FORDYCE, DAVID, an elegant and learned writer, was born at Aberdeen in the year 1711. Having received the early part of his education at the grammar school, at the age of 13 he was entered at the Greek class in Marischal college, Aberdeen; in 1728 he took the degree of A. M. and was afterwards, in 1742, admitted professor of philosophy in the same college. He was originally designed for the ministry; to prepare himself for which was the whole object of his ambition, and for a course of years the whole purpose of his studies. How well he was qualified to appear in that character, appears from his "Theorica, a dialogue concerning the art of preaching." Having finished this work, he went abroad in 1750 on his travels, in order to obtain fresh stores of knowledge; but after a successful tour through several parts of Europe, he was, on his return home, unfortunately cast away in a storm on the coast of Holland, in the 41st year of his age. Besides the above work, he wrote Dialogues on Education, 8vo, and a Treatise of Moral Philosophy, published in the Preceptor. The third edition of his Theorica was published in London, in 1751, after his death, by his brother James, the subject of the following article.

FORDYCE, James, a Scotch divine, justly esteemed for his piety and ingenuity, as well as for his pulpit eloquence, was born at Aberdeen in the year 1720. He received his classical education at the public grammar school, and went afterwards to the Marischal college, where he went through the usual course of studies necessary for a minister of the gospel. His natural abilities were excellent, and he improved to the utmost the favourable opportunities he enjoyed at the university, which made him be considered as well qualified for a preacher of the gospel at an early period of life. His first appointment was that of second minister in the church of Brechin in the county of Angus, after which he accepted of a call to Alloa near Stirling. The people of that parish were prepossessed in favour of another, and prejudiced against Mr Fordyce, which could not fail to be a most unpleasant circumstance; yet by his impressive delivery, and indefatigable attention to every part of his ministerial duty, he soon changed their prejudice into esteem, and their esteem into admiration.

During his residence at Alloa, he drew on him the notice of the public by three excellent sermons; the first on the eloquence of the pulpit, the second on the method of promoting edification by public institutions, and the third on the delusive and bloody spirit of popery, preached before the synod of Perth and Stirling. But still greater wonder and astonishment were excited by his inimitable sermon on the folly, infamy, and misery of unlawful pleasure, preached before the general assembly of the church of Scotland in 1760. It contains such masterly composition with respect to description, spirit, and elegance, and was delivered with such uncommon solemnity, animation, and pathos, that it filled his learned fathers and brethren with astonishment, and justly raised him to unrivalled eminence among his clerical contemporaries. About this time he was complimented with a degree of doctor in divinity by the university of Glasgow, probably on account of the fame he acquired by this extraordinary sermon.

The friends of Dr Fordyce being mostly in London, he was invited to that metropolis to be the colleague of Dr Lawrence, minister of a respectable congregation in Mowkwell-street, on whose death, which happened a few months after, Dr Fordyce became once more famous for his pulpit eloquence, always preaching to overflowing audiences. This popularity he justly deserved, whether with respect to the elegance of his compositions, or their happy tendency to impress the heart with the love of virtue and religion. Yet even Dr Fordyce lived to see his popularity on the decline; for such as attend a place of worship from mere motives of curiosity must have fickle and unstable minds, changing their preachers as they do their dress, loving to be where others are, of doing what others do, and of admiring what others admire, for they have no taste of their own.

His pews were thinned from another cause, which was the failure of a younger brother, an extensive banker, which ruined many of the doctor's constant hearers and most liberal supporters. Although the doctor could not be reasonably blamed for the failure of his brother, yet it is certain that it brought a degree of odium on the whole family. Another cause of the diminution of his hearers was an unhappy difference between him and Mr Toller his colleague, which happened in the year 1755, and which ended in a division of the congregation, many respectable families following Mr Toller to another place of worship. Soon after this he declined officiating as a minister, the impaired state of his health rendering such a step necessary. The best specimen of pulpit eloquence which perhaps ever came from his pen, was delivered at the ordina
FOREMAST of a Ship, a large round piece of timber, placed in her fore part or forecastle, and carrying the fore-sail and fore-top-sail yards. Its length is usually ⅔ of the main mast, and the fore-top-gallant mast is ⅓ the length of the fore-top.

FOREMAST-Men, are those on board a ship that take in the top-sails, slang the yards, furl the sails, bose, trice, and take their turn at the helm, &c.

FOREST, in Geography, a huge wood; or, a large extent of ground covered with trees. The word is formed of the Latin foresta, which first occurs in the capitulars of Charlemagne, and which itself is derived from the German forst, signifying the same thing. Spelman derives it from the Latin foris restat, by reason forests are out of towns. Others derive foresta from feris, q. d. foresta, quod sì tuta statio fervorum, as being a safe station or abode for wild beasts.

The Caledonian and Hercynian forests are famous in history. The first was a celebrated retreat of the ancient Picts and Scots: the latter annually occupied the greatest part of Europe; particularly Germany, Poland, Hungary, &c. In Caesar's time it extended from the borders of Alsata and Switzerland to Transylvania; and was computed 60 days journey long, and 9 broad: some parts or cantons thereof are still remaining.

The ancients adored forests, and imagined a great part of their gods to reside therein: temples were frequently built in the thickest forests; the gloom and silence whereof naturally inspire sentiments of devotion, and turn men's thoughts within themselves.

For the like reason, the Druides made forests the place of their residence, performed their sacrifices, instructed their youth and gave laws therein.

FOREST, in Law, is defined, by Manwood, a certain territory of woody grounds and fruitful pastures, privileged for wild beasts and fowls of forest, chase, and warren, to rest and abide under the protection of the king, for his primely delight; bounded with unremovable marks and meres, either known by matter of record or prescription; replenished with wild beasts of venery or chase, with great coverts of vert for the said beasts; for preservation and continuance whereof, the vert and venison, there are certain particular laws, privileges, and officers.

Forests are of such antiquity in England, that, excepting the New Forest in Hampshire, erected by William the Conqueror, and Hampton Court, erected by Henry VIII. it is said, that there is no record or history which makes any certain mention of their erection, though they are mentioned by several writers and in several of our laws and statutes. Ancient historians tell us, "that New forest was raised by the destruction of 32 parish churches, and many villages, chapels, and manors, for the space of 30 miles together, which was attended with divers judgments on the posterity of William I. who erected it, for William Rufus was there shot with an arrow, and before him Richard the brother of Henry I; and Henry nephew to Robert, the eldest son of the Conqueror, did hang by the hair of the head in the boughs of the forest, like unto Absalom." Blount.

Besides the New forest, there are 68 other forests in England, 13 chases, and more than 700 parks; the four principal forests are New forest, on the sea, Shireswood;
FOR

Forest.
Fore-staff.

may fine and imprison for offences within the forest, it being a court of record: and therefore a writ of error lies from hence to the court of king's bench, to rectify and redress any mal-administrations of justice; or the chief justice in eyre may adjourn any matter of law into the court of king's bench.

FOREST-LAWS, are peculiar laws, different from the common law of England. Before the making of Charta de Foresta, in the time of King John and his son Henry III. confirmed in parliament by 9 Henry III. offences committed therein were punished at the pleasure of the king in the severest manner. By this charter, many forests were disafforested and stripped of their oppressive privileges, and regulations were made for the government of those that remained; particularly, killing the king's deer was made no longer a capital offence, but only punished by fine, imprisonment, or abjuration of the realm: yet even in the charter there were some grievous articles, which the clemency of later princes has since by statute thought fit to alter per assisa foresta. And to this day, in trespasses relating to the forest, voluntas reputabitur pro facto; so that if a man be taken hunting a deer, he may be arrested as if he had taken a deer.

FOREST TOWNS, in Geography, certain towns of Suabia in Germany, lying along the Rhine, and the confines of Switzerland, and subject to the house of Austria. Their names are Rhinefield, Seckingen, Lafrenburg, and Waalsdor.

FORE-Staff, an instrument used at sea for taking the altitudes of heavenly bodies. The forest-staff, called also the fore-staff, takes its denomination hence, that the observer, in using it, turns his face towards the object; in opposition to the back-staff, where he turns his back to the object.

The fore or cross-staff, consists of a straight square staff, graduated like a line of tauts, and four crosses or vanes, which slide on it. The first and shortest of these vanes, is called the ten cross, or vane, and belongs to that side of the instrument on which the divisions begin at three degrees and end at ten. The next longer vane, is called the thirty cross, belonging to that side of the staff in which the divisions begin at ten degrees and end at thirty. The next vane is called the sixty cross, and belongs to the side where the divisions begin at twenty degrees and end at sixty. The last and longest, called the ninety cross, belongs to the side where the divisions begin at thirty degrees and end at ninety.

The use of this instrument is to take the height of the sun and stars, or the distance of two stars: and the ten, thirty; sixty, or ninety crosses, are to be used according to the altitude is greater or less; that is, if the altitude be less than ten degrees, the ten cross is to be used; if above ten, but less than thirty, the thirty cross is to be used; &c. Note. For altitudes greater than thirty degrees, this instrument is not so convenient as a quadrant or semicircle.

TO OBSERVE AN ALTITUDE BY THIS INSTRUMENT.—Apply the flat end of the staff to your eye, and look at the upper end of the cross for the centre of the sun or star, and at the lower end for the horizon. If you see the sky instead of the horizon, slide the cross a little nearer the eye; and if you see the star instead of the horizon, slide the cross farther from the eye; and thus continue moving till you see exactly the sun or star's centre by the top of the cross, and the horizon by the bottom thereof. Then the degrees and minutes, cut by the inner edge of the cross upon the side of the staff peculiar to the cross you use, give the altitude of the sun or star.

If it be the meridian altitude you want, continue your observation as long as you find the altitude increase, till moving the cross nearer to the eye. By subtracting the meridian altitude thus found from 90 degrees, you will have the zenith distance. To work accurately, an allowance must be made for the height of the eye above the surface of the sea, viz. for the English foot, 1 minute; for 5 feet, 25; for 10 feet 33; for 20 feet, 5; for 40 feet, 7, &c. These minutes subtracted from the altitude observed, and added to the zenith distance observed, give the true altitude and zenith distance.

TO OBSERVE THE DISTANCE OF TWO STARS, OR THE MOON'S DISTANCE FROM A STAR, BY THE FORE-STAFF.—Apply the instrument to the eye, and looking to both ends of the cross, move it nearer or farther from the eye till you see the two stars, the one on the one end, and the other on the other end of the cross; then the degrees and minutes cut by the cross on the side proper to the vane in use give the stars distance.

FORESTALLER, a person who is guilty of forestalling. See the next article.

FORESTALLING, in Law, buying or bargaining for any-corn, cattle, victuals, or merchandise, in the way as they come to fairs or markets to be sold, before they get thither, with an intent to sell the same again at a higher price.

The punishment for this offence, upon conviction at the quarter sessions by two or more witnesses, is, for the first time, two months' imprisonment and the loss of the goods, or the value; for the second offence the offender shall be imprisoned six months, and lose double the value of the goods: for the third offence he shall suffer imprisonment during the king's pleasure, forfeit all his goods and chattels, and stand on the pillory; but the statute does not extend to malsters buying barley, or to badgers licensed.

FORESTER, a sworn officer of the forest, appointed by the king's letters patent, to walk the forest at all hours, and watch over the vert and venison; also to make attachments and true presentments of all trespasses committed within the forest.

If a man come into a forest in the night, a forester cannot lawfully beat him before he makes some resistance; but in case such a person resists the forester, he may justify a battery. And a forester shall not be questioned for killing a trespasser that, after the peace cried to him, will not surrender himself; if it be not done on any former malice; though, where trespassers in a forest, &c. do kill a person that opposes them, it is murder in all, because they were engaged in an unlawful act, and therefore malice is implied to the person killed.

FORETHOUGHT FELONY, in Scots Law, signifies premeditated murder. See MURDER.

FORFAR, a town of Scotland, and capital of the county of that name, situated in N. Lat. 56. 37. W. Long. 2. 55. This town, with Dundee, Cupar, Perth, and St Andrew's, jointly send one member to the British parliament. It stands in the great valley.
estate for life or years, may forfeit it many ways, as Forfeiture.
well as by reason of felony; such as alienation, claiming
a greater estate than he hath, or affirming the re
version to be in a stranger, &c. When a tenant in
tail makes leases not warranted by the statute; a copy
holder commits waste, refuses to pay his rent, or do
suit of court; and where an estate is granted upon
condition, or non-performance thereof, &c. they will
make a forfeiture.

Entry for a forfeiture ought to be by him who is
next in reversion, or remainder, after the estate
forfeited. As if a tenant for life or years commits a for
feiture, he who has the immediate reversion or re
mainder ought to enter, though he has the fee, or only
an estate-tail.

II. Forfeiture in criminal cases is twofold; of real,
and personal estates.

1. As to real estates by attaint in high trea
son, a man forfeits to the king all his lands and ten
ements of inheritance, whether fee-simple or fee-tail;
and all his rights of entry on lands and tenements,
which he had at the time of the offence committed,
or at any time afterwards, to be for ever vested in the
crown; and also the profits of all lands and tenements,
which he had in his own right for life or years, so long
as such interest shall subsist. This forfeiture relates
backwards to the time of the treason committed; so as
Commentists
avoid all intermediate sales and encumbrances, but
not those before the fact: and therefore a wife's joine
rare is not forfeitable for the treason of her husband;
because settled upon her previously to the treason
committed. But her dower is forfeited, by the express
provision of statute 5 and 6 Edw. VI. c. 31. And yet
the husband shall be tenant by courtesy of the wife's
lands, if the wife be attainted of treason; for that is
not prohibited by the statute. But, though after atta
in the forfeiture relates back to the time of the
treason committed, yet it does not take effect unless an
attainted be had, of which it is one of the fruits; and
therefore, if a traitor dies before judgment pronounced,
or is killed in open rebellion, or is hanged by martial
law, it works no forfeiture of his lands: for he never
was attainted of treason. But if the chief justice of
the king's bench (the supreme coroner of all England)
in person upon the view of the body of him killed in open
rebellion, records it and returns the record into his own
court, both lands and goods shall be forfeited.

The natural justice of the forfeiture or confiscation
property, for treason, is founded on this consideration:
That he who hath thus violated the fundamental prin
cipal of government, and broken his part of the ori
ginal contract between king and subject, hath abando
ned his connexion with society, and hath no right to
any thing of those advantages which before belonged
to him purely as a member of the community; among
which social advantages, the right of transferring or
transmitting property to others is one of the chief.
Such forfeitures, moreover, whereby his posterity must
suffer as well as himself, will help to restrain a man,
not only by the sense of his duty, and dread of personal
punishment, but also by his passions and natural affec
tions; and will interest every dependent and relation
he has to keep him from offending: according to that
beautiful sentiment of Cicero, "ne vero me fugit quam
sit acetum, parentum sceleris filiorum penitus; sed hoc
preclar..."
in both parts of the united kingdoms. In new
modelling these laws, the Scots nation and the English
house of commons struggled hard, partly to maintain,
and partly to acquire, a total immunity from forfeiture
and corruption of blood; which the house of lords as
firmly resisted. At length a compromise was agreed
to, which is established by this statute, viz. that the
same crimes, and no other, should be treason in Scot-
land that are so in England; and that the English for-
feitures and corruption of blood should take place in
Scotland till the death of the then pretender, and then
cease throughout the whole of Great Britain: the lords
artfully proposing this temporary clause, in hopes (it is
said) that the prudence of succeeding parliaments
would make it perpetual. This has partly been done by
the statute 17 Geo. II. c. 39. made in the year preceding
the late rebellion, the operation of these indemnifying
clauses being thereby still further suspended till the
death of the sons of the pretender.
In petit treason and felony, the offender also for-
fears all his chattel interests absolutely, and the profits
of all freeholds during life; and after his death
all his lands and tenements in fee simple (but not those
in tail) to the crown, for a very short period of time:
for the king shall have them for a year and a day, and
may commit therein what waste he pleaseth; which is
called the king’s year, day, and waste. Formerly the
king had only a liberty of committing waste on the
lands of felons, by pulling down their houses, extir-
pating their gardens, plowing their meadows, and
cutting down their woods. And a punishment of a
similar spirit appears to have obtained in the oriental
countries, from the decrees of Nebuchadnezzar and
Cyrus in the books of Daniel and Ezra; which,
besides the pain of death inflicted on the delinquents
there specified, ordained, “that their houses shall be made
a dunghill.” But this tending greatly to the prejudice
of the public, it was agreed in the reign of Henry I.
of England, that the king should have the profits of
the land for one year and a day in lieu of the destruc-
tion he was otherwise at liberty to commit: and there-
fore magna charta provides, that the king shall only hold
such lands for a year and a day, and then restore them
to the lord of the fee, without any mention made of
waste. But the statute 17 Edward II. de prerogativa
regis, seems to suppose, that the king shall have his year,
day, and waste; and not the year and day insted of
waste: which Sir Edward Coke (and the author of the
Mirror before him) very justly look upon as an en-
croachment, though a very ancient one, of the royal
prerogative. This year, day, and waste, are now
usually compounded for; but otherwise they regularly
belong to the crown: and after their expiration the
land would naturally have descended to the heir (as in
gavelkind tenure it still does) did not its feudal quality
intersect such descent, and give it by way of escheat
to the lord. These forfeitures for felony do also arise
only upon attainder; and therefore a felo de se forfeits
no lands of inheritance or freehold, for he never is at-
tained as a felon. They likewise relate back to the
time the offence was committed as well as forfeitures
for treason, so as to avoid all intermediate charges and
conveyances. This may be hard upon such as have
unwarily engaged with the offender; but the cruelty
and reproach must lie on the part, not of the law, but
of
Forfeiture of the criminal: who has thus knowingly and dishonestly involved others in his own calamities.

2. The forfeiture of goods and chattels accures in every one of the high kinds of offences; in high treason, misprision thereof, petit treason, felonies of all sorts whether clergyable or not, self murder or felony de se, petty larceny, standing mute, &c. For flight, also, on an accusation of treason, felony, or even petit larceny, whether the party be found guilty or acquitted, if the jury find the flight, the party shall forfeit his goods and chattels: for the very flight is an offence, carrying with it a strong presumption of guilt, and is at least an endeavour to elude and to stifle the course of justice prescribed by the law. But the jury very seldom find the flight: forfeiture being looked upon, since the vast increase of personal property of late years, as too large a penalty for an offence to which a man is prompted by the natural love of liberty.

There is a remarkable difference between the forfeiture of lands and of goods and chattels. (1.) Lands are forfeited upon attainder, and not before; goods and chattels are forfeited by conviction. Because in many of the cases where goods are forfeited, there is never any attainder; which happens only where judgment of death or outlawry is given: therefore, in those cases, the forfeiture must be upon conviction or not at all; and, being necessarily upon conviction in those, it is so ordered in all other cases, for the law loves uniformity. (2.) The forfeiture of lands has relation to the time the fact was committed, so as to avoid all subsequent sales and encumbrances: but the forfeiture of goods and chattels has no relation backwards; so that those only which a man has at the time of conviction shall be forfeited. Therefore a traitor or felon may bona fide sell any of his chattels, real or personal, for the sustenance of himself and family between the fact and conviction; for personal property is of so fluctuating a nature, that it passes through many hands in a short time; and no buyer could be safer, if he were liable to return the goods which he had fairly bought, provided any of the prior venders had committed a treason or felony. Yet if they be collusively and not bona fide parted with, merely to defraud the crown, the law (and particularly the statute 13 Eliz. c. 5.) will reach them; for they are all the while truly and substantially the goods of the offender: and as he, if acquitted, might recover them himself, as not parted with for a good consideration; so, in case he happens to be convicted, the law will recover them for the king.

FORFEX, in Roman antiquity, was a way of drawing up an army in the form of a pair of shears. It was intended to receive the cuneus or wedge, if the enemy should make use of that figure. For when the forfex opened to admit the wedge, they had an opportunity of defeating their design, and cutting them in pieces.

FERRICULA, the Earwig, a genus of insects belonging to the order of coleoptera. See ENTOMOLOGY.

FORGE, properly signifies a little furnace, wherein smiths and other artificers of iron or steel, &c. heat their metals red hot, in order to soften them and render them more malleable and manageable on the anvil.

An ordinary forge is nothing but a pair of bellows, the nozzle of which is directed upon a smooth area, on which coals are placed. The nozzle of a pair of bellows may be also directed to the bottom of any furnace, to excite the combustion of the coals placed there, by which a kind of forge is formed. In laboratories, there is generally a small furnace consisting of one cylindrical piece, open at top, which has at its lower side a hole for receiving the nozzle of a double bellows. This kind of forge furnace is very convenient for fusions, as the operation is quickly performed, and with few coals. In its lower part, two inches above the hole for receiving the nozzle of the bellows, may be placed an iron plate of the same diameter, supported upon two horizontal bars, and pierced near its circumference with four holes diametrically opposite to each other. By this disposition, the wind of the bellows, pushed forcibly under this plate, enters at these four holes; and thus the heat of the fire is equally distributed, and the crucible in the furnace is equally surrounded by it. This contrivance is used in the forge-furnaces for melting copper, with this difference only, that these furnaces are square, which is a matter of no consequence.

As the wind of bellows strongly and rapidly excites the action of the fire, a forge is very convenient when a great heat is to be applied quickly: but it is not suitable when the heat is to be gradually increased.

The forge, or blast of bellows, is used in several operations in small; as to fuse salts, metals, ores, &c. It is also much used in works in the great, which require strong heat, without much management; and chiefly in the smelting of ores, and fusion of metallic matters.

FORGE is also used for a large furnace, wherein iron ore, taken out of the mine, is melted down; or it is more properly applied to another kind of furnace, wherein the iron-ore, melted down and separated in a former furnace, and then cast into sows and pigs, is heated and fused over again, and beaten afterwards with large hammers, and thus rendered more soft, pure, ductile, and fit for use.

FORGE in the train of artillery, is generally called a travelling forge, and may not be improperly called a portable smith's shop: at this forge all manner of smith's work is made, and it can be used upon a march as well as in camp. Formerly they were very ill contrived, with two wheels only, and wooden supports to prop the forge for working when in the park. Of late years they are made with four wheels, which answers the purpose much better.

FORGE for red-hot Balls, is a place where the balls are made red hot before they are fired off: it is built about five or six feet below the surface of the ground, of strong brick-work, and an iron grate, upon which the balls are laid, with a large fire underneath.

FORGER, in Law, one guilty of forgery.

FORGERY, (from the French forgeur, i.e. accuder, fabricere, "to beat on an anvil, forge, or form," may be defined at common law, to be "the fraudulent making or alteration of a writing, to the prejudice of another man's right." For which the offender may suffer fine, imprisonment, and pillory. And also, by a variety of statutes, a more severe punishment is inflicted on the offender in many particular cases, which are so multiplied of late as almost to become general. We shall mention the principal instance.

By statute 5 Eliz. c. 14. to forge or make, or know-
FORGE

 Forgery, in Law, the act of FORGERY.

 Forgery, in smithery, the heating or hammering of iron on an anvil, after having first made it red hot in the forge, in order to extend it into various forms, and fashion it into various works.

 There are two ways of forging and hammering iron. One is by the force of the hand, in which there are usually several persons employed, one of them turning the iron and hammering likewise, and the rest only hammering. The other way is by the force of a water-mill, which raises and works several huge hammers beyond the force of man; under the strokes whereby the workmen present large lumps or pieces of iron, which are sustained at one end by the anvils, and at the other by iron chains fastened to the ceiling of the forge. See MILL.

 This last way of forging is only used in the largest works, as anchors for ships, &c., which usually weigh several thousand pounds. For the lighter works, a single man serves to hold, heat, and turn with one hand, while he hammers with the other.

 Each purpose the work is designed for requires its proper heat; for if it be too cold, it will not feel the weight of the hammer, as the smiths call it when it will not batter under the hammer; and if it be too hot, it will red scorch or break or crack under the hammer.

 The several degrees of heat the smiths give their iron are, first, a blood-red heat; secondly, a white-flame heat; and thirdly, a sparkling or welding heat.

 FORISFAMILIATION, in Law. When a child, upon receiving a portion from his father, or otherwise, renounces his legal title to any further share of his father's succession, he is said to be forisfamiliated.

 FORK, a well known instrument, consisting of a handle and blade, divided at the end into two or more points or prongs.

 The pitch-fork is a large utensil of this construction employed in hay-making, &c.

 The table-fork, an instrument now so indispensable, did not come into use in England till the reign of James I., as we learn from a remarkable passage in Coynet. The reader will probably smile at the solemn manner in which this important discovery or innovation is related: "Here I will mention a thing that might have been spoken of before in discourse of the first Italian towns. I observed a custom in all those Italian cities and towns through which I passed, that is not used in any other country that I saw in my travels, neither do I think that any other nation of Christen-
dome doth use it, but only Italy. The Italians and most strangers that are commerce in Italy, do al-
ways at their meals use a little fork or when they eat
their meat; for while with their knife which they
hold in one hand they cut the meat out of the dish,
they fasten the fork which they hold in the other
hand upon the same dish, so that whatsoever he be
that sitting-in the company of any others at meals
shall unadvisedly touch the dish of meat with his
fingers from which all the table doth cut, he will give
occasion of offence unto the company as having trans-
gressed the laws of good manners, inso much that
for his error he shall be at least brow-beaten if not re-
prehended in words. This form of feeding I under-
stand is generally used in all parts of Italy, their forks
for the most part being made of yron, steel, and
some of silver, but those are used only by gentlemen.
The reason of their curiosity is, because the Italian
cannot by any means endure to have his dish touch-
éd with fingers, seeing all men's fingers are not alike
clean. Hereupon myself thought good to imitate
the Italian fashion by this forked cutting of meat,
not only while I was in Italy, but also in Germany,
and often times in England since I came home: be-
ing once quipped for that frequently using my fork, by
a certain learned gentleman, a familiar friend of mine,
Mr Lawrence Whittaker; who in his merry humour
 doubted not to call me a table servefer, only for using
a fork at feasting, but for no other cause.”

FORLI, an ancient and considerable town of Italy,
capital of a territory of the same name, in
Romagna, with a bishop's see. The public structures are
very handsome; and it is seated in a fertile, healthy,
and pleasant country, 10 miles south-east of Faenza,
and 45 north-east of Florence. E. Long. 12. i. N.
Lat. 44. 28.

FORLORN-Hope, in the military art, signifies men
detached from several regiments, or otherwise appoin-
ted, to make the first attack in day of battle; or at a
sieve, to storm the countercarp, mount the breach, or
the like. They are so called from the great danger
they are unavoidably exposed to; but the word is old,
and begins to be obsolete.

FORM, in Physics, denotes the manner of being
peculiar to every body; or that which constitutes it a
particular body, and distinguishes it from every
other.

Mr Harris uses the term form likewise in another
sense, as an efficient animating principle; to which he
supposes Ovid to refer in the first lines of his Metamor-
phoses.

In nova fert animus mutatas dicere formas,
Corpora.

These animating forms are of themselves no objects
either of the ear or of the eye; but their nature or
character is understood in this, that were they never to
exert their proper energies on their proper subjects,
the marble on which the sculptor exercises his art
would remain for ever shapeless, and the harp from
which the harper calls forth sounds would remain for
ever silent.

Thus also, the animating form of a natural body
is neither its organization nor its figure, nor any other
of those inferior forms which make up the system of
its visible qualities: but it is the power, which is yet
able to produce, preserve, and employ these. It is the
power, which first moves, and then conducts that la-
tent process, by which the acorn becomes an oak, and
the embryo becomes a man; by which digestion is
performed in plants and animals, and, which depart-
ing, the body ceases to live, and its members putrify:
and by which every being produces another like itself,
and every species is continued. In animals, it is that
higher faculty, which, by employing the organs of
sense, peculiar to them as animals, distinguishes them
as sensitive beings from vegetables; and it is also that
more noble faculty, which by its own divine vigour,
unassisted perhaps with organs, makes and denominates
him a being intellectual and rational. So that Mr
Harris reckons two sorts of forms, those which are
passive elements, and those which are efficient causes.
And all of them agree in this, that they give to every
being its peculiar and distinctive character: and on the
whole he concludes, that form appears in part to be an
element, and in part an efficient cause, i. e. a cause
which associates the constituent elements of natural
substances, and which employs them, when associated;
according to their various and peculiar characters.

