The volume now embodies: Arches—brickwork, table for small quantities and deductions—chimneys—church roofs—cornices—cottages for the poor—doors, sizes of—estimates of building (plan 1, sections 1, 2, plate v.)—estimate of a small house—estimate of building (plan 2, section 3, plate v.)—estimates of lean-to and porch—Gothic arches and the Grecian orders—Grecian pillars, diameters of—interior walls—lead—plaster, original prices supposed in tables—rain gutters—rustics and tracery panels—sizes to which the tables apply nearest—scantling, or sizes of timber, floors—scantling, or sizes of timber, roofs—stone walls, deduction for—stone, theory of comparative expense of labour to—tables, list of—tables, application of—windows, sizes of, plates iii., iv.

The tables themselves are fifty-three in number, and as special references are made to five plates, and as the prices are carefully given with the equally carefully calculated quantities, the volume is a most useful one of its class.

Appendix to the Second Edition of Mechanical Inventions and Suggestions on Land and Water Locomotion, Tooth Machinery, &c. By Lewis Gompertz, Esq. Pp. 16. Wood Engravings. London: Saunders, Otley, & Co. 1859.

This little pamphlet, as its title indicates, is a sequel to the volume reviewed in vol. v. of our first series, page 161. Few of our readers are probably aware that Mr. Gompertz was one of the earliest—if not really the first—to propose the use of an "Endless Railway" for wheeled carriages, such as we now see carried out in the various "traction engines," which have been brought to something like perfection. Its author opens his present appendix with a set of notions as to improvements upon his original views on this subject; and he then discusses a variety of matter, amongst which are a "Train of boats; a steam or manumotive carriage for passing canals without the body touching the water;" a glass for reading at a distance; invalid walking sticks; and a variety of other matter.

Many useful hints may be gathered from Mr. Gompertz's ideas on these and kindred points; and they will find that a great many of his suggestious are now practical facts.

Instructions Pratiques a L'Usage des Inventeurs: Formalites a Accomplir en tous pays pour obtenir la concession de Patentes ou Brevete d'Invention. Par Armengaud, Ainé, et J. Mathieu. 8vo. Pp. 136. Paris. 1859.

Foreign inventors will find this to be a most useful companion, for it will show them at once how they stand with reference to all the countries wherein patents can be obtained. The volume embraces condensed information as to the patent law procedure in Germany, Austria, Baden, Bavaria, Belgium, the Brazils, Chili, Denmark, the Two Sicilies, Spain, the Roman States, America, France and Algeria, Great Britain, Greece, Hanover, Holland, Italy, New Grenada, Paraguay, Peru, Portugal, Prussia, Rio de la Plata, Russia, Poland, Sardinia, Saxe-Sweden and Norway, Switzerland, Turkey, and Wirtemberg.

The matter is carefully written, and it goes so well into matters of fact that we are bound to recommend it to all who are masters of the language in which it is written.

Metropolis Gas Reports made at Various Meetings of the Deleoates. By Samuel Hughes. 8vo. Pp. 38. London.

This pamphlet is one of the results of the great movement now making ou every side for cheapening gas, and giving it to the public generally in a more equitable manner than hitherto. Mr. Hughes goes very carefully and judiciously into his matter in hand, and he takes mauy pains to compare the relative gas prices in different localities, and to eliminate the facts as actually aduced, for the purpose of baring fully the mauy curious anomalies existing throughout the gas trade. All who are working to forward the gas movement will gain a good part of their object by taking advantage of what Mr. Hughes has here done for it.

CORRESPONDENCE.

LUNAR MOTION.

As Mr. Mitford's letter in the February *Journal* avows that he did not mean to raise a question of the moon's axial rotation, it needs no further reply.

Mr. Wilson's statement or supposition is (concisely stated), that the moon has, most probably, a rotation "on the axis of the radius vector of the moon's geocentric orbit," owing to a cause which is assumed when the question is attempted to be solved by geometry, or by mechanical contrivances only; throughout his paper he besides evidently infers that the earth's gravitation is the only force acting upon the moon.

In respect to the lunar motion being the result of a cause, Mr. Wilson is right, since it is by the *forces* acting upon and within the moon that she is kept within her orbit, and has nearly the same face constantly turned to the earth; but the geometrical and mechanical view of the case is entirely under the governance of the theorist who endeavours to set forth in the simplest possible manner the effects of the causes above referred to:—by taking the point to which the motion of the moon is referred at the centre of her orbit, she is seen to have orbital revolution, and what Mr. Wilson calls "radial" rotation, and by taking the point of reference outside of the moon's orbit, and infinitely distant, the moon is seen to have orbital revolution and axial rotation—similarly by employing in the mechanical illustration of the moon's motions, a rigid bar to connect the centre of the moon's orbit with the moon, Mr. Wilson's view of the case is set forth, and by counteracting the influence of the rigid bar, and substituting a rotatory motion of the moon, the ordinary view is exhibited. The implied statement, that the earth's gravitation is the only force acting upon the moon, will be seen to interfere considerably with a correct idea upon the subject; nature is perfect as a whole, the earth and moon are not the only bodies in the universe, and are therefore not to be regarded as separate from the solar system in this, any more than in any other question which affects them; on the contrary, the most extensive view of the subject would be obtained by looking at it in reference to the influence of the fixed stars as well as other parts of the universe. It will, however, be amply sufficient for the present purpose to attend to the solar system only.

The forces acting upon the moon are various. Primarily, even in preference to the gravitative force of the earth, is that of the sun; the force retaining the earth in its orbit about the sun exceeds that by which the moon is retained in its orbit about the earth by 2·233 times: from an examination of the epicycloidal curve described by the moon about the sun, this fact is more particularly evident, for its path is everywhere concave towards the sun. The actions and reactions of the earth's motions, of which there are many, and of the planets, as they approach to or recede from the moon, are also to be considered, as they produce various dynamical actions upon the moon.

Without identifying each of these actions with the bodies whose gravitative forces produce them, it may be sufficient to set forth some of their more prominent results as they are manifested in the motions of the moon.

1st. The moon does not exactly, by some degrees, constantly present the same face to the earth, but has *libration*, which consists of two kinds, one owing to the rotation being uniform and the orbital revolution not so, the other owing to the rotation being performed in a plane inclined to that of the ecliptic 1 deg. 30 min. 11 sec., whereas the moon's orbit is inclined 5 deg. 8 min. 47·9 sec. to the ecliptic. If the lunar motion could be correctly shown by the whirling of a stone in a sling, certainly the moon would always preserve exactly the same face towards the earth.

2nd. The moon, in her orbital revolution round the earth, describes an *ellipse* of an eccentricity equal to 0·05484 of her mean distance from the earth; that is, the radius vector of her orbit varies within certain limits, which could not be the case if her motion was correctly represented by the analogy of a stone in a sling.

3rd. The plane of the moon's orbit has a *tilting motion;* this could not occur if exactly analogised by the type of a stone whirling in a sling.

4th. If this analogy is to be perfectly carried out, and "radial" rotation substituted for axial, one would expect some *connection* to be traceable between the *period* of the *diurnal rotation* of a planet and the period of its satellite's orbital revolution and "radial" rotation; there is no such connection to be made out.

5th. The planet's *plane* of *diurnal rotation* ought at least to have some relation to that of the orbital revolution and "radial" rotation of the satellite; no such relation is traceable; on the contrary, the orbits of the satellites of Uranus are almost perpendicular to the ecliptic and to the planes of his orbital and diurnal revolution, also M. Struve found that the orbit of Neptune's satellite is inclined 35 deg. to the ecliptic.

Taking only the earth and moon into account, gravitation cannot be regarded as an analogue to the sling, for the sling is made to be the conveyer or conductor of three forces to the stone, viz.:—1st. A force restraining the stone from flying away from the centre. 2nd. A force giving the stone motion at right angles to the direction of the former force, and, in combination with the restraining force, producing the circular path of the stone. 3rd. The friction of the sling upon the stone, thereby inducing on the stone a motion similar to that of the exterior parts of the sling itself. The third force makes the sling and stone virtually an analogue of the parts of the some revolving mass, and not of a planetary system with its secondaries or satellites.

Summing up the arguments and illustrations here set forth, it therefore appears that the most rational way of describing the lunar motion is to call that motion by which nearly the same face is constantly presented to the earth, its motion round its axis; it follows that the fact of the position of the moon's centre of gravity being further from the earth than the centre of its mass is accounted for by the combined action of the orbital and axial motions, thus producing the effect of centrifugal force on the side of the moon away from us.

Many of the data alluded to here are taken from Herschel's "Outlines of Astronomy" (Edition 1849), pages 237–273, and 335–338.

W. H. WALENN.

London, February, 1860.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

ROYAL SOCIETY.

JANUARY 12, 1860.

"On the forces that produce the great current of the air and of the ocean," by Mr. T. Hopkins.

"On the movements of liquid metals and electrolytes," by Mr. Gore.

"Notes of researches on the polyammonias," No. 7, by Dr. Hofmann, F.R.S.

JANUARY 19, 1860.

"On the electrical discharge through rarified gases and vapours," by Prof. Plücker.

"On the interruption of the voltaic discharge in vacuo by magnetic force, and on vacuo as indicated by the mercurial syphon," by J. P. Gassiot, Esq.

These papers were illustrated by very interesting experiments.

JANUARY 26, 1860.

"On the alteration of the pitch of sound through different media," by S. Ringer, Esq.

"On the frequent occurrence of phosphate of lime in the crystalline forms in human urine, and on its pathological importance," by Dr. Hassall.

FEBRUARY 2, 1860.

"On the hereditary transmission of an epileptiform affection accidentally produced," by B. Séquard.

"On the saccharine function of the liver," by Dr. Harley. The author related a number of experiments which he had performed in concert with Professor Sharpey; the results of which experiments show that the animal as well as the vegetable kingdom possesses a sugar-forming power. The conclusions the author arrived at are in favour of the following generally received views upon this interesting subject:—1. Sugar is a normal constituent of healthy blood. 2. The portal blood of an animal fed on *mixed* diet contains sugar; but that of a *fasting* animal, as well as of one fed *solely* on *flesh*, is devoid of saccharine matter. 3. The *livers* of healthy animals contain sugar irrespective of the kind of food. 4. The sugar found in the bodies of *omnivorous* animals is partly derived directly from their food, partly formed by their own livers. 5. The livers of *carnivorous* animals possess the power of forming a substance called glucogene; which glucogene is, at least in part, transformed into sugar in the liver.

ROYAL INSTITUTION.

JANUARY 19, 1860.

"On light," by Prof. Tyndall.

The second lecture commenced with (1) an account of Newton's division of the solar spectrum into seven colours—red, orange, yellow, green, blue, indigo, and violet. It was then demonstrated (2) that bodies possess different powers of refraction and dispersion; (3) that the smaller the aperture the purer will be the spectrum; (4) that the colours of a pure spectrum cannot be further decomposed (blue will always be blue, red be red, etc.); (5) that the colours of natural bodies are not inherent, they are coloured by the light which falls upon them; (6) that, when the colours of the spectrum are mixed they produce white; (7) that any two colours whose mixture produces white are complementary colours. The truth of these propositions was manifested in a most convincing manner by a series of experiments, mostly by the agency of the electric light. We subjoin the following memoranda:—Velocity of light in a second: in air, 192,000 miles; in water, 144,000 miles; in glass, 128,000 miles; in a diamond, 77,000 miles. Velocity of sound in a second: in air, 1090 feet; in water, 4686 feet; in glass, 18,000.

GLASGOW PHILOSOPHICAL SOCIETY.

JANUARY 18, 1860.

"On incrustations of boilers using sea water," by Mr. J. R. Napier.

"On the density of steam," by Prof. Rankine.

DECEMBER 14, 1859.

"On the process of ageing in calico printing," by Mr. W. Crum.

"On the recent investigations of M. Leverrier on the motion of Mercury," by Professor Thomson.