The philosophers generally allow two principles of
bodies: matter, as the common basis or substratum of
all; and form, as that which specifies and distinguishes
each; and which added to a quantity of common mat-
ter, determines or denominates it this or that; wood, or
fire, or ashes, &c.

Substantial forms seem to have been first broached by
the followers of Aristotle, who thought matter, under
different modes or modifications, not sufficient to con-
stitute different bodies; but that something substantial
was necessary to set them at a greater distance: and
thus introduced substantial forms, on the footing of
souls, which specify and distinguish animals. What
led to this erroneous notion were the circumstances of
life and death: For observing, that, as soon as the
soul was departed out of a man, all motion, respira-
tion, nutrition, &c. immediately ceased, they conclu-
ded, that all these functions depended on the soul,
and consequently that the soul was the form of the
animal body, or that constituted it such: that the
soul was a substance, independent of matter, no
body doubted; and hence the forms of other bodies
were concluded equally substantial. But to this it is
answered, that though the soul be that by which a
man is man, and consequently is the form of the hu-
man body, as human; yet it does not follow, that it
is properly the form of this body of ours, as it is a
body; nor of the several parts thereof, considered as
distinct from each other: For those several parts have
their proper forms so closely connected with their mat-
ter, that it remains inseparable therefrom long after
the soul has quitted the body; thus flesh has the form
of flesh, bone of bone, &c. long after the soul is
removed as well as before. The truth is, the body does
not become incapable of performing its accustomed
functions because the soul has deserted it; but the soul
takes its leave, because the body is not in a condition
to perform its functions.

The ancient and modern corpuscular philosophers,
therefore, with the Cartesians, exclude the notion of
substantial forms; and show, by many arguments, that
his possessing the former, he was employed as mediator betwixt Pope Julius II. and Louis XII. of France, who were at that time at variance; and he happily succeeded in conciliating the difference. Having taken leave of the Pope, he passed through France on his return home, where he was kindly received by the king and queen, who bestowed upon him the bishopric of Bourges in France, which annually brought him in 400 tons of wine, 10,000 francs of gold, and other smaller articles. Besides all this, he was most liberally rewarded by Pope Julius, who promoted him to the archbishopric of St. Andrew's, as has been already mentioned; conferred on him the two rich abbeys of Dunfermline and Aberbrothie; and made him his legate à latere. At that time, however, there were two other candidates for the archiepiscopal see. The learned Gavin Douglas, bishop of Dunkeld, having been nominated by the queen, had actually taken possession of it; but John Hepburn, a bold and factious man, having been preferred by the monks, drove out the officers of Gavin Douglas, and placed a strong garrison in the castle. So great was the power of this man, that when Forman was nominated by the Pope, no person could be found who durst proclaim the bulls for his election. At last Lord Home, at that time the most powerful nobleman in Scotland, was induced, by large promises, besides some gifts of great consequence, among which was the donation of the abbacy of Coldingham to his youngest brother David, to undertake the task. It was executed at Edinburgh and St. Andrew's; to which places Lord Home's brother went with 10,000 men; though the doing of it, contrary to Forman's inclination, proved a source of much trouble to that nobleman afterwards. The quarrel betwixt Hepburn and Forman, however, was at last terminated by the latter surrendering the bishopric of Moray, as well as some years revenue of the archbishopric itself; paying Hepburn also 3000 French crowns annually out of his ecclesiastical revenues. On the appointment of the duke of Albany to the regency, Hepburn endeavoured to undermine the prime minister's credit with that nobleman, by representing him as one who had in a manner collected all the money in the country, and who consequently might endanger the tranquility of the kingdom. These insinuations, however, were but little regarded by the regent; and Forman had the good fortune afterwards to make up a difference between him and the nobility, which was likely to be attended with much bloodshed. In 1517, the archbishop was appointed by the states one of the lords of the regency, on occasion of the duke of Albany's going to France. We have already mentioned his embassy to Pope Julius II. In M'Kenzie's Lives we are informed, that in the collection of the Letters of the Scottish Kings from the year 1505 till the year 1626, in the lawyers library, there is a letter from the pope to King James IV. wherein he not only highly commends Forman, but likewise promises that at the first creation of cardinals he should be made one. This letter is dated the 6th of May 1511: but the pope died before he had an opportunity of performing his promise. In the same collection there is a letter from the duke of Albany to Leo X. Julius's successor, wherein he presses the pope to advance him to the dignity of a cardinal promised him by his predecessor, and to continue him his legate à latere. Archbishop Forman died in 1521, and was buried at Dunfermline. Dempster says that he wrote a book against Luther, a book concerning the Stoic Philosophy, and a Collection out of the Decretals.

FORMATION, in Philosophy, an act whereby something is formed or produced. For the formation of the fetus in the womb, see ANATOMY, No. 109, 110.

FORMATION OF STONES. See STONE.

FORMATION OF METALS AND MINERALS. See METAL AND MINERAL.

FORMATION, in Grammar, signifies the manner of forming one word from another; thus, accountship is formed from accountant, and thus the last from account. FORMEDON, in Law, (breve de forma donationis), a writ that lies for a person who has a right to lands or tenements, by virtue of any entail, arising from the statute of Westm. 2 Ch. II.

This writ is of three kinds, viz. a descender, remainder, and reverter. Formedon in descender, lies where a tenant in tail infests a stranger, or is dispossessed and dies, and the heir may bring this writ to recover the lands. Formedon in remainder, lies where a man gives lands, &c. to a person in tail, and for the default of issue of his body, the remainder to another in tail: here if the tenant in tail die without issue, and a stranger abates and enters into the land, he in remainder shall have this writ. Formedon in reverter, lies where lands are entailed on certain persons and their issue, with remainder over for want of issue; and on that remainder failing, then to revert to the donor and his heirs; in this case, if the tenant in tail die without issue, and also he in remainder, the donor and his heirs, to whom the reversion returns, may have this writ for the recovery of the estate, though the same be alienated, &c.

FORMIE, or FORMIA, in Ancient Geography, a maritime town of the Adjectum or New Latium, to the south-east of Cajeta; built by the Laecdonianians, (Strabo) called originally Hormiae, on account of its commodious harbour. An ancient municipium. Formian, the people; who were admitted to the liberty of the city the very year in which Alexandria was built; but not to the right of suffrage till a long time after the second Punic war, (Livy). Formia at this day lies in ruins, near a place now called Mola.

FORMICA, the Ant, a genus of insects belonging to the order of hymenoptera. See ENTOMOLOGY Index.

The insects called white ants, which abound in Africa and the East Indies, belong to the genus termes, which see in ENTOMOLOGY Index.

FORMICA Leo, the Ant lion, so called from its devouring great numbers of ants. It is the catterpillar or worm of a fly much resembling the libellae or dragon flies; and feeds chiefly upon ants.

FORMING is used for the act of giving being or birth to any thing.

The word is also simply used for giving the figure to anything. The potter forms his vessels as he pleases. Geometry teaches how to form all kinds of figures.

It is likewise used for the producing of a thing; thus, the lineaments of the face began to be formed.
as much certainty as an European sportsman could with
a fusee. These people are very dirty in their manner
of eating. They have neither plates, dishes, nor spoons,
nor even the small sticks used in China. Whatever
they dress is placed on a plain board or mat, and
they make use of their fingers for conveying it to
their mouths. They eat flesh half raw; and provided
it has been only presented to the fire, it appears to
them excellent. Their beds are formed of fresh ga-
tered leaves. The men almost naked, and wear only
a piece of cloth which hangs from their girdle to their
knees. Those among them, who, according to the
judgment of the chiefs of the village, have borne away
the prize for agility in running, or dexterity in the
chase, obtain the honourable privilege of making on
their skin, by a very painful operation, several fantas-
tical figures of flowers, trees, and animals. All have
the right of blackening their teeth, and of wearing or-
naments of bracelets and crowns made of shells and
crystal.

The islanders who inhabit the northern part, where
the climate is somewhat colder, clothe themselves with
the skins of the stags which they kill in hunting. They
make a kind of dress of them without sleeves, that
pretty much resembles a dalmatic, or vestment worn
at the altar by the Roman clergy. They wear on
their heads caps in the form of a cylinder, made of
palm leaves, and ornamented with several crowns
placed one above another, on the top of which they
fix plumes composed of the feathers of a cock or
pheasant.

The marriage ceremonies of the inhabitants of For-
mosa approach near to the simple laws of nature. They
neither purchase, as in China, the women whom they
espouse, nor does interest ever preside over their uni-
ions. Fathers and mothers are scarcely ever consulted.
If a young man has a mind to marry, and has fixed his
affection on a young girl, he appears for several days
following near the place where she lives with a musical
instrument in his hand. If the young woman is satis-
fied with the figure of her gallant, she comes forth and
joins him: they then agree and settle the marriage
contract. After this, they give notice to their parents
who prepare a wedding dinner, which is always given
in the house where the young woman resides, and where
the bridegroom remains without returning again to his
father. The young man afterwards considers the house
of his father-in-law as his own. He becomes the
whole support of it, and he has no farther connection
with that of his father; like married women in Eu-
rope, who generally quit their paternal home in order
to live with their husbands. These islanders there-
fore seldom offer up vows for obtaining male chil-
dren: they prefer daughters, because they procure
them sons-in-law, who become their supports in old
age.

Although the Formosans are entirely subjected to
the Chinese, they still preserve some remains of their
ancient government. Each village chooses three or
four old men from among those who have the greatest
reputation for probity. By this choice they become
the rulers and judges of the rest of the hamlet. They
have the power of finally determining all differences;
and if any one should refuse to abide by their judg-
ment, he would be immediately banished from the vil-
lage, without hopes of ever being able to re-enter it,
and none of the inhabitants would afterwards dare to
receive him.

The natives pay in grain the tribute imposed on
them by the Chinese. To regulate every thing that
concerns the laying on and collecting of this impost,
government has established a Chinese in every village,
who is obliged to learn the language and act as inter-
preter to the mandarins. These interpreters are most
extortioners to the miserable people, whom they
ought rather to protect: they are such insatiable
leeches that they can scarcely ever be satisfied. This
daily and domestic tyranny has already caused the de-
struction of three villages in the southern part of the
island, where formerly there were twelve. The in-
habitants of these villages revolted, expelled their in-
terpreters, refused to pay tribute any longer to the Chi-
inese, and have united themselves to the independent nation
in the eastern part of the island.

It was in the island of Formosa that John Struy
affirms to have seen with his own eyes a man who had
a tail more than a foot in length, covered with red
hair, and greatly resembling that of an ox. This
man with a tail said, that his deformity, if it was one,
proceeded from the climate, and that all those of the
southern part of the island were born with tails like
his.—But John Struy is the only author who attests
the existence of this extraordinary race of men; no
other writer who has spoken of Formosa makes the
least mention of them. Another circumstance, no less
singular, and which appears to be little better authen-
ticated, is, that in this island women are not permit-
ted to bring forth children before they are 35, although
they are at liberty to marry long before that age.

Reckten* thus expresses himself concerning this
strange custom.

"When women are first married, they bring no chil-
dren into the world: they must, before that is permit-
ted, have attained the age of 35 or 37. When they
are big with child, their priestesses pay them a visit,
and tread on their bellies with their feet, if it be neces-
sary, and make them miscarry, with perhaps greater
pains than they would have in being brought to bed.
It would be not only a shame, but an enormous crime,
to bring forth a child before the time prescribed.
I have seen some females who had already destroyed
the fruit of their womb 15 or 16 times, and who were big
for the 17th when it was lawful for them to bring forth
a living child."

To our description of Formosa we shall add the fol-
lowing account of a dreadful disaster that befell this
unhappy island. The details were conveyed by a letter
from Peking, addressed to M. Bertin, and dated the 14th of July 1782.

"The waters of the ocean have well nigh deprived
China of one of its most valuable maritime posses-
sions. The island of Tay-oan, known in Europe by
the name of Formosa, has been almost swallowed up by
them. It has been reported here, that part of the
mountain which divides the island has sunk and dis-
appeared; that the rest has been overturned; and that
the greater part of the inhabitants have perished. Such
have been for some days the popular reports in this
capital. Government, however, has put a stop to them,
by informing the populace of the real truth; such as it
has been announced to the emperor by the officers who
have this small portion of his territories under their ju-
risdiction. I cannot do better than transcribe what they
have written. The dispatches of the Chinese officers,
addressed to the emperor, run thus:

"Bechen, governor-general of the province of Fok-
en and Tche-Kyang-yi, viceroy of Fokien, and others,
make known to your majesty the disaster
that has lately befallen the island of Tay-ouan.
Monta-ho, and other principal officers of this island, have
acquainted us, that on the 21st of the fourth moon
(May 22, 1782), a most furious wind, accompanied
with heavy rain and a swell of the sea greater than ever
remembered, had kept them under continual apprehen-
sion of being swallowed up by the waves, or buried in
the bowels of the earth, from the hour of yu until
the hour ousi (A). This dreadful tempest seemed to blow
at the same time from the four cardinal points of the
compass, and continued with equal violence during the
above-mentioned time. The buildings where the tri-
əuans were held, the public granaries, the barracks,
salt warehouses, and works, have been totally destroy-
ed, and every thing they contained is lost: warehouses
and workshops, as well as private houses, for the most
part, present nothing but ruins and heaps of rubbish.
Of 27 ships of war which were in the harbour, 12 have
disappeared; two others have been dashed to pieces,
and 10 are scattered in such a manner that they are
rendered entirely unfit for service; other smaller ves-
sels of different sizes, above 100 in number, have
shared the same fate; eighty have been swallowed up;
five others, which had just taken in a lading of rice
for Fokien, have sunk, and their cargoes, which
amounted to 100,000 bushels, are wholly lost. With
regard to other vessels, whether small or great, which
had not entered the harbour, 10 or 12 of the largest
are reckoned to have been swallowed up; those of in-
sferior size, as well as a prodigious number of barks,
boats, and other small vessels of different kinds, have
disappeared, without leaving the least piece of stock
behind them. As the whole island has been covered
with water, the provisions have been either swept
away, or spoilt so as to render them prejudicial to the
health of those who use them in their present state.
The crops are entirely lost. When we shall have
been informed of particulars, we shall not fail to give
your majesty the earliest intelligence of them.—After
having received this letter from Mon-ha-ho, and the
other principal officers residing at Tay-ouan, I em-
ployed the utmost diligence to give every assistance
in my power to this unfortunate island; and I or-
dered the travelling commissary, and Trey-oer, ge-
eral of the province, to get particular information
of the number of those who have perished, of the
houses destroyed, and of the quantity of salt and other
provisions that has been lost: I have likewise enjoined
them to rebuild with the utmost expedition the tribu-
als, granaries, and other public edifices; to dispatch
proper persons to search for the vessels and ships that
have disappeared; to repair those which are not alto-
gether unfit for service, and to send immediately to the
neighbouring countries for salt and other necessary pro-
ishions: but above all, to ascertain in the most accurate
manner the different losses sustained by the inhabitants,
and the precise number of people that have perished, in
order that I may be able to give the fullest information
to your majesty."

The emperor of China caused a particular detail of
these losses to be published, together with the following
letter:

"Tchang-yu, &c. Tchem-hoei-Thon-Tsong-tou of
Fokien, and others, have informed me of the dismal
event that hath taken place in the island of Tay-ouan,
which is a district of the province of Fokien. They
have written to me, that on the 21st of the fourth
moon—[Here the emperor repeats what is contained
in the preceding letter, and continues thus]. I com-
mand Tsong-tou to get the best information he can of
the different losses sustained by the inhabitants of the
island, and to transmit the particulars to me, in or-
der that I may give them every assistance to repair them.
My intention is, that all the houses which have been
thrown down shall be rebuilt entirely at my expence;
that those be repaired which are only damaged; and
that provisions, and every thing which the people
stand in immediate want of, be supplied them. I
should feel much pain, were even one among them to
be neglected: I therefore recommend the utmost dili-
gence and strictest inquiry, as I am desirous that none
of my subjects should entertain the least doubt of the
tender affection which I have for them; and that they
should know that they are all under my eyes, and
that I myself will provide for their wants. With
regard to my ships of war, tribunals, and public ed-
ifices, let them be restored to their former state with
money taken from the public treasury, and let the
general account of the whole expence be laid before
me."

The missionary who sent this account farther says,
From these letters it evidently appears, that this dis-
aster happened in consequence of an earthquake; but
he adds, that the volcano which occasioned it must be
at a prodigious depth below the sea. He does not pre-
tend to give an explanation of it; he is contented with
observing, that the same scene seems to have passed on
the island of Formosa as at Lima and Lisbon.

FORMULA, or FORMULARY, a rule or model, or
 certain terms prescribed or decreed by authority, for
 the form and manner of an act, instrument, proceeding,
or the like.

FORMULA, in Church History and Theology, sig-
nifies a profession of faith.

FORMULA, in Medicine, imports the constitution of
 medicines, either simple or compound, both with re-
spect to their prescription and consistence.

FORMULA, a theorem or general rule, or expression,
for solving certain particular cases of some problem, &c.

\[ \frac{1}{2} + \frac{1}{2} = \frac{1}{2} \]

so \( \frac{1}{2} + \frac{1}{2} \) is a general formula for the greater of
two.

(A) The hours of the Chinese are double ours: the hour yu begins at three in the morning, and ends at five; ousi begins at three in the afternoon and ends at five.
cording as the ground requires. Some are fortified with bastions, others with demibastions. Some again are in form of a square, others of a pentagon. A fort differs from a citadel, as this last is built to command some town.

Royal Fort, is one whose line of defence is at least 26 fathoms longs.

Sicilian Fort, is a scone or redoubt, constituted by re-entering and salient angles, having commonly from five to eight points, and the sides flanking each other.

Vitrified Forts, a very singular kind of structures found in the highlands and northern parts of Scotland, in which the walls have the appearance of being melted into a solid mass, so as to resemble the lava of a volcano, for which indeed they have been taken by several persons who have visited them.

These walls were taken notice of by Mr Williams an engineer, who wrote a treatise upon the subject, and was the first who supposed them to be works of art; other naturalists having attributed them to a volcanic origin. These works are commonly situated on the tops of small hills, commanding an extensive view of the adjacent valley or low country. The area on the summit, varying as is supposed, according to the number of cattle the proprietor had to protect, or the dependants he was obliged to accommodate, is surrounded with a high and strong wall, of which the stones are melted, most of them entirely; while others, in which the fusion has not been so complete, are sunk in the vitrified matter in such a manner as to be quite enclosed with it; and in some places the fusion has been so perfect, that the ruins appear like masses of glass.

Mr Williams has not only absolutely determined the walls in question to be the works of art, but has even hazarded a conjecture as to the manner in which they were constructed, and which, according to him, was as follows. Two parallel dikes of earth or sod being raised, in the direction of the intended wall, with a space between them sufficient for its thickness, the fuel was put in, and set on fire. The stones best adapted for the purpose, called the plum-pudding stone, are everywhere to be found in the neighbourhood. These were laid on the fuel, and when melted, were kept by the frame of earth from running off; and by repeating the operation, the wall was raised to a sufficient height. This opinion of the stones being thrown in without any order, is thought to be confirmed by the circumstance of there not being anywhere a large one to be seen, nor a stone laid in any particular direction, nor one piece which has not in some degree been affected by the fire. Mr Williams mentions a fact tending to confirm his hypothesis, viz. of a brick-kiln situated on the declivity of an eminence, so as to be exposed to the wind, which happening to rise briskly one time when the kiln was burning, so increased the heat, that the bricks were melted, and ran, like a lava, for a considerable way down the hill.

The opinion of Mr Williams has been embraced by several other authors, particularly Mr Freebairn and Mr Anderson, the latter having published two treatises upon these buildings in the Archæologia. In the same work, however, we meet with a paper by the Hon. Denis Harrington, in which the author expresses quite different sentiments. He observes, that Mr Williams, and the other antiquarians, who suppose the walls in question to be works of art, imagine that the reason of their being constructed in this manner was the ignorance of cement, which in these remote ages prevailed in Scotland: but with respect to this circumstance, he says, that if one side of the wall only was heated, and that to any considerable height, the matter in fusion would in all likelihood drop down to the bottom, without operating as any cement to the loose stones thrown amongst it. This circumstance of the walls being vitrified only on one side, is indeed remarkable, and takes place in most of the forts of this kind, to be met with at present; but with regard to it, Mr Barrington observes, that he himself has been twice in the Highlands of Scotland, and has found very few hills of any height which were clothed with wood; the trouble therefore of carrying it up to the top of such a mountain would be very considerable. But to this it might easily be replied, that we cannot by any means argue from the present state of the hills in the Highlands to their state in a very remote period of antiquity. At that time, it is neither impossible, nor in the least improbable, that most of the hills in Scotland were overgrown with wood; or at any rate, there undoubtedly was plenty of peat, which is still used as fuel in Scotland, and which affords such a strong heat as to be advantageously employed in smelting iron, as we are informed by M. Magellan. A third particular mentioned by Mr Williams is, that these enclosures were intended as places of defence; and in support of this opinion he alleges, that there are dried wells found within most of them. But on this Mr Barrington observes, that shelter from the weather was also necessary, "upon the top of a bleak Scotch hill, whilst thirsty (or a succedaneum for it) would be often in greater request than the bare element of water."

This objection, however, as well as the last, is evidently very frivolous; for these buildings might have roofs as well as any other; and whatever necessity there might be for whisky occasionally, water was certainly an indispensable requisite.

Mr Barrington having thus given his reasons for dissenting from the opinion of Mr Williams and the antiquaries just mentioned, proceeds to state his own. He tells us, that having travelled for 27 years the most mountainous circuit in Wales, he has frequently observed enclosures of dry stones, particularly a long tract in the western part of Merionethshire, called in the language of the country Duffryn, i.e. the vale. On first viewing these small enclosures made with walls of thick stones, he was at a loss to imagine how it could be worth while to construct such strong fences for so inconsiderable a piece of ground as they enclosed; but, on examining the adjacent country, he found it almost entirely covered with stones of a similar kind; and, of consequence, the smaller the space to be cleared, the less expensive would be the removal. "For the same reason (says he), such dry walls are often of a great thickness, and sometimes the corners of the enclosures are filled with stones to a great width, this being the only possible means of procuring pasture." To a practice of the same kind our author would assign the origin of the works in question; but the objection occurs very strongly, that the walls in Scotland are vitrified, and it is not to be supposed that such trouble would
Vitrified extremity of it, which have evidently been guided by art into that position; it being impossible that they could have rested there, had they been rolled down from the higher parts. The obvious reason for placing them in such a position has been, that on an alarm of danger they might be projected into the path below, which could be done by the efforts of a very few men: and when this was done, the passage would be entirely obstructed, or at least rendered so difficult that it could be defended by a few against any number of assailants. Some other large stones are placed on an eminence to the left, probably with a view to block up a hollow channel, by which an enemy might have attempted to ascend. When we come to the top of the hill, a few feet below the rampart which crowns the whole, there appears an outward wall, approaching on the sides of the hill so near the upper rampart, as to have only a trench of 10 or 12 feet wide between them. This outward wall is in some places so low as to be almost level with the rock, though in other places it rises to the height of two or three feet; but the whole is covered with a line of vitrified matter sticking fast to the rock all along, and nearly of the same breadth, which is about nine feet. The remains of this wall are strongly vitrified, except in one place on the north side, where, for about 70 yards, the rampart is formed only of dry stones and earth. At the east side, where the hill is more accessible, there is a prodigious mound of vitrified matter, extending itself to the thickness of about 40 feet. At the southeast corner, and adjoining to this immense mound is an outwork, consisting of two semicircular vitrified walls, with a narrow pass cut through them in the middle; which appears to have been another, and perhaps the principal entry to the fort.

The inner wall, surrounding the summit of the hill, encloses an oblong area of about 75 yards long and 30 broad, rounded at each of the ends like the outward wall. It is of considerable height, and nearly of the same thickness with the outward one. It has some appearance of having been defended with four turrets or bastions: but the traces are so imperfect, that Mr Tytler does not lay much stress on his observations in this respect; a number of small tumuli of earth, with a stone in the centre, were more discernible. On the east side a portion of the internal space appears separated from the rest by two ranges of stones fixed strongly in the earth, and forming a right-angled parallelogram. "This separation (says our author) is immediately discernible by the eye, from this circumstance, that the whole of the enclosed summit has been most carefully cleared from stones, of which there is not one to be seen, unless those that form this division, and the single one in the middle of the circle of tumuli above mentioned. What has been the design of this separated space, it is difficult to conjecture. It might perhaps have marked the residence of those of a higher rank, or served as a temple for the purposes of devotion." On the east end of the large area on the summit is a well of about six feet in diameter, which has probably been sunk very deep in the rock, though now it is filled up with rubbish to within a yard of the top.

The other fortified hills mentioned by Mr Cardnell are those of Dun-Evan in the shire of Nairn; Tor-
ent doubt, that the vitrified materials on the tops of these hills were the vestiges of works of art, and the remains of structures reared for the purposes of security and defence. The bishop of Derry, when on a tour to the north of Scotland, visited the hill of Craig Phadrick near Inverness, and expressed his opinion, that the mounds of vitrified matter were not the remains of any artificial work, but the traces of an ancient volcano. In the Phil. Trans. of the Royal Society of London for 1777, Part II. No. 20, is an account of Creeck Foterick, there termed a Volcanic hill near Inverness, in a letter from Thomas West, Esq. to Mr. Law, F. R. S. in which the writer does not hesitate to pronounce this hill an extinguished volcano; and having sent specimens of the burnt matter for the inspection of the Royal Society, the secretary subjoins a note to the paper, intimating, that these specimens having been examined by some of the members well acquainted with volcanic productions, were by them judged to be real lava. Such was likewise the opinion of the late Andrew Crosbie, Esq. who, in an account which he gave to the Philosophical Society of Edinburgh in 1785, offered some very curious conjectures with regard to the process of nature, by which he supposed the whole of this hill to have been thrown up from the bottom of the sea by the operation of intestine fire.

Mr. Tytler agrees with those who think the vitrified structures to be artificial works; but he differs from Mr. Williams and others, who think that they were vitrified on purpose for cementing the materials together. His reason for this is, that the number of forts that show marks of vitrification, is considerable when compared with those that do not. He therefore considers the vitrification as accidental; and that it must have been accomplished in the following manner. In the rude state in which we must suppose Scotland to have been in early times, it is very probable that their buildings, both for habitation and defence, would be frequently constructed of loose stones of an irregular shape; of which, by themselves, it would scarcely be possible to fabricate a wall of any tolerable strength. Hence it became necessary to use wood as well as stone in their construction. This kind of building, then, in our author's opinion, was begun by raising a double row of palisades or strong stakes in the form of the intended structure, in the same way as in that ancient mode of building described by Palladio under the name of riempriato à cossa, or coffer-work. These stakes were probably warped across by boughs of trees laid very closely together, so as to form two fences running parallel to each other at the distance of some feet, and so close as to confine all the materials of whatever size that were thrown in between them. Into this intermediate space, Mr. Tytler supposes, were thrown boughs and trunks of trees, earth and stones of all sizes, large or small as they could quarry or collect them. Very little care would be necessary in the disposition of these materials, as the outward fence would keep the mound in form. In this way it is easy to conceive that a very strong bulwark might be reared with great dispatch; which, joined to the natural advantages of a very inaccessible situation, and that improved by artful contrivances for increasing the difficulty of access, would form a structure capable of answering every purpose of security or defence. The most formidable attack against such a building would be fire, which would no doubt be always attempted, and often with success, by an enemy who undertook the siege. If the besiegers prevailed in gaining an approach to the ramparts, and surrounding the external wall, set fire to it in several places, the configuration must speedily have become universal, and the effect may be easily imagined. If there happened to be any wind at the time to increase the heat, the stony parts could not fail to come into fusion; and as the wood burnt away, sinking by their own weight into a solid mass, there would remain a wreck of vitrified matter tracking the spot where the ancient rampart had stood; irregular, and of unequal height, from the fortuitous and unequal distribution of the stony materials of which it had been composed. This conjecture appears very probable from their appearance at this day. They do not seem to have ever been much higher than they are at present, as the fragments that have fallen from them, even where the wall is lowest, are very inconspicuous. The durable nature of the materials would prevent them from suffering any changes by time; though from the gradual increase of the soil, they must in some places have lost considerably of their apparent height, and in others been quite covered. Mr. Williams, in making a cut through the ramparts at Knockfarril, found in many places the vitrified matter covered with peat moss half a foot thick.