"On photographed images of electric sparks," by Professor Thomson.

"Note on the bursting of the reservoirs of the Crinan Canal, showing the power of running water," by Mr. Keddie.

JANUARY 4, 1860.

"On the variation of the periodic times of the earth and inferior planets, produced by matter falling into the sun," by Professor Thomson.

"On instruments and methods for observing atmospheric electricity," by Professor Thomson.

INSTITUTION OF CIVIL ENGINEERS.

DECEMBER 6, 1859—JANUARY 2, 1860.

Discussion on Mr. R. B. Grantham's paper, "On arterial drainage and outfalls."

JANUARY 24, 1860.

"Description of the works and mode of execution adopted in the construction and enlargement of the Lindal Tunnel, on the Furness Railway," by Mr. F. C. Stileman.

JANUARY 31, 1860.

"Upon the means of communication in the empire of Brazil—chiefly in reference to the works of the Mangaratiba Serra Road, and to those of the Mauá, the first Brazilian Railway," by Mr. E. B. Webb.

FEBRUARY 7, 1860.

"Description of the works on the Netherton Tunnel branch of the Birmingham Canal," by Mr. James R. Walker.

CHEMICAL SOCIETY.

JANUARY 9, 1860.

"On refining gold when alloyed with tin and antimony, so as to render it fit for the purposes of coinage," by Mr. R. Warrington. The author fluxed the gold with oxide of copper and a little borax.

"On certain sources of loss of precious metal in assaying operations," by Mr. G. H. Makins. There was a loss in expelling from the volatilisation of gold and silver, and a loss in parting from the solubility of gold in nitric acid containing nitrous acid.

"On the double sulphides of copper and iron," by Mr. F. Field.

INSTITUTE OF BRITISH ARCHITECTS.

JANUARY 9, 1860.

Mr. Hayward brought under the notice of the meeting a question lately raised as to the right of an architect to retain his drawings, which led to a discussion. The chairman expressed a strong opinion in the affirmative, under certain circumstances. Mr. Barry and others took the same view.

Mr. Burnell read a paper, entitled, "Sixty years since; or, improvements in building materials and construction during the present century."

Afterwards, Mr. Edmeston read some notes "On the use of zinc in roofs, and the causes of failure therein."

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.

THIS is a new association, established in May, 1859, under the name of the "Engineers' Debating Society." Its members principally consist of students in the two departments of engineering. We hope in future to be able to notice how it follows out its views, as stated in the rules now before us.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

DECEMBER 27, 1859.

"On the building stones used in Manchester," by Mr. Binney.

SOCIETY OF ARTS.

FEBRUARY 22, 1860.

"On a new lime light," by Mr. S. Squire.

MONTHLY NOTES.

MARINE MEMORANDA.

The aggregate amount of postage (sea, inland, and foreign) on mails conveyed to and from Europe by the several lines of mail steamers employed by this department was 484,668 dols. 54 c., and by the British packets of the Cunard line, performing an equal number of trips, 805,629 dols. 64 c. The North German Lloyd and Hamburg lines of mail packets also conveyed mails to and from Bremen and Hamburg respectively, the postages on which amounted to 48,151 dols. 71 c., making the total postages on United States and European mails, conveyed by all lines during the year, 1,338,449 dols. 89 c. Temporary arrangements have been made, on the terms of the Act of 1858, for the continuance of weekly service by American or foreign steamships, between New York and Liverpool, or Southampton, embracing semi-monthly trips to Havre, and trips once a month to Bremen and back. This, in connection with the Cunard line, secures semi-weekly service between America and Great Britain, and with the Bremen and Hamburg steamers, a direct mail at least as frequently as three times a month to and from Germany.

It has been decided that the four vessels building for this service shall be called the *Leinster*, *Munster*, *Connaught*, and *Ulster*, being the names of the four provinces of Ireland. Mr. Laird, of Birkenhead, is constructing the *Munster* and the *Ulster*. Messrs. James Watt & Co., of Birmingham, will supply the engines. Mr. Laird is also building the *Connaught*. The last of the four, the *Leinster*, is being built at Blackwall by Messrs. Samuda Brothers; and Messrs. Ravenhill & Co. are to supply the engines for the two last-named vessels. The first was lately launched from Mr. Laird's, and the others will quickly follow. The new postal service will commence in June next, when the whole distance between Euston Station, London, and the Westland Row Station, Dublin, must be completed in 11¼ hours, twice a day each way on week days, and once on Sundays, under penalties ranging to £80 per trip for all delays beyond the 11¼ hours, except caused at sea by fog, snow storms, or saving human life. There can be no remission of penalties for delays from any cause whatever in the land portion of the service.

The relative strength of the French, Russian, and English navies, is shown in the following statistical facts:—France has afloat, and ready for sea at a moment's notice, 33 ships of the line, 34 frigates, and other vessels to the number of 244—all steamships afloat, and 61 building. Russia has 9 ships of the line afloat, 18 frigates, and other vessels to the number of 100—all steamships, and 48 building. These are most formidable navies, for they could be manned at once. To meet these fleets if a war should unfortunately arise, this country has at home and in the Mediterranean 27 line-of-battle ships, 14 frigates and corvettes, 29 sloops and gun-vessels, all steamships. The total force of the steam navy on 1st December, in commission, was 27 line-of-battle ships, 43 frigates and corvettes, 92 sloops and smaller vessels, and 164 gun boats—in all, 204. Of this force 55 vessels are in China and the East. The actual strength of the steam navy is 48 line-of-battle ships afloat, and 11 building; 34 frigates afloat, and 9 building; 9 block-ships; 16 corvettes afloat, and 5 building; 80 sloops and smaller vessels afloat, and 15 building; 3 iron-cased ships building; 27 gun vessels afloat, and more building; 169 gun boats, and 23 building. It is intended to launch during the ensuing financial year, 20 line-of battle ships, 12 frigates, 4 iron-cased ships, 4 corvettes, 15 sloops, and 23 gun vessels and gun boats.

Marine engineering is everywhere tolerably brisk. Iron shipbuilding promises in particular to be active on the Tyne this year. Messrs. Palmer & Co., of Jarrow, have 1800 hands employed, and have just taken another large yard on the Tyne opposite to their works. The first of the twin express steamships, of 3000 tons each, and building by them for the Galway Company, will be launched with her engines on board in March next, and the second steamer a month after. Messrs. Palmer are also erecting the scaffolding for commencing with the large frigate for the Government, which vessel will be named the *Defender*. The same firm are also building an express steamer for the London and South-Western Railway, to run between Southampton and Guernsey. They are also about to build a steamship to be employed in the goods' and passengers' trade between the Tyne and London, and to make the voyage in 24 hours with regularity.

The following number of accidents occurred on the western rivers of America during the year 1859:—Steamboats sunk, some of which were subsequently raised, 62; steamboats burned, 26; steamboats lost by explosions, 4; steamboats exploded steampipes, 2; lives lost by steamboat disasters, 396; estimated loss of property, 2,333,000 dols. The sinking of the sixty-two steamers was the result of the following causes:—Encountering snags, logs, sawyers, and stumps, 25; ice, 3; foundered in storms, 3; collisions with hidden obstructions, 31. There were in all, collisions of boat with boat, or with river banks, bridges and wharf boats, causing disaster or considerable damage, 28.

There are already lines of steamships running from the Tyne and from West Hartlepool to Hamburg, Rotterdam, and Cronstadt; but it is understood that another line of screw steamships is about to be established between Middlesborough, Cronstadt, and Hamburg. Accommodations are completed, and the running will begin as soon as the spring trade opens.

The new *Princess Royal*, built to replace the old well-known boat, lately ran the passage from Greenock to Liverpool in 15 hours, making the distance between the Cloch and Cumbrae Lights in 59 minutes, we believe the fastest on record by a Channel steamer; besides, the *Princess Royal* was laden with cargo and passengers. Her engines were working 20 revolutions per minute.

SUPPLY OF EAST AND WEST INDIAN FIBRES FOR OUR HOME MANUFACTURERS.—A company of highly influential gentlemen and merchants, now or lately connected with our East Indian possessions, have formed themselves into a company, and have given notice of their intention to apply for a special Act of Parliament to enable them to hold lands and secure especial trading privileges in India, for the purpose of growing certain fibres, and preparing them for manufacturing purposes by patented processes, the right to which the company have secured by purchase of the inventor, Mr. J. H. Dickson, so long and favourably known to all flax growers and linen factors. Mr. Dickson's patented machines, and chemical processes for rendering these fibres available, are amongst the most important of our time. The importance of a very large and speedy increase of the raw material for our staple manufactures in wool, silk, cotton, flax, and hemp, is universally admitted, the supply having now for years past fallen short of our manufacturing needs. That India has the means of supplying these growing demands of our manufacturers has been repeatedly demonstrated, the only thing wanting being the necessary capital, directed by a practical knowledge of commerce, united with a proper scientific appreciation of the qualities of our Indian plants, and the proper mode of preparing them ready for manufacturing purposes. The beautiful fibres which have been produced from the various varieties of flax, Rhea or Assam grass, the Neilgherry nettle, the jute, the plaintain, the aloe, the pine apple, and many others of high value, growing in all parts of India, by the patented processes of Mr. J. Hill Dickson, have been from time to time exhibited at our scientific societies, and have been thoroughly tested by our most experienced manufacturers.

An Artist-Mechanic.—In the workshops of Messrs. Yates, the well-known engineers of Blackburn, Lancashire, there is employed an engine smith named James Sharples. James Sharples has painted the interior of the forge in which he earns his daily bread. He has since engraved it with his own hands, and an impression from the plate now forms a very important addition to the pictorial adornments of the walls of our study. The original of the plate was entirely his own conception; and he spent three years—cribbed from his leisure hours after his daily toil in the forge, which he has delineated so well, and possibly from his sleep. We have not seen the picture itself, but the engraving is an admirable work, even considered as the production of a well-taught professional artist. As the work of a totally untaught man, employed the day through in the very hardest of the toilsome branches of a mechanical engineer's workshop, it is wonderful. The plate, which measures 17 inches by 13, cost our artist-mechanic the labour of five years to engrave, in addition to the three spent in painting it. It represents, to the left of the foreground, a large forge fire, in which three men are employed in heating one end of an engine shaft. How many such shafts must our heroic artist mechanic have forged during the eight years which wore away whilst he was at his artist work! Behind these figures are two men employed in slinging another shaft, whilst a third has apparently come from a back division to confer or receive an order. Further back, we have a glimpse of three men who are at a sling; and in the distance, in another division, we see a forgeman and "strikers" busily engaged. There is a fine contrast of light and shade about the engraving; and the different tools of the forge workshop, hanging in due order on the wall and scattered about the floor, are put in, as, we will venture to say, they never were before. The perspective is perfectly true, and with the mechanical execution of the details of the engraving no fault whatever can be found. The whole of the work has been executed in pure line by the hand graver, except the flesh and shirts and caps of the men, which are stippled. In fact, nothing but the gravers—which he made himself—have touched the plate. We ought, perhaps, to add that whilst there is no publisher's name upon the plate, it bears that it is printed by H. Wilkinson, of 93 Charrington Street, Somerstown, London. Well may we say to this man of hard labour and scant repose that we hope the world will duly reward his labours, and in some sort dignify his name.

New Explosive Substances.—M. Bœttger, an eminent German chymist, has just discovered a curious property of carburetted hydrogen or illuminating gas—viz., that being brought into contact with certain saline solutions, and especially with nitrate of silver, it will, by chymical combinations, form substances of a highly explosive nature. A few particles of that obtained with nitrate of silver will, when subjected to friction, explode with as much violence as the fulminate of mercury. This will in some measure account for certain instances of explosion hitherto unexplained. Dr. J. Torrey, of New York, some time ago discovered that illuminating gas, when conveyed through copper pipes, would in time produce an explosive deposit on the inner surface. In 1839, a gas-fitter at New York, while engaged in taking down some copper pipes in a house, happened to blow through one of them in order to try whether it was stopped up or not. This instantly caused a violent explosion; the man's whole face was frightfully lacerated, and he died of his wounds a few hours afterwards. Dr. Torrey, who has paid much attention to the subject, states that the substance which causes the explosion has the appearance of a black crust, and that, if scraped with a bit of wire, however slightly, it will detonate, ejecting a quantity of dust and smoke from the pipe. Dr. Torrey, nevertheless, by dint of great perseverance, succeeded in collecting a teaspoonful of this dangerous compound, which appeared under the form of dark-brown shiny scales, reducible to a red powder by trituration. When struck with a hammer on an anvil, it would explode, producing luminous sparks, and if touched with a red hot iron it would go off like gunpowder. The temperature necessary to make it detonate was about 200 degrees centigrade (392 Fahr.). This substance seems to have been of the same nature as those discovered by M. Bœttger, and which he describes as being combinations of copper with carburetted hydrogen, the latter acting therein the same part as cyanogen in other well-known fulminates. Gaspipes are seldom or never made of copper now, and neither iron nor lead is liable to produce any fulminating compound.

New Blue Colour.—According to a recent discovery of M. Ch. Tissier, if an acidulous solution of a salt of alumina is boiled with a solution of ferro-cyanide of potassium, a white precipitate is immediately formed, which soon acquires a bluish tint in contact with the atmosphere. If the salt of alumina be in excess, so that the whole of the cyanide be absorbed, the precipitate in question might be described as a kind of Prussian blue, in which the cyanide of iron is replaced by the cyanide of aluminium. When dried this precipitate presents a beautiful dark blue, and as it acquires hardness its fracture is brilliant. If reduced to powder, its blue becomes lighter, resembling ultramarine. This compound is likely to be introduced into oil painting. The globulous berry of the privet *(ligustrum vulgare)*, which is black when ripe, furnishes, according to M. Nickles, a colouring matter of a beautiful crimson hue, soluble in water and alcohol, but insoluble in ether. Alkalis render it green; acids, on the contrary, restore it to its original colour. As this substance has various peculiar properties, M. Nickles has given it the name of liguline, from the name of the plant which produces it. Among its properties there is one which renders it applicable to chemical analysis, for it becomes green in contact with water impregnated with a solution of bicarbonate of lime.

Forward.—No practical result of human industry, genius, or meditation, has sprung forth entire and complete from the master hand or mind of an individual designer working straight to its object, and foreseeing and providing for all details. As in the building of a great city, so in every such product, its historian has to record rude beginnings, circuitous and inadequate plans; frequent demolition, renewal, and rectification; the perpetual removal of much cumbrous and unsightly material and scaffolding, and constant opening out of wider and grander conceptions; till at length a unity and a nobility is attained little dreamed of in the imagination of the first projector.—*Sir John Herschel.*

The Peterhead Coast and the English Lakes in the Stereoscope.—The system of stereoscopic representation of landscape objects, is certainly making wonderful strides towards perfection. A year or two ago, no one, we think, would have dreamed of the sharpness, breadth, and general artistic effect which have now been reached. The examples from different localities, so widely separated as our heading indicates, fully support this opinion as to the permanent advance of the art.

The wonderfully grand and bold coast of Buchan, in Aberdeenshire, has furnished the most striking examples of rock scenery which we have yet seen. We have before us six of these views, photographed by Mr. George Dawson, of London, and published by Mr. Taylor, of Peterhead. There are two views of "Rocks near Slain's Castle;" two views of "Slain's Castle itself;" "The Bullers of Buchan," and "The North Harbour, Peterhead."

In all the rock views, the combination of the sea inlets, with the gigantic masses of rocks which flank them, produces a most charming effect; and the distances have been admirably managed in bringing out the minute prominences and cavities in the rocks with a clear sharpness, and yet with a fine ærial perspective effect. But to our mind the view of the grand old Slains Castle—where we have a picture made up almost entirely of enormous masses of rock, with curiously disintegrated surfaces and a fine clear depth running right into the face of the cliff—is the finest of the series. "The Bullers of Buchan"—a natural double arch of rock, through which we have glimpses of the sea behind, form a strikingly grand picture. "No man," said Dr. Johnson, "can see it with indifference who has either sense of danger or delight in rarity. If I had any malice against a walking spirit (it is added), instead of laying him in the Red Sea, I would condemn him to reside in the Buller of Buchan." "The North Harbour, Peterhead," is a curious example of what the photographer can make of a scene full of motion. Here we have in the distance the town of Peterhead; in the middle distance, the harbour with a forest of masts; and in the foreground, a vast mass of moving figures working about amongst confused groups of herring barrels. Its only fault is that of being rather dark; but the process for taking objects in motion always renders this a great difficulty.

Of the lake views, we have two views of the time-worn ruins of "Furness Abbey, Lancashire;" "Skelwith Force and Stock Ghyll Force, Westmorland;" "Rydal Village, with Fairfield in the distance," and "Kirkstone Pass, with Brothers' Water in the distance," all issued by Mr. Farrer, of Ulverston.

Nothing can be finer than the ruined archway of Furness Abbey, with the stones individually thrown sharply out in the loosened portions; and the yet hardly injured mouldings, with every leaf of the venerable ivy tree clinging to the masonry, fully developed. The other view of the interior of the ruins, taken from a somewhat elevated position, is an equally good example of distance, in ruins. "Skelwith Force," with its rocky foreground, and "Stock Ghyll," with its greater depth of ravine, are equally good in their way. The mist rising from the water in the former gives a fine natural effect to the picture; but in both, the too pure whiteness of the water itself, shows what the photographer has yet to surmount before he can produce perfect specimens of this class.

"Rydal Village" is a view which spreads before us the Church, Rydal Hall, and the various mansions and cottages of the district, with excellent clearness; and although the darkness shows that the wooded landscape has been somewhat sacrificed to the fine development of Fairfield in the distance, the view is a good one.

Perhaps the best of the series is "Kirkstone Pass;" with the old wall which guards the traveller from the ravine in the foreground, and Brothers' Water in the distance, it affords a very beautiful picture. With such pictures as these within our reach, we have indeed an attractive addition to our domestic adornments. The approaching summer will no doubt see troops of photographers discovering further beauties, and accomplishing still higher triumphs.

Actinism of Light.—If a solution of starch or dextrine be subjected to the action of solar light for a short time, (say for a quarter of an hour, if there be but a very small quantity of matter), it will be found to be completely changed into glucose (grape sugar), whose presence is easily recognised by the ordinary reactions, and even by its sweet taste. M. Niepce thinks that he has determined that by surrounding the bunches of grapes in the early part of autumn by bags of white paper dipped in tartaric acid, not only their ripening is hastened, but the quantity of sugar which they contain is greatly increased. Tartaric acid is now well-known to have the power of *storing up* the light in the condition of chemical efficacy.

Cultivation and Manufacture of Silk in France.—Before the year 1789 France produced annually 6,500,000 kilogs. of silk cocoons; during the Revolution the yearly produce fell to 3,600,000 kilogs.; under the Consulate it rose again to 4,200,000 kilogs.; under the Empire to 5,200,000 kilogs., and remained growing up to 1853. In 1830 the produce was 11,000,000 kilogs.; in 1840 15,000,000 kilogs. From 1846 to 1853 it varied below and above 20,000,000 kilogs.; at last, in 1853, the produce reached its maximum with 26,000,000 kilogs.; from this time it went down rapidly (owing to the disease), and sank in 1855 to 7,500,000 kilogs. During the last years the medium price for the kilogramme of cocoons was eight francs, whereas before the Revolution it had been two francs fifty centimes. The number of the looms in 1780 was 15,000; only 3000 during the Revolution; 8000 in 1805; 11,000 in 1811; 22,000 in 1820; 47,000 in 1846; and, at last, 72,000 in 1855. We have given the weights according to the French style, but our readers will no doubt remember that the kilogramme represents 2·2 pounds English.

How Paris is Lighted.—Paris, within the old boundaries, is lighted by 15,160 gas lamps and 437 oil; the zone between the old and new boundaries contains 2943 of the former and 1683 of the latter. The number of gas-burners in private establishments in old Paris is 302,000, and in the new districts 56,000. Oil lamps still seem to linger in the French capital.

APPARATUS FOR LUBRICATING AXLES AND BEARINGS.—The accompanying engravings illustrate a new mode of lubricating the axles of railway carriages, the journals of shafts, and for other similar purposes, for which letters patent have been obtained in this country by Mr. John Henry Johnson. According to this invention, it is proposed to use, in connection with any convenient or suitable lubricating apparatus or oil elevator, a capillary pad or cushion, composed of wool, cotton, or other suitable material, and combined with a metallic conducting spout, which is pressed by one or more springs against the underside of the enlargement or shoulder of the journal of the axle or shaft. Fig. 1 of the engravings, represents a sectional elevation of an oil elevator, fitted with the pad and spout for removing the oil from the shoulder of the journal, and conveying it back into the oil reservoir. Fig. 2 is a corresponding end view of the same. On referring to these figures, it will be seen that the oil elevator consists of a leather frame-work, A, destined to receive the pad, B, which lubricates the journal, C, against which it is pressed. The frame, A, rests upon a plate, attached to a spring, D, which bears upon the bottom of the oil reservoir, and thus maintains the pad against the axle journal. The oil is introduced to the pad, B, by the cotton wicks or elevators, E, which dip into the oil reservoir. During the rapid rotation of the journals of axles or shafting, the oil employed for lubrication tends to escape at the shoulders of the journal, but by the use of the additional pad or brush, F, which constantly rubs against the shoulder

Fig. 1.

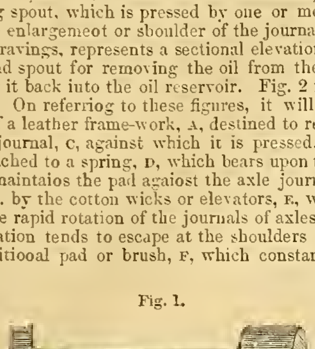
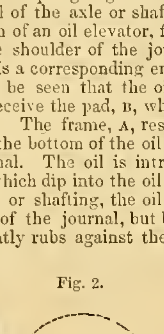


Fig. 2.



of the journal, the oil is collected therefrom, and is directed by a spout back into the oil reservoir again. The pad, F, is fixed upon a piece of leather, G, connected by the two blade springs, H, with the main part, A, of the lubricator. At the end of these springs, H, is formed the spout, I, which receives the oil for the purpose of conveying it back again into the reservoir or axle-box. A small earthen pad, J, is fixed to the spout so as to rub against the shoulder of the journal, and dry it, as shown in fig. 1. Although the pad, F, has been represented in the figures as being applied to an oil elevator, it may be used quite independently and may be adapted to the axle itself, and fixed to the upper portion of the axle-box which contains the bearing brass. The pad may also be fixed next to the bearing, in which case it is important that it be composed of hard metal, such as bronze, for example, and that it be free to play or vibrate on the pin which connects it with the spout. In certain cases, and according as the quantity of oil required to be re-directed into the oil reservoir is more or less considerable, the capillary pad may be dispensed with. Thus, when there is a considerable collection of oil at the shoulder of the journal, the capillary pad should be used in combination with a metal rubbing surface of bronze or other hard metal, which will act as a "doctor," in removing and collecting the oil from the shoulder of the journal; but when such collection of oil is not very extensive, and if two such metal rubbing surfaces or "doctors" are used, the capillary pad may be altogether dispensed with.