In confirmation of this opinion, our author likewise urges that in the fortification on Craig Phadrick, a large portion of the outward rampart bears no marks of vitrification. The reason of this seems to be, that the steepness of the hill on that side renders a low fence of stones and turf sufficient; and no wood had probably been employed in its construction. "It appears therefore highly probable (concludes our author), that the effect of fire upon these hill fortifications has been entirely accidental; or to speak more properly, that fire has been employed not in the construction, but towards the demolition of such buildings: and for the latter purpose it would certainly prove much more effectual than for the former. It is much to be doubted, whether it would be all possible, even in the present day, by the utmost combination of labour and of skill, to surround a large space of ground with a double rampart of stones compacted by fire, of such height and solidity as to answer any purpose of security, or defence against an enemy. Any structure of this kind must have been irregular, low, fragile, easily scaled, and quite insecure; a much weaker rampart, in short, than a simple wall of turf or wooden palisade. The vestiges yet remaining, as I have already observed, give no room to suppose that the vitrified mound has ever been much more entire than it is at present. The effect of fire upon structures reared in the manner I have supposed them to have been, will account most perfectly for their present appearance. It was from necessity that the builders of these fortifications betook themselves to a mode of structure so liable to be destroyed by fire. In those parts where stones could be easily quarried, of such size and form as to rear a rampart by themselves of sufficient strength and solidity, there was no occasion to employ wood or turf in its construction; and it was therefore proof against all asauls
In the paper already quoted, Mr Tytler observes, that "these ancient fortifications present a more curious and interesting object of speculation, than those uncertain and indeed fruitless conjectures as to the mode in which they have been raised." This, he justly observes, must have been before the use of mortar was known; for as the country abounded in limestone, and the builders certainly would exert all their powers in giving them a proper degree of strength, it would undoubtedly have been used. Hence we must ascribe to these a very considerable degree of antiquity; for as the Britons were taught the use of mortar by the Romans, it is probable that we must date the origin of the structures in question before the time of the invasion of that people, or at least soon after it: so that we must look upon them to be more than 1650 years old; but how far beyond that period we are to search for their origin, does not appear. "All that we can conclude with certainty (says our author) is, that they belong to a period of extreme barbarism. They must have been constructed by a people scarcely removed from the state of savages, who lived under no impression of fixed or regulated property in land; whose only appropriated goods were their cattle; and whose sole security, in a life of constant depredation, was the retreat to the summits of those hills of difficult access, which they had fortified in the best manner they could. As the space enclosed was incapable of containing a great number of men, especially if occupied in part by cattle, it is presumed that these retreats were formed chiefly for the security of the women and children of the canton, and of their herds. They could be defended by a few men, while the rest of the tribe were engaged with their enemies in the field."

Our author concludes his dissertation with a conjecture, that the forts in question were constructed, not only before the Roman invasion, but before the introduction of the rites of the Druids into Britain.

FORTALICE, in Scotts Law, signifies anciently a small place of strength, originally built for the defence of the country; and which on that account was formerly reckoned \textit{inter regalia}, and did not go along with the lands upon which it was situated without a special grant from the crown. Now, fortalices are carried by a general grant of the lands; and the word is become synonymous with manor-place, messuage, &c.

FORTAVENTURA, one of the Canary islands, 50 miles long, and from 8 to 24 broad, fertile in corn and excellent fruits; and remarkable for its numerous breed of goats and prodigious quantity of goat-milk cheese. The number of inhabitants amounts to 100,000.


FORTESCUE, SIR JOHN, lord chief justice of the King's Bench, and lord high chancellor of England, in the reign of King Henry VI. was descended from the ancient family of Fortescue, in the county of Devon. He studied the municipal laws of England in Lincoln's Inn, of which he was made one of the governors in the fourth and seventh years of the reign of King Henry VI. In 1430, he was called to the degree of a serjeant at law, and in 1441 was constituted the king's serjeant. The following year he was made lord chief justice of the King's Bench; in which honourable station he continued till near the end of that king's reign, who, showed him many particular marks of his favour, and advanced him to the post of lord high chancellor of England. During the reign of King Edward IV., he followed the fortunes of the house of Lancaster, and was many years in exile with Queen Margaret and Prince Edward her son. At length they having a prospect of retrieving their desperate fortunes, the queen and prince returned to England, and Sir John Fortescue, with many others, accompanied them; but soon after the decisive battle of Tewkesbury, he was cast into prison and attained, with other Lancastrians; but found means to procure his pardon from Edward IV. He wrote, 1. A learned commentary on the politic laws of England, for the use of Prince Edward; to one edition of which Mr Selden wrote notes. 2. The difference between an absolute and limited monarchy, as it more particularly regards the English constitution (which was published, with some remarks, by John Fortescue, afterwards Lord Fortescue, in 8vo, in 1714; and a second edition was published with amendments, in 1729); And several works, which still remain in manuscript. He died near 90 years of age; and was buried in the parish church of Ebberton, where a monument was erected to his memory, in 1677, by one of his descendants.

FORTH, one of the most noble and commodious rivers in Scotland. It takes its rise near the bottom of Ben Lomond; and running from west to east, receives in its passage many considerable streams, deriving their waters from the eminences in the midland counties of North Britain. Between Stirling and Alloa, the Forth winds in a most beautiful and surprising manner; so that, though it is but four miles by land, it is 24 by water between those two places. Below Alloa the river expands itself to a great breadth between the counties of Lothian and Fife, till at Queensferry it is contracted by promontories shooting into it from both coasts; so that, from being four or five, there it is not above two miles broad. In the middle of the channel lies a small island called Inchgarve, which has a spring of fresh water: upon the island there is an ancient fort, which has been lately repaired; and if there were either forts or blockhouses on the opposite promontories, that part of the river which lies between Alloa and Queensferry would be as secure and convenient a harbour as could be desired. A little below this, the near shore lies Inchcolm, on which are the remains of an ancient monastery of considerable extent; and opposite to Leith stands the island of Inchkeith, formerly fortified, but now furnished with a light-house. Below Queensferry the north and south shores receding, the body of the water gradually enlarges till it becomes two or three leagues broad, affording several safe harbours on both sides, and excellent roads throughout, unembarrassed with latent rocks, shoals, or sands; and allowing secure anchorage to the largest ships within a league of the coast in almost any part of the Firth, and to vessels of a smaller size within a mile or less. The Firth, or (as it is commonly written) the Frith, of Forth, is, at the mouth of it, from North Berwick to Fife Ness, full five leagues broad; having the little island of May (on which there is a light-house, and there might also be a fort) in the middle of it, and to the west of this the rocky island of Bass; notwithstanding...
standing which, the largest fleet may enter and sail up it many miles with the utmost facility and in the greatest safety. In 1781, Admiral Parker's fleet lay some weeks opposite to Edinburgh, accompanied by 500 sail of merchantmen, the whole in view of the city and castle.

The Forth was known to the ancients by the name of Bodecia, or (as Ptolemy calls it) Boteria, and has been ever famous for the number of its havens: some of which are, indeed, in their present condition, scarce worthy of that name. It is navigable for merchantmen as high as Alloa, 50 miles from the sea; and for coasters as far as Stirling, 24 miles further by water, though only four by land in a direct line, as already observed. The tide flows only a full mile above Stirling to a place called Craigforth, where the proprietor intercepts the passage of the salmon by a sluice or weir, very injurious to the large tract of country which stretches as far as Lochend westward. The river from Stirling to the bridge of Aberfoyle, at the entrance into the West Highlands, is only passable for man or horse at few places, and these in dry seasons. It glides gently through a dead flat, from Gartmore eastward; and on these accounts (says Mr Knox) it might be made navigable for barges, at a trilling expense to the proprietors of the lands, an improvement much wanted in a rich, extensive, and populous valley, without market towns, coal and lime. Supposing this work to be executed, of which there is some probability, the whole extent of navigation on the Forth, will, including all its windings, exceed 200 miles, through a coast of nearly 100 miles; fertile, populous, industrious; and from Stirling eastward, almost lined with towns, anciently the seats of commerce and navigation, till they were ruined by the English depredations; in which miserable state some of them still remain, while others begin to resume the appearance of business. The principal object of these towns was the fisheries; which they prosecuted with great vigour as far as Iceland, till the time of the Union, from which period the eastern fisheries gradually dwindled away; and the poor fishermen, unable to subsist themselves upon air and water, took up the trade of smuggling; but so soon as the fishery laws shall be amended, the salt duties abolished, and an adequate bounty extended to boats as well as busses, these people will readily fall into the track of their ancestors, live by honest industry, and add new vigour to our naval strength. Many of the ports are nearly choked up, others want repairs, which neither the individuals nor the corporations of those decayed places can accomplish. Though the harbours on the Forth are in general small, the depth of water might be made sufficient for vessels of 200 tons burden, which fully answer the purposes of their coasting and Baltic trade; but to obtain this, or even a less depth of water, an aid of 30,000l. would be requisite.

By this river and the Clyde, Scotland is almost divided into two parts. The Forth falls into the east sea below Edinburgh, and has an easy communication with the whole eastern coast of Great Britain; with France, Ostend, Holland, Hamborough, Prussia, Danzig, Russia, Sweden, Denmark, Norway, and Greenland. The Clyde falls into the Atlantic ocean below Glasgow, and communicates with the western coast of Great Britain; with Ireland, the south of France, Portugal, Spain, the Mediterranean, America, and the West Indies. These two rivers, thus falling in opposite directions into the two seas which envelop our island, and the neck of land between them amounting scarcely to 24 miles, gave rise to the idea of a junction, so as to open a communication across the kingdom, and thereby cut off the long dangerous navigation by the Land's End, and the Pentland Frith: an object of vast utility, and which has been happily accomplished. See Canal.

FORTIFICATION;

THE art of fortifying a town, or other place; or of putting it in such a posture of defence, that every one of its parts defends, and is defended by, some other parts, by means of ramparts, parapets, moats, and other bulwarks; to the end that a small number of men within may be able to defend themselves for a considerable time against the assaults of a numerous army without, so that the enemy in attacking them must of necessity suffer great loss.

The origin and rise of fortification is undoubtedly owing to the degeneracy of mankind. In the first ages of the world, men were dispersed up and down the countries in separate families, as we are told in the histories of the Jews and Scythians, who wandered from one place to another, for the sake of finding pasture for their cattle. These families became in time so numerous as to form large communities, which settled all together in a place; from whence villages and towns had their origin and rise: but they found it was necessary, for the common security, to surround these towns with walls and ditches, to prevent all violences from their neighbours, and sudden surprises. This was sufficient for some time, till offensive weapons were invented, and conquering became a fashion. Then walls with loop holes were made at proper distances, in order to screen the defenders against the arrows of the assailants: but finding that, as soon as the enemy got once close to the walls, they could from no part be discovered or repulsed; for this reason they added square towers at proper distances from each other, so that every part of the wall might be defended, by the adjacent sides of the towers. This manner of enclosing towns, however, was found to be imperfect, because there remained still one of the faces of the towers which Fronted the field that could not be seen from any other point, and therefore could not be defended. To remedy this, they made the towers round instead of square, imagining this figure to be the strongest to resist the battering engines, as likewise to be better defended from the other parts of the wall.

Notwithstanding the superiority of this method above the former, there remained yet a part of these
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whose point turns towards the place a re-entering angle, such as $A$, $X$, $N$.

15. If there be drawn two lines parallel to the principal or outline, the one at 3 toises distance, and the other at 8 from it; then the space $y x$ included between the principal one and that farthest distant, is called the rampart.

And the space $x z$, contained by the principal line, and that near to it, and which is generally stained black, is called the parapet.

16. There is a fine line drawn within four feet of the parapet, which expresses a step called banquette.

N. B. All works have a parapet of three toises thick, and a rampart of 8 to 10, besides their slopes. The rampart is elevated more or less above the level of the place, from 10 to 20 feet, according to the nature of the ground and the particular constructions of engineers.

The parapet is a part of the rampart elevated from 6 to 7½ feet above the rest, in order to cover the troops which are drawn up there from the fire of the enemy in a siege; and the banquette is two or three feet higher than the rampart, or about four feet lower than the parapet; so that when the troops stand upon it they may just be able to fire over the parapet.

17. The body of the place, is all that which is contained within this first rampart: for which reason it is often said to construct the body of the place; which means properly, the construction of the bastions and curtains.

18. All the works which are constructed beyond the ditch before the body of the place are called outworks.

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<td>Cape of ravel.</td>
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In the first vertical column are the numbers expressing the lengths of the exterior sides from 80 to 260. In the second, the perpendiculars answering to these sides. In the third, the lengths of the faces of bastions: and in the fourth, the lengths of the capitals of the ravelins.

The forts are mostly, if not always, squares: for which reason, the perpendiculars are made one-eighth of the exterior sides; because if they were more, the gorges of the bastions would become too narrow.

The little fortification is chiefly designed for citadels, and are commonly pentagons; the perpendiculars are made one-seventh of the exterior side: the mean is used in all kinds of fortifications from an hexagon upwards to any number of sides; and the great is seldom used but in an irregular fortification, where there are some sides that cannot be made less without much expense, or in a town which lies near a great river, where the side next the river is made from 200 to 260 toises; and as that side is less exposed to be attacked than any other, the perpendicular is made shorter, which saves much expense.

The faces of the bastions are all ⅔ of the exterior sides, or nearly so, because the fractions are neglected.

It may be observed in general, that in all squares the perpendicular is ⅓ of the exterior side, and all pentagons ⅔, and in all the rest upward ⅔.

1. Construction of Orillons and retired Flanks.

Describe the front $MPQRST$ as before, and divide the flank into three equal parts, of which suppose $SR$ to be one: from the opposite flanked angle $M$, draw a line $MN$, in which take the part $m r$ of 5 toises; take likewise $RN$ in the line of defence $MR$, produced, equal to 5 toises, and join $nm$, upon which as a base describe the equilateral triangle $mpm$, and from the angle $p$, opposite to the base as centre, is described the circular flank $nm$.

And if $SR$ be bisected by the perpendicular $1, 2$, and another be erected upon the face $ST$, at $S$; the intersection $2$ of these two perpendiculars will be the centre of the arc which forms the orillon.

The orillons are very useful in covering the retired flanks, which cannot be seen but directly in the front; and as these orillons are round, they cannot be so easily destroyed as they would be if they were of any other figure.

2. Construction of Ravelins or Half-moons.

Fig. 2. Set off 55 toises, from the re-entering angle $O$ of the counterscarp, on the capital $LO$, or on the perpendicular produced, and from the point $L$ draw lines to the shoulders $AB$: whose parts $LM$, $LN$, terminated by the counterscarp, will be the faces, and $MO$, $ON$, the semi-gorges, of the ravelin required.

This is M. Vauban's method of constructing ravelins, according to some authors: and others will have the faces of the ravelin to terminate on those of the bastions within 3 toises of the shoulders; which seems to be the best way, for these ravelins cover the flanks much better than the others.

The ditch before the ravelin is 12 toises, its counterscarp parallel to the faces of the ravelins; and it is made in a circular arc, before the salient angle; as likewise all ditches are in general.

When the ravelins are made with flanks, as in fig. 3, the faces should terminate on those of the bastions, at least 5 toises from the shoulders.

The flanks are made by setting off 10 toises from the extremities of the faces, from $f$ to $h$, and from $m$ to $i'$; and from the points $h, i$, the flanks $h, k, l, m, p$, are drawn parallel to the capital $LO$ of the ravelin.
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in fig. 2. its salient angle E is 50 toises from the salient angle of the ravelin 10 toises as before.
The ditch before the counterguards is 12 toises, and its countergaurd parallel to the faces.
Counterguards are made before the ravelin on some particular occasions only; but are frequently constructed before the bastions, as covering the flanks wonderfully well. Some authors, as Mr Blondel and Mr Coehorn, will have them much narrower than they are here.


Fig. 11.

Fig. 12. Produce the capital of the ravelin beyond the salient angle A, at a distance AB of about 80 toises; draw DBE at right angles to AB; in which take BD, BE, each equal to 55 toises; and on the exterior side DE, trace a front of a polygon in the same manner as that of the body of the place, making the perpendicular BE 10 toises, and the faces 30.
The branches DA, EA, of the hornwork, when produced, terminate on the faces of the bastions, within 5 toises of the shoulders. The ditch of the hornwork is 12 toises, and its countergaurd parallel to the branches; and in the front terminates at the shoulders, in the same manner as the great ditch before the bastions.
The capital of the ravelin before the front of the hornwork is 35 toises, and the faces terminate on the shoulders, or rather 2 or 3 toises beyond them; and the ditch before the ravelin is 8 toises.
There are sometimes retrenchments made within the hornwork, such as S, S; which are constructed by erecting perpendiculars to the faces of the ravelin, within 25 toises of their extremities. This retrenchment, like all others, has a parapet turned only with a berm of 8 feet before it; as likewise a ditch from 3 to 5 toises broad.

Fig. 13. When a hornwork is made before the bastion, the distance DL of the front from the salient angle of the bastion is 100 toises, and the branches terminate on the faces of the adjacent ravelins within 5 toises from their extremities; all the rest is the same as before.


Fig. 14.

Plate CCXII.

From the salient angle, A (fig. 14) of the ravelin, as a centre, describe an arc of a circle with a radius of about 120 toises, cutting the capital of the ravelin produced at C; from the point C, set off the cords CB, CF, each of them equal to 110 toises; and on each of which, as an exterior side, construct a front of a polygon of the same dimensions as in the hornwork; that is, the perpendicular should be 18 toises, the faces 30, and the branches terminate on the faces of the bastions within 25 toises of the shoulders.
The ditch is 12 toises, the capital of the ravelin 35, and its ditch 8; that is, the same as in the hornwork.
Sometimes the crownwork is made before the bastion, as in fig. 15. The arc is described from the salient angle A of the bastion, with a radius of 120 toises, as before; and the branches terminate on the faces of the adjacent ravelins, within 25 toises of their extremities; the rest of the dimensions and constructions are the same as before.

Hornworks, as well as crownworks, are never made but when a large spot of ground falls beyond the fortification, which might be advantageous to an enemy in a siege, or to cover some gate or entrance into a town.


Although we have not hitherto mentioned the covert-way, nevertheless all fortifications whatsoever have one: for they are esteemed to be one of the most essential parts of a modern fortification; and it is certain, the taking the covert-way, when it is in a good condition and well defended, is generally the most bloody action of the siege.
After having constructed the body of the place, and all the outworks which are thought necessary, lines are drawn parallel to the outmost countergaurd of the ditches, at 6 toises distant from it; and the faces m, m, n, n, included between that line and the countergaurd, will be the covert-way required.

Fig. 16. There is in every re-entering angle of the Fig. 16. counterscarp a place of arms m; which is found by setting off 20 toises from the re-entering angle a, on both sides from a to b, and from a to c; and from the points b, c, as centres, arcs are described with a radius of 25 toises, so as to intersect each other in d; then the lines drawn from this intersection to the points b, c, will be the faces of the places of arms.
If lines are drawn parallel to the lines which terminate the covert-way, and the places of arms at 20 toises distant from them, the space x, x, x, x, between these lines and those which terminate the covert-way will be the glacis.
At the extremities of the places of arms, are traverses made, such as v, v, which serve to enclose them; these traverses are 3 toises thick, and as long as the covert-way is broad; and a passage is cut in the glacis round them, of about 6 or 8 feet, in order to have a free communication with the rest of the covert-way.
There are also traverses of the same dimensions before every salient angle of the bastion and outworks, and are in the same direction as the faces of those works produced; and the thickness lies at the same side as the parapets.
The passages round these last traverses are likewise from 6 to 8 feet wide.
In each place of arms are two sally ports m, m, which are 10 or 12 feet wide, for the troops to sally out; in time of a siege, they are shut up with barriers or gates.

10. Construction of Arrows and Detached Redoubts.

An arrow is a work made before the salient angles of the glacis, such as A, fig. 16. It is composed of a parapet of 3 toises thick, and 40 long; and the ditch before it 5 toises, terminating in a slope at both ends. The communication from the covert-way into these arrows is 4 or 5 toises wide; and there is a traverse, r, at the entrance, of 3 toises thick, with a passage of 6 or 8 feet round it.
A detached redoubt is a kind of work much like a ravelin, with flanks placed beyond the glacis; such as B; they are made in order to occupy some spot of ground.
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Plate CCXII.

The ground which might be advantageous to the besiegers; likewise to oblige the enemy to open their trenches farther off than they would do otherwise.

Their distance from the covert-way ought not to exceed 120 toises, that it may be defended by musket shot from thence.

The gorge a 6 is 40 toises; the flanks a, b, f, which are perpendicular to the gorge, 10; and the faces c d, f d, 50; the ditch before it is 6 toises, ending in slopes at both ends; the covert-way 4; the branches of the covert-way are 42 toises long, or thereabouts; the faces of the places of arms y, y, which are perpendicular to the branches, 10; and the other, which is parallel to them, 13.

The communication from the covert-way into the redoubt, is 5 or 6 toises wide; and there is a traverse made just at the entrance, and another in the middle when it is pretty long. The parapets of this communication terminate in a slope or glacis.

If these redoubts are above 50 toises distant from the covert-way, the besiegers carry their trenches round, and enter through the gorge; by which the troops that are in them are made prisoners of war, if they do not retire betimes; to prevent which, some other outworks should be made to support them.


Fig. 17. When the ground is low, and water to be found, there is often a ditch about 10 or 12 toises made round the glacis; and opposite to the places of arms are constructed lunettes, beyond the ditch: such as D, whose breadth on the counterscarp of the ditch is 10 toises, from b to a, and from c to d; and the faces a L, d L, are parallel to those of the places of arms; the ditch before them is from 8 to 10 toises wide.

The second covert-way is 4 toises, the semi-gorges of the places of arms, m, about 15, and the faces perpendicular to the counterscarp; the second glacis is from 15 to 18 toises broad.

This second covert-way has traverses everywhere, in the same manner as the first.


A profile is the representation of a vertical section of a work; it serves to show those dimensions which cannot be represented in plans, and is necessary in the building of a fortification. Profiles are generally constructed upon a scale of 30 feet to an inch. It would be endless to describe all their particular dimensions; we shall therefore lay down the principal rules only, given by M. Vauban, on this subject.

1. Every work ought to be at least 6 feet higher than that before it, so that it may command those before it: that is, that the garrison may fire from all the works at the same time, with great and small arms, at the besiegers in their approaches. Notwithstanding this specious pretense, there are several authors who object against it. For, say they, if you can discover the enemy from all the works, they can discover, by the same reason, all the works from their batteries; so that they may destroy them without being obliged to change their situation, and thereby dismount all the guns of the place before they come near it.

But if all works were of the same height, those within cannot be destroyed, till such time as those before them are taken: guns might be placed in the covert-way and outworks to obstruct the enemy’s approach; and when they come near the place, they might be transported into the inner works: and as the body of the place would be much lower, the expense would be considerably diminished.

But when works are low, they are easily enflamed by the ricochet batteries, which is a kind of firing with a small quantity of powder, by giving the gun an elevation of 10 or 12 degrees; this might however be partly prevented, by making the parapets near the salient angles, for the space of 8 toises on each side, 3 or 6 feet higher than the rest of the works.

2. The covert-way should be lower than the level ground, otherwise the body of the place must be raised very high, especially where there are several outworks: this is to be understood only when the works exceed each other in height, otherwise it need not be below the level.

3. The bases of all inward slopes of earth should be at least equal to the height, if not more.

4. The bases of all outward slopes of earth, two-thirds of their height.

5. The slopes of all walls, or revetments, should be one-fifth of their height; or one-sixth might perhaps be sufficient: the height of a wall is estimated from the bottom of the ditch, and not from the beginning of its foundation.

6. The slopes of all parapets and traverses are one-sixth of their breadth; that is, 3 feet towards the field; or the inside, where the banquettues should be 3 feet higher than the outside.

7. When the revetment of a rampart goes quite up to the top, 4 feet of the upper part is a vertical wall of 3 feet thick, with a square stone at the top of it projecting 6 inches; and a circular one below, or where the slope begins, of 8 or 10 inches diameter: they go quite round the rampart, and the circular projection is called the cordon.

Where the straight part of the wall ends and the slope begins, the wall is always made 5 feet thick; and the counterforts or buttresses reach no higher than the place.

8. When the rampart is partly walled and partly turfed, then one-fifth of the height which is turfed must be added to 5 feet, to get the thickness of the wall above.

And having the thickness of any wall above, by adding one-fifth of its height from the bottom of the ditch, the sum will be the thickness of the wall at the bottom; but if a sixth part is only taken for the slope, then a sixth part must be added.

For instance, suppose a rampart of 30 feet high from the bottom of the ditch, and that 10 of which are to be turfed; then the fifth part of 10, which is 2, added to 30, gives 32 for the wall above; and as this wall is 20 feet high, the fifth of which is 4, and 4 added to the thickness 7 above, gives 11 for the thickness near the foundation.

Fig. 18, represents (in military perspective) the profiles of the body of a place, the ravelin, and covert-way; CCXXIII. which gives a clear idea of what is meant by a profile, and from which those of all other works may be easily conceived.

Sect. II.
Sect. II.  

Of Irregular Fortification.

The most essential principle in fortification consists in making all the fronts of a place equally strong, so that the enemy may find no advantage in attacking either of the sides. This can happen no otherwise in a regular fortification situated in a plain or even ground; but as there are but few places which are not irregular in their works or situations, and the nature of the ground may be such as makes it impracticable to build them regular without too great expense; it is so much the more necessary to show in what consists the strength or weakness of a town irregularly fortified, so that the weakest part may be made stronger by additional outworks; as likewise, if such a place is to be attacked, to know which is the strongest or weakest part.

1. Construction of an Irregular Place situated in an open country.

If the place to be fortified is an old town enclosed by a wall or rampart, as it most frequently happens, the engineer is to consider well all the different circumstances of the figure, situation, and nature of the ground; and to regulate his plan accordingly, so as to avoid the disadvantages, and gain all the advantages possible: he should examine, whether by cutting off some parts of the old wall or rampart, and taking in some ground, the place can be reduced into a regular figure, or nearly so; for if that can be done without increasing the expense considerably, it should by no means be omitted. Old towns have often towers placed from distance to distance, as Douay, Tournay, and many other places, which are generally made use of, and mended when it may be done. If there is a rampart without bastions or towers, it must be well considered whether bastions may not be added, or if it is not better to make only some outworks: if the ditch about this rampart is not too wide and deep, it would be advantageous to make detached bastions; otherwise ravelins and counterguards must be constructed. Special care must be taken to make all the sides of the polygon as nearly equal as possible, and that the length of the lines of defence do not exceed the reach of musket-shot; but if that cannot be done, those sides which are on the narrowest part should be made the longest.

If it should happen that some of the sides are inaccessible or of very difficult approach, either on account of some precipice, marshy ground, or inundation, they may be made much longer than the others which are of easy access, and the flanks need not be so large as the rest; by doing so there will be some expenses saved, which may be used in making the other sides stronger by adding more outworks.

There are few situations but what are more advantageous in some parts than in others; it is therefore the business of an engineer to distinguish them, and to render those sides strong by art which are not so by nature.