UNITED LABOUR.—The achievements of intellectual power, though frequently begun by one mind and completed by another, have ever been the results of united labour. Slow in their growth they gradually approximate to a more perfect condition. The variety in the objects and phenomena of nature summons to research a variety of intellectual gifts: observation collects her materials and patiently plies her humble avocation: experiment with her quick eye and ready hand develops new facts. The lofty powers of analysis and combination generalise insulated results and establish physical laws; and in the ordeal of contending schools and rival inquirers truth is finally purified from error.—*Brewster's Life of Newton.*

PHOTOGRAPHIC LENSES.—A comprehensive report, signed by Mr. J. T. Taylor, of 81 South Bridge, Edinburgh, has recently been presented to the Photographic Society of Scotland, with the view of laying before that body a succinct description of the various lenses now in use, and proposed for photographic purposes. It states that the lens known as the ordinary view lens, consists of an achromatic meniscus lens placed in one end of a short tube, the length of which is usually about the same as the diameter of the lens. A series of stops, or contracted apertures, is placed at the open end of the tube; the whole arrangement when in the camera being thus:—The end containing the lens is next the ground glass—the lens itself being so mounted as to have its convex side also next the ground glass. In this position, if an attempt be made to focus with the full aperture of the lens (the stops being entirely removed), a hazy, indistinct picture, will be the result—the presence of the stops being necessary to the attainment of sharpness. If the position of the lens is reversed, sharpness is attained without any stop; but in this case the field is so much curved as to limit the sharpness to a small spot. This arrangement is practically of little use in photography, unless where an instantaneous view of a particular object is desired. In an ordinary view lens, the smallness of the stop necessitates a somewhat long exposure. Mr. Grubb recently patented a peculiar kind of meniscus lens, which claimed to give sharp definition with a much larger stop than the old form would admit of. The ordinary achromatic meniscus is composed of a bi-convex crown and a bi-concave flint, usually cemented together with Canadian balsam or other transparent cement. Grubb's aplanatic lens, while externally of the same shape and appearance, differs in this respect, that the crown glass lens is concavo-convex with positive focus, and the flint glass the same, with negative focus—the inner surfaces being of the same radii to admit of their being cemented together. It may here be stated that cementing the parts of an achromatic lens together, quickens and intensifies its action by removing the reflection of two of its surfaces. What is chiefly claimed for the Grubb lens is its increased size of aperture, enabling portraits or groups to be taken by it. The general flatness of field and simplicity of the achromatic meniscus would leave nothing to be desired were it not for the property it possesses of causing marginal straight lines to be slightly curved inwards. To remedy this, Professor Petzval invented a new lens, which professed to render marginal straight lines of absolute straightness. As such a condition cannot (so far as we are at present aware) be fulfilled by a single lens, this, of course, is a combination of two achromatics, the front one being a meniscus—convex side outward, the back one being also achromatic, but having a negative focus, or being what is properly known as a "diminishing glass," the elements of which are so adjusted that the aberrations consequent on the front lens shall be corrected by it. This lens of Petzval's is now somewhat extensively manufactured under various names, according to the taste or whim of the manufacturer. One calls it the "Orthoscopic" lens; another, the "Orthographic" lens; a third, the "Caloscopic" lens; a fourth, the "Petzval" lens, and so on. In reality these lenses are all nearly identical, and differ only in any important degree in the mode in which they are mounted. The only other view lens we are aware of is one invented by Mr. Sutton, of Jersey, made public by him in a communication to the London Photographic Society, and printed, with diagrams, in a recent number of *Photographic Notes.* It consists of two meniscus lenses of equal foci—one at each end of a tube—convex out. Half-way between is placed a small concave lens, of a focus equal to one of the others. The name of this lens is "Sutton's Triplet;" and in the author's communication above referred to, he assumes that as Petzval's lens is not free from distortion, another possessing this desideratum is imperatively called for. This, he says, is only possessed by his triplet lens. Having at some length made these preliminary remarks, a few words will suffice to lay before you the results of our trials with these lenses. It is deemed expedient not to mention the names of the various makers of those tried by us—suffice it to say they are opticians of the highest eminence. The subject selected was a uniform line of buildings (Montague Street) about 200 yards distant from the camera, with a range of wooden paling in the foreground about fifty feet distant. The camera employed was 12 by 10 for the compound, and 10 by 8 for the meniscus lenses. The general definition of the resulting pictures is very good indeed—perhaps owing to the care with which we selected our lenses; but in every case, with *one* exception, there was more or less distortion. While the lenses of the meniscus form gave, as was expected, a slight curving *inwards* of the marginal straight lines, those of the Petzval form gave curvature in the *opposite* direction. The stops of all the Petzvals were, with one exception, placed close to the back combination; one, however, had it placed before the *front* lens, and as this one was considered to give very good definition, it may hence be safely inferred that the position of the stop is not of so much importance as some deem it. For general landscape purposes, either of those forms of lens, viz., the meniscus and Petzval, will answer well enough, if carefully made; but for architectural subjects they will not answer so well. "Sutton's Triplet" is the only lens we have been able to procure which gives perfect freedom from distortion.

NECESSITY OF PURSUING THE DETAILS OF SCIENCE.—It seems to be a necessary condition of human science that we should learn many useless things in order to become acquainted with those which are of service; and as it is impossible antecedently to experience to know the value of our acquisitions, the only way in which mankind can secure all the advantages of knowledge is to prosecute their inquiries in every possible direction. There can be no greater impediment to the progress of science than a perpetual and anxious reference at every step to palpable utility. Assured that the general result will be beneficial, it is not wise to be too solicitous as to the immediate value of every individual effort. Labours which may appear to many out of all proportion to the value of the result may be preparing the way for the achievements of some splendid genius who may combine their minute details into a magnificent system, or evolve from a multitude of particulars collected with painful toil some general principle destined to illuminate the career of future ages.—*Samuel Bailey.*

THE MONEY MANUFACTURE.—The total coinage at the Royal Mint during the last fifteen years has been no less than £78,499,868. Of this £73,772,613 was gold, £4,540,388 silver, and £186,867 copper. The amount coined each year has varied considerably. Thus, in 1850 the total was £1,621,380, and in 1853, £12,664,125. Last year the amount coined again fell to £10,69,359. The gold coined reached its *maximum* in 1853, and its *minimum* in 1858; the silver coinage was greatest in 1853, and smallest in 1848; and the copper coinage was only £448 in 1850, while it was £61,538 in 1854.

ENGINEERING IN CHEMISTRY IN FARMING.—Mr. Mechi, the pioneer of scientific farming, has often been laughed at on account of his so-called visionary ideas on farming. The following is what he recently said at a meeting of the Farmer's Club:—"For the last six years my gain as landlord and tenant on my little farm of 170 acres has been nearly £700 per annum. Even this year, with wheat at 42s. per qr., I have gained £600 after paying every expense. Of course, much of this benefit has arisen from steam power, drainage, deep cultivation, and other improvements; but the liquefied manure system has greatly contributed to this result." If Mr. Mechi is wrong, we presume he can be corrected; if he is right, we have equal grounds for the presumption that he is deserving of some applause and credit for his energetic labours in the cause of farming science.

Gas Companies.—In the United Kingdom 991 cities and towns are furnished with gas. Of these 95 are supplied by municipal corporations or private individuals, and 896 by trading companies. In Scotland, 149 towns are lighted without, and 8 with, special Acts of Parliament. In Ireland, 52 towns are lighted without, and 4 towns with, special Acts of Parliament. In England, 533 towns are lighted without, and 150 with, Acts of Parliament. The sum expended by the 896 gas companies in England, Ireland, and Scotland amounts to £25,041,309, and by the private individuals and corporations on the remaining 95 gas works, to £2,114,505, being a total of £27,155,814. A ton of English gas coal will yield 9000 cubic feet of gas, 14 cwt. of coke, 10 gallons of tar, and 10 gallons of ammoniacal liquor, while the light from each ton is equal to 420 lbs. of sperm candles. A ton of Scotch cannel will yield 11,500 cubic feet of gas, 10 cwt. of coke, 14 gallons of tar, and 14 gallons of ammoniacal liquor, while the light is equal to 820 lbs. of sperm candles; and a ton of Boghead cannel (the Torbane mineral) will give, when manufactured into gas, light equal to 1950 lbs. of sperm candles. The quantity of gas manufactured annually exceeds twenty-five thousand millions of cubic fee .

The above particulars have been furnished to us by Mr. Flintoff, a gentleman who is at present engaged in lecturing on the gas question, with a view of bringing about a reduction in the prices now charged; a matter in which all must wish success to his mission.

Health of Great Cities.—The question "Is the Paris of 1760 more or less salubrious than the Paris of 1860?" has lately occupied some of the thinkers of France. The decision is against the present state of things. No doubt, large thoroughfares have been cut through Paris; its police regulations are infinitely superior to those of the capital in 1760, and much better executed; the sewerage has been immensely improved; the houses which were built on the bridges in 1760, obstructing the passage of air and light, are now gone; and the crowded churchyards close to every church in the heart of the metropolis no longer exist; there are no private slaughter-houses, the streets are swept much better, the mud and filth removed both speedily and regularly; the supply of water is infinitely superior; and within the last few years 193 narrow and dirty streets and lanes have been erased from the map of Paris. These are certainly most valuable improvements, but let us examine the other side of the picture. The present surface of the capital comprises 78,020,000 metres, which in 1760 did not contain more than 600,000 souls; while in 1860 its population is nearly 1,800,000, that is, three times as many. In 1760 Paris had outgrown the space inclosed by the Boulevards, and the last straggling houses touched the line of the octroi-wall, now pulled down. Beyond these were nothing but villas, gardens, and orchards, with here and there princely mansions surrounded with vast parks, 78 in number, within the present fortifications. Thus, in 1760, Bercy only consisted of 17 houses; St. Mande had 22; Charonne, 19; Ménilmontant, 17; Belleville, 24; La Villette, 15; La Chapelle, 11. Montmartre was scarcely worth mentioning, and Batignolles did not exist at all. Hence, in 1760 Paris was constantly swept by a pure country breeze. Again, of the 33,703,307 square metres which Paris contained at that time, upwards of seven millions were occupied by gardens belonging either to convents or princely palaces, and forming so many lungs of the metropolis. At that time there was no gas; now, every time a gas-pipe has to be mended a quantity of black earth has to be thrown up, exhaling a suffocating stench which generally makes you cough in passing. The water which is contained in the wells of Paris is not fit to drink, both on account of the geological condition of the soil, and because, proceeding from subterranean lakes, it has filtered through the cemeteries and sewers of the city. And yet it is with such deleterious waters that bread is made in Paris, and rich wines are weakened for the market. In 1760 there was not a single manufactory in Paris; now there is nothing to be seen from the heights that overlook the city but a forest of high chimneys, all emitting volumes of a thick pungent smoke, which ultimately descends under the form of an impalpable soot, and is inhaled by the inhabitants within a considerable radius from the spot, causing, when the wind blows in their direction, a short cough, which is certainly not conducive to longevity. The conclusion in favour of the salubrity of Paris in 1760, compared with that of the present day, need therefore excite no surprise. Now, if this is the case with Paris, we are well satisfied that it is far worse with London and other large cities here. The fact is, that we have lived on under an old state of sanitary arrangements, long after the increase of population and industrial works rendered a total change vitally necessary, we found this out long ago, and we have now awakened to the terrible reality of the case. The question now is, how are we to get out of it?