If the situation is low and watery, lunettes or sentinels, and such other small outworks, should be constructed; because they are not of any great expense, and may make a very good defence. But if one side of the place only is low, and running water is to be had, a second ditch and covert-way with lunettes may be made, by observing, that if the first glacis is made to slope, so as to become even with the level of the water in the second ditch; or if the water can be swelled by means of dikes or sluices, so as to overflow the best part of the first glacis, it should be done: for by so doing these works will be able to make a very good defence, since the besiegers will find it a difficult matter to lodge themselves upon this glacis; which cannot be done but with a few toises of the first covert-way, where the besieged are ready to receive them, and to destroy their works with great advantage; whereas the enemy cannot support their workmen but from the second covert-way, which is too far off to be of any great service to them.

But if the situation is of a dry nature, without any water upon it, caissoniers should be made in the great ditch, from the curtains to the ravelin, and batteries raised in the entrance of the ditch before the ravelin, whose parapet must slope off into a glacis so as to afford no cover for the enemy behind them. Arrows and detached redoubts are likewise very proper to be used in such a case; and sometimes horn or crownworks, if it should be thought convenient: but these works should never be constructed without an absolute necessity, either to occupy a spot of ground which might be advantageous to the enemy, or to cover some gate or entrance into the town; for they are of great expense, and their defence seems not to be answerable to it.

Most of the places in Flanders are fortified with bornworks, such as Ypres, Tournay, Lisle, and others.

If the place to be fortified is new, and the situation will not admit of a regular construction, particular care must be taken in choosing such a spot of ground as is most advantageous, and least liable to any disadvantages either in the building or in the maintaining of it. All hills or rising grounds should be avoided, which might command any part of the works; marshy grounds, because such situations are unwholesome; or lakes and standing waters for the same reason, excepting a lake is or may be made navigable. Good water should be had either within the place or near it, for it is absolutely necessary for men and cattle: the air should be wholesome; otherwise the continual sickness that may reign in such a place might prevent people to come and live in it, and the garrison would not be in a condition to defend themselves as they ought to do. In short, all the different circumstances attending such an undertaking should be maturely considered before a resolution is taken to fortify any place.

When a situation is fixed upon, the next thing to be considered is the bigness of the town and the number of its works; which must absolutely depend upon the consequence such a place is of to a nation. If it is only to guard a pass or entrance into a country, it need not be so large: but if it is to be a place either to promote or to protect trade, it should be large and commodious: the streets should be wide, and the buildings regular and convenient. As to what regards the fortification, its construction should depend on the nature of the situation, and the number of works, on the funds or expense a prince or a nation will be at; which, however, ought to be according to the benefit arising from
FORTIFICATION.

AB, is a stone wall; and the passages $x$ are shut up with sluices, to retain the water in the ditches in dry seasons: and to prevent an enemy from destroying the sluice near the point $c$, whereby the water would run out and leave the ditches dry, the redoubt $y$ was built in the little island hard by, in order to cover that sluice; without which precaution the place might be insolated from the river side, where the water is shallow in dry seasons.

The hornwork $k$ beyond the Rhine was built to cover the bridge; but as this work cannot be well defended across the river, the hornwork $h$ was made to support the other.

Before finishing the description of this plan, we shall show how to find the long side $AB$.

After having inscribed the two sides $GE$, $GF$, in a circle, draw the diameter $CD$, so as to be equally distant from the line joining the points $EF$ that is parallel to it. On this diameter set off 100 toises on each side of the centre; from these points draw two indefinite perpendiculars to the diameter; then if from the points $EF$, as centres, two arcs are described with a radius of 180 toises, their intersections $A$ and $B$, with the said perpendiculars, will determine the long side $AB$, as likewise the other two $FB$ and $EA$. In like manner may be found the long or short side of any polygon whatsoever.

When a place near a river is to be fortified for the safety of commerce, particular care should be taken in leaving a good space between the houses and the water side, to have a quay or landing place for goods brought by water; it should also be contrived to have proper places for ships and boats to lie secure in stormy weather, and in time of a siege; and as water-carriage is very advantageous for transporting goods from one place to another, as likewise for bringing the necessary materials, not only for building the fortifications, but also the place itself, the expenses will be lessened considerably when this convenience can be had; for which reason, places should never be built anywhere else but near rivers, lakes, or the sea; excepting in extraordinary cases, where it cannot be avoided.

FORTIN, FORTELER, or Field-fort, a sconce, or little fort, whose flanked angles are generally 120 degrees distant from one another.

The extent and figure of fortins are different, according to the situation and nature of the ground; some of them having whole bastions, and others demi-bastions. They are made use of only for a time, either to defend the lines of circumvallation, or to guard some passage or dangerous post.

FORTISSIMO, in Music, sometimes denoted by FFF, or $f'f'$, signifies, to sing or play very loud or strong.

FORTITUDE, a virtue or quality of the mind, generally considered as the same with COURAGE; though in a more accurate sense they seem to be distinguishable. Courage may be a virtue or a vice, according to circumstaries; fortitude is always a virtue: we speak Fortitude of desperate courage, but not of desperate fortitude. A contempt or neglect of danger, without regard to consequences, may be called courage; and this some brutes have as well as we: in them it is the effect of natural instinct chiefly; in man it depends partly on habit, partly on strength of nerves, and partly on want of consideration. But fortitude is the virtue of a rational and considerate mind, and is founded in a sense of honour and a regard to duty. There may be courage in fighting a duel, though that folly is more frequently the effect of cowardice; there may be courage in an act of piracy or robbery: but there can be no fortitude in perpetrating a crime. Fortitude implies a love of equity and of public good; for, as Plato and Cicero observe, courage exerted for a selfish purpose, or without
Fortitude, without a regard to justice, ought to be called audacity rather than fortitude.

This virtue takes different names, according as it acts in opposition to different sorts of evil; but some of those names are applied with considerable latitude. With respect to danger in general, fortitude may be termed 
temperament; with respect to the dangers of war, 
vigour; with respect to pain of body or distress of mind, 
patience; with respect to labour, activity; with respect to 
injury, forbearance; with respect to our condition in 
general, magnanimity.

Fortitude is very becoming in both sexes; but courage is not so suitable to the female character; for in women, on ordinary occasions of danger, a certain degree of timidity is not unseemly, because it betokens gentleness of disposition. Yet from those of very high rank, from a queen or an empress, courage in emergencies of great public danger would be expected, and the want of it blamed; we should overlook the sex, and consider the duties of the station. In general, however, masculine boldness in a woman is disagreeable; the term courage conveys an offensive idea. The female warriors of antiquity, whether real or fabulous, Camilla, Theseistres, and the whole community of 
Amazons, were unamiable personages. But female courage exerted in defence of a child, a husband, or a near relation, would be true fortitude, and deserve the highest eulogiums.

The motives to fortitude are many and powerful. This virtue tends greatly to the happiness of the individual, by giving composure and presence of mind, and keeping the other passions in due subordination. To public good it is essential; for without it, the independence and liberty of nations would be impossible. It gives to a character that elevation which poets, orators, and historians, have in all ages vied with one another to celebrate. Nothing so effectually inspires it as rational piety; the fear of God is the best security against every other fear. A true estimate of human life; its shortness and uncertainty; the numberless evils and temptations to which by a long continuance in this world we must unavoidably be exposed; ought by no means to discourage or to throw any gloom on our future prospects: they should teach us, that many things are more formidable than death; and that nothing is lost, but much gained, when, by the appointment of Providence, a well spent life is brought to a conclusion.

Let it be considered too, that pusillanimity and fearfulness can never avail us any thing. On the contrary, they debase our nature, poison all our comforts, and make us despisible in the eyes of others; they darken our reason, disconcert our schemes, enfeebles our efforts, extinguish our hopes, and add tenfold poignancy to all the evils of life. In battle, the brave soldier is in less danger than the coward; in less danger even of death and wounds, because better prepared to defend himself; in far less danger of infelicity; and has before him the animating hope of victory and honour. So in life, the man of true fortitude is in less danger of disappointment than others are, because his understanding is clear, and his mind disencumbered; he is prepared to meet calamity without the fear of sinking under it; and he has before him the near prospect of another life, in which they who piously bear the evils of Fortitude this will obtain a glorious reward.

Fortuna, a goddess worshipped with great devotion by the ancient Greeks and Romans; who believed her to preside over human affairs, and to distribute wealth and honour at her pleasure. See Fortuna.

Fortunate Islands, in Ancient Geography, certain islands (concerning the situation of which authors are not agreed), famous for the golden apples of the Hesperides.—The common opinion is, that they are the Canary Islands.

Fortune (Fortuna), a name which among the ancients seems to have denoted a principle of fortuity, whereby things came to pass, without being necessitated thereto; but what and whence that principle is, they do not seem to have ever precisely thought. Hence their philosophers are often intimating, that men only framed the phantom Fortune to hide their ignorance; and that they call Fortune whatever befalls a man without his knowing for what purpose. Hence Juvenal (Sat. x. ver. 366) affirms, they were men who made a deity of fortune.

Nullum numen obest, si sit prudentia; sed te Nos facimus, Fortuna, deam, celeoque locamus.

The ingenious Sir Spence gives another reading of this passage:

Nullum numen habet, si sit prudentia; sed te Nos facimus, Fortuna, deam, celeoque locamus.

This reading, he thinks, agrees best with the context: Juvenal says, ver. 364, that the two things we should pray for are good health and good sense; that we might be the authors of our own happiness if we pleased; ver. 363; that virtue is the only way to true happiness, ver. 364; that if we ourselves are prudent, Fortune has no power over us; and that, in truth, she is no goddess at all, and has only usurped a seat in heaven from the folly of mankind, ver. 366. Fortune was not considered as a deity by the old Romans, but was made so by the devotion and folly of the vulgar; and Sir Spence says, that he has seen an ancient gem, in which Cybele, the mother of the gods, is represented as turning away her head from Fortune, in an attitude of disowning and rejecting her; (Polymetis, p. 170, 174, &c.)

According to the opinion of the heathens, therefore, fortune in reality was only the arrival of things in a sudden and unexpected manner, without any apparent cause or reason: so that the philosophical sense of the word coincides with what is vulgarly called chance.

But in religion it had a further force; altars and temples in great numbers were consecrated to this Fortune, as a deity. This intimates, that the heathens had personified, and even deified, their chance; and conceived her as a sort of goddess, who disposed of the fate of men at her pleasure. Hence that invocation of Horace, O diva, gratum que regis antium, in the 35th ode of the first book, where he recommends Augustus, then preparing for a visit to Britain, to her protection. From these different sentiments it may be inferred, that the ancients at one time took Fortune for a peremptory cause, bent upon doing good to
FORUM, in Roman antiquity, a public standing place within the city of Rome, where causes were judicially tried, and orations delivered to the people.

Forum was also used for a place of traffic, answering to our market-place. These were generally called foran ovaleum; in contradistinction to the former, which were called fora civilia.

The fora civilia were public courts of justice, very magnificent in themselves, and surrounded with porticoes and stately edifices; of these there were six very remarkable: 1. Forum Romanum. 2. Julianum. 3. Augustum. 4. Palatium. 5. Forum Tranii. 6. Forum Aurelii. The Forum Romanum was the most noted, and is often called simply Forum, by way of eminence. Here was the pleasing place called Rostra, the Comitium, the sanctuary of Saturn, temple of Castor, &c. See Rostra, Comitium, &c.

The fora ovalea, or market-places, were very numerous. The chief of them were the forum boarium for oxen or beef; suovarium for swine; pistorium for bread; cucupedinarium for dainties; olitorium for garden stuff.

The Grecian ἄλειμα, exactly correspond with the Roman fora, being places where courts and markets were held. At Athens they had many fora, but the chief of them were the old and the new. Forum Indicem, was the seat of the praetor appointing the place in Rome where cases were to be tried. Agere forum denoted the bringing on causes out of Rome, in a Roman province (Cicero, Suetonius); the same with agere conventum (Florus).

The term forum added to a proper name, denoted some town or market borough: as,

**Forum Allicini**, a place mentioned only by Tacitus; and, from what be says of it, thought to be Ferrara, capital of the duchy of that name in Italy. E. Long. 12. 5. N. Lat. 44. 46.

**Forum Appia** (Cicero, Luke); a town of the Volsci, in Latium, on the Via Appia; a little beyond the Tres Tabernae; set down in the Jerusalem Itinerary as situated near the river Nympheus: now entirely extinct.


**Forum Domitii**, a town of Gallia Narbonensis; probably built by Domitius Ahenobarbus, who commanded in those parts: New Frontignan, or Frontigniac, in Languedoc, near the Mediterranean. E. Long. 3. 30. N. Lat. 43. 30.

**Forum Fulvii**, a town of Liguria, surnamed Valentinum: from which it is conjectured that it is new Valentia, in the duchy of Milan; which is confirmed by Pauthinger's distances. E. Long. 9. N. Lat. 43. 5.

**Forum Gallorum**, a small town of the Cispadana, on the Via Æmilia, eight miles from Mutina, beyond the river Scultena. Here Anthony defeated Pansa, and was in his turn defeated by Hirtius: Now Castelfranco, in the territory of Bologna.—Another Forum Gallorum, a town of the Vassoues in the Hither Spain: Now Guerres, a small town of Aragon.

**Forum Julianum**. There are several towns of this name; as a Forum Julianum of Gallia Narbonensis; or Foreignum: Now Frejus, or Frejus, in Provence, at
the mouth of the Argena. Forum Julium Carnorum, to
the north of Aquileia, in the Transpadana: Novo Civi-
dal di Friuli, formerly Civial d’Austria, in the terri-
ory of Venice.

Forum Jiunitorum, a town of the Iasbres, in the
Transpadana: Novo Crema, capital of the Crema, in
the territory of Venice. E. Long. 10° 15'. N. Lat. 45°
20'.

Forum Lovic, a town of the Semnones, in the Cis-
padana: Novo Forli, in Romagna. E. Long. 12° 45'.
N. Lat. 44° 25'.

Forum Sgesianorum, situated on the east side of
the Liger, in Gallia Celtica: now Fouras, on the Loire, in
the Lyonnais, capital of the territory of Forez. E.
Long. 4° 15'. N. Lat. 45° 44'.

Forum Tiberii, a town of the Pagus Tigrinorum, in
Belgica, on the left or south side of the Rhine: New
Keyserstull; literally the tribunal of Tiberius, which
he held there when commander in the Rhetic war.

Forum Volcani (Strabo); the Campi Phlegraei of
Pliny; a place in Campania encompassed with rocky
eminences, near Puteoli, and distant from it two miles
towards Naples, emitting smoke, and in some places
flame, like a large extensive furnance, and yielding sul-
phur: now called Solfatara, in the Terra di Lavoro.

Forum is also used, among casuists, &c. for jurisdic-
tion; thus they say, In foro legis, &c.

FOSS, or fosse, in Fortification, &c. a ditch or
moat. The word is French, formed of the Latin par-
ticipie fossum, of the verb fodio, “I dig.”

Foss, Fossa, in Anatomy, a kind of cavity in a bone,
with a large aperture, but no exit or perforation.
When the aperture is very narrow, it is called a rima.
Foss is particularly used for the cavity or denture in
the back part of the neck.

FOSSA MAGNA, or NAVICULARIS, is an oblong
 cavity, forming the inside of the pudendum pubes-crene, and
which presents itself upon opening the labia; and in
the middle whereof are the carunculae myrtiformes. See
Anatomy.

Fossa, in our ancient customs, was a ditch full of
water, where women committing felony were drowned;
as men were hanged: Nam et ipsi in omnibus tenementis
suis omnem ab antiquo legem habuerunt justitionem, videlicet
ferrum, fossam, furcas, et similia. In another sense it is
taken for a grave, as appears by these old verses:

Hic jacet in fossa Belis venerabilis ossa:
Hic est fossatus, qui hoc erat hic catedratus.

Foss Way was anciently one of the four great Rom-
ian highways of England: so called, according to
Camden, because it was ditched on both sides, which
was the Roman method of making highways.

FOSSARI, in antiquity, a kind of officers in the
eastern church, whose business was to inter the dead.

Cicenius relates, that Constantine created 950 fos-
saries, whom he took out of the divers colleges or com-
panies of tradesmen: he adds, that they were exempted
from taxes, services, burdensome offices, &c.

E. Goar, in his notes on the Greek Euchologion, in-
sinuates that the fosserii were established in the times
of the apostles; and that the young men, who carried
off the body of Anastas, and those persons full of the
fear of God who interred St Stephen, were of the num-
ber.

St Jerome assures us, that the rank of fossarior held
the first place among the clerks; but he is to be understood
of those clerks only who had the direction and instan-
tce of the interment of the devout.

FOSSSE, the Roman military way in South Britain,
begins at Totness, and passes through Exeter, Tiv-
hesher, Shepton Mallet, Bath, Cirencester, Leicester,
the Vale of Belvoir, Newark, Lincoln, to Barton up-
on the Humber, being still visible in several parts,
thoug'h of 1400 years standing. It had the name from
the fosses or ditches made by the sides of it.

FOSSIL, in Natural History, denotes, in general,
every thing dug out of the earth, whether it be a na-
tive thereof, as metals, stones, salts, earths, and other
minerals; or extraneous, reposed in the bowels of the
earth by some extraordinary means, as earthquakes, the
deluge, &c.

Native fossils are substances found in the earth, or
on its surface, of a simple structure, exhibiting no ap-
pearances of organization; and these are included un-
der the general names of simple and compound, earthy
or metallic minerals. See MINERALOGY.

Extraneous fossils are bodies of the vegetable or ani-
mal kingdoms accidentally buried in the earth. Of the
vegetable kingdom, there are principally three kinds;
trees or parts of them, herbaceous plants, and corals :
and of the animal kingdom there are four kinds: sea
shells, the teeth or bony palates and bones of fishes,
complete fishes, and the bones of land animals. See
GEOLOGY.

These adventitious or extraneous fossils, thus found
buried in great abundance in divers parts of the earth,
have employed the curiosity of several of our latest na-
turalists, who have each their several system to account
for the surprising appearances of petrified sea fishes,
in places far remote from the sea, and on the tops of
mountains; shells in the middle of quarries of stone;
and of elephants teeth, and bones of divers animals, pe-
culiar to the southern climates, and plants only growing
in the east, found fossil in our northern and western
parts.

Some will have these shells, &c. to be real stones,
and stone plants, formed after the usual manner of other
figured stones; of which opinion is the learned Dr
Lister.

Another opinion is, that these fossil shells, with all
the foreign bodies found within the earth, as bones,
trees, plants, &c. were buried therein at the time of
the universal deluge: and that, having been penetra-
ed either by the bituminous matter absconding chiefly
in watery places, or by the salts of the earth, they have
been preserved entire, and sometimes petrified.

Others think, that these shells, found at the tops
of the highest mountains, could never have been carried
thither by the waters, even of the deluge; inasmuch as
most of these aquatic animals, on account of the weight
of their shells, always remain at the bottom of the wa-
ter, and never move but close along the ground. They
imagine, that a year's continuance of the waters of the
deluge, intermixed with the salt waters of the sea, up-
on the surface of the earth, might well give occasion
to the production of shells of divers kinds in different
climates;
FOS

OTHERS think, that the waters of the sea, and the rivers, with those which fell from heaven, turned the whole surface of the earth upside down; after the same manner as the waters of the Loire, and other rivers, which roll on a sandy bottom, overturn all their sands, and even the earth itself, in their swellings and inundations; and that in this general subversion, the shells came to be interred here, fishes there, trees there, &c. See DELUGE.

Dr Woodward, in his Natural History of the Earth, pursuing and improving the hypothesis of Dr Burnet, maintains the whole mass of earth, with every thing belonging thereto, to have been so broken and dissolved at the time of the deluge, that a new earth was then formed on the bosom of the water, consisting of different strata or beds of terrestrial matter, ranged over each other usually according to the order of their specific gravities. By this means, plants, animals, and especially fishes and shells, not yet dissolved among the rest, remained mixed and blended among the mineral and fossil matters; which preserved them, or at least assumed and retained their figures and impressions either indentedly or in relief. See GEOLOGY.

FOSSIL Pitch. See PETROLEUM, MINERALOGY Index.

FOSTER, James, a nonconformist divine, very highly celebrated for his pulpit eloquence and erudition, was born at Exeter in the year 1697. At the age of five years he was put to the free school of that city, where his progress in the acquisition of grammar was so rapid, that his master boasted of him as the most eminent genius in his school. From this seminary he went to the academy where young men designed for clergymen in the dissenting interest were educated, where his progress and applause were equally great. His apprehension was remarkably quick, his judgment solid, memory retentive, eloquence commanding, and his talents for argumentation were truly admirable; but above all, his piety was genuine, and few men possessed candour, modesty, liberality, integrity, tenderness and benevolence, in such a remarkable degree. He commenced preacher at the age of 21, and was much admired where he occasionally officiated. About this time the doctrine of the Trinity was much agitated in the west of England, which was not consonant to the notions of Mr. Foster, and the honesty and openness of his heart would not allow him to conceal these, which brought so much odium upon him from the orthodox party, that he retired to another scene of action. He became pastor of a congregation at Milborne-port, in Somersetshire; but as soon as his hearers became zealously attached to what was deemed the orthodox opinion, he retired to Ashwick under the hills of Mendip, in the same county. In this asylum he preached to two congregations at a little distance from each other, as poor as they were plain, the united contributions of which did not amount to 1 g. per annum. In this humble poverty and obscurity he lived for some years, honourable, however, as it was occasioned by his determined uprightness and sincerity. In the year 1720, he gave the world his "Essay on Fundamentals, with a particular regard to the doctrine of the ever-blessed Trinity," &c. The design of this work was to check an uncharitable and intolerant spirit, at that time extremely prevalent, by shewing that the trinitarian notion is not a fundamental article of Christianity, or made an express condition of salvation in the sacred scriptures. A sermon accompanied this essay, entitled "The resurrection of Christ proved, and vindicated against the most important objections of the ancient Jews, or modern Deists, and his disciples shown to be sufficient witnesses of the fact." From Ashwick he removed to Trowbridge in Wiltshire, where his congregation did not usually exceed 20 or 30 people.

By reading Dr. Gale's treatise on infant baptism, he became a convert to the doctrine, that immersion is the true scriptural rite, and was accordingly soon after baptised in London in conformity to that mode. This unreserved manner of adopting whatever his conscience believed to be truth, excluded him from almost every religious party among whom he might otherwise have expected preferment. But while he deliberated with himself whether he should abandon the ministry, and acquire the knowledge of some mechanical employment, Robert Houlston, Esq. took him to his house in the capacity of chaplain, where his circle of acquaintances became wider and more respectable. In 1724, he was appointed to succeed Dr. Gale in the Baptist congregation in Barbican, London. In the year 1728 he commenced a Sunday evening lecture in the Old Jewry, which he continued till within a short time of his death, with such a degree of popularity as few dissenters at that time experienced. In 1732 appeared his valuable work, entitled "The usefulness, truth, and excellency of the Christian revelation, defended against the objections contained in a late book, called Christianity as old as the Creation," &c. In this reply Mr. Foster exhibited no ordinary share of talents and ingenuity, and it was admired by the candid and judicious of every description. Dr. Tindal, against whom it was written, is said to have spoken of it always with great respect. He published a volume of sermons in the year 1734, followed by other three volumes, the last of which appeared in 1744. At this time he was appointed successor to Dr. Jeremiah Hunt, in the protestant congregation at Pinners-hall. In 1746, he attended the earl of Kilmarnock when under sentence of death for high treason, after which he published an octavo pamphlet, with the title of "An account of the behaviour of the late earl of Kilmarnock after his sentence, and on the day of his execution."

He received from the Marischal college of Aberdeen the degree of doctor in divinity, accompanied with handsome letters from the principal and Professor Foyse, the latter of whom thus addressed him. "We beg that you will be so good as to accept of the diploma, as a small mark of the sincere veneration we have for you, and of the sense we entertain of the eminent services you have done to the cause of liberty, religion, and virtue, by your writings as well as public instructions." The first volume in quarto of his "Discourses on all the Principal Branches of Natural Religion and Social Virtue," was published in the year 1749, and the second appeared in 1752. They were published by subscription; and to evince the high estimation in which
his talents and virtues were held, 2000 names were contained in the list, many of them distinguished by their dignified rank and literary abilities.

In the month of April 1750, he was seized with a violent distemper, from the effects of which he never thoroughly recovered; yet while at all able to officiate, he continued to preach till the beginning of 1752, when he had another attack, which seems to have been of a paralytic nature. After declining for some time, he expired like a genuine Christian on the 9th of November, in the 57th year of his age. His private and public life were alike irreproachable. Such was the wonderful extent of his beneficence, that he must have died in indigent circumstances, had it not been for the numerous subscriptions to his discourses on natural religion. Mr Rider gives him the following eulogium:

"His voice was naturally sweet, strong, distinct, harmonious, always adapted to his matter, always varied as his method changed; as expressive of the sense as the most judicious recitative. Monotony was a fault he was never guilty of. His action, the soul of eloquence, was grave, expressive, free from distortions, animated without being theatrical; in short, such as became the pulpit. He reminded us of Paul at Athens, arresting the attention of his auditors." It was no doubt such rare accomplishments which induced Mr Pope to be an occasional hearer, and to pay him the following compliment:

Let modest Foster, if he will, excel
Ten metropolitans in preaching well.

In a poem describing the respective merits of dissenting ministers at that period, and supposed to have been the work of Mr Savage, we find the following lines upon Dr Foster.

But see th' accomplish'd orator appear,
Refin'd his language, and his reasoning clear;
Those only, Foster, hast the pleasing art,
At once to charm the ear and mend the heart.

Besides the works formerly taken notice of, Dr Foster published three funeral sermons, one of which was intended for that celebrated confessour Mr Emlyn; together with a number of essays in the Old Whig.

Foster, Samuel, an ingenious English mathematician of the last century, and astronomical professor in Cressham college, was one of that learned association which met for cultivating the new philosophy during the political confusions, and which Charles II. established into the Royal Society. Mr Foster, however, died in 1672, before this incorporation took place; but wrote a number of mathematical and astronomical treatises, too many to particularize. There were two other mathematical students of this name; William Foster, a disciple of Mr Oughtred, who taught in London, and Mark Foster, author of a treatise on trigonometry, who lived later than the former two.

Fother, or Foder, is a weight of lead, containing eight pigs, and every pig one and twenty stone and a half; so that it is about a ton or common cart load. Among the plumbers in London, it is nineteen hundred and a half; and at the mines it is two and twenty hundred and a half. The word is of Teutonic origin, from fater.

Fothergill, Dr George, was born in Westmorland in 1705, where his family had been long seated on a competent estate that had descended regularly for several generations. After an academical education in Queen's college, Oxford, of which he became a fellow, he was, in 1731, elected principal of St Edmund's hall, and presented to the vicariate of Bromley in Hampshire. Having been long afflicted with an asthma, he died in 1760. He was the author of a collection of much esteemed sermons, in 2 vols. 8vo. The first volume consists of occasional discourses, published by himself; the second printed from his MSS.

Fothergill, Dr John, a late eminent physician, son of John and Margaret, Quakers, was born in 1712, at Carr End in Yorkshire, where his father, who had been a brewer at Knaresborough (after having travelled from one end of America to the other), lived retired on a small estate which he cultivated. The Doctor was the second of five children (four sons and a daughter), and received his education under the care of his grandfather Thomas Hough, a person of fortune in Cheshire, which gave him a predilection for that county, and at Sedbergh in Yorkshire. He afterwards served his time to one Mr Bartlett an apothecary at Bradford. From thence he removed to London, and became a pupil of Dr (afterwards Sir Edward) Wilmot, at St Thomas's hospital. He then went to the university of Edinburgh to study physic, and took his doctor's degree there. From Edinburgh he went to Leyden; whence, after a short stay, he returned to London, and began to practise about the year 1740, in a house in White-hart Court, Lombard-street, where he resided during the greatest part of his life, and acquired most of his fortune. In 1746, he was admitted a licentiate of the College of Physicians in London; and in 1754 a fellow of that of Edinburgh, to which he was a considerable benefactor. He afterwards became a member of the Royal Medical Society at Paris, and a member both of the Royal and Antiquarian Societies. He continued his practice with uninterrupted success till within the last two years of his life, when the illness which he had brought on himself by unremitting attention, obliged him to give up a considerable part of it. Besides his application to medical science, he had imbied an early taste for natural history, improved by his friend Peter Collinson, and employed himself on conchology and smaller objects of botany. He was for many years a valuable contributor to the Gentleman's Magazine; where his observations on the weather and diseases were begun in April 1751, and discontinued in the beginning of 1756, being disappointed in his views of exciting other experienced physicians in different parts to imitate the example. He had very extensive practice, but he did not add to his art any great or various improvements. His pamphlet on the ulcerous sore throat is, on every account, the best of his publications; but owes much of its merit to the information of the late Dr Letherland. It was printed in 1748, on the re-appearance of that fatal disorder which in 1739 had carried off the two only sons of Mr Pelham. In 1762 Dr Fothergill purchased an estate at Upton in Essex; and formed a botanic garden there, the second in Europe; Kew is the first. In 1766 he began regularly to withdraw, from Midsummer to Michaelmas, from the excessive fatigue of his profession, to Lee Hall, near Middlewich, in Cheshire; which, though he only rent-
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He took no fees during this recess, but attended to prescribe gratis at an inn in Middlesbrough once a week. In 1757, after he found himself obliged to relax his attention to business, he removed from his house in the city, to reside in Harpur-street, Red-Lion Square. Some time before his death he had been industrious to contrive a method of generating and preserving ice in the West Indies. He was the patron of Sidney Parkinson, and drew up the preface prefixed to his account of the voyage to the South Sea. At his expense also was made and printed an entire new translation of the whole Bible, from the Hebrew and Greek originals, by Anthony Purver, a Quaker, in two volumes, 1764, folio, and also, in 1780, an edition of Bishop Percy's "Key to the New Testament," adapted to the use of a seminary of young Quakers, at Awtworth, near Leeds in Yorkshire, founded in 1778 by the Society, who purchased, by a subscription in which Dr Fothergill stood foremost, the house and estate of thirty acres which the Foundling Hospital held there, but which they found inconvenient for their purpose on account of distance. The Doctor himself first projected this on the plan of a smaller institution of the same kind at Gildersome. He also endowed it handsomely by his will. It now contains above 300 children of both sexes, who are clothed and instructed. Among the other beneficent schemes suggested by Dr Fothergill were those of bringing fish to London by land carriage, which, though it did not in every respect succeed, intended to destroy a supposed combination; and of rendering bread much cheaper, though equally wholesome, to the poor, by making it with one part of potatoes and three parts of household flour. But his public benefactions, his encouragements of science, the instances of his attention to the health, the police, the convenience of the metropolis, &c. we cannot pretend to specify. The fortune which Dr Fothergill had acquired was immense; and, taking all things together, the house and moveables in Harpur-street, the property in Essex, and the estate in Cheshire (which he held on a lease), and his ready money, amounted to 80,000l. His business, when he was in full practice, was calculated at near 7000l, per annum. In the influenza of 1775 and 1776, he is said to have had 60 patients on his list daily, and his profit was estimated at 8000l. per annum.

The disorder which hastened his death was a scirrhus of the prostate, and an obstruction of the bladder (in which were found after his death two quarts of water), which had been gradually coming on him for six years past, occasioned by a delicacy, which made him unwilling to sit down to his carriage, and when, after his temporary recovery from it the year before he died, he submitted to use relief in his carriage, it was too late. He died at his house in Harpur-street, December 26, 1780; and his remains were interred, January 5, in the Quakers burying-ground at Winchmore-hill, whether they were accompanied by more than 70 coaches and post-chaises, notwithstanding the intention of the executors to have the funeral private. The Doctor by his will appointed, that his shells and other pieces of natural history should be offered to the late Dr Hunter at 500l under the valuation he offered to be taken of them. Accordingly Dr Hunter Fothergill bought them for 1200l. The drawings and collections in natural history were also to be offered to Mr (now Sir Joseph) Banks at a valuation. His English portraits and prints, which had been collected by Mr John Nickolls of Ware, and purchased by him for 80 guineas, were bought for 200 guineas by Mr Thane. His books were sold by auction, April 30, 1781, and the eight following days. His house and garden at Upton, in which 15 men were constantly employed, were valued at 10,000l. He spared no expense to augment this as well as his other collections. He had an ingenious artist qualified to collect for him at the Cape of Good Hope, and another on the Alps, and employed for several years before his death a painter in natural history at Leeds.

Dr Fothergill's character was excellent. A transaction, indeed, with regard to one Dr Leeds, gave occasion to some of his enemies to blame him; but how unjustly, has been abundantly shown by his biographers Dr Elliot and Dr Lettsome. Besides the pamphlet already mentioned, Dr Fothergill wrote a considerable number of Tracts, which are now collected into one volume 8vo, by Dr Elliot. He sometimes wrote in the newspapers, and is said to be the author of more than 100 letters in the Gazetteer, concerning the New Pavement.

FOTHERGILLA, a genus of plants belonging to the polyandria class. See Botany Index.

FOTHERING, a peculiar method of endeavouring to stop a leak in the bottom of a ship while she is afloat, either under sail or at anchor. It is usually performed in the following manner: A basket is filled with ashes, cinders, and chopped rope yarns, and loosely covered with a piece of canvas; to this is fastened a long pole, by which it is plunged repeatedly in the water, as close as possible to the place where the leak is conjectured to lie. The oaken or chopped rope yarns being thus gradually shaken through the twigs, or over the top of the basket, are frequently sucked into the hole along with the water, so that the leak becomes immediately choked; and the future entrance of the water is thereby prevented.

FOTHERINGAY, a town of Northamptonshire, about four miles from Stamford, situated on the river Avon, or Nen, and consisting of one street. Edward duke of York, in the reign of Henry V. founded and endowed a fine collegiate church here, in which he was interred. At the dissolution, the college and the choir were pulled down, and the bodies of the founder and his family left exposed till Queen Elizabeth's time, who ordered them to be interred, and the present monuments to be erected. On the north side of the church is a free school, founded by Henry VII. or Edward VI. endowed with 20l. per annum for a master, payable out of the exchequer by the receiver of the county. The bridge over the river here was first built by Queen Elizabeth, 1573, of timber, with three pillars upon the foundation. Daniel, first earl of Nottingham, and the other trustees for William Saville, marquis of Halifax, rebuilt it in 1722, of freestone from King's Cliff. On the south-east side of the cliff stood the castle; which was of great antiquity and considerable strength. Mary queen of Scots, who had been in the custody of Sir Amias.
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moistened, to make it duly cohere. Then they take either wood or metal models of what they intend to cast, and apply them so to the mould, and press them into the sand, as to leave their impression there. Along the middle of the mould is laid half a small brass cylinder, as the chief canal for the metal to run through, when melted, into the models or patterns; and from this chief canal are placed several others, which extend to each model or pattern placed in the frame. After this frame is finished, they take out the patterns, by first loosening them all around, that the sand may not give way.

Then they proceed to work the other half of the mould with the same patterns in just such another frame; only that it has pins, which, entering into holes that correspond to it in the other, make the two cavities of the pattern fall exactly on each other.

The frame, thus moulded, is carried to the melter; who, after extending the chief canal of the counterpart, and adding the cross canals to the several models in both, and strewing mill dust over them, dries them in a kind of oven for that purpose.

Both parts of the mould being dry, they are joined together by means of the pins: and to prevent them giving way, by reason of the melted metal passing through the chief cylindrical canal, they are screwed or wedged up like a kind of press.

While the moulds are thus preparing, the metal is fusing in a crucible of a size proportionate to the quantity of metal intended to be cast.

When the moulds are coolish, the frames are unscrewed or unwedged, and the cast work taken out of the sand, which sand is worked over again for other casting.

FOUNDEY of Statues. The casting of statues depends on the due preparation of the pit, the core, the wax, the outer mould, the inferior furnace to melt off the wax, and the upper to fuse the metal. The pit is a hole dug in a dry place something deeper than the intended figure, and made according to the prominence of certain parts thereof. The inside of the pit is commonly lined with stone or brick; or when the figure is very large, they sometimes work on the ground, and raise a proper fence to resist the impulse of the melted metal.

The inner mould, or core, is a rude mass to which is given the intended attitude and contours. It is raised on an iron grate, strong enough to sustain it, and is strengthened by several bars of iron. It is generally made either of potters clay, mixed with hair and horse dung; or of plaster of Paris mixed with brick dust. The use of the core is to support the wax, the shell, and lessen the weight of the metal. The iron bars and the core are taken out of the brass figure through an aperture left in it for that purpose, which is soldered up afterwards. It is necessary to leave some of the iron bars of the core, that contribute to the steadiness of the projecting part, within the brass figure.

The wax is a representation of the intended statue. If it be a piece of sculpture, the wax should be all of the sculptor’s own hand, who usually forms it on the core: Though it may be wrought separately in cavities, moulded on a model, and afterwards arranged on the

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ribs of iron over the grate; filling the vacant space in the middle with liquid plaster and brick dust, whereby the inner core is proportioned as the sculptor carries on the wax.

When the wax, which is the intended thickness of the metal, is finished, they fill small iron tubes perpendicular to it from top to bottom, to serve both as canals for the conveyance of the metal to all parts of the work; and as vent holes, to give passage to the air, which would otherwise occasion great disorder when the hot metal came to encompass it.

The work being brought thus far, must be covered with its shell, which is a kind of crust laid over the wax, and which being of a soft matter, easily receives the impression of every part, which is afterwards communicated to the metal upon its taking the place of the wax, between the shell and the mould. The matter of this outer mould is varied according as different layers are applied. The first is generally a composition of clay, and old white crockeries well ground and sifted, and mixed up with water to the consistence of a colour fit for painting: accordingly they apply it with a pencil, laying it seven or eight times over, and letting it dry between whites. For the second impression they add horse dung and natural earth to the former composition. The third impression is only horse dung and earth. Lastly, The shell is finished by laying on several more impressions of this last matter, made very thick with the band.

The shell, thus finished, is secured by several iron girths, bound round it, at about half a foot distance from each other, and fastened at the bottom to the grate under the statue, and at top to a circle of iron where they all terminate.

If the statue be so big that it would not be easy to move the moulds with safety, they must be wrought on the spot where it is to be cast. This is performed two ways: in the first, a square hole is dug under ground, much bigger than the mould to be made therein, and its inside lined with walls of free-stone or brick. At the bottom is made a hole of the same materials, with a kind of furnace, having its aperture inwards: in this is a fire made to dry the mould, and afterwards melt the wax. Over this furnace is placed the grate, and upon this the mould, &c. formed as above. Lastly, A little to the side of the square pit, is made another large furnace to melt the metal. In the other way, it is sufficient to work the mould above ground, but with the like precaution of a furnace and grate underneath. When finished, four walls are to be run around it, and by the side thereof a massive made for a melting furnace. For the rest, the method is the same in both. The mould being finished, and enclosed as described, whether under ground or above it, a moderate fire is lighted in the furnace under it, and the whole covered with planks, that the wax may melt gently down, and run out at pipes contrived for that purpose, at the foot of the mould, which are afterwards exactly closed with earth, so soon as the wax is carried off. This done, the hole is filled up with bricks thrown in at random, and the fire in the furnace augmented, till such time as both the bricks and mould become red hot. After this, the fire being extinguished, and every thing cold again,
Foundery. Standing on the face. Having well shaped the inside strokes of his letter, he deepens the hollows with the same tools; for if a letter be not deep in proportion to its width, it will, when used at press, print black, and be good for nothing. This work is generally regulated by the depth of the counter-punch. Then he works the outside with proper files till it be fit for the matrix.

But before we proceed to the sinking and justifying of the matrices, we must provide a mould to justify them by, of which there is a draught in Plate CCXXIII.

Every mould is composed of an upper and an under part. The under part is delineated in fig. 1. The upper part is marked fig. 2 and is in all respects made like the under part, excepting the stool behind, and the bow or spring also behind: and excepting a small roundish wire between the body and carridge, near the break, where the under part hath a small rounding groove made in the body. This wire, or rather half wire, in the upper part makes the nick in the shank of the letter, when part of it is received into the groove in the under part. These two parts are so exactly fitted and gaged into one another: (viz. the male gage marked c in fig. 2, into the female marked g in fig. 1,) that when the upper part of the mould is properly placed on, and in the upper part of the mould, both together make the entire mould, and may be slid backwards for use so far, till the edge of either of the bodies on the middle of either carriage comes just to the edge of the female gages cut in each carriage; and they may be slid forward so far, till the bodies on either carriage touch each other: and the sliding of these two parts of the mould backwards makes the shank of the letter thicker, because the bodies on each part stand wider asunder: and the sliding them forwards makes the shank of the letter thinner, because the bodies on each part of the mould stand closer together. The parts of the mould are as follow: viz. a. The carriage. b. The body. c. The male gage. d. e. The mouth-piece. f. The register. g. The female gage. h. The leg. a. a. a. The bottom-plate. b. b. b. The wood on which the bottom-plate lies. e. e. c. The mouth. d. d. The throat. e. d. d. The pallat. f. The nick. g. g. The stool. h. h. The spring or bow.

Then the mould must be justified: and first the founder justifies the body, by casting about 20 proofs or samples of letters; which are set up in a composing stick, with all their nicks towards the right hand; and then by comparing these with the pattern letters, set up in the same manner, he finds the exact measure of the body to be cast. He also tries if the two sides of the body are parallel, or that the body be no bigger at the head than at the foot, by taking half the number of his proofs and turning them with their heads to the feet of the other half; and if then the heads and the feet be found exactly even upon each other, and neither to drive out nor get in, the two sides may be pronounced parallel. He farther tries whether the two sides of the thickness of the letter be parallel, by first setting his proofs in the composing stick with their nicks upwards, and then turning one-half with their heads to the feet of the other half; and if the heads and feet lie exactly upon each other, and neither drive out nor get in, the two sides of the thickness are parallel.

The mould thus justified, the next business is to prepare the matrices. A matrix is a piece of brass or copper of about an inch and a half long, and of thickness in proportion to the size of the letter it is to contain. In this metal is sunk the face of the letter intended to be cast, by striking the letter punch about the depth of an n. After this the sides and face of the matrix must be justified and cleared with files of all bunchings made by sinking the punch.

Everything thus prepared, it is brought to the furnace; which is built of brick upright, with four square sides, and a stone on the top, in which stone is a wide round hole for the pan to stand in. A foundery of any consequence has several of these furnaces in it.

As to the metal of which the types are to be cast, this, in extensive foundries, is always prepared in large quantities; but cast into small bars, of about 20 pounds weight, to be delivered out to the workmen as occasion requires. In the letter foundry which has been long carried on with reputation under the direction of Mess. Wilson and Son, at Glasgow, it is informed, that a stock of metal is made up at two different times of the year, sufficient to serve the casters at the furnace for six months each time. For this purpose, a large furnace is built under a shade, furnished with a wheel vent, in order the more equally to heat the sides of a strong pot of cast iron, which holds when full 15 hundred weight of the metal. The fire being kindled below, the bars of lead are let softly down into the pot, and their fusion promoted by throwing in some pitch and tallow, which soon inflame. An outer chimney, which is built so as to project about a foot over the farthest lip of the pot, catches hold of the flame by a strong draught, and makes it act very powerfully in melting lead; whilst it serves at the same time to convey away all the fumes, &c. from the workmen, to whom this laborious part of the business is committed.

When the lead is thoroughly melted, a due proportion of the regulus of antimony and other ingredients are put in, and some more tallow inflamed to make the whole incorporate sooner. The workmen now having mixed the contents of the pot very thoroughly by stirring long with a large iron ladle, next proceed to draw the metal off into the small troughs of cast iron, which are ranged to the number of fourscore upon a level platform, faced with stone, built towards the right hand. In the course of a day 15 hundred weight of metal can be easily prepared in this manner; and the operation is continued for as many days as are necessary to prepare a stock of metal of all the various degrees of hardness. After this, the whole is disposed into presses according to its quality, to be delivered out occasionally to the workmen.

The founder must now be provided with a ladle, which differs nothing from other iron ladles but in its size; and he is provided always with bars of iron of different sizes, which he uses according to the size of the letters he is to cast. Before the caster begins to cast, he must kindle his fire in the furnace to melt the metal in the pan. Therefore he takes the pan out of the hole in the stone, and there lays in coals and kindles them; and, when they are well kindled, he sets the pan in again.
FOUQUIERES, James, an eminent painter, was born at Antwerp in 1580, and received his chief instructions from Velvert Brougel. He applied himself to the study of landscapes, and went to Italy to improve himself in colouring. He succeeded so happily, that his works are said to be nearly equal to those of Titian. —He was engaged and much caressed at the court of the elector Palatine, and in France. By some misconduct, however, he sunk into poverty, and died in 1629, in the house of an inconsiderable painter. He had resided for several years at Rome and Venice, where he acquired that excellent style of colouring and design for which his works have been distinguished.

FOURCHEE, or FOURCHY, in Heraldry, an appellation given to a cross forked at the end. See HERALDRY.

FOURCROY, Anthony Francis de, a late celebrated French chemist. See SUPPLEMENT.

FOURMONT, Stephen, professor of the Arabic and Chinese languages, and one of the most learned men of his time, was born at Herbelai, a village four leagues from Paris, in 1583. He studied in Marzarin college, and afterwards in the Seminary of Thirty-three. He was at length professor of Arabic in the Royal College, and was made a member of the Academy of Inscriptions. In 1738, he was chosen a member of the Royal Society of London, and of that of Berlin in 1741. He was often consulted by the duke of Orleans, first prince of the blood; who had a particular esteem for him, and made him one of his secretaries. He wrote a great number of books; the most considerable of which have been printed are, 1. The Roots of the Latin Tongue, in verse. 2. Critical Reflections on the Histories of ancient Nations, 2 vols. 4to. 3. Meditations Sinicae, folio. 4. A Chinese Grammar, in Latin, folio. 5. Several dissertations printed in the Memoirs of the Academy of Inscriptions, &c. He died at Paris in 1744.

He ought not to be confounded with Michael Fourmont, his younger brother; who took orders, was professor of the Syriac language in the Royal College, and a member of the Academy of Inscriptions. He died in 1746.

FOURNERS, in Lumsdale, Lancashire, is a tract, between the Kent, Leven, and Duddon sands, which runs north parallel with the west sides of Cumberland and Westmoreland; and on the south runs out into the sea as a promontory. Here, as Mr Camden expresses it, "the sea, as if enraged at it, lashes it more furiously, and in high tides, even devours the shore, and made three large bays; viz. Kentand, into which the river Ken empties itself; Levensand, and Duddensand, between which the land projects in such a manner that it has its name hence; Foresness and Foreland, signifying the same with us as "promontorium anterus in Latin." Bishop Gibson, however, derives the name of Fourners or Furness, from the numerous furnaces that were there anciently, the rents and services of which (called Bloomsmithe rents) are still paid. This whole tract, except on the coast, rises in high hills and vast piles of rocks called Fourners-Fells; among which the Britons found a secure retreat, trusting to these natural fortresses, though nothing was inaccessible to the victorious Saxons; for we find the Britons settled here 238 years after the arrival of the Saxons: because at that time Egfrid king of Northumbria, and gave St. Cuthbert the land called Chesturmell, and all the Britons in it, as it is related in his life. In these mountainous parts are found quarries of a fine durable slate to cover buildings with, which are made use of in many other parts of the kingdom. Here are several cotton mills lately erected; and if fuel for fire were more plentiful, the trade of this country would much increase: but there being no coals nearer than Wigan or Whitehaven, and the coast duties high, firing is rather scarce, the country people using only turf or peat, and that begins to be more scarce than formerly. In the mosses of Furness much fir is found, but more oak: the trunks in general lie with their heads to the east, the high winds having been from the west. High Furness has ever had great quantities of sheep, which browse upon the holies left in great numbers for them; and produces charcoal for melting iron ore, and oak bark for tanners use, in great abundance. The forests abound with deer and wild boars, and the Meg or acorn, or large stag, whose horns are frequently found under ground here. The low plain part of Furness, which is so called to distinguish it from the mountainous part, produces all sorts of grain, but principally oats, whereof the bread eaten in this country is generally made; and there are found here veins of a very rich iron ore, which is not only melted and wrought here, but great quantities are exported to other parts to mix with poorer ores. The three sands above mentioned are very dangerous to travellers, by the tides and the many quicksands. There is a guide on horseback appointed to Kent or Lancaster sands at 10l. per annum, and to Leven at 6l. per annum, out of the public revenue; but to Duddon, which are most dangerous, none; and it is no uncommon thing for persons to pass over in parties of 100 at a time like caravans, under the direction of the carriers, who go to or fro every day. The sands are less dangerous than formerly, being more used and better known, and travellers never going without the carriers or guides. "Furnis abbey up in the mountains," was begun at Tulket in Amounderness 1124, by Stephen earl of Boulogne, afterwards king of England, for the monks of Savigny in France, and three years after removed to this valley, then called Bekangesgill, or, "the vale of nightshade." It was of the Cistercian order, endowed with
Tame fowl make a necessary part of the stock of a country farm. See Poultry.

Fowls are again distinguished into two kinds, viz., land and water fowl, these last being so called from their living much in and about water: also into those which are accounted game, and those which are not. See Game.

FLOWLING, the art of catching birds by means of bird-lime, decoys, and other devices, or the killing of them by the gun. See Bird-Catching, Bird-Lime, Decoy, Shooting, and the names of the different birds in the order of the alphabet.

FLOWLING, is also used for the pursuing and taking birds with hawks, more properly called Falconry or Hawking. See these articles.

FLOWING Piece, a light gun for shooting birds. That piece is always reckoned best which has the longest barrel, from 3½ to 6 feet, with a moderate bore; though every fowler should have them of different sizes, suitable to the game he designs to kill. The barrel should be well polished and smooth within, and the bore of an equal bigness from one end to the other; which may be proved, by putting in a piece of pasteboard, cut of the exact roundness of the top: for if this goes down without stops or slipping, you may conclude the bore good. The bridge-pan must be something above the touch-hole, and ought to have a notch to let down a little powder: this will prevent the piece from recoiling, which it would otherwise be apt to do. As to the locks, choose such as are well filled with true work, whose springs must be neither too strong nor too weak. The hammer ought to be well hardened, and pliable to go down to the pan with a quick motion.

FOX, in Zoology. See CANIS, Mammalia Index.

The fox is a great nuisance to the husbandman, by taking away and destroying his lambs, geese, poultry, &c. The common way to catch him is by gins; which being baited, and a train made by drawing raw flesh across in his usual paths or haunts to the gin, it proves an inducement to bring him to the place of destruction.

The fox is also a beast of chase, and is taken with greyhounds, terriers, &c. See Hunting.

FOX, John, the martyrologist, was born at Boston in Lincolnshire, in the year 1577. At the age of 16 he was entered a student of Brasen-Noose College in Oxford; and in 1543 he proceeded master of arts, and was chosen fellow of Magdalen College. He discovered an early genius for poetry, and wrote several Latin comedies, the subjects taken from Scripture, which his son assures us were written in an elegant style. Forsaking the muse, he now applied himself with uncommon assiduity to the study of divinity, particularly church-history; and, discovering a premature propensity to the doctrine of reformation, he was expelled the college as an heretic. His distress on this occasion was very great; but it was not long before he found an asylum in the house of Sir Thomas Lucy of Warwickshire, who employed him as a tutor to his children. Here he married the daughter of a citizen of Coventry. Sir Thomas's children being now grown up, after residing a short time with his wife's father, he came to London; where finding no immediate means of subsistence, he was reduced to the utmost degree of want; but was at length
length (as his son relates) miraculously relieved in the following manner: As he was one day sitting in St Paul's church, emaciated with hunger, a stranger accosted him familiarly, and, bidding him to be of good cheer, put a sum of money into his hand; telling him, at the same time, that in a few days new hopes were at hand. He was soon after taken into the family of the duchess of Richmond, as tutor to the earl of Surrey's children, who, when their father was sent to the Tower, were committed to her care. In this family he lived at Ryegate in Surrey, during the latter part of the reign of Henry VIII. the entire reign of Edward VI. and part of that of Queen Mary; but at length, persecuted by his implacable enemy Bishop Gardiner, he was obliged to seek refuge abroad. Basil in Switzerland was the place of his retreat, where he subsisted by correcting for the press. On the death of Queen Mary he returned to England; where he was graciously received by his former pupil the duke of Norfolk, who retained him in his family as long as he lived, and bequeathed him a pension at his death.

Mr Secretary Cecil also obtained for him the rectory of Shipton near Salisbury; and we are assured that he might have had considerable church preferment, had it not been for his unwillfulness to subscribe to the canons. He died in the year 1587, in the 70th year of his age; and was buried in the chancel of St Giles's, Cripplegate. He was a man of great industry, and considerable learning; a zealous, but not a violent reformer; a nonconformist, but not an enemy to the church of England. He left two sons; one of whom was bred a divine, the other a physician. He wrote many pieces; but his principal work is, the Acts and Monuments of the Church, &c. commonly called Fox's Book of Martyrs. His facts are not always to be depended on, and he often loses his temper; which, considering the subject, is not much to be wondered at.

Fox, George, the founder of the sect of English Quakers, was a shoemaker in Nottingham. The accounts of those times tell us, that as he wrought at his trade, he used to meditate much on the Scriptures; which, with his solitary course of life, improving his natural melancholy, he began at length to fancy himself inspired; and in consequence thereof set up for a preacher. He proposed but few articles of faith, insisting chiefly on moral virtue, mutual charity, the love of God, and a deep attention to the inward motions and secret operations of the Spirit; he required a plain simple worship, and a religion without ceremonies, making it a principal point to wait in profound silence the directions of the Holy Spirit. Fox met with much rough treatment for his zeal, was often imprisoned, and several times in danger of being knocked on the head. But all discouragements notwithstanding, his sect prevaled much, and many considerable men were won over to it; among whom were BARCLAY and PENN. He died in 1681. His followers were called Quakers. See QUAKERS.

FOX. Right Honourable Charles James, a late distinguished British statesman and orator. See SUPPLEMENT.

FOX-GLOVE. See DIGITALIS, BOTANY and MATERIA MEDICA Indic.
FRANCE.

FRANCE, a large kingdom of Europe, situated between 5° W. and 8° E. Long. and between 42° and 51° N. Lat. being bounded by the English channel and the Netherlands on the north; by Germany, Switzerland, Savoy, and Piedmont, on the east; by the Mediterranean sea, and the Pyrenean mountains, which separate it from Spain, on the south; and by the bay of Biscay on the west.

The kingdom of France was originally possessed by the Celts or Gauls. They were a very warlike people, and often checked the progress of the Roman arms; nor did they yield till the time of Julius Caesar, who totally subdued their country, and reduced it to the form of a Roman province. The Romans continued in quiet possession of Gaul, as long as their empire retained its strength, and they were in a condition to repress the incursions of the German nations, whom even in the zenith of their power they had not been able to subdue. But in the reign of the emperor Valerian, the ancient Roman valour and discipline had begun to decline, and the same care was not taken to defend the provinces as formerly. The barbarous nations, therefore, began to make much more frequent incursions; and among the rest the Franks, a German nation, inhabiting the banks of the Rhine, proved particularly troublesome. Their origin is variously accounted for; but the most probable supposition is, that the people of the emperor Gordian, the people inhabiting the banks of the Lower Rhine, entered into a confederacy with those who dwelt on the Weser, and both together assumed the name of Franks or Frisians. Their first irruption, we are told by Sulpicius, happened in the year 254, the second of Valerian's reign. At this time they were few in number; and were repulsed by Aurelian, afterwards emperor. But discouraged by this check, they returned two years after in far greater numbers; but were again defeated by Gallienus, whom Valerian had chosen for his partner in the empire. Others, however, continued to pour in from their native country in such multitudes, that Gallienus, no longer able to drive them out by force of arms, made advantageous proposals to one of their chiefs, whom he engaged to defend the frontiers against his countrymen as well as other invaders.