British Ironstone.—Ironstone, or the raw "mine" material from which our blast furnaces produce what is really the most precious metal in the world, differs so greatly in its general characteristics, that to the uninitiated, most of them appear to be anything but ferruginous matter. There are at present about 150 known varieties of this stone, but these may be classed in the following eight principal divisions:—1. Black band ironstone of Scotland. This is the principal ironstone of Scotland: when smelted with cold blast it produces an inferior iron, and indeed as a cold-blast iron can hardly be made, since with the generally inferior fuel there obtained the necessary heat for smelting is with difficulty maintained with cold blast, and the furnaces are consequently liable to serious fluctuations in working: the cold-blast iron of Scotland is scarcely in any instance superior to the hot-blast of that country. When made by hot blast the iron produced is of a useful quality for foundry purposes, though not very tough. 2. Hematite ironstone of Cumberland; produces either with hot or cold blast a very strong tough pig, forming a good iron either for forge or melting purposes, but red-short. It is very good as a toughening mixture. 3. Cleveland ironstone of Yorkshire. This is a different and peculiar quality of ironstone, only recently worked, but the iron made from it is now largely exported and also used extensively in this country. With hot blast it produces a serviceable but rather cold-short iron, and a fair quality for castings or forge purposes. The ironstone of this district is invariably smelted by hot blast. 4. Clay band ironstone of Derbyshire, Staffordshire, and Shropshire; produces a good tough iron with either hot or cold blast, and when judiciously mixed in the furnace a fine quality of pig is obtained for best and general purposes. 5. Hydrate ironstones of the Churnet Valley; these give a very fine soft iron with either hot or cold blast. 6. Northamptonshire ironstone. At first a very inferior description of iron was obtained from this ore; but now with a better management of the furnace specially adapted to this ore, and good fuel, a very soft and fluid quality of melting iron is produced with hot blast, which compares well with the general average. 7. South Wales clay band ironstone; produces fine descriptions of pig iron with either hot or cold blast. The South Wales ironworks are chiefly dependent for their iron making on the excellent quality of fuel obtained there, and the mixtures of ores used in the furnaces are largely imported from surrounding districts. 8. Forest of Dean ironstone; produces with either hot or cold blast a very fine kind of pig iron.

The Practical Value of Theoretical Men.—Remote as the philosopher's profound conceptions and subtle trains of thought seem to be from the needs of every-day life, the most astounding of the practical augmentation of man's power has sprung out of them. Nothing might seem less promising of profit than Oersted's painfully pursued experiments with his little magnets, voltaic pile and bits of copper wire. Yet out of these has sprung the electric telegraph! Who that watched the philosophic Black experimenting on the abstract nature of caloric could have foreseen that his discovery of latent heat would be the standpoint of Watt's invention of a practically operative steam engine! The production of chloroform is amongst the more subtle experimental results of modern chemistry. The blessed effects of its proper exhibition in the diminution of the sum of human agony are indescribable. But that application was not present to the mind of the scientific chemist who discovered the product, any more than was the gas-lit-tow to the mind of Priestley or the condensing engine to that of Black.—*Professor Owen.*

Industrial Statistics of Great Britain.—Recent statistical examinations have shown that 6,061,574 (out of 9,816,597 adult males, of 20 years and upwards) of our population, 31·0 per cent. are engaged in mechanical arts, trade, and domestic service; 16·1 in agriculture, 8·4 in manufactures, and 6·3 per cent. in mining and mineral works. In the metropolis, the respective ratios are 47·6, 1·1, 6·0, and 3·5 per cent. The 9,816,597 adults above referred to are thus more distinctively analysed on the basis of the last census:—Class I. Persons engaged in the general or local Government of the country, 65,330; II. Persons engaged in the defence of the country, 78,498; III. Persons in the learned professions (with their immediate subordinates), either filling public offices or in private practice, 87,422; IV. Persons engaged in literature, the fine arts, and the sciences, 94,790; V. Persons engaged in the domestic offices, or duties of wives, mothers, mistresses of families, children, relatives, 2,777,017; VI. Persons engaged in entertaining, clothing, and performing personal offices for man, 1,620,881; VII. Persons who buy or sell, keep, let, or lend, money, houses, or goods of various kinds, 162,265; VIII. Persons engaged in the conveyance of men, animals, goods, and messages, 252,196; IX. Persons possessing or working the land, and engaged in growing grain, fruits, grasses, animals, and other products, 1,576,081; X. Persons engaged about animals, 63,506; XI. Persons engaged in art and mechanic productions, in which matters of various kinds are employed in combination, 554,878; XII. Persons working and dealing in animal matters, 419,282; XIII. Persons working and dealing in matters derived from the vegetable kingdom, 789,314; XIV. Persons working and dealing in minerals, 623,171; XV. Labourers and others—branch of labour undefined, 290,227; XVI. Persons of rank or property not returned under any office or occupation, 147,879; XVII. Persons supported by the community, and of no specified occupation, 103,453; other persons of no stated occupations or conditions, 110,407; making a total of persons, aged 20 and upwards, in England and Wales, 9,816,597. It appears that there are some 671,579 domestic servants, 883,462 persons employed exclusively in providing raiment and dress for society, 1772 actors of plays, 9012 musicians, 30,050 persons engaged in books, 2942 in shows and games, 7263 in making pictures and engravings, 3896 in making carvings and figures, 5970 in making arms, 21,743 in building ships, 336,372 in building houses, 39,930 as machinists, 13,342 as carriage makers, 16,791 as watch and philosophical instrument makers, and 16,048 as makers of chymicals; 111,098 supply animal food, 104,320 deal in vegetable food, and 173,376 provide the indispensable necessaries classed as "drinks and stimulants."

Our Textile Manufactures—Wool.—In 1844 the total colonial and foreign supplies were 65,713,761 lb., and in 1858, 126,738,723 lb., an increase of about 94 per cent. Enormous must have been the growth of the demand which has outstripped even this great increase. Of the 61,000,000 lb. additional received in 1858, Australia contributed nearly 34,000,000 lb., the wool production of that quarter of the world having increased nearly 300 per cent. since 1844. South America sent about 6,000,000 lb. more; British India nearly 15,000,000 lb. more; and Southern Africa upwards of 14,000,000 lb. more, our settlements there having yielded 2,197,143 lb. in 1844, and 16,597,504 lb. in 1858. The advance on British India from 2,765,853 lb. in 1844 to 17,333,507 lb. in 1858 is also very striking. European sources of supply are stagnant, having yielded 38,079,624 lb. in 1844, and only 28,632,555 lb. in 1858. This decrease has occurred in Spain and Germany, the deliveries from the former country having retrograded from 918,853 lb. in 1844 to 110,510 lb. in 1858, while the latter fell off from 21,847,684 lb. in 1844 to 10,595,186 lb. in 1858. It is a suggestive and interesting circumstance that while the old world is thus failing still further to supply the wants of the Yorkshire mills there seems no limit to the production of the new. Notwithstanding the immense increase in the colonial deliveries the agriculturists at home have rarely been receiving better prices for their wool than they have recently obtained. While, therefore, the wool colonies have conferred immense benefits on the north of England, they have inflicted no injury on any home interest.

River Inundations Prevented by Sowing Grass.—The necessity of legislative enactments for the prevention of inundations has lately been strongly felt in France by the new dangers arising from the late frosts and heavy rains. The Loire, Isere, and other rivers are alreading committing devastations, and it is feared these will again become alarming. A sum of £400,000 is already proposed to be applied to the re-planting of the hilly districts, so as to absorb superabundant water; and a remarkable simple suggestion appeared in the *Siecle*—merely to sow grass thickly everywhere in these high regions. From accurate observations made by M. Guyemard, of Grenoble, 100 millimetres of grass absorb 47 millimetres of water before allowing any to flow off, and as the greatest inundations (of 1856) arose from a fall of 90 millimetres in two days, it follows that while 47 would be absorbed only 43 would flow off, which would not cause any injurious overflow. Planting with wood would be a much slower process. This hint is worth considering here.

General Knowledge and Division of Labour.—The subjects of knowledge are too numerous and complicated and human life far too short to allow even the highest intellect to embrace the whole. As we look through the vast accumulation of science our minds would be oppressed by the various objects which present themselves, did we not take them in detail and concentrate our observation on a part. Although a concentrated attention is requisite to success, yet it is by no means necessary that men should devote themselves exclusively to their favourite subjects. The sciences are so connected that they throw light on each other; and he has the fairest chance of success in any one career, who starts well furnished with general information while he possesses the only means of saving himself from becoming an intellectual artizan. —*Samuel Bailey.*

The Mind of Man in his Work.—Consider all the work of men's hands, all the inventions of men's wit, then we shall find that the most perfect production still proceeds from the most perfect thought and that it is mind alone which we admire, while we bestow our applause on the graces of a well-proportioned statue or the symmetry of a noble pile.—*David Hume.*

Factory Accidents.—During the six months ended the 31st of October last there were 2083 accidents from machinery, of which 27 were fatal, and 127 not arising from machinery; of these eight were fatal. There were 435 convictions for factory offences, the total amount of fines imposed having been £791, *plus* £290 costs. Mr. Horner, noticing the necessity of prosecuting mill-owners for working women and children beyond the time limited by law, says that a quarter of a century's experience convinces him that the legislative interference for the regulation of the labour of such persons is now viewed by the great majority of mill-owners as having done, and is still doing, a vast amount of good, without any injurious interference with the prosperity of their trade, and he believes that any proposal to repeal the law would encounter a stout resistance on the part of the masters. Mr. Redgrave urges the expediency of enforcing the educational test, so to speak, as a qualification for working in factories; he says that one great object to be attained is the attendance of children at school before they are employed at all, and another, the prevention of the employment of children under the age of 12, unless they have been to school, and have reached a fixed standard of attainments.

New Mode of Inhaling Chloroform.—Dr. Faure, a French practitioner, has proposed a much more sensible plan of inhaling this great softener of physical pain, than has hitherto been used. This method consists in causing that agent to be inhaled by one nostril only, the other remaining meanwhile in free communication with atmospheric air. The apparatus is extremely simple, consisting of a bottle with two necks or tubulatures, and capable of containing 100 grammes of water. An India-rubber tube with a tapering end is adapted to one of the necks, and is intended for insertion into the nostril; the other neck remains open, the operator stopping it with his thumb when necessary. The tube is 17 centimetres in length, and has a diameter of at least 13 millimetres. To use this apparatus, pour about 1 to 12 grammes of chloroform into the bottle, and having stopped the open tubulature with your thumb, let the patient receive the tube into his nostril, recommending him to breath naturally. There being no communication between the bottle and the atmosphere, the chloroform does not evaporate, and the patient is not aware of any unpleasant sensation. The subject having now acquired the habit of breathing in that way, the operator gradually slackens the pressure of his thumb, and allows a little air to enter, by which means the patient inhales atmospheric air charged with a little chloroform. From that moment, according as the painful sensation increases or diminishes, the outer air is alternately admitted or excluded, until the thumb, being entirely withdrawn, the patient receives the full quantity required. The operation may also be conducted thus:—Let the patient breathe through the empty bottle, and then introduce a drop of chloroform, and then another, and so on gradually. The great point is not to allow the effluvia of chloroform suddenly to exercise too irritating an influence upon the respiratory organs. After the second or third minute, the operator should shake the bottle, so as to project the liquor on its sides, by which the evaporating surface is considerably increased. Should the patient happen to open his mouth, the operator must close it with his hand. By this process the patient feels no pain, no sensation of suffocation or dyspnæa, nor is there any congestion of the brain. The state of anæsthesia may be continued with the greatest ease, and without danger, by keeping the tube ready to be again introduced into the nostril, if necessary; nor is there any possibility of sudden asphyxia, as the effects of the agent develop themselves very gradually.

The great end of all human industry is the attainment of happiness. For this were arts invented, sciences cultivated, laws ordained, and societies modelled. Even the lonely savage, who lies exposed to the inclemency of the elements and the fury of wild beasts, forgets not for a moment this grand object of his being. Ignorant as he is of every art of life, he still keeps in view the end of all those arts, and eagerly seeks for felicity amidst the darkness with which he is environed.—*David Hume.*

PROVISIONAL PROTECTION FOR INVENTIONS

UNDER THE PATENT LAW AMENDMENT ACT.

☞ When city or town is not mentioned, London is to be understood.

Recorded August 2.

1784. Henry Fletcher, Swan Court, Manchester—Certain improvements in sewing and embroidering machinery.

Recorded August 3.

1792. Tullins P. Fay, Liverpool—Improvements in machinery or apparatus for obtaining and applying motive power.

Recorded September 16.

2110. Thomas Richardson, New Bridge Street, Newcastle-upon-Tyne—Improvements in the manufacture of sulphuric acid and in applying the heat generated in the process.

Recorded September 27.