This expedient did not long answer the purpose. In 260 the Franks, taking advantage of the defeat and captivity of Valerian in Persia, broke into Gaul, and afterwards into Italy, committing everywhere dreadful ravages. Five years afterwards they invaded Spain; which they possessed, or rather plundered, for the space of 12 years; nor could they be driven out of Gaul till the year 275, when the emperor Probus not only gave them a total overthrow in that country, but pursued them into their own, where he built several forts to keep them in awe. This intimidated them so much, that nine of their kings submitted to the emperor, and promised an annual tribute. They continued quiet till the year 387; when, in conjunction with the Saxons pirates, they plundered the coasts of Gaul, carrying off an immense booty. To revenge this insult, the emperor Maximian entered the country of the Franks the following year, where he committed such ravages that two of their kings submitted to him; and to many of the common people who chose to remain in Gaul, he allowed lands in the neighbourhood of Treves and Cambrai.

The restless disposition of the Franks, however, did not allow them to remain long in quiet. About the year 293, they made themselves masters of Batavia and part of Flanders; but were entirely defeated, and forced to surrender at discretion, by Constantius the father of Constantine the Great, who transplanted them into Gaul. Their countrymen in Germany continued quiet till the year 355, when they renewed their depredations; but being overtaken by Constantine the Great, two of their kings were taken prisoners, and thrown to the wild beasts in the shows exhibited on that occasion.

All these victories, however, as well as many others said to have been gained by the Romans, were not sufficient to prevent the incursions of this restless and turbulent nation: insomuch that, in the year 355, they had made themselves masters of 40 cities in the province of Gaul. Soon after, they were totally defeated by the emperor Julian, and again by Count Theodosius, father to the emperor of that name; but in the year 388, they ravaged the province with more fury than ever, and cut off a whole Roman army that was sent against them. As the western empire was at this time in a very low state, they for some time found more interruption from other barbarians than from the Romans, till their progress was checked by Aetius.

When the war with Aetius broke out, the Franks were governed by one Pharamond, the first of their Pharamond kings of whom we have any distinct account. He is the one supposed to have resigned from the year 417 or 418, king to 428; and is thought by Archbishop Usher to have been killed in the war with Aetius. By some he is supposed.


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F R A N C E.

France. supposed to have compiled the Salic laws, with the assistance of four sages named Wiegast, Loegast, Wilegast, and Soldegast. But Valesius is of opinion that the Franks had no written laws till the time of Clovis.

Clodio. Pharmond was succeeded by his son Clodio, who likewise carried on a war against the Romans. He is said to have received a terrible overthrow from Aetius near the city of Lens; notwithstanding which, he advanced to Cambrey, and made himself master of that city, where for some time he took up his residence. After this he extended his conquests as far as the river Somme, and destroyed the cities of Troyes and Cologne, Tournay and Amiens. He died in the year 449, and was succeeded by Meroveus.

Meroveus. Authors are not agreed whether the new king was brother, or son, or any relation at all, to Clodio. It seems probable indeed, that he was of a different family; as from him the first race of French kings were styled Merovingian. He was honoured and respected by his people, but did not greatly enlarge the boundaries of his kingdom. He died in 458.

Childeric. Meroveus was succeeded by his son Childeric; who, being no longer kept in awe by Aetius, made war on the Romans, and extended his conquests as far as the river Loire. He is said to have taken the city of Paris after a siege of five years, according to some, and of ten, according to others. The Roman power was now totally destroyed in Italy; and therefore Clodo- veus, Clovis, or Louis, for his name is differently written, who succeeded Childeric, set himself about making an entire conquest of Gaul. Part of the province was still retained by a Roman named Syagrius, who probably had become sovereign of the country on the downfall of the western empire in 476. He was defeated and taken prisoner by Clovis, who afterwards caused him to be beheaded, and soon after totally reduced his dominions.

Thus was the French monarchy established by Clovis in the year 487. He now possessed all the country lying between the Rhine and the Loire; which, though a very extensive dominion, was yet considerably inferior to what it is at present.

Clovis had been educated in the Pagan religion, and continued in that profession till the 30th year of his age; notwithstanding which, he allowed his subjects full liberty of conscience. Having married, however, Clotilda, daughter of the duke of Burgundy; this princess, who was a zealous Christian, used all her influence with her husband to persuade him to embrace her religion. For some time he continued to waver; but happening to gain a battle, where, being in great danger, he had invoked the god of Clotilda and the Christians, he afterwards gave such a favourable ear to the discourses of Remigius bishop of Rheims, that he soon declared himself a convert, and was baptized in the year 496. His acknowledgment of the truths of the gospel was not followed by any amendment of life; on the contrary, he employed the remainder of his life in the aggrandizement of himself and extension of his dominions by the most abominable treachery, fraud, and violence. In his attacks on Armorica he proved unsuccessful. The inhabitants of this country, which comprehended the maritime part of ancient Gaul lying between the rivers Seine and Loire, had united for their defence; and though abandoned by the Romans, made a powerful defence against the barbarians who assailed them on all sides. Clovis, finding them too powerful to be subdued by force, proposed an union with his people, which they readily accepted, and this the more easily on account of his professing the Christian religion. Thus the Christianity of Clovis in several instances proved subservient to the purposes of his ambition, and his power became gradually very formidable. The Burgundians at this time possessed all the country from the forest of Vosges to the sea of Marseilles, under Gozendeau the uncle of Clotilda; who, to secure his own authority, had put to death two of his brothers, one of whom was the father of the French queen. The third brother, Godogesul, whom he had spared and allowed to possess the principality of Geneva, conspired with Clovis to drive him from his dominions. A war having commenced between the French and Burgundian monarchs, the latter was deserted in a battle by Godogesul, and obliged to fly to Avignon, leaving his antagonist master of the cities of Lyons and Vienne. The victor next laid siege to Avignon; but it was defended with such vigour, that Clovis at last thought proper to accept of a sum of money and an annual tribute from Gozendeau; who was likewise obliged to cede to Godogesul the city of Vienne, and several other places taken during the war.

Gozendeau no sooner found himself at liberty from his enemies, than he assembled a powerful army; with which he advanced towards Vienne, where Godogesul himself resided at that time. The place was garrisoned by 5000 Franks, and might have made considerable resistance; but Gozendeau being admitted through the subterraneous passage of an aqueduct, massacred most of the Franks, sent the rest prisoners to the king of the Visigoths, and put Gozendeau to death. This was quickly followed by the submission of all the other places which had owned the authority of Godogesul: and Gozendeau, now thinking himself able to resist the power of Clovis, sent a message to inform him, that he must no longer expect the promised tribute; and though Clovis was very much mortified with this deflection, he found himself obliged for the present to put up with the injury, and accept of the alliance and military service of the king of Burgundy.

His next expedition was against the Visigoths, who possessed considerable territories on both sides of the Pyrenean mountains. His motives for this undertaking were expressed in the following speech to his nobility when assembled in the city of Paris, which he considered as the capital of his dominions. "It is with concern (said the religious monarch) that I suffer the Ariana to possess the most fertile part of Gaul: let us, with the aid of God, march against them; and having conquered them, annex their kingdom to our dominions." The plan was approved of by the council; and Clovis marched against a prince for whom he had but lately professed the greatest regard, vowing to erect a church in honour of the holy apostles, if he succeeded in his enterprise. Alaric the king of the Visigoths was a young man destitute of military experience, though personally brave. He did not therefore hesitate at engaging his antagonist; but unable to contend with the veteran troops of Clovis, his army was utterly defeated on the banks of the Clain, 10 miles
France.

France.

of being conquered by Gontran and Childerbert, who had entered into a league for that purpose. After his death Fredegonde implored the protection of Gontran for herself and her infant son Clotaire; which he gave readily granted, and obliged Childerbert to put an end to the war. He found himself, however, greatly difficult to keep Fredegonde and Bruneon in awe; for these two princesses having long rives and implacable enemies, were continually plotting the destruction of each other. This, however, he accomplished, by favouring sometimes Bruneon and sometimes Fredegonde; so that, during his life, neither of them durst undertake any thing against the other.

On the 28th of March 593, died Gontran, having lived upwards of 60, and reigned 32 years. Childerbert succeeded to the kingdom without opposition, but did not long enjoy it; he himself dying in the year 596, and his queen shortly after. His dominions were divided between his two sons Theodobert and Thierry, the first of whom was declared king of Austrasia, and the latter king of Burgundy. As Theodobert was only in the 11th year of his age, and Thierry in his 10th, Bruneon governed both kingdoms with an absolute sway. Fredegonde, however, took care not to let slip such a favourable opportunity as was offered her by the death of Childerbert, and therefore made herself mistress of Paris, and some other places on the Seine. Upon this Bruneon sent against him the best part of his forces in Austrasia, who were totally defeated; but Fredegonde died before she had time to improve her victory, leaving her son Clotaire heir to all her dominions.

For some time Bruneon preserved her kingdom in peace; but in the end her own ambition proved her ruin. Instead of instructing Theodobert in what was necessary for a prince to know, she took care rather to keep him in ignorance, and even suffered him to marry a young, noble and handsome slave of his father's. The new queen was possessed of a great deal of affability and good nature; by which means she in a short time gained the affection of her husband so much, that he readily consented to the banishment of Bruneon. Upon this disgrace she fled to Thierry king of Burgundy, in the year 598. By him she was very kindly received; and instead of exciting jealousies or misunderstandings between the two brothers, she engaged Thierry to attempt the recovery of Paris and the other places which had been wrested from their family by Fredegonde, procuring at the same time a considerable body of auxiliaries from the Visigoths. This measure was so acceptable to Theodobert, that he likewise raised a numerous army, and invaded Clotaire's dominions in conjunction with his brother. A battle ensued, in which the forces of Clotaire were totally defeated, and himself obliged soon after to sue for peace: which was not granted, but on condition of his yielding up the best part of his dominions.

This treaty was concluded in the year 600; but three years afterwards, it was broken by Clotaire. He was again attacked by the two brothers, and the war carried on with great vigour till the next spring. At this time Thierry having forced Landri, Clotaire's general, to a battle, gave him a total overthrow; in which the king's infant son Merovene, whom he had sent along with Landri, was massacred; to gratify, as Clotaire pretended, the malice of Bruneon. After this victory, Thierry marched directly to Paris; fully bent on the destruction of his cousin, which now seemed inevitable. This, however, was prevented by Theodobert; who no sooner heard of the victory gained by Thierry, than he became jealous of his success, and offered Clotaire such terms of peace as he gladly accepted. The latter having then nothing to fear on the side of Austrasia, quickly compelled Thierry to listen to terms of accommodation also.

This behaviour of Theodobert greatly provoked his brother; and his resentment was highly inflamed by Bruneon, who never forgot her disgrace in being banished from his court. A war was therefore commenced between the two brothers in 605; but it was so highly disapproved of by the nobility, that Thierry found himself obliged to put an end to it. The tranquillity which now took place was again disturbed in 607, by Theodobert's sending an embassy to demand some part of Childerbert's dominions, which had been added by the will of that monarch to those of Burgundy. The nobility of both kingdoms were so much averse to war, that they constrained their kings to consent to a conference, attended by an equal number of troops; but Theodobert, by a scandalous breach of his faith, brought double the number, and compelled his brother to submit to what terms he pleased. This piece of treachery instantly brought on a war; for Thierry was bent on revenge, and his nobility no longer opposed him. It was necessary, however, to secure Clotaire by a negotiation; and accordingly a promise was made of restoring those parts of his dominions which had formerly been taken from him, provided he would remain quiet. This treaty being finished, Thierry entered Theodobert's dominions, defeated him in two battles, took him prisoner, used him with the utmost indignity; and having caused an infant son of his to be put to death, sent him to his grandmother Bruneon. By her orders he was first shaved and confined in a monastery; but afterwards, fearing lest he should make his escape, she caused him to be put to death.

Clotaire, in the mean time, thought that the best method of making Thierry keep his word was to seize on those places which he had promised to restore to him, before his return from the war with Theodobert. This he accordingly did; and Thierry no sooner heard of his having done so, than he sent him a message requiring him to withdraw his forces, and, in case of his refusal, declared war. Clotaire was prepared for this; and accordingly assembled all the forces in his dominions, in order to give him a proper reception. But before Thierry could reach his enemies, he was seized with a dysentery; of which he died in the year 612, having Bruneon lived 26 years, and reigned 17.

On the death of Thierry, Bruneon immediately caused his eldest son, named Sigebert, then in the 10th year of his age, to be proclaimed king. It is probable that she intended to have governed in his name with an absolute sway; but Clotaire did not give her time to discover her intentions. Having great intelligence in Austrasia and Burgundy, and knowing that the nobility in both kingdoms were disinclined to Bruneon, he declared war against her; and she being betrayed by her generals, fell into the hands of her enemies. The Clotaire gave her up to the nobles; who generally hated
bated her, and who used her in the most cruel manner. After having led her about the camp, exposed to the insults of all who bad the meanness to insult her, she was tied by the leg and arm to the tail of an untamed horse, which, setting off at full speed, quickly dashed out her brains. After this her mangled body was reduced to ashes, which were afterwards interred in the abbey of St Martin at Autun.

Thus in the year 613, Clotaire became sole monarch of France; and quietly enjoyed his kingdom till his death, which happened in 628. He was succeeded by Dagobert; who proved a great and powerful prince, and raised the kingdom of France to a high degree of splendour. Dagobert was succeeded by his sons Sigebert and Clovis; the former of whom had the kingdom of Austrasia, and the latter that of Burgundy. Both the kings were minors at the time of their accession to the throne, which gave an opportunity to the mayors of the palace (the highest officers under the crown) to usurp the whole authority. Sigebert died in 640, after a short reign of one year; leaving behind him an infant son named Dagobert, whom he strongly recommended to the care of the chief minister of the palace, who was his mayor; but did not long suffer him to enjoy that honour. He had not the cruelty, however, to put him to death; but sent him to a monastery in one of the Western islands of Scotland; and then, giving out that he was dead, advanced his own son Childerich to the throne. Childerich was expelled by Clovis king of Burgundy; who placed on the throne Childeric, the second son of Sigebert. Clovis died soon after the resurrection, and was succeeded in his dominions by his son Clotaire, who died in a short time, without issue. He was succeeded by his brother Childeric; who, after a short reign, was murdered with his queen, at that time big with child, and an infant son named Dagobert; though another, named Daniel, had the good luck to escape.

The affairs of the French were now in the most deplorable situation. The princes of the Merovingian race had been for a long time entirely deprived of their power; and their officers called mayors of the palace. In Austrasia the administration had been totally engrossed by Pepin and his son Grimaldo; while Achambaud and Ebroin did the same in Neustria and Burgundy. On the reunion of Neustria and Burgundy to the rest of the French dominions, this minister ruled with such a despotism, that the nobility of Austrasia were provoked to a revolt; electing for their duke two chiefs named Martin and Pepin. The forces of the confederates, however, were defeated by Ebroin; and Martin having surrendered on a promise of safety, was treacherously put to death. Pepin lost no time in recruiting his shattered forces; but before he had any occasion to try his fortune a second time in the field of battle, the assassination of Ebroin delivered him from all apprehensions from that quarter. After his death, Pepin carried every thing before him, overthrew the royal army under the command of the new minister Bertaire; and, having got possession of the capital, caused himself to be declared mayor of the palace; in which station he continued to govern with an absolute sway during the remainder of his life.

Pepin (who had got the surname of Heristal from his palace on the Meuse) died in the year 714, having enjoyed unlimited power for 26 years. He appointed his grandson Thualoibride, then only six years of age, to succeed him in his post of mayor of the palace. This happened during the reign of Dagobert already mentioned; but this prince had too much spirit to suffer himself to be deprived of his authority by an infant. The adherents of the young mayor were defeated in battle, and this defeat was soon followed by his death. Charles, however, the illegitimate son of Pepin, was now raised to the dignity of duke by the Austrasians; and by his great qualities seemed very worthy of that honour. The murder of Dagobert freed him from a powerful opponent; and the young king Chilperic, who after Dagobert's death was brought from a cloister to the throne, could by no means cope with such an experienced antagonist. On the 10th of March 717, Charles had the good fortune to surprise the royal camp as he passed through the forest of Arden; and soon after a battle ensued, in which the king's forces were entirely defeated. On this Chilperic entered into an alliance with Eudes duke of Aquitania, whose friendship was purchased by the coronation of his son Charlemagne, which Eudes had seized for himself. Charles, however, having placed on the throne another of the royal family named Clotaire, advanced against Chilperic and his associate, whom he entirely defeated near Soissons. After this disaster, Eudes, despairing of success, delivered up Chilperic into the hands of his antagonist; after having stipulated for himself the same terms which had been formerly granted him by the captive monarch. Charles, now advanced to the summit of power, treated Chilperic with great respect; and on the death of Clotaire, caused him to be proclaimed king of Austrasia; by which, however, his own power was not in the least diminished; and from this time the authority of the kings of France became merely nominal; and so inactive and indolent were they accounted, that historians have bestowed upon them the epithet of *fainéants*, i.e. "lazy or idle." Charles, however, had still one competitor to contend with. This was Rainfrid, who had been appointed mayor of the palace by the minister who had made such a vigorous resistance, that Charles was obliged to allow him the peaceable possession of the country of Anjou. No sooner, however, had Charles thus set himself at liberty from domestic enemies, than he was threatened with destruction from foreign nations. The Suevians, Frisonis, and Alemanns, were successively encountered and defeated. Eudes also, who had perfidiously broken the treaties to which he had bound himself, was twice repulsed; after which Charles invaded Aquitain, and obliged the treacherous duke to hearken to reason. This was scarce accomplished, when he found himself engaged with a more formidable enemy than any he had yet encountered. The Saracens having overthrown great part of Asia, now turned their victorious arms westward, and threatened Europe with total subjection. Spain had already received the yoke; and having passed the Pyrenees, they next invaded France, appearing in vast numbers under the walls of Toulouse. Here they were encountered and defeated by Eudes; but this proved only a partial check. The barbarians once more passing the Pyrenees, entered France with such a powerful army, that Eudes was no longer able to
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Having soon become weary of residing at the court of Aquitain, determined to escape from thence, and put himself under the protection of Astolphus king of the Lombards; but he was killed in attempting to force a pass on the confines of Italy. Pepin in the mean time continued to push his good fortune. The submission of the Saxons was soon followed by the reduction of Britain; and that by the recovery of Narbonne from the Infidels. His next exploit was the protection of Pope Stephen III. against Astolphus the king of the Lombards, who had seized on the exarchate of Ravenna, and insisted on being acknowledged king of Rome. The pope, unable to contend with such a powerful rival, hastened to cross the Alps and implore the protection of Pepin, who received him with all the respect due to his character. He was lodged in the abbey of St Dennis, and attended by the king in person during a dangerous sickness with which he was seized. On his recovery, Stephen solemnly placed the diaDEM on the head of his benefactor, bestowed the regal unction on his sons Charles and Carloman, and conferred on the three princes the title of patrician of Rome. In return for these honour, Pepin accompanied the pontiff into Italy at the head of a powerful army. Astolphus, unable to withstand such a powerful antagonist, shut himself up in Pavia, where he was closely besieged by the Franks, and obliged to renounce all pretensions to the sovereignty of Rome, as well as to restore the city and exarchate of Ravenna, and swear to the observance of the treaty. No sooner was Pepin gone, however, than Astolphus broke the treaty he had just ratified with such solemnity. The pope was again reduced to distress, and again applied to Pepin. He now sent him a pompous epistle in the style and character of St Peter himself; which so much inflamed the zeal of Pepin, that he instantly set out for Italy and compelled Astolphus a second time to submit to his terms, which were now rendered more severe by the imposition of an annual tribute. Pepin next made a tour to Rome; but finding that his presence there gave great uneasiness both to the Greeks and to the pope himself, he thought proper to finish his visit in a short time. Soon after his return Astolphus died, and his dominions were usurped by his general Didier; who, however, obtained the papal sanction for what he had done, and was recognized as lawful sovereign of the Lombards in the year 756.

Pepin returned to France in triumph; but the peace of his dominions was soon disturbed by the revolt of the Saxons, who always bore the French yoke with the utmost impatience. Their present attempts, however, proved equally unsuccessful with those they had formerly made; being obliged to submit and purchase their pardon not only by a renewal of their tribute, but by an additional supply of 300 horse. But while the king was absent on this expedition, Vaisar duke of Aquitain took the opportunity of ravaging Burgundy, where he carried his devastations as far as Chalons. Pepin soon returned, and entering the dominions of Vaisar, committed similar devastations, and would probably have reduced the whole territory of Aquitain, had he not been intercepted by the hostile preparations of his nephew Tassilo the duke of Bavaria. The king, however, contented himself at present with securing his frontiers by a chain of posts, against any invasion; after which he resumed his enterprise on the dominions of Vaisar. The latter at first attempted to impede the progress of his antagonist by burning and laying waste the country: but finding this to no purpose, he determined to try his fortune in an engagement. Victory declared in favour of Pepin; but he refused to grant a peace upon any terms. The French monarch advanced to the banks of the Garonne; while Vaisar was abandoned by his ally the duke of Bavaria, and even by his own subjects. In this distress he retired with a band of faithful followers into the country of Saintonge, where he defended himself as long as possible, but was at last deprived both of his crown and life by the victor.

Thus the duchy of Aquitain was once more annexed to the crown of France; but Pepin had scarce time to indulge himself with a view of his new conquest when he was seized with a slow fever, which put an end to his life in the year 768, the 54th of his age, and 17th of his reign. He was of a short stature, Pepin, whence he had the surname of Le Bref, or the Short; but his great actions justly entitled him to the character of a hero: though under the succeeding reign his own fame seemed to have been entirely forgot, and on his tomb was only inscribed, "Here lies the father of Charles." Pepin was succeeded in his authority by his two sons Charles and Carloman; to whom by his dying breath he bequeathed his dominions. They continued to reign jointly for some time; but the active and enterprising spirit of Charles gave such umbrage to the weak and jealous Carloman, that he regarded him with envy, and was on the point of coming to an open rupture with him, when he himself was taken off by death, and thus the tranquility of the empire was preserved.

The first military enterprise of Charles was against Hunalde, the old duke of Aquitain, who leaving the monastery where he had resided upwards of 20 years, assumed the royal title, and was joyfully received by his subjects, already weary of the French yoke. Charles took the field with the utmost expedition, and with difficulty prevailed upon his brother Carloman, who was then alive, to join him with his forces. But the junction was scarcely effected, when Carlemann withdrew his forces again, and left his brother to carry on the war in the best manner he could. Charles, though thus deserted, did not hesitate at engaging the enemy; and having overthrown them in a great battle, Hunalde was obliged to fly to the territories of Lupus, duke of Gascony. Charles quickly sent an embassy demanding the fugitive prince; and Lupus, not daring to disobey the orders of such a powerful monarch, yielded up the unfortunate Hunalde, who was instantly cast into prison, from which, however, he afterwards made his escape.

The death of Carlemann, which happened in the year 771, left Charles sole master of France, but the revolt of the Saxons involved him in a series of wars from which he did not extricate himself for 33 years. These had long been tributaries to the French, but frequently revolted; and now, when freed from the terror of Pepin's arms, thought they had a right to shake off the yoke altogether. Charles entered their country with a powerful army; and having defeated them in a number
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The Saxons made an obstinate defence, but were at last obliged to submit; and Charles employed his army three days in demolishing the monuments of idolatry in that place; which so much disheartened the whole nation, that for the present they submitted to such terms as he pleased to impose; and which were rendered easier than they probably would have been, by the news which Charles now received from Italy. He had concluded a marriage with the daughter of Didier king of the Lombards; but this had been dissolved by the pope, who reproached the Lombards with the first stain of the leprous. Thus all friendship was dissolved between Didier and Charles; and as the Lombard monarchs seem to have had a kind of natural enmity towards the popes, it is not surprising that it should now break out with uncommon fury. Didier having seized and frightened to death Pope Stephen IV, used his utmost endeavours to reduce his successor Adrian I. to a state of entire dependence on himself. Adrian applied to the French monarch, the usual resource of the pontiff in those days. Charles was very willing to grant the necessary assistance, but the nobility were averse to an Italian war; so that he was obliged to act with great circumspection. Several embassies were therefore sent to Didier, entreating him to restore to the Pope those places which he had taken from him, and at last even offering him a large sum of money if he would do so; but this proposal being rejected, he obtained the consent of his nobility to make war on the Lombards. Didier disposed his troops in such a manner, that the officers of Charles are said to have been unanimously of opinion, that it would be impossible to force a passage. This, however, was accomplished, either through the superior skill of Charles, according to some historians, or a panic which seized the Lombard soldiers, according to others; after which Didier, with the old duke of Aquitaine, who had escaped from his prison, and taken refuge at his court, shot themselves up in Pavia. Adalguise, the only son of the Lombard monarch, with the widow and children of Carloman, fled to Verona. That city was immediately invested by the conqueror, and in a short time obliged to submit. Adalguise had the good luck to escape to Constantinople, but we are not informed what became of Carloman's widow and children. Charles, after paying a short visit to Rome, returned to the siege of Pavia. The place was vigorously defended, until famine and pestilence obliged the inhabitants to implore the clemency of Charles. He resolved to make a sacrifice to his own obstinacy in opposing the intention of the people; Didier was taken prisoner and carried into France; but we are not informed of his fate afterwards. His kingdom, however, was totally dissolved, and Charles was crowned king of Lombardy at Milan in the year 774.

Having received the oaths of allegiance from his new subjects, Charles set out for Saxony, the inhabitants of which had again revolted, and recovered Eresbouerg their capital. The king soon recovered this important post; but a detachment of his army being cut off, and new troubles arising in Italy, he was obliged to accept of the proposals of the Saxons, though his sincerity was very doubtful. Having therefore only strengthened the fortifications of Eresbourg, and left a sufficient garrison in the place, he set out for Italy, which was all in commotion through the intrigues of the emperor of the East, and Adalguise of Didier. The presence of Charles restored tranquillity in that quarter; but in the mean time, the Saxons having taken Eresbourg and destroyed the fortifications, threatened to annihilate the French power in that quarter. On the king's return, he found them employed in the siege of Sigebourg. His sudden arrival struck the barbarians with such terror, that they instantly sued for peace; which the king once more granted, but took care to secure their obedience by a chain of forts along the river Lippe, and repairing the fortifications of Eresbourg. An assembly of the Saxons was held at Padernbourn, and a promise was made, that the nation should embrace the Christian religion after which the king set out on an expedition to Spain in the year 778.

This new enterprise was undertaken at the request of Ibnala, the Moorish sovereign of Saragossa, who had been driven from his territory. He was restored, however, by the prowess of Charles, who reduced the cities of Pampeluna and Saragossa. He reduced also the city of Barcelona, and the kingdoms of Navarre and Arragon; but, on his return, he met with a severe check from the Gascons, who attacked and defeated the rear-guard of his army with great slaughter as they passed the Pyrenean mountains. This engagement, which seems to imply some defect in the prudence or military skill of Charles, has been much celebrated among romance writers, on account of the death of Roland a famous warrior.

Next year, 779, he paid a visit to Italy with his two sons Carloman and Louis. Having passed the winter at Pavia, he entered Rome next spring amidst the acclamations of the inhabitants. Here, in the 35th year of his age, he divided his dominions in presence of the pope betwixt his two sons Carloman and Louis. The former, who now took the name of Pepin, had Lombardy; the latter Aquitaine. Having then received the submission of Tassilion duke of Bavaria, he set out for Saxony, where he took a most severe revenge on the people of that country for the many treacheries they had been guilty of. The present revolt was chiefly owing to a chief named Witikind, who had twice before fled from the victorious arms of Charles, and taken refuge at the court of Denmark. Returning from thence, in the king's absence, he roused his countrymen to action, while the generals of Charles, disagreeing among themselves, neglected to take proper methods for repelling the enemy. In consequence of this, they were entirely defeated on the banks of the Weser in the year 782. Charles arrived in time to prevent the total destruction of his people, and directly penetrated into the heart of the country. Witikind unable to resist his antagonist, once more fled into Denmark; but 4,500 of his followers perished at once by the hands of the executioner. An universal insurrection was the consequence of this unheard of cruelty; and though during three years the French monarch was constantly successful in the field, he found it impossible by any force whatever to subdue the spirit.
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The king did not at present make war against the Moors; probably foreseeing that they would be called off by their Christian enemies in Spain. This accordingly happened; the victories of Alonso the Chaste obliged them to leave France; after which Charles marched in person to attack the Saxons and Hungarians. The former consented again to receive the Christian religion, but were likewise obliged to deliver up a third part of their army to be disposed of at the king's pleasure; but the Hungarians defended themselves with incredible vigour. Though often defeated, their love of liberty was altogether invincible; so that the war was not terminated but by the death of the king, and an almost total destruction of the people: only one tribe could be induced to acknowledge the authority of the French monarch.