2180. Frederick Simpson, City Terrace, St. Luke's—An improved method of fastening or securing envelopes and other like receptacles, also for affixing postage stamps, receipt stamps, and all other similar labels requiring adhesive properties.

Recorded October 5.

2254. Jane Ann Herbert, Guilford, Surrey—Manufacturing of oxychloride of lead.—(Communication from Ludwig Brumleu, New York, U.S.)

Recorded October 13.

2338. Thomas Vicars, sen., Thomas Vicars, jun., Thomas Ashmore, and James Smith, Liverpool—Improvements in the manufacture of bread, biscuits, and like articles and in the machinery and apparatus connected therewith.

Recorded October 18.

2376. John Darlington, 36 Cannon Street—Improvements in glass furnaces.

Recorded October 19.

2390. John K. Blackwell, 73 Gloucester Terrace, Hyde Park—Improvements in reverberatory and other furnaces.—(Communication from W. H. Kirkpatrick, 11 Rue Martel, Paris.)

Recorded October 24.

2426. Pierre M. A. Laurent, Havre, France—Certain improvements in eye-glasses for optical instruments.

Recorded October 31.

2478. Isaac Brown, Carlisle—Improvements in the treatment of growing crops.
2482. Antoine Chevrier, 21 Rue du Faubourg, St. Martin, Paris—Neutralizing the smell and savour of all vegetable and animal substances without their being adulterated by the use of essences of spirits and aromatical products.
2486. John T. Pitman, 67 Gracechurch Street—Improvements in the construction of forges.—(Communication from Joseph H. Hyatt, Peekskill, New York, U. S.)

Recorded November 4.

2519. Jean G. Meyer, Paris—The employment of the "tacca pinatifida" as a substitute for straw now used in various manufactures.

Recorded November 7.

2534. Henry Grafton, Chancery Lane—Improvements in bell and other signal apparatus to dwelling houses and other places, which improvements are also applicable to knobs or handles and fastenings of doors and the like.

Recorded November 8.

2538. Adolphe Learch, Brussels, Belgium—An improved process of manufacturing embossed sheets or stuffs, called embossed fictitious leather for hangings and household furniture.—(Communication from Henry Hendryckx, St. Josse-Ten-Noode, near Brussels.)

Recorded November 10.

2558. Samuel Evans, Walter Evans, and Henry Evans, Derby—Improvements in polishing thread and yarn, and in machinery to be employed for that purpose.

Recorded November 12.

2572. Richard Howson, York—Improvements in bells and gongs, and in their manufacture.

Recorded November 14.

2583. Henry J. Daniell, Donnington Park, Leicester—Improvements in the construction of breech-loading fire-arms.

Recorded November 15.

2584. William H. Ward, Auburn, Cayuga, New York, U. S.—Improvements in wheels for railway engines and carriages.
2590. Charles P. Alvey, Commerce Place, Brixton Road—Improved machinery or apparatus for the manufacture of envelopes.
2591. William H. Ward, Cayuga, New York, U.S.—Improvements in tanning hides and skins.
2592. William Wilkins, Banbury, Oxford—A ridge tressel, or apparatus which may be employed on the ridges of buildings, to support persons and planking.
2593. Alfred V. Newton, 66 Chancery Lane—An improvement in the manufacture of hose or flexible pipe.—(Communication from Nehemiah Hunt, Boston, U.S.)
2594. Thomas D. Perkin, King David Street, St George's in the East—Improvements in the manufacture of colouring matters.—(Communication from Rudolph Knosp, Stutgart.)
2595. James Graham, Warrington Junction, Lancashire—Improvements in treating and applying products obtained when galvanising iron.

Recorded November 16.

2596. Charles Green, Winnington, near Northwich, Chestershire—Improvements in the method of applying heat in the manufacture and drying of salt.
2597. Whitmore Baker, Downham, Norfolkshire—Apparatus to facilitate the delivery of coins, for the giving of change and the like.
2598. William Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in gas burners. —(Communication from George Mill, Toronto, Canada, West.)
2599. Robert White, Edinburgh—Improvements in shirts.
2600. Thomas Greenwood and John Batley, Leeds, Yorkshire—Improvements in the construction of the beds of lathes, and the tables of planing machines.
2601. George Taylor, Clarence Iron Works, Leeds, Yorkshire—An improvement in the mode of manufacturing wrought-iron crank axles.
2602. James Burrow, Ashford Parsonage, Bakewell—Improvements in umbrellas and parasols.
2603. James Ward and Henry Burman, Stratford-on-Avon, Warwickshire—Improvements in machinery for making bricks and tiles, and for moulding peat and plastic substances.

Recorded November 17.

2604. Jerome A. Drieu and Auguste Legeay, 1B Welbeck Street, Cavendish Square—A tissue, being a substitute for leather, mill-board, and papier-maché.
2605. Isaac White, Nailsea, Somersetshire—Improvements in glass furnaces.
2606. David Jones, Dartmouth Street, Birmingham, Warwickshire—Improvements in metallic casks.
2607. Richard Laming, Clifton Villas, Maida Hill West—Improvements in obtaining alkalies and alkaline compounds.
2608. Thomas Robinson, St. Helens, Lancashire—Improvements in steam engines.
2609. John L. Jullion and Gordon Pirie, Stoneywood Works, Aberdeen, North Britain—An improvement in the manufacture of paper.
2610. James M'Kenzie, and Stephen T. Wentworth, 16 St. Martins-le-Grand—Improvements in breech-loading fire-arms.

Recorded November 18.

2611. John H. Brierley, 19 Milton Place, Halifax, Yorkshire—A belt or band fastener.
2612. William Gossage, Widnes, Lancashire—Improvements in the manufacture of carbonate of soda.
2613. James Pinchbeck, Camden Street, Islington—Improvements in consumer's compensating gas meters, which are partly applicable to ordinary consumer's meters.

Recorded November 19.

2614. Joseph Willcock, 89 Chancery Lane—Improvements in the construction and arrangement of the boiler and working parts of steam fire-engines, parts of which are applicable to engines for other purposes.—(Communication from Joseph G. E. Larned, Brooklyn, New York, U.S.)
2615. Samuel Corbett, Wellington—An improvement or improvements in pulpers for pulping food for cattle.
2616. William Clark, 53 Chancery Lane—Improvements in the preservation of animal and vegetable matters.—(Communication from Louis J. F. Margueritte, Paris.)
2617. William Blinkhorn, Sutton, near St. Helens, Lancashire—The novel application of certain materials to the manufacture of bricks, quarries, or tiles to be employed principally in the construction of furnaces as "fire-bricks."
2618. John Knight, Newton Heath, near Manchester—Certain improvements in or applicable to looms for weaving, part of which is applicable to lubricating axles and bearings for other purposes.
2619. Edward Barlow and Francis Hamilton Bolton-le-Moors, Lancashire—Certain improvements in carding engines.
2620. Auguste H. Le Pontois, L'Orient, France—Improvements in machines for distributing seed and manure.
2621. John Bancroft, Halifax, Yorkshire—Improvements in the manufacture of fabrics adapted to be used for curtains, coverings of furniture, table covers, and such like uses.
2622. Charles Busc, 45 Essex Street, Strand—The manufacture of artificial marbles.
2623. Auguste Godchaux, 45 Essex Street, Strand — Improvements in the modo of printing forms or models, or copies of penmanship and designs on paper, and other fabrics.
2624. John Petrie, jun., Rochdale, and John Lord, Manchester, Lancashire—Improvements in machinery or apparatus for drying rags, wool, and other fibrous materials.
2625. Alfred V. Newton, 66 Chancery Lane—Improvements in the mode of and machinery for drying cloths.—(Communication from Bezaleel Sexton, East Windsor, Hartford, Connecticut, U. S.)
2626. Jehu Hollinsworth, Cecil Street, Strand, Westminster—Improvements in the mode of and machinery for cutting irregular and other forms.—(Communication from Charles P. Bailey, Zanesville, Ohio, U. S.)
2627. George Laidlaw, Glasgow—Improvements in hats and other coverings for the head.
2628. Henry Naylor and William Crossley, Calder Vale, near Todmorden, Lancashire—Improvements in pickers used in looms for weaving.

Recorded November 21.

2629. James Webster, Birmingham, Warwickshire—An improvement or improvements in pressure and vacuum gauges.
2630. Pierre Jochem, Paris—Improvements in brakes for railway and other carriages.
2631. William Whittle, Smethwick, near Birmingham, Warwickshire—Improvements in the manufacture of nails, and in machinery to be used in the said manufacture.
2632. Joseph Cowan, Liverpool—Improvements in "bracing" or connecting the angles or corners of chairs and other like articles of cabinet furniture.
2633. William E. Newton, 66 Chancery Lane—An improved machine for moulding and pressing bricks.—(Communication from John W. Crary, Pensacola, Escambia, Florida, U. S.)
2635. George W. Lenox, Billiter Square—Improvements in the manufacture of ships' blocks.
2636. Joseph Apsey, Cornwall Road, Lambeth, Surrey, and William G. Buckwell, Phœnix Stone Works, East Greenwich, Kent—Improvements in boilers and other furnaces, smoke consuming and steam generating.

Recorded November 22.

2638. Edward T. Hughes, 123 Chancery Lane—Improvements in weaving silk and other materials, and in the machinery or apparatus employed therein.—(Communication from Horace Verzier, Lyons, France.)
2639. Benjamin Amsden, St. Alban's, Hertfordshire—Improvements in the manufacture of straw and other descriptions of hats and bonnets.
2640. James Shand, 245 Blackfriars Road, Surrey, and John Rowley, 3 St. George's Road, Notting Hill—Improvements in fire engines, part of which improvements are applicable to other pumps.
2641. George White, 34 Dowgate Hill, Cannon Street—Improvements in gloves.—(Communication from Mr. Emmanuel Escoube, Toulouse, France.)
2642. Pierre Marchand, Emile Marchand, and Josse Marchand, Dunkirk, France—Improvements in refining lamp oil made from oleaginous seed.
2643. Thomas B. Daft, Tottenham—An improvement in coating sheathing metal.
2644. William E. Newton, 66 Chancery Lane—Certain improvements in obtaining compensation for the effects of changes of temperature in time-keepers.—(Communication from Henry B. James, Trenton, Mercer, New Jersey, U. S.)
2645. Charles G. Hill, Commerce Square, High Pavement, Nottingham—An improved goffering machine, together with the apparatus connected therewith.
2646. Robert Mushet, Coleford, Gloucestershire—An improvement or improvements in the manufacture of iron and steel.

Recorded November 23.

2647. William H. Ward, Auburn, Cayuga, New York, U. S.—A system of signal flags.
2648. William H. Ward, Auburn, Cayuga, New York, U. S.—Improved signal lanterns.
2649. Edward T. Hughes, 123 Chancery Lane—Improvements in the manufacture of a certain substance to supersede blasting powder.—(Communication from Nicholas Rave, the elder, Curegham, near Brussels, Belgium.)
2650. William Keates, Liverpool—An improved mode of manufacturing or forming the foundation or body of compound cylinders used for printing or embossing fabrics.
2651. Edward T. Hughes, 123 Chancery Lane—An improved chemical combination to supersede blasting powder.—(Communication from Nicholas Rave, the elder, Curegham, near Brussels, Belgium.)
2652. Josiah T. Smith, Birmingham, Warwickshire—An improvement or improvements in heating, puddling, and other reverberatory furnaces used in the manufacture of iron.
2653. Benjamin Bagster, King's Road, Gray's Inn—Improvements in means or apparatus for giving surface finish to paper, which improvements are applicable to copperplate and other printing, as also to embossing.
2654. Thomas Eastman, Southsea, Hants— Improved means of raising the blades of screws employed to propel ships, and apparatus for getting at such screws, and for performing other operations under water.
2655. Thomas Lister, Sheepbridge Iron Works, Chesterfield, Derby—Improvements in the construction of sanatory privies and water-closets, part of which improvements is applicable as a tap for drawing off liquids.
2656. John Knowles, jun., St. Helen's, Lancashire—An improved apparatus for the prevention of accidents in winding from mines, which apparatus is also applicable for other similar purposes.

Recorded November 24.

2657. Francis Preston, Manchester, and Henry W. Garret, Salford, Lancashire—Improvements in the construction of cartridges.
2658. John Langford, Birmingham, Warwickshire—Improvements in inkstands, and in combining with inkstands instruments for holding and damping stamps, labels, and other articles.
2659. William C. Maniece, Manchester—Improvements in cop tubes used in machinery for spinning fibrous substances.
2660. Frederic Prince, Hove, Sussex—Improved apparatus for reducing the resistance of the atmosphere to the progress of railway trains.
2661. James Fyfe, Greenock, Renfrewshire—Improvements in apparatus for regulating and adjusting the flow and pressure of liquids.
2662. William Eassie, High Orchard, Gloucester—An improved joint for boarding and planking of all kinds.
2663. Alfred Hubart and Victor Chantillon, Liege, Belgium—Improvements in the manufacture of casks, barrels, and other like vessels of glass, and in machinery or apparatus employed therein.
2664. William S. Losh, Wreay Skye, Cumberland—Improvements in the manufacture of paper, and in the preparation of a substance to be employed therein.
2665. William S. Collins, jun., Bristol, Somersetshire, and Frederick J. Chard, Warwick Street, Pimlico—Improvements in apparatus for propelling vessels.

Recorded November 25.

2666. William Smith, 19 Salisbury Street, Adelphi—Improvements in applying and working propellers in boats or vessels.—(Communication from M. Eugene Lacroix, Rouen.)
2667. Charles Smith, Isaac Smith, and John Smith, Hopwood, near Heywood, Lancashire—Certain improvements in looms for weaving, and in apparatus for cutting the loops to form pile fabrics.
2668. Thomas Carr, Bebington, Chestershire—Improvements in arrangements and mechanism for drying glue, moulded clay, sugar, white lead, and various other substances and articles of manufacture.
2669. James Sim, Aberdeen, North Britain—Improvements in measuring and registering the flow or discharge of liquids.
2670. Isaac A. Reid, Smethwick, near Birmingham, and William Rennie, Birmingham, Warwickshire—An improvement or improvements in connecting brooms with their sticks or handles.
2671. Hingston Lindon, Plymouth, Devonshire—Machinery or apparatus for raising and forcing fluids, which is also applicable for other useful purposes.
2672. Matthew Tildesley, Willenhall, Staffordshire—Improvements in locks and latches.—(Communication from John Bisset, New York, U. S.)
2673. George E. Donisthorpe, Leeds—Improvements in apparatus for hackling, dressing, and combing silk waste and other fibres.

Recorded November 26.

2674. Augustus S. Lukin, Swansea, Glamorganshire—Improvements in apparatus for drawing window blinds.
2675. Ferdinand Scheithauer, 4 South Street, Finsbury — An improved machine for printing woollen and other fabrics.
2677. Caleb Bedells, Leicester—Improvements in the manufacture of shoes and boots, and in fabrics suitable for use in this manufacture.
2678. Walker Moseley, 17 and 18 New Street, Covent Garden—Improvements in fountain pens.
2679. Moritz Auerbach—Improved apparatus to be applied to omnibuses, stage-coaches, and other similar vehicles, to indicate the distance each passenger travels, and the amount of his fare.—(Communication from Eduard Schroder and Julius Amuel, Berlin, Prussia.)
2680. Thomas Watson and George Healey, Rochdale, Lancashire—Certain improvements in the manufacture of silk velvets.
2681. Moritz Auerbach—Improved apparatus to be applied to cabs, hackney-carriages, and other similar vehicles, to indicate the number of persons carried, the distance travelled, and the amount of fares.—(Communication from Eduard Schroder and Julius Amuel, Berlin, Prussia.)

2682. William M'Naught, Manchester, and John L. Taylor, Bolton, Lancashire—An improved method of increasing the temperature of water for feeding steam boilers or vessels for generating steam, and in apparatus connected therewith.

Recorded November 28.

2683. James Eastwood, Railway Iron Works, Litchurch, Derby—Improvements in steam hammers, and in valves to be used therewith.
2684. James Eastwood, Railway Iron Works, Litchurch, Derby—Improvements in lathes.
2685. Enoch Tomey, Perth, North Britain—Improvements in apparatus for insulating telegraphic wires or conductors.
2686. Alexander W. Williamson, University College, and Loftus Perkins, Francis Street, Gray's Inn Road—Improvements in machinery for propelling vessels.
2687. Thomas Luck, Spalding, Lincolnshire—Improvements in apparatus for removing straw from thrashing machines.
2688. Paul R. Hodge, 16 Chalcot Crescent, Primrose Hill—The treatment and use of a new material in making of paper or other compounds of vegetable pulp.
2689. Edward H. Bentall, Heybridge, near Maldon, Essex—Improvements in machinery for cutting vegetable substances.
2690. Edward H. Bentall, Heybridge, near Maldon, Essex—Improvements in apparatus for crushing or grinding grain or seeds.
2691. Joseph Bower, Hunslet, Yorkshire—An improved method of preparing clay for the manufacture of crucibles, pots, and earthenware.
2692. Charles Sells, Stockwell, Surrey—Improvements in steam engines.
2693. Richard A. Brooman, 166 Fleet Street—An improved poultry waggon.—(Communication from Parfait Goit, Paris.)
2694. Richard A. Brooman, 166 Fleet Street—Improvements in the preparation of red colouring matters or dyes.—(Communication from Messrs. Renard Freres, Lyons.)

Recorded November 29.

2695. Francis H. Wenham, Brixton, Surrey—Certain improvements in steam engines.
2696. Henry Sharpe, 26 Broad Street Buildings—Improvement in the mode of preparing wool for the purpose of carding or combing it with a view to its being afterwards wove into thread.—(Communication from Hyppolite Dubeux, Lisbon, Portugal.)
2697. James King and John Sutcliffe, Rochdale, Lancashire—Certain improvements in and applicable to mules for spinning.
2698. Henry O. Robinson, 16 Park Street, Westminster—Improvements in machinery and apparatus for the manufacture of sugar.
2699. John B. Berger, Upper John Street, Fitzroy Square—An improved mode of and apparatus for facilitating the calculations required for navigating ships or vessels.
2700. Leon N. Dejean, Paris—Improvements in hydraulic motive power.
2701. Charles Colwell, Belvidere Place, Southwark—An improved means of propelling sea-going vessels without the use of either paddle-wheel or screw propeller now adopted.
2702. Thomas Richardson, Newcastle-on-Tyne—Improvements in the manufacture of certain compounds of soda and potash.
2703. Manuel L. J. Lavater, Strand—Improvements in vulcanised India-rubber bands.

Recorded November 30.

2705. Thomas Fitton, Manchester—Improvements in the slide valves of steam engines.
2706. Bernhard Samuelson and William Manwaring, Britannia Works, Banbury, Oxford—Improvements in reaping and mowing machines.
2707. Samuel Mortimer and George Swaine, Bradford, Yorkshire—Improvements in machinery or apparatus for spinning and doubling wool or other fibrous substances.
2708. Edward Dorsett, 76 Old Broad Street—A new manufacture of heavy oil.
2709. Joseph M. Wilson, Manchester—Improvements in finishing woven fabrics, called Arabian stripes or scarfs.
2710. Hippolyte de Matthys, Antwerp, Belgium—Improvements in electric telegraph cables.
2711. Jean B. Teil, Bordeaux, France—Improvements in the construction of umbrellas and parasols.
2712. William E. Newton, 66 Chancery Lane—Improvements in the construction of pianofortes.—(Communication from Frederick Mathushek, New York, U. S.)
2713. George J. Firmin, Atlas Chemical Works, Borough Road, Southwark, Surrey—Improvements in the manufacture of tartaric and citric acids, and certain salts in connection therewith.
2714. John Lawson and Stephen Cotton, Leeds, Yorkshire—Improvements in machinery for cutting and forming the teeth or cogs of wheels.

Recorded December 1.

2716. George K. Geyelin, 462 Oxford Street—Making close folding metallic spring laths, mattresses, and bedsteads.
2717. Charles A. Fournier, 60 Boulevart de Strasbourg, Paris—A process and apparatuses intended to find out the escapes of lighting gas from the conveying pipes, and to determine the precise leaking places of the said pipes.
2718. Alphonse Mosselman, 17 Rue St. Ghislain—An aromal electrical girdle.
2719. Thomas Silver, Philadelphia, Pennsylvania, U. S.—Improvements in apparatus for governing or regulating the speed of steam and other engines.
2720. James Cocks, 25 Cornhill—Improvements in the mode of manufacturing cloths or materials for trowserings.
2721. Thomas Till, Birmingham Heath, Warwickshire—Improvements in machinery for the manufacture of horse nails and other wrought nails.
2722. William E. Newton, 66 Chancery Lane—Improved apparatus applicable for beating eggs, or mixing substances or liquids.—(Communication from Edwin P. Monroe, New York, U. S.)
2723. John Paton, Glasgow—Improvements in valves.
2724. George Davidson, Mugie Moss, Aberdeen—Improvements in the manufacture of paper bags, and in the machinery or apparatus used therein.
2725. John H. Johnson, 47 Lincoln's Inn Fields, and 166 Buchanan Street, Glasgow—Improvements in apparatus for preserving and cooking food.—(Communication from John M'Cormick, Madison, Indiana, and Edward Pincus, Philadelphia, U. S.)
2726. Nathaniel S. Dodge, 44 St. Paul's Churchyard—Improvements in the construction of lamps.—(Communication from William Fulton, Cranberry, Middlesex, New Jersey, U. S.)

Recorded December 2.

2727. William Betts, Wharf Road, City Road—Improvements in the manufacture of capsules, and in the machinery or apparatus employed therein.
2728. John Moore, 46 New Road, Woolwich, Kent—An improved damper of chimnies and flues.
2729. Thomas F. Bradson, Birmingham, Warwickshire—Improvements in door springs.
2730. Daniel Makinson, Bolton-le-Moors, and James Hope, Harwood Lee, near Bolton-le-Moors, Lancashire—Certain improvements in carding engines.
2731. George F. Smith, 15 Golden Square—Improvements in smelting and purifying iron and other ores.—(Communication from Robert W. Sievier, Hamburg.)
2732. William H. Aldridge, Kingsdown, Bristol—Certain improvements in paddle-wheels or propellers of steam ships.
733. Alfred V. Newton, 66 Chancery Lane—Certain improvements in the construction of coiled springs.—(Communication from Carlos French, Seymour, New Haven, Connecticut, U. S.)
2734. Alfred V. Newton, 66 Chancery Lane—An improved mode of treating India-rubber, gutta-percha, and analogous gums.—(Communication from George A. Engelhard and Horace H. Day, New York, U. S.)

Recorded December 3.

2735. Thomas R. Russel, Liverpool—The application of a certain metal for the movement of watches and other timekeepers.
2736. Thomas Hall, Ancoats Grove, Manchester—Certain improvements in the construction of cartridges.
2737. Joseph W. Wilson, Buckingham Street, Strand—Improvements in the mode of forming and constructing boxes or cases for postal and other purposes.
2738. Francis Palling, Esher Street, Lambeth, Surrey—Improvements in the construction of lamps for burning oils and tallow.
2739. Henry E. Drayson, Bridge Street, Westminster—Improvements in the mode of extinguishing fires in ships, steam boats, vessels of every description, houses, warehouses, stores, or other buildings of whatever kind, and in the machinery connected therewith.
2740. James Anderson and James Bradshaw, Liverpool—Improvements in the construction of the furnaces of bakers' ovens for the purpose of consuming smoke, which improvements are also applicable to the consumption of smoke in other furnaces.
2741. Richard Bond and William Hayhurst, Burnley, Lancashire—Improved machinery or apparatus to be employed in the manufacture of a certain description of "temples" used in power looms for weaving.
2742. Perceval M. Parsons, Arthur Street West, London Bridge—Improvements in fire-arms and projectiles.
2743. Nathaniel Clayton and Joseph Shuttleworth, Lincoln—Improvements in steam boiler safety valves.
2744. John Rudkin, Slate Works, Groby, near Leicester—Improvements in stoppers for bottles.
2745. Edwin A. Curley, Richmond Street, St. George's Road, Southwark, Surrey—Improved mechanical arrangements or contrivances for measuring, registering, and regulating the flow of liquids, and likewise for measuring and regulating the passage of fluids and vapours.