These exploits were finished between the years 793 and 798: after which Charles invaded and subdued the islands of Majorca and Minorca; which the dissensions of the Moorish chiefs gave him an opportunity of doing. The satisfaction he felt from this new conquest, however, was soon damped by the troubles which broke out in Italy. After the death of Pope Adrian, his nephew aspired to the papal dignity; but a priest named Leo being preferred, the disappointed candidate determined on revenge. He managed matters so well, that his designs were concealed for four years. At last, on the day of a procession, a furious assault was made on the person of Leo. The unfortunate pontiff was left for dead on the ground; but having with difficulty recovered, and made his escape to the Vatican, he was protected by the duke of Spoleto, at that time general of the French forces. His cause was warmly espoused by Charles, who invited him to his camp at Paderborn in Westphalia; whence he dispatched him with a numerous guard to Rome, promising soon after to visit that metropolis, and redress all grievances. His attention for the present, however, was called by the descendants of the Normans on the maritime provinces of his dominions; so that he was obliged to defer the promised assistance for some time longer. Having constructed forts at the mouths of most of the navigable rivers, and further provided for the defence of his territories, by instituting a regular militia, and appointing proper squadrons to cruise against the invaders, he set out for the fourth and last time on a journey to Rome. Here he was received with the highest possible honours. Leo was allowed to clear himself by oath of the crimes laid to his charge by the enemies, while his accusers were sent into exile. On the festival of Christmas, in the year 800, after Charles had made his appearance in the cathedral of St Peter, and assisted devoutly at mass, the pope suddenly put a crown on his head; and the place instantly resounded with acclamations of "Long life to Charles the August, crowned by the hand of God! Long life and victory to the great and pacific emperor of the Romans!" His body was then consecrated and anointed with royalunction; and after being conducted to a throne, he was treated with all the respect usually paid to the ancient Caesars; from this time also being honoured with the title of Charlemagne, or Charles the Great. In private conversation, however, he usually protested, that he was ignorant of the pope's intention at this time; and that, had he known it, he would have disappointed
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France disappointed him by his absence: but these protestations were not generally believed; and the care he took to have his new title acknowledged by the eastern emperors, evidently showed how fond he was of it.

Charles, now raised to the supreme dignity in the west, proposed to unite in himself the whole power of the first Roman emperors, by marrying Irene the empress of the East. But in this he was disappointed by the marriage of that princess by Nicephorus; however, the latter acknowledged his new dignity of Augustus, and the boundaries of the two empires were amicably settled. Charles was further gratified by the respect paid him by the great Haroun Al-Rashid, caliph of the Saracens, who yielded to him the sacred city of Jerusalem, and holy sepulture there. But in the mean time his empire was threatened with the invasion of a very formidable enemy, whom even the power of Charles would have found it hard to resist. These were the Normans, at this time under the government of Godfrey a celebrated warrior, and who by their adventurous spirit and skill in maritime affairs, threatened all the western coasts of Europe with desolation. From motives of mutual convenience a treaty peace was established, and Charles made use of this interval to settle the final distribution of his dominions. Aquitain and Gascony, with the Spanish Marche, were assigned to his son Louis; Pepin had Italy confirmed to him; and to this was added the greatest part of Bavaria, with the country now possessed by the Grisons. Charles the eldest had Neustria, Austrasia, and Thuringia. The donation was supposed to be rendered more authentic by the sanction of the pope. This division, however, had scarce taken place, when the princes were all obliged to defend their dominions by force of arms. Louis and Pepin were attacked by the Saracens, and Charles by the Sclavonians. All these enemies were defeated; but while Charles hoped to spend the short remainder of his life in tranquillity, he was once more called forth to martial exertions by the hostile behaviour of Godfrey the Norman leader. Charles sent him a message of defiance, which was returned in the same style by Godfrey: but the former, by artfully fomenting divisions among the northern powers, prevented for a while the threatened danger; but these disturbances being quelled, the Normans renewed their depredations, and Charles was obliged to face them in the field. An engagement, however, was prevented by the death of Godfrey, who was assassinated by a private soldier; on which the Norman army retreated, and the dominions of the empire still remained free from these invaders. Still the latter days of Charles were embittered by domestic misfortunes. His favourite daughter Rotrude died, as did also Pepin king of Italy; and these misfortunes were soon followed by the death of his eldest son Charles. The emperor then thought proper to associate his only surviving son Louis with him in the government; which was formally done at Aix-la-Chapelle. Charles himself survived this transaction only a few months; his death happened on the 27th of January 814, in the 71st year of his age, and 47th of his reign.

By the martial achievements of this hero, the French monarchy was raised to its utmost pitch of splendour. He had added the province of Aquitain to the territories of his ancestors; he had confounded the inhabitants of Brittany to the shores of the ocean, and obliged them to submit to a disgraceful tribute. He had reduced under his dominion all that part of Spain which extends from the Pyrenees to the river Ebro, and includes the kingdoms of Rouillon, Navarre, Aragon, and Catalonia. He possessed Italy from the Alps to the borders of Calabria; but the duchy of Beneventum, including most of the present kingdom of Naples, escaped the yoke after a transitory submission. Besides these extensive countries, Charles added to his territories the whole of Germany and Pannonia; so that the French now had the jurisdiction of all the country from east to west, from the Ebro in Spain to the Vistula; and from north to south, from the duchy of Beneventum to the river Eyder, the boundary between Germany and the dominions of Denmark. In acquiring these extensive dominions Charles had been guilty of horrid and repeated massacres, for which, however, he had been in some measure excusable by the barbarity and rebellious disposition of the people with whom he had to deal, upon whom no mild measures would probably have had any effect. His establishing of schools throughout the conquered provinces, showed also his inclination to govern his subjects in peace, and to take proper steps for their civilization; though indeed many parts of his private conduct showed no small inclination to cruelty; particularly the fate of the sons of Carloman, of whom no account could ever be obtained. His advice to his son Louis indeed was excellent; exhorting him to consider his people as his children; to be very mild and gentle in his administration, but firm in the execution of justice; to reward merit; promote his nobles gradually; choose ministers deliberately, but not remove them capriciously or without sufficient reason. All these prudent maxims, Decline of however, were not sufficient to enable Louis to govern his empire dominions so extensive, and people so turbulent as he had to deal with. At the time of the decease of his father this prince was about 36 years of age, and had married Ermengarde, daughter of the count of Hesbay of the diocese of Liege, by whom he had three sons, Lothaire, Pepin, and Louis. Lothaire, the eldest, was associated with himself in the empire, and the two youngest were intrusted with the governments of Aquitain and Bavaria. Every one of the princes proved unfaithful to their father, as well as enemies to one another. The death of Ermengarde, and the marriage of the emperor with Judith a princess of Bavaria, artful but accomplished, proved the first source of calamity to the empire. In the year 823, Charles, the emperor's youngest son, was born; and his pretensions became in time more fatal to the public tranquillity than the ambition and disobedience of all the rest. Various parts of the Imperial dominions were likewise assaulted by foreign enemies. The inhabitants of Brittany and Navarre revolted; the Moors invaded Catalonia; while the ambition of Judith produced a war amongst the brothers themselves.

Charles at first had been appointed sovereign of that civil war part of Germany bounded by the rivers Danube, the among the Maine, the Neckar, and the Rhine; the country of sons of Louis the Grisons and Burgundy, comprehending Geneva and the Swiss cantons; but this was opposed by the three eldest sons. Pepin and Louis advanced with the united forces of Aquitain and Bavaria, while the Imperial
the Saracens, whose invasions were encouraged by the duke of Beneventum and the Greek emperor. Charles passed into Italy with only a few followers; but when he came to Pavia, at which place the pontiff had appointed to meet him, he was informed that Carloman, king of Bavaria, and son of Louis the German, was already in Italy with a powerful army, and laid claim to the imperial title in virtue of his father's right. Charles prepared to oppose him by force of arms; but his generals conspired against him, and the soldiers declared their resolution not to pass the Alps. On this he was obliged to retire to France, at the very moment that Carloman, dreading his power, prepared to return to Germany. This was the last of Charles's enterprises. His journey brought on a return of his indisposition, which was rendered fatal through the treachery of a Jewish physician named Zedechnus, who administered poison to him under pretence of curing his malady. He expired in a miserable cottage upon Mount Cenis, in the 34th year of his age, and 38th of his reign over the kingdom of France.

The ambition of Charles had been productive of much distress both to himself and to his subjects. His eldest son Louis, surnamed from a defect in his speech, the Stammerer, was, of a quite different disposition; but his feeble administration was ill calculated to retrieve matters in their present situation. He died on the 20th of April 879, while on a march to suppress some insurrections in Burgundy. He left his queen Adelaide pregnant; who some time after his decease was delivered of a son, named Charles. After his death followed an interregnum; during which a faction was formed for setting aside the children of Louis the Stammerer, in favour of the German princes, sons to Louis the brother of Charles the Bald. This scheme, however, proved abortive; and the two sons of the late king, Louis and Carloman, were crowned kings of France. Another kingdom was at that time erected by an assembly of the states, namely the kingdom of Provence, which consisted of the countries now called Lyonnais, Savoy, Dauphiny, Franche Comté, and part of the duchy of Burgundy; and the kingdom was given to Duke Boson, brother-in-law to Charles the Bald. In 881, both kings of France died; Louis, as was suspected, by poison; and Carloman, of a wound was received accidentally while hunting. This produced a second interregnum, which ended with the calling in of Charles the Gross, emperor of Germany. His reign was more fortunate than that of any of his predecessors. The Normans, to whom he had given leave to settle in Friesland, sailed up the Seine with a fleet of 700 ships, and laid siege to Paris. Charles, unable to force them to abandon their undertaking, prevailed on them to depart by a large sum of money. But the king could not advance the money at once, he allowed them to remain in the neighbourhood of Paris during the winter; and they in return plundered the country, thus amassing vast wealth besides the sum which Charles had promised. After this ignominious transaction Charles returned to Germany, in a very declining state of health both as to body and mind. Here he quarreled with his empress; and being abandoned by all his friends, he was deposed, and reduced to such distress, that he would not even have had bread to eat.
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In the year 1110, Philip prevailed on the court of Rome to have his affair reviewed in an assembly at Poictiers; where, notwithstanding his utmost efforts, sentence of excommunication was a fourth time pronounced against him. Yet, in spite of all these sentences, as Queen Bertha was dead, and the count of Anjou offered, for a large sum of money, to give whatever assistance was requisite for procuring a dispensation, Philip at last prevailed, and the countess was proclaimed queen of France. But though the king's domestic affairs were now in some degree quieted, his negligence in government had thrown the affairs of the nation into the greatest disorder. He therefore associated with him in the government his eldest son Louis. This prince was the very reverse of his father; and by his activity and resolution, keeping constantly in the field with a considerable body of forces, he reduced the rebellious nobility to subjection, and according to the best historians, at this time saved the state from being utterly subverted.

For these services the queen looked upon the young prince with so jealous an eye, and gave him so much disturbance, that he found it necessary to retire for some time into England; where he was received by King Henry I. with the greatest kindness. He had not been long at court, before Henry received by an express a letter from Philip telling him, that, for certain important reasons, he should be glad if he closely confined his son, or even despatched him altogether. The king of England, however, instead of complying with this infamous request, shewed the letter to Louis, and sent him home with all imaginable marks of respect. Immediately on his return he demanded justice; but the queen procured poison to be given him, which operated so violently that his life was despaired of. A stranger, however, undertook the cure, and succeeded; only a paleness remained in the prince's face ever afterwards, though he grew so fat that he was surnamed the Gross.

On his recovery, the prince was on the point of revenging his quarrel by force of arms; but his father having caused the queen to make the most humble submissions to him, his resentment was at length appeased, and a perfect reconciliation took place.

Nothing memorable happened in the reign of King Philip after this reconciliation. He died in the year 1118, and was succeeded by his son Louis the Gross. The first years of his reign were disturbed by insurrections of his lords in different places of the kingdom; and these insurrections were the more troublesome, as they were secretly fomented by Henry I. of England, that by weakening the power of France his duchy of Normandy might be the more secure. This quickly brought on a war; in which Henry was defeated, and his son William obliged to do homage to Louis for the duchy of Normandy. As the kings of England and France, however, were rivals, and exceedingly jealous of each other, the latter espoused the cause of William the son of Robert duke of Normandy, whom Henry had unjustly deprived of that duchy. This brought on a new war; in which Louis, receiving a great defeat from Henry, was obliged to make peace upon such terms as his antagonist thought proper. The tranquillity, however, was but of short duration. Louis renewed his intrigues in favour of William, and endeavoured to form a confederacy against Henry; but the latter found means not only to dissipate this confederacy, but to prevail upon Henry V. emperor of Germany to invade France with the whole strength of the empire on one side, while he prepared to attack it on the other. But Louis having collected an army of 200,000 men, both of them thought proper to desist. Upon this the king of France would have marched into Normandy, in order to put William in possession of that duchy. His great vassals, however, told him they would do nothing; that they had assembled in order to defend the territories of France from the invasion of a foreign prince, and not to enlarge his power by destroying that balance which arose from the king of England's possession of Normandy, and which they reckoned necessary for their own safety. This was followed by a peace with Henry; which, as both monarchs had now seen the extent of each other's power, was made on pretty equal terms, and kept during the life of Louis, who died in 1137, leaving the kingdom to his son Louis VII.

The young king was not endowed with any of those qualities which constitute a great monarch. From the superstition common to the age in which he lived, he undertook an expedition into the Holy Land, from whence he returned without glory. In this expedition he took his queen Eleanor along with him; but was so much offended with her gallantries during her stay there, as well as her behaviour afterwards, that he divorced her, and returned the duchy of Guienne which he received with her as a portion. Six weeks after this he married Henry duke of Normandy, count of Anjou and Maine, and heir apparent to the crown of England. This marriage was a very great mortification to Louis; and procured him the surname of the Young, on account of the folly of his conduct. When Henry ascended the throne of England, some wars were carried on between him and Louis, with little advantage on either side: at last, however, a perfect reconciliation took place; and Louis took a voyage to England, in order to visit the shrine of St. Thomas of Canterbury. On his return he was struck with an apoplexy; and though he recovered for that time, yet he continued ever after paralytic on the right side. After having languished for about a year under this malady, he died on the 18th of September 1180, leaving the kingdom to his son Philip.

This prince, surnamed The Gift of God, The Magnanimous, and The Conqueror, during his lifetime; and, as Great if all these titles had fallen short of his merit, styled Augustus after his death,—is reckoned one of the greatest princes that ever sat on the throne of France, or any other. It doth not, however, appear, that these titles were altogether well founded. In the beginning of his reign he was opposed by a strong faction excited by his mother. This indeed he suppressed with a vigour and spirit which did him honour; but his taking part with the children of Henry II. of England in their unnatural contests with their father, and his treacherous combination with John to seize his brother's kingdom when he was detained in prison by the emperor of Germany, must be indelible stains in his character,
character, and for ever exclude him from the title of Magnanimous. As to military skill and personal valour, he was evidently inferior to Richard I. of England; nor can his recovering of the provinces held by the English in France, from such a mean and dastardly prince as King John, entitle him with any justice to the surname of Conqueror. In politics he was evidently the dupe of the pope, who made use of him to intimidate John into a submission, by promising him the kingdom of England, which he never meant that he should enjoy. As to account of these transactions, which were the principal ones of this reign, is given under the article ENGLAND, No. 121—141.

Philip died in 1237, and was succeeded by his son Louis VIII. and he, in 1226, by Louis IX. afterwards styled St. Louis. This prince was certainly possessed of many good qualities, but deeply tinctured with the superstition of the times. This induced him to engage in two crusades. The first was against the Saracens in Egypt: in which he was taken prisoner by the Infidels, and treated with great cruelty; but at last obtained his ransom, on condition of paying a million of pieces of gold, and surrendering the city of Damietta. He no sooner regained his liberty, than he entered Syria with a view of doing something worthy of his rank and character. From this expedition he was obliged to return sooner than he intended, by the news of the decease of his mother Queen Blanche, whom he had appointed regent in his absence, and who had managed the national affairs with the greatest prudence. The king, however, found many disorders in the kingdom upon his return; and these he set himself to reform with the utmost diligence. Having succeeded in this, he yielded to Henry III. of England, the Liege, Querqu, Perigord, and some other places; in consideration of Henry and his son Prince Edward their renouncing, in the fullest manner, all pretensions to Normandy and the other provinces of France which the English had formerly possessed.

The reputation of this monarch for candour and justice was so great, that the barons of England, as well as King Henry III. consented to make him umpire of the differences which subsisted between them. But though he decided this matter very justly, his decision was not productive of any good effect. At last the king, having settled every thing relating to his kingdom in a proper manner, set out on another crusade for Africa, where he died of the plague, on the 25th of August 1270.

Notwithstanding the misfortunes of Louis, his successor Philip, surnamed the Hardy, continued the war against the Infidels with great vigour. Being reinforced by his uncle Charles king of Sicily, he brought the war to a more fortunate conclusion than his predecessor had been likely to do. The Saracens were defeated in two engagements, and the king of Tunis obliged to sue for peace; offering at the same time to double the tribute he formerly paid to the crown of Sicily; to reimburse the expenses of the war; and to permit the Christian religion to be freely propagated throughout his dominions. Having accomplished this, the two princes set sail for Europe; but the seeds of the distemper which had infected the army in Africa, not being eradicated, broke forth on their arrival in Sicily, and raged for some time with great violence. Besides a vast number of common people, the king's brother John, his queen Isabella, with his brother and sister-in-law the king and queen of Navarre, and his uncle and aunt the count and countess of Poitiers, perished by this dreadful malady.

On his return to France, Philip took possession of the counties of Provence and Thoulouse; married his second son, though then very young, to the only daughter of the king of Navarre; while he himself espoused Mary the daughter of the duke of Brabant, reckoned one of the most beautiful princesses of the age. He steadily enforced the regulations of his predecessor, who had prohibited the barons from making private wars upon one another; procured the friendship of Edward I. of England by ceding to him the county of Agenois; and entered into a war with Spain in order to support the pretensions of his nephews, the Infants de la Cerda, to the throne of Castile.

The events of this war were of no great importance; and the king's attention was quickly called off from them by the death of his eldest son Louis at the age of twelve years. This disastrous event happened in the year 1275, not without a suspicion of poison; and the young queen, Mary, was accused by a surgeon named La Brosse as guilty of his death. Philip gave some credit to the accusation: but having applied to a nun, who pretended to be inspired, for full satisfaction, her answer proved fatal to La Brosse. The queen being cleared by this pretended prophetess, La Brosse was accused of a treasonable correspondence with the king of Castile, and condemned to death. The manner of his trial and execution, however, were such, that the tide of popular favour was turned; La Brosse was by the voice of the people declared to be innocent, and the king and queen themselves loudly condemned. During these unfavourable circumstances, the Sicilians, over whom Charles of Anjou had established his authority, instigated by John of Procida, a noble exile, came to a resolution of freeing themselves at once from the French yoke by a general massacre. This cruel French resolution was accordingly put in execution; and the massacred French, to the number of 8000, murdered in one night; after which Peter of Arragon, sailed to the island, where he was received by the inhabitants as their king and saviour. Charles was sensibly affected by this misfortune; and having laid siege to Messina, sailed directly to Marseilles, where he obtained a powerful reinforcement. But during his absence on this occasion, his son, to whom he had entrusted the care of the siege, having rashly ventured an engagement with the Spanish fleet, was entirely defeated and taken prisoner; which so much affected the father that he died of grief, and Sicily was inseparably attached to the house of Arragon.

The misfortunes of Charles were followed by others equally great to Philip himself. Pope Martin IV., in the warmth of his zeal for the cause of the duke of Anjou, had excommunicated Pedro king of Arragon, and bestowed his kingdom on Charles of Valois, a younger son of the king of France: In attempting to defend himself against the execution of this unjust sentence, Pedro was mortally wounded; but, soon after, the French fleet being defeated by that of Arragon, the king was so much affected by the misfortune that he fell sick. His disease was augmented by the...
heat of the climate and the fatigues of war; so that, quite worn out with grief and infirmities, he expired at Perpignan in the 41st year of his age, and 10th of his reign.

By the death of Philip the Hard, the French crown devolved on his second son, called also Philip, and from the beauty of his person surnamed the Fair; who had espoused the princess of Navarre, and at the time of his accession was in his 17th year. By the marriage with this princess he had obtained the counties of Champagne and Brie; yet with all this increase of power he found himself unable to support the war in which his predecessor had engaged. For this reason he thought proper to abandon the interest of the Infants de la Cerda, and settle the differences with Castile. The treaty was concluded by the mediation of Edward I. of England; at whose intercession Charles the Lame, son to the duke of Anjou already mentioned, was released from his captivity; Edward himself paying part of his ransom. On this Charles consented to renounce his claim on Sicily; and Philip himself promised that his kinsman Philip of Valois should renounce all pretensions to the crown of Aragon. In return for this generosity, the latter obtained the eldest daughter of Charles, with the territories of Anjou and Maine as a dowry.

The tranquility procured by this treaty, however, was soon interrupted by differences with Edward the promoter of it; Pope Boniface VIII. and Guy de Dampier, count of Flanders. The difference with England took place by a mere accident. A Norman and an English vessel having met off the coast of Bayonne, and having both occasion for water, the crews met and quarrelled at the same spring. A Norman was killed in the squabble by his own weapon, with which he assaulted an Englishman, as the latter pretended: but however the matter was, complaints were made by the Normans to Philip; who, without giving himself much trouble to inquire into the merits of the cause, instantly allowed them to redress their supposed injuries. On this a kind of piratical war commenced between the two nations, in which the two sovereigns for some time took no active part; though other nations interfered; the Irish and Dutch seamen siding with the English, and those of Flanders and Genoa with the French. Thus the powers on both sides were gradually augmented, till at last the affair became so serious, that in one engagement 15,000 French are said to have perished. Philip, alarmed at such a caricature, summoned the king of England as his vassal to attend; and, on his refusal, declared his estates in France to be forfeited. After a number of negotiations, Philip declared that he would be satisfied with the nominal cession of the province of Guienne, which he engaged instantly to restore to the king of England as soon as it should be put into his hands. Edward complied with his demands; but no sooner had the French monarch obtained possession of that country, than he persisted in the forfeiture of the English possessions in France; which treacherous proceeding instantly produced a war betwixt the two nations. Edward, that he might defend himself against such a formidable adversary, concluded a treaty with the emperor Adolphus, together with the counts of Brittany, Holland, Bar, Juliers, Gueldres, and Flanders; while Philip strengthened himself by an alliance with John Baliol of Scotland; and thus laid the foundation of that strict union which took place between France and Scotland for two centuries. During this war the French made a descent on the coast of England, and destroyed the town of Dover; while Edward, in revenge, landed in Gascony with an army of 50,000 men. No great exploits, however, were performed with this mighty armament; and both parties finding themselves pretty equally matched, contented to a suspension of arms for two years; during which a peace was finally concluded by the mediation of Pope Boniface VIII. Guienne was restored; Edward was confirmed in his conquests, and married Margaret the sister of Philip; while his eldest daughter Isabella was given in marriage to the prince of Wales.

Both Philip and Edward behaved to the allies whom they had engaged in their cause with equal perfidy. Baliol was abandoned by Philip to the resentment of Edward; while Guy, earl of Flanders, was left equally exposed to the resentment of Philip.

The reconciliation betwixt the French and English monarchs was soon followed by a difference with Pope Boniface, whom they had appointed mediator between them. Sensible of his assuming disposition, however, they had intimated in the reference made to him, that he was chosen as a private man, and not as the successor of St. Peter. The haughty pontiff, however, soon showed, that he was not by any means to be treated as a private person, and a contumelious Philip quickly ensnared. Boniface began with forbidding the clergy to grant the king any subsidies without first obtaining the consent of the Holy See, under the pain of excommunication. Philip revenged himself by prohibiting any ecclesiasties from sending money out of the kingdom without his leave; and by protecting the Colonnas, who were the implacable enemies of Boniface. By this his holiness was so much irritated that he sent a most abusive letter to Philip; after which he summoned the clergy of France to a council at Rome; which Philip retaliated, by seizing the temporalties of those who obeyed the summons, and recalling his brother Charles of Valois, who had the title of the Pope's General. Sensible, however, of the danger that attended this contest, he despatched two emissaries, under pretence of conciliating the differences, to levy such a body of troops as might execute his hostile purposes against the holy father. With these he suddenly invested the pope in his native city of Anegna; and while the bull was preparing for the excommunication of Philip, and releasing his subjects from their obedience, the pope himself was obliged to surrender prisoner to the troops of the prince whom he designed to anathematize.

Though Boniface had been at this time delivered up to the troops of Philip through the treachery of the people of Anegna, yet he was no sooner taken prisoner and brought to distress, than they rescued him from his guards and conveyed him to Rome, where he soon after died of grief and shame. His successor Benedict revoked the excommunication of Boniface, and attempted to regain the allegiance of Philip by gentle means; but, before this could be effected, he himself was cut off by death, not without strong suspicions of poison. After his decease Philip offered to procure
France. by every means in his power. In this he was assisted
by his uncle Charles of Valois, on whom he at length
entirely devolved the government of the kingdom.
This regent, however, behaved with such cruelty as is
supposed to have proved fatal to the king himself; for
having put to death a nobleman named Enguerrand de
Poitier de Marigny, who enjoyed the confidence of the
late king, this cruelty was so much resented, that
his friends were thought to have administered poison to
the king; who expired suddenly after drinking a glass
of cold water, in the 26th year of his age, and second
of his reign. Immediately after his death, Charles
prepared to dispute the sovereignty with the brothers
of the late sovereign. Philip count of Poitou, the
eldest brother, was at that time at Rome assisting in
the election of a new pope; and it was not until a
month after the death of his brother that he was able
to put an end to the intrigues which took place on that
occasion: but on his arrival in France, the throne
was assigned to him by the unanimous voice of the people.
His prospects, however, were for a short time clouded
by the queen dowager Clementine being declared a
woman who has been ennobled among the kings of France
under the name of John I. His death in three weeks
secured the throne to Philip; who, on account of the
tallness of his stature, was surmized the Long. His
conduct proved superior to that of his predecessor, who
had unsuccessfully attempted to subdue the Flemings,
and had even suffered himself to be duped by their
count; but Philip, by his vigorous behaviour, so reduced
them, that they compelled their sovereign to consent
to a peace upon honourable terms. He summoned
Edward II. of England to do homage for his posses-
sions in France; but that monarch, finding himself in-
volved in difficulties, which rendered the visit inconve-
nient, sent excuses to Philip, which he was pleased to
accept. As the French monarch had formerly taken
the cross during the lifetime of his father, he now pro-
posed to put his vow in execution; but was dissuaded
from this by the pope himself, at whose request he
sent an army into Italy to put an end to the contending
factions of the Guelphs and Gibellines, who for so
long time filled the country with blood and slaughter.
The event proved unfortunate; and the disgrace was
rendered more mortifying by a contagious distemper,
which swept off many thousands of French subjects.
This was supposed by the superstitious people of
these times to be occasioned by the Jews, who had conspired
with the Saracens to poison the springs; and that the
execution of the project was committed to some le-
pers who lived by themselves in hospitals richly endow-
ed. On this a persecution was instantly commenced
against these unfortunate men, and great numbers of
them were burnt alive; while the Jews in general were
abandoned to the rage of the populace, who insulted
their persons, and plundered their houses without re-
monse.