Recorded December 5.

2747. Edward Kelley, Erdington, near Birmingham, Warwickshire—An improved wash-stand, part of which is also applicable for other useful purposes.
2748. John Hawkins, Lisle Street, and Charles Hawkins, Walsal, Staffordshire—Certain improvements in the construction of furnaces for consuming smoke, applicable to stationary and marine boilers, and other closed fire-places.
2749. Julius Benn, Tiffield, Northampton—Improvements in drills.
2751. Charles Short, Westwood, Selston, Thomas B. Smeeton, Underwood, Nottingham, and William Bowler, Butterley Park, Pentrich, Derby—The manufacture of bricks, tiles, drain pipes, or other articles from cinder or refuse slag.
2752. George Feldwick, St. Martin's Court, Westminster—An improvement in roller blinds.
2753. Alfred Lancaster, Kensington—Improvements in breech-loading fire-arms, in projectiles, and in apparatus for charging cartridges for breech-loading and other arms.
2754. William Hutton, West Hartlepool, Durham—Improvements in preventing the destruction of the timbers of piers, docks, and other structures by the action of sea worms or other marine animals.
2755. Enrico A. L. Negretti and Joseph W. Zambra, Hatton Garden—Improvements in stereoscopes.

Recorded December 6.

2757. François Coignet, 33 Boulevart St. Martin, Paris—Improvements in the manufacture of beton or composition applicable for purposes of covering, building, and construction, and for various uses as artificial stone.
2758. Charles Sells, Stockwell, Surrey—Improvements in marine steam engines for driving screw and other propellers.
2759. James Shaw, Manchester—Improvements in the insulation and laying down conducting wires for the transmission of telegrams or telegraphic messages.
2760. James Jones and John Hilton, Rhodes, near Middleton, Lancashire—Improvements in apparatus to be used in dyeing, dunging, soaping, and clearing fabrics.
2761. Edwin A. Wood, Victoria Terrace, Notting Hill, West—Certain improvements in anchors.
2763. Archibald Turner, Leicester—Improvements in the manufacture of elastic fabrics.
2764. Ferdinand Potts, Birmingham, Warwickshire—Improvements in the mode of manufacturing or finishing tubes for certain purposes.

Recorded December 7.

2765. Frederick Levick, Blaina Cwm Celyn and Coalbrook Vale Iron Works, Monmouthshire—A new or improved cock oven.
2767. James Anderson, Newton, Ayrshire—Improvements in obtaining motive power.
2768. Thomas Bradford, Manchester—Certain improvements in machinery or apparatus for wringing and mangling textile fabrics.
2769. Richard A. Brooman, 166 Fleet Street—Improvements in marine steam engines for driving screw and other propellers, and in screw propellers.—(Communication from Nicolas H. Labrouse, Paris.)
2770. Frederick W. Schafer, Brewer Street—Improvements in cash, deed, jewel, and other boxes.
2771. Robert H. Collyer, 8 Alpha Road, St. John's Wood—A chemical ink pencil or composition applicable as an instrument or means for writing, drawing, and marking.
2772. Moritz Jacoby, Nottingham—Improvements in the manufacture of twist lace.
2773. Thomas R. Harding, Leeds, Yorkshire—Improvements in combs or hackles for combing, carding, or hackling flax, cotton, silk, or other fibrous materials (which are also applicable to raising the nap or pile of woollen or other cloths), and in the making of pins or teeth for such combs or hackles.
2775. Charles C. S. de Changy, Boulogne-sur-Mer, France—Improvements in the manufacture of bread, which improvements are also applicable in the preparation of dough or paste for other purposes.
2776. Joseph Mabbot, 7 Sunbury Terrace, Liverpool Road—Improvements in windguards for chimnies.
2777. Robert T. Pattison, Daldorch House, Ayrshire—Improvements in printing and dyeing certain woven fabrics and yarns.

Recorded December 8.

2778. William Spence, 50 Chancery Lane—Improvements in rotating harrows.—(Communication from Sidney S. Hogle, Cleveland, Cuyahoga, Ohio, U. S.)
2779. John G. N. Alleyne, Butterley Iron Works, Alfreton, Derby—Improvements in the manufacture of boilers, ships' tanks, and other hollow vessels of iron and steel.
2780. John Arrowsmith, Bilston, Staffordshire—A new or improved method of constructing land batteries and gun boats.
2781. John Arrowsmith, Bilston, Staffordshire—Improvements in the manufacture of beams or girders, and in machinery and furnaces used in the said manufacture.
2783. Robert Gray and Thomas H. Scholfield, York—Improvements in flattening and tempering steel wire and sheet steel, and also in the tubes employed in the furnaces.
2784. Thomas Crook, Bolton-le-Moors, Lancashire—Improvements in machinery or apparatus for making paper bags.
2785. William Prosser and John Hogg, Witton Park, Darlington, Durham—An improved cooking apparatus particularly suitable for military purposes.
2786. John Norris, jun., and Thomas Till, Birmingham, Warwickshire—Improvements in machinery to be used in manufacturing horse nails and other wrought nails.
2787. Frederick H. Elliott and Charles A. Elliott, Strand, Westminster—An improved method of preventing drawing boards and other flat wooden surfaces from warping or twisting, and of adding to the strength thereof.
2788. Augustus Rumpff, King Street, Cheapside—An improved fastening for portmonnaies, portfolios, bags, and other like articles.—(Communication from C. Weintraud, the younger, Offenbach.)
2789. John Macintosh, 40 North Bank, Regent's Park—Improvements in the manufacture of waterproof and other fabrics, and of moulded or formed articles.
2790. John Macintosh, 40 North Bank, Regent's Park—Improvements in setting artificial teeth.
2791. John Macintosh, 40 North Bank, Regent's Park—Improvements in cartridges and projectiles.

Recorded December 9.

2792. William Boaler, 76 Cedar Street, New York, U. S.—An improved compound for washing purposes.
2793. John Lawson and William Hago, Glasgow—Improvements in apparatus to be used in spinning or twisting.
2794. Joel Spiller, Cardiff, Glamorganshire, Wales—Improvements in dry articles or bodies formed of plastic clay.
2795. John Tenwick, Clarendon Street, Portsmouth, Hampshire—Improvements in the construction of steering apparatus adapted for ships and such like navigable vessels.
2796. Hesketh Hughes, Homerton, and John Moore, Manchester—Improvements in machinery for transferring and engraving designs and figures on to cylindrical and flat surfaces.
2797. John D. Dunnicliff, Nottingham—An improvement in the manufacture of bonnet fronts and ruches.
2798. William Betts, Wharf Road, City Road—An improved manufacture of capsules.
2799. James Thomson, Robert Thomson, and Henry Thomson, Buckden, Huntingdon—An improved agricultural implement.

Recorded December 10.

2800. Rudolph Heilman, Manchester—The preparation of a new colour, called Azaleine, and its applications to dyeing and printing.—(Communication from Jean G. Keller, Mulhouse, France.)
2801. Frederick C. Calvert and Charles Lowe, Manchester—Improvements in dyeing and printing certain yarns and fabrics.
2802. George Davies, 1 Serle Street, Lincoln's Inn, and 28 St. Enoch Square, Glasgow—An improvement in tobacco pipes, mouth-pieces, and cigar or cigarette holders. —(Communication from Messrs. Viney, Sommer, and Hamm, Paris.)

DESIGNS FOR ARTICLES OF UTILITY.

Registered from 6th January, to 14th February, 1860.

Jan. 6,	4225	John Hall, London Street, E.C.—"A superheating apparatus for steam boilers."
„ 10,	4226	The Shotts Iron Company, Shotts Iron Works, near Motherwell, N B.—"Improved chimney or draught doors for domestic fire grates."
„ 14,	4227	Laurie and Marner, 313 Oxford Street, W.—"Improved folding carriage head."
„ 17,	4228	Charles Grey Hill, Commerce Square, High Pavement, Nottingham—"A graduated goffered cap front."
„ 18,	4229	Henry Wilde, St. Ann's Churchyard, Manchester—"Improved wire rope, for lightning conductors."
„ 19,	4230	Amies and Barford, Peterborough—"Sack elevator."
„ 23,	4231	S. Allcock and Co., Redditch—"The coronet needle case."
„ 28,	4232	James Hicks, 23 Hatton Garden, E.C.—"Hick's self-registering mercurial minimum and maximum thermometer."
„ —	4233	James Alexander Forrest, Lime Street, Liverpool—"Improved photographic bath stand."
Feb. 3,	4234	Harry Pelling, 22 Leigh Street, Burton Crescent, W.C.—"Rifle and general cape over-coat, with sleeve."
„ 10,	4235	Easterbrooke and Allcard, Albert Works, Sheffield—"Combined ratchet brace."
„ 13,	4236	Henry Bowen, High Street, Camden Town, N W.—"Hat."
„ 14,	4237	Daniel M'Arthur, Bothwell Street, Glasgow—"Apparatus for longitudinally plaiting or folding ribbon."

TO READERS AND CORRESPONDENTS.

Completion of Volume IV., Second Series, of the Practical Mechanic's Journal. —The present Part, No. 144, completes Volume IV., Second Series, of this *Journal*, or the twelfth volume of the entire work as far as published. The entire set of volumes may be had from any bookseller, in cloth, lettered in gold, price 14s. each; or the whole 144 parts may be purchased separately, as originally published, at 1s. each—any single part being obtainable. The whole twelve volumes may also be had, handsomely bound in half calf, in six double volumes, twenty-four parts in each, with the Plates bound separately to correspond—price 31s. 6d. for each double and its separate volume of Plates. Volume IV., Second Series, contains nineteen quarto pages of copperplate engravings, nearly 500 engravings on wood, and 344 pages of letterpress.

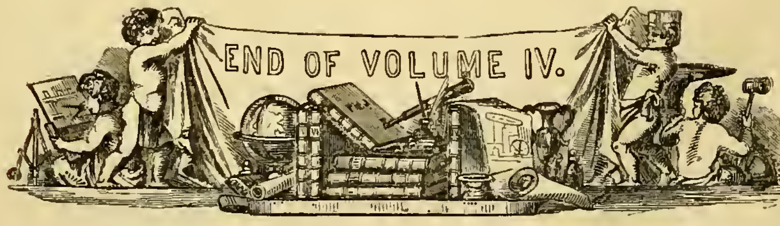
A Young Engineer, Ruabon.—1. Unfortunately we have not yet been able to obtain the full particulars we wanted. 2. Bromford Iron Works, West Bromwich, Staffordshire.

Tyro, Plymouth.—We are afraid that the "devotion of one line" to his query would answer very little purpose The boiler he sketches is a very good generator for moderate sizes. Without a long calculation and various references we could not possibly give him the dimensions for the power and evaporation mentioned. There are scores of books reviewed in this *Journal* which would tell him all he wants. Look them over and tell us, if he meets with any difficulty.

Milnsbridge, Huddersfield.—A correspondent, writing from this place, has omitted to append his name to his letter. Will he be good enough to forward it.

Rosin Gas.—In this communication, at pp. 298-9 of our February *Journal*, in the fifth line from the bottom of the last paragraph, p. 299, for "station master" read "station meter."

H Graham, Wakefield.—1. The pressure tending to force out the plug must necessarily vary with the area. It would be the same thing in the tube as in the plate. 2. If we understand this rightly—it is somewhat obscurely expressed—his view of the case is correct.



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