The remaining part of the reign of Philip was spent
in attempting to regulate the internal concerns of his
kingdom. A design had been formed by his prede-
cessors of establishing a certain standard for the coin,
weights, and measures, throughout France: and this
was adopted by Philip; who, in order to carry it more
effectively into execution, purchased from the comtes
of Valois, Clermont, and Bourbon, their right of
coinage within their own dominions. But notwith-
standing all his endeavours for this purpose, he never
could bring the scheme to bear: nor indeed could be
in any degree conciliate the affections of his subjects.
He died of a fever and dysentery in the year 1322, the
28th year of his age, and 9th of his reign.

By the death of Philip, the crown of France de-
volved on his brother Charles IV. who had obtained the
name of Fair. After settling some disputes with Fair,
the duke of Burgundy, his next step was to dissolve
his marriage with Blanch, who still continued in pri-
son, and to espouse Mary the daughter of Henry
emperor of Germany. This marriage was contracted
with a view to the Imperial crown itself, which had
been so long separated from that of France; and in
1324 an opportunity offered for Charles to gratify his
ambition. At that time the Imperial dignity was dis-
puted between Louis of Bavaria and Frederic of Au-
stria; the latter of whom had been taken prisoner in a
battle with Louis. But Pope John, who entertained an
implacable hatred against Louis, fulfilled the sen-
tence of excommunication against him, entrusting the
execution of it to Leopold the brother of Ferdinand.
The king of France was induced to embark in the same
cause, by a promise of the spoils of Bavaria; while
Frederic himself consented to relinquish his pretensions
to the empire which he had so unsuccessfully main-
tained. Louis, however, by instantly releasing his priso-
ner, and dismissing him in an honourable manner,
engaged his friendship, and disarmed his most formidable
antagonist. But the pope was not to be dis-
appointed. A considerable sum of money induced Leo-
pold to persevere in his hostilities, while it was de-
termined that a new council of electors should be held
in order to transfer the Imperial crown to Charles. In
pursuit of this visionary scheme, the king of France
set out for the frontiers of Germany with a splendid
army; but soon found that there was no possibility of
accomplishing his wishes. Leopold alone, from mo-
tions of interest, remained his friend; the rest showed
the greatest indifference; and even his brother-in-law
the king of Bohemia abstained himself from the diet;
while in a short time the death of the queen put an end
to all connexions with that crown.

On the decease of Mary, Charles espoused Joanna
daughter to the count of Evreux: and in order to
avert the calamities to be feared from an infant suc-
cession, he entered into an alliance with Robert king of
Scotland; by which it was provided, that should either
of the sovereigns die without an heir apparent, the
states of the kingdom should fill the vacant throne, and
the survivor of the two kings should with his whole force
support the legality of the nomination against any other
competitor; though even this proved insufficient to
avert the danger which now threatened the kingdom, as
shall be explained in the sequel.

Charles died in the year 1328, in the 34th year of Candidates
his age, leaving his queen pregnant; and as the suc-
cession depended on the fruit of the queen's pregnancy, the kingdom on
a regent in the mean time was necessary; and two candidates instantly appeared for this important post, of Charles
urging at the same time their right to the crown as
well as to the regency. These were, Philip de Valois,
cousin-german to the deceased king; the other, Ed-
ward III. king of England, who aspired to the throne.
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in right of his mother, and the nephew of Charles the Fair. His pretensions, however, were easily set aside, and Philip was confirmed in the regency: from which he soon after stepped into the throne, on the queen being delivered of a daughter; from which circumstance he acquired the surname of Fortunate. But though the pretensions of Edward, both to the regency and crown, were unanimously rejected by the people, it was still impossible for Philip to think of the claims of such a formidable rival without uneasiness.

He therefore summoned the English monarch to do homage for his possessions in France; and, upon his not answering his summons, forfeited them, and seized his revenues. This at last induced Edward to cross the sea and pay his homage; which Philip consented to receive in any form, upon condition of a proper explanation being afterwards given: but as this was studiously delayed after the return of the king of England, the province of Guienne was again seized by the French monarch. Edward, unwilling to lose his continental dominions, or involve himself in a war for the sake of a mere ceremony, sent over a formal deed, by which he acknowledged that he owed liege homage to France. Thus the flame was smothered for the present; and perhaps would have been entirely extinguished, had it not been for the intrigues of Robert of Artois, brother-in-law to the king of France himself, who had been expelled his country, and had taken refuge in England. By him he was persuaded to renew his pretensions to the crown of France, which of necessity produced a war.

For some time, indeed, neither party made any open declaration of hostility; but as both monarchs were possessed of great prudence and sagacity, they soon penetrated each other's designs. Philip, under pretence of taking the cross, began to make prodigious armaments, strengthening himself at the same time by alliances on every side; while Edward, determining to renew his claim to the crown of France, projected the conquest of Scotland. This, however, he could not accomplish; and in the mean time Philip, in order to favour the Scots, with whom he was in alliance, suffered his subjects to make irritations into Guienne.

In 1337, the war broke out openly. Philip having detached a squadron of his fleet against the Infidels, employed the rest, consisting chiefly of Genoese vessels, against the English. As in this war it was of great importance which side was taken by the Flemings, these people were courted by both parties. Louis count of Flanders declared for Philip, but his subjects were more inclined to King Edward. James Arteville a brewer, the most able and artful man in the country, governed them at that time as much as if he had been their prince; and the advantages arising from the English commerce determining him in favour of Edward, that prince, at his request, embarked for Sluys with a numerous army. Here he arrived in 1338; and on his first landing, it was resolved that the German princes in alliance with him should act against France. But for this a pretence was wanting. The vassals of the empire could not act by Edward's orders, or even as his allies, without directions from the emperor, and he was in league with France. This difficulty, however, was soon overcome: the French had made themselves masters of Cambrai, and the emperor resolved that it should be retaken. With this view he created Edward Vicar General of the Empire; an empty title, but which seemed to give him a right of commanding the services of the princes of Germany. The Flemings, who were vassals of France, likewise pretended scruples at invading the territories of their liege lord. To quiet these, Edward, by the advice of Arteville, assumed the title of King of France; and by virtue of this right challenged their assistance for dethroning Philip de Valois, the usurper of his kingdom. This step, which he feared would begot endless animosities and jealousies, he did not take without hesitation; and, according to Mr Hume, from this time we may date the commencement of that great animosity which the English have always borne to the French.

Edward's first attempts were upon the city of Cambrai, to which he laid siege; but in a short time he was prevailed upon by Robert d'Artois to raise the siege and march into Picardy. This country he entered with an army of near 50,000 men, composed mostly of foreigners. Philip came within sight of him with an army of near 100,000, composed chiefly of native subjects; and it was daily expected that a battle would ensue. But the English monarch was averse to engage against so great a superiority; and Philip thought it sufficient if he eluded the attacks of his enemy, without running any unnecessary hazard. The two armies faced each other for several days; mutual defiance were sent; and Edward at last retired into Flanders, and dispersed his army.

Such was the fruitless and almost ridiculous conclusion of Edward's first expedition, which had plunged him into the greatest difficulties. He had contracted near 300,000l. of debt; he had anticipated all his revenue; he had pawned every thing of value which belonged either to himself or his queen; nay, he was obliged in some measure even to pawn himself to his creditors, by desiring their permission to go over to England in order to procure supply, and by promising on his word of honour to return in person if he did not remit their money. On his arrival in England, however, he procured a large supply, sufficient to enable him to make all the necessary preparations for a new invasion; and so certain were the English that France would now be conquered, that the parliament, before Edward's departure, protested that they owed him no obedience as king of France, but that the two kingdoms must remain for ever distinct and independent.

The king of England set out on his second expedition with a fleet of 240 vessels. Philip had prepared a fleet of 400 vessels, manned with 40,000 men; which he stationed off Sluys, in order to intercept him in his passage. The two fleets met on the 13th of June 1340; but the English, either by the superior abilities of Edward, or the greater dexterity of his seamen, entirely gained the wind of the enemy, and had the sun in their backs; and with these advantages began the action. The battle was fierce and bloody; The English archers, whose force and address were now much celebrated, galloped the French on their approach; and when the ships grappled together, the example of the king and the nobility who were with him so animated the seamen and soldiers, that they maintained everywhere a superiority over the enemy. The Flemings observing the battle, hurried out of their ports, and brought
brought a reinforcement to the English; which coming unexpectedly, had a greater effect than in proportion to its power and numbers. Two hundred and thirty ships were taken: and 30,000 Frenchmen were killed, with two of their admirals: the loss of the English was incon siderable, compared to the greatness and importance of the victory. None of Philip’s courtiers, it is said, dared to inform him of the event; till his fool or jester gave him a hint, by which he discovered the loss he had sustained.

After this great victory, Edward landed his forces and laid siege to Tournay. Philip marched to his relief with a very numerous army: but acted with so much caution, that Edward found himself in a manner blocked up in his camp: and the countess dowager of Hainault, sister to Philip, mother-in-law to Edward, and sister-in-law to Robert d’Artois, coming out of a convent, to which she had retired, interposed with so much spirit and address, that she engaged all parties to agree to a truce for a year, and might perhaps have brought about a peace if she had survived.

In 1344, however, Edward’s ambition was once more excited by the invitation of the count de Montfort, who had possessed himself of the province of Brittany, and applied to Edward to second his claims. An offer of this kind entirely coincided with Edward’s most sanguine desires. He was happy in the promised assistance of Montfort, an active and valiant prince, closely united to him by interest, and thus opening to him an entrance into the heart of France. These flattering prospects, however, were for a while damped by the imprisonment of Montfort; whose aims being discovered, he was besieged in the city of Nantes and taken. But Jane of Flanders his wife soon made up for the loss of her husband. This lady courageously undertook to support the falling fortunes of her family. She assembled the inhabitants of Nantes, where she then resided; and carrying her infant son in her arms, de plored her misfortunes, and attempted to inspire the citizens with an affection for her cause. The inhabitants of Nantes instantly espoused her interests, and all the other fortresses of Brittany embraced the same resolution. The king of England was apprised of her efforts; and was entreated to send her succours with all possible expedition to the town of Hennebont, in which place she resolved to sustain the attacks of the enemy. Charles de Blois, Philip’s general, anxious to make himself master of so important a fortress as Hennebont, and still more to take the countess a prisoner, sat down before the place with a large army, and conducted the siege with indefatigable industry. The defence was no less vigorous: several sallies were made by the garrison, in which the countess herself was still the most active, and led on the assault. Observing one day that their whole army had quitted the camp to join in a general storm, she sailed out by a postern at the head of 300 horse, set fire to the enemies’ tents and baggage, put their cutters and servants to the sword, and occasioned such an alarm, that the French desisted from the assault, in order to cut off her communication with the town. Thus intercepted, she retired to Auray, where she continued five or six days; then returning at the head of 500 horse, she fought her way through one quarter of the French camp, and returned to her faithful citizens in triumph. But the besiegers had at

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length made several breaches in the walls; and it was apprehended that a general assault, which was hourly expected, would be fatal. A capitulation was therefore proposed, and a conference was already begun, when the countess, who had mounted on a high tower, and was looking towards the sea with great impatience, detected some ships at a distance. She immediately exclaimed that succours were arrived, and forbade any further capitulation. She was not disappointed in her wishes; the fleet she discerned carried a body of English gentlemen, with 6000 archers, whom Edward had prepared for the relief of Hennebont, but who had been long detained by contrary winds. They entered the harbour under the conduct of Sir Walter Manny, one of the most valiant commanders of his time. This relief served to keep up the declining spirits of the Bretons until the time appointed by the late truce with Edward was expired, on which he was at liberty to renew the war in greater form.

The succours under Sir Walter Manny were quickly followed by a more considerable reinforcement commanded by Robert of Artois, who made himself master of the city of Vannes soon after his arrival: but the French soon recovered the city, and Robert was compelled to relinquish his prize after receiving a mortal wound. Edward himself, eager to revenge the death of his ally, soon landed at Morbihan near Vannes with an army of 12,000 men. With this small number he undertook at once the siege of Vannes, Nantes, and Rennes: but by dividing his forces, he failed in every enterprise, and gave an opportunity to John duke of Normandy, the king of France’s eldest son, to invest him in his camp. In this situation his provisions soon began to fail; and Edward, notwithstanding all his valour, would have been obliged to surrender, had he not, by a train of artful negotiations, induced Philip to relinquish the advantage he had obtained, and consent to a truce of three years. This was accomplished by the mediation of the court of Rome; and the French monarch was soon made sensible of the partiality of that court, and the imprudence of the step he himself had taken. Edward soon found a pretence to renew the war, from the execution of some nobles of Brittany, who, he said, were partisans of Montfort, and chose to look upon their punishment as an infraction of the treaty.

Philip now endeavoured to secure himself against the power of his rival by alliances, and by purchasing the city of Montpelier from the king of Majorca: but in the mean time, the English, under the command of the earl of Derby, had invaded Guienne, twice defeated the French army commanded by the count de Lisle, and made themselves masters of a great number of towns. Philip, by reason of the exhausted state of his treasury, was for some time incapable of making any opposition. To recruit his finances, he was obliged to lay a duty on salt; which gave such offence to his subjects as had almost excited a rebellion. When these discontents were assuaged, however, he was soon raised an army of 100,000 men, whose courage was further raised by the presence of the dukes of Normandy and Burgundy. The English general was therefore compelled to stand upon the defensive. One fortress after another was surrendered to the French; till at length nothing appeared but the total extinction of the power of
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of England upon the continent. In this situation, Edward resolved to bring relief in person to his dis- terred subjects and allies; and accordingly embarked in 1346 at Southampton, on board a fleet of near 1000 sail, of all dimensions. He carried with him, besides all the chief nobility of England, his eldest son the prince of Wales (afterwards surmamed the Black Prince), a youth of about 15 years old, and already remarkable both for understanding and valour above his age. His army consisted of 4000 men at arms, 10,000 archers, 10,000 Welsh infantry, and 6000 Irish, all which he landed safely at La Hogue, a port in Normandy, which country he determined to make the seat of the war.

The intelligence of Edward's landing, and the deva- station caused by his troops, who dispersed themselves over the whole face of the country, soon spread universal consternation through the French court. The rich city of Caen was taken and plundered by the English without mercy; the villages and towns, even up to Paris, shared the same fate; and the French had no other resource but by breaking down their bridges, to attempt putting a stop to the invader's career. In the mean time, Philip was not idle in making preparations to repress the enemy. He had stationed one of his generals, Godemar de Faye, with an army on the opposite side of the river Somme, over which Edward was to pass; while he himself, at the head of 120,000 fighting men, advanced to give the English battle. Edward, thus unexpectedly exposed to the danger of being enclosed and starved in an enemy's country, published a reward to any that should bring him intelligence of a passage over the river Somme. This was discovered by a peasant of the country, named Gobin Agace: and Edward had just time to get his whole army over the river, when Philip appeared in his rear. Of the battle that ensued, in which the French were overthrown with great slaughter, an account is given under the article CRESSEY.

Edward next laid siege to Calais, which was then defended by John de Vienne, an experienced com- mander, and supplied with every thing necessary for defence. It was at length taken, after a twelvemonth's siege, the defenders having been reduced to the last extremity by famine and fatigue: for the consequences of which, see the article CALAIS.

From the very beginning of this unfortunate war, Philip had invariably showed himself desirous of peace, and the victory of Cressy rendered him still more so. Edward also, notwithstanding his successes, was unable to support the expenses of the war any longer. The mediation of the court of Rome was therefore readily accepted, and a truce for three years concluded. At the same time, Philip met with some recompense for the losses he had sustained, by the acquisition of Dauphiny, which has ever since given the title of Dauphin to the eldest son of the king of France. It was obtained by the resignation of Hubert prince of Dauphiny; who, being disappointed in his hopes of marrying Joan, daughter of the duke of Bourbon, gave up his territories to Charles the grandson of Philip, who had married that lady; himself retiring into a convent. Soon after this event, the king himself, who had been some time a wi- dower, was married to Blanch, the daughter of Philip count of Evreux, and Jane queen of Navarre; and his son John to the countess of Boulogne. But the happy- ness occasioned by these marriages was soon interrupt- ed by the death of the king; who expired in the year 1350, the 57th of his age, and 23rd of his reign.

On the death of Philip his eldest son John took pos- session of the kingdom; but scarcely was he seated on the throne, when he disgusted his nobility by an un- seasonable act of severity. Robert de Brienne, count of Eu and Guises, had been taken prisoner by the king of England at Caen; and under pretence of ne- getting his ransom, had passed several times between France and England; but being accused of a treason- able correspondence with Edward, he was by order of his sovereign suddenly arrested, condemned, and be- headed, without any form of trial. At his death, it is said that he confessed his treasonable practices; but that has not been authenticated by any historian of credit. Having been constable of France, the sword, the badge of his office, was delivered to Charles de la Carda: but his fate was equally unfortunate with that of his predecessor, being soon after assassinated by Charles king of Navarre, surnamed The wicked. This Infamous prince, celebrated for his personal qualifications, but conduct of detested for his crimes, was the son-in-law of John himself. He had demanded the duchy of Angouleme of the king; but as the latter had thought proper to be- stow it upon Carda, he had taken the effectual method of revenging himself, by assassinating his rival. John did not fail to show a proper resentment; but such was the weakness of his government, that the king of Na- varre set him at defiance, and would not des- cend to the ceremony of asking pardon until John had sent him his second son as an hostage for his personal security. To these offences the king of Navarre added another still more atrocious, viz. that of aspiring to the crown of France itself; to which he pretended a right derived from his mother, being grandson by the female side to Louis the Boisterous. But his more immediate demands were the countries of Champagne and Brie. To obviate all difficulties on this head, however, John bestowed the duchy of Normandy on his eldest son Charles; and commanded him to seize the estates of the king of Navarre. On this the latter soon made his appearance at Paris; but John found himself obli- ged to appease his murmurs at the expense of no less than 100,000 crowns.

All this time the truce with England had been very ill observed on both sides; the French had possessed themselves of the post of St Jean d'Angeli; and the English had surprised the town of Guises. The rival houses of Montfort and Blois still continued their animosities; while Edward continued to threaten war. The king of Navarre went on with his intrigues; and even the dauphin was drawn into a confederacy against his father. John, however, being informed of their machinations, found means to defeat them effectually. The dauphin was reclaimed by pointing out to him the impropriety of his conduct, and the disadvan- tage which must unavoidably accrue to himself from the connexions which he had formed. The king of Navarre was invited with his principal adherents, to an entertainment, where they were unexpectedly ar- rested: the former being sent prisoner to Chateau and con- Gaillar, and several of the most obnoxious of the latter put to death. The rest of the conspirators, instead
France.

That warlike and enterprising monarch had never lost sight of the object he had originally embraced; and on the expiration of the truce he sent his son, the prince of Wales, from the colour of his armour surnamed the Black Prince, with a fleet towards the coast of France. Young Edward had with this fleet entered the mouth of the river Garonne, burnt the towns and villages of Languedoc, and retired with the plunder into the country of Guienne. Edward himself, who had likewise passed over to the continent, wasted the country as far as St Omer; but the French king, notwithstanding all these provocations, determined to avoid a battle, and therefore prohibited his general, the constable of Bourbon, from coming to an engagement, though his army was much superior to that of the prince of Wales. With the flower of his troops, however, he pursued Edward from St Omer to Hesdin, where he defied him to a pitched battle; but the latter, without minding his bravades, continued his march to Calais, from whence he embarked for England. After his departure, John called an assembly of the states at Paris, where he explained the distressed situation of his finances, and showed so fully the necessity of assisting him in the defence of the kingdom, that they consented to maintain an army of 30,000 men during the war. To supply the other exigencies of government, they revived the duty on salt, and added a variety of other imposts; but at the same time appointed a committee of their own number to take care that the money was solely appropriated to the public service.

The satisfaction which John received from these grants, and the suppression of some disturbances which happened about this time, was soon overcast by the news that the prince of Wales had marched with an army of 12,000 men from Bourdeaux: and, after ravaging the Agenois, Quercy, and the Limousin, had entered the province of Berry. The young warrior had penetrated into the heart of France with this trifling body of forces, in hopes of joining the duke of Lancaster in Guienne. But he soon found that his scheme was impracticable: the country before him was too well guarded to permit his advancing further; and all the bridges behind were broken down, which effectually barred a retreat. In this embarrassing situation, his perplexity was increased, being informed, that the king of France was actually marching at the head of 60,000 men to intercept him. He at first thought of retreating: but soon finding it impossible, he determined calmly to wait the approach of the enemy; and, notwithstanding the disparity of forces, to commit all to the hazard of a battle.

It was at a place called Maupertuis, near Poictiers, that both armies came in sight of each other. The French king might very easily have starved the English into any terms he thought proper to impose; but such was the impatient valour of the French nobility, and such their certainty of success, that it might have been equally fatal to attempt repressing their ardour to engage. In the mean time, while both armies were drawn out, and expecting the signal to begin, they were stopped by the appearance of the cardinal of Perigord, who attempted to be a mediator between them. However, John, who made himself sure of victory, would listen to no other terms than the restitution of Calais; with which the Black Prince refusing to comply, the onset was deferred till the next morning, for which both sides waited in anxious suspense.

During this interval, the young prince strengthened his post by new intrenchments; and placed 300 men in ambush, with as many archers, who were commanded to attack the enemy in flank during the heat of the engagement. Having taken these precautions, he ranged his army in three divisions; the first commanded by the earl of Warwick, the rear by the earls of Salisbury and Suffolk, and the main body by himself. In like manner, the king of France arranged his forces in three divisions; the first commanded by the duke of Orleans; the second, by the dauphin, attended by his younger brothers; while he himself led up the main body, seconded by his youngest and favourite son, then about 14 years of age. As the English were not to be attacked only by marching up a long narrow lane, the French suffered greatly from their archers, who were posted on each side behind the hedges. Nor were they in a better situation upon emerging from this danger, being met by the Black Prince himself, at the head of a chosen body of troops, who made a furious onset upon their forces, already in great disorder. A dreadful overthrow ensued: those who were the French defeated, as yet in the lane recoiled upon their own forces, while the English troops who had been placed in ambush, took that opportunity to increase the confusion, and confirm the victory. The dauphin and the duke of Orleans were among the first that fled. The king of France himself made the utmost efforts to retrieve by his valour what his rashness had forfeited; but his single courage was unable to stop that consternation which had now become general through his army; and his cavalry, soon flying, he found himself exposed to the enemy's fury. At length, spent with fatigue and despairing of success, he thought of yielding himself a prisoner; and frequently cried out, that he was ready to deliver himself to his cousin the prince of Wales.

The honour of taking him, however, was reserved for a knight of Arras, whose name is not known, who was seized by Dennis de Morbec, a knight of Arras, who had been obliged to fly his country for murder.

In April following, the prince conducted his royal prisoner through London, attended by an infinite concourse of people of all ranks and stations. His modesty upon this occasion was very remarkable: the king of France was clad in royal apparel, and mounted a white steed distinguished by its size and beauty; while the prince himself rode by his side upon a mean little horse, and in very plain attire.

This dreadful defeat, which happened in the year 1356, almost entirely ruined the French affairs: and the miseries which ensued from this cause were greatly augmented by internal commotions. The dauphin, who had now assumed the government, was altogether unable to govern a turbulent and sedulous people at such a crisis. An assembly of the states, which he called, took the opportunity to limit the power of the prince, impeach the former ministers, and demand the liberty of this assembly.
and he was heard to express himself in a very noble manner upon the occasion: "Though (says he) good faith should be banished from the rest of the earth, yet she ought still to retain her habitation in the breast of kings." In consequence of this declaration, he actually returned to England once more; and yielded himself a prisoner, since he could not be honourably free. It is said by some, that his passion for the countess of Salisbury was the real cause of his journey; but we want at this time the foundations for such an inducement. He was long in the Tower, the Black where he had resided during his captivity; and soon after he closed a long and unfortunate reign, by his death, which happened in the year 1384, about the 56th year of his age.

Charles, surnamed the Wise, succeeded his father on the throne of France; and this monarch, merely by the force of a finely conducted policy, and even though suffering some defeats, restored his country once more to tranquillity and power. He quelled and dissipated a set of banditti, who had associated themselves under the name of Companions, and who had long been a terror to the peaceable inhabitants. He had them enrolled into a body, and led them into the kingdom of Castile against Peter, surnamed the Cruel, whom his subjects had dethroned, and who, by means of an alliance with the English, endeavoured to get himself reinstated upon the throne. In consequence of these alliances, the English and French again came to an engagement; their armies on the one side commanded by the Black Prince; on the other, by Henry of Tramayres, and Bertrand du Guesclin, one of the most consummate generals and accomplished characters of the age in which he lived. However, the usual good fortune of the English prince prevailed; the French lost above 20,000 men, while only four knights and 40 private men on the side of the English were slain.

Nevertheless, these victories were attended with very few good effects. The English, by their frequent levies, had been quite exhausted, and were unable to continue an army in the field. Charles, on the other hand, cautiously forebore coming to any decisive engagement; but was contented to let his enemies waste their strength in attempts to plunder a fortified country. When they were retired, he then was sure to rally forth, and possess himself of such places as they were not strong enough to defend. He first fell upon Pontlieu; the citizens of Abbeville opened their gates to him; those of St Valois, Rue, and Crottoy, imitated the example; and the whole country was in a little time reduced to total submission. The southerm provinces were, in the same manner, invaded by his generals with equal success; while the Black Prince, destitute of supplies from England, and wasted by a cruel and consumptive disorder, was obliged to return to his native country, leaving his affairs in the south of France in a desperate condition.

In this exiguity, the resentment of the king of England was excited to the utmost pitch; and he seemed resolved to take signal vengeance on his enemies of the continent. But the fortunate occasion was now elapsed; and all his succeeding designs were marked with ill success. The earl of Pembroke and his whole army were intercepted at sea, and taken prisoners by Henry of Castile. Sir Robert Knolles, one of his generals on the continent, at the head of 30,000 men, was defeated by Bertrand du Guesclin; while the duke of Lancaster, at the head of 25,000 men, had the mortification of seeing his troops diminished one half by flying parties, without ever coming to a battle.

At last, the English affairs were totally ruined by the death of the Black Prince and King Edward. On receiving this news, the armies of Charles attacked the English on all sides. One, under the command of the duke of Burgundy, entered Artois; another entered Auvergne, under the command of the duke of Berry; that which acted in Guienne was commanded by the duke of Anjou; and the forces in Bretagne were under the constable Guesclin: the king himself had a powerful body of troops, that he might be able to repair any accident which should happen through the chance of war. The constable joined the duke of Burgundy, who found it difficult to oppose Sir Thomas Felton and the seneschal of Bourdeaux. Soon after his arrival, the constable attacked and defeated them, making both the commanders prisoners of war. This victory was so well pursued, that, at the close of the campaign 1377, Bayonne and Bourdeaux, with the districts about them, and the fortress of Calais with its dependencies, were all the places left to England on the continent.

Thus Charles established once more the house of Valois on the throne of France, but did not long live to enjoy his good fortune. He died in the year 1379, at the age of 44, of the consequences of poison formerly given him by the king of Navarre, as has already been mentioned. The immediate operation of this poison had been suspended by the skill of a physician sent by the emperor Charles IV. He opened an issue in his arm, the running of which preserved his life; but the physician declared, that whenever it should dry up, the consequence would be fatal. Not long before his death, Charles had commenced a process against the king of Navarre for this crime. Several of the associates of the latter suffered on this occasion, and the king himself was deprived of his possessions in Normandy, as well as his lordship of Montpelier, which had been given him in lieu of the counties of Champagne and Brie, and the duchy of Burgundy which he had claimed. He did not long survive the death of his allies, and of the French monarch whom he destroyed. His death, of which Navarre was singular and very terrible; for having been afflicted with the leprosy, he had been obliged to make use of some bandages dipped in sulphur, and afterwards steeped in brandy. These took fire by the carelessness of age, and the unfortunate prince was burnt to death.

Charles V. was succeeded by his son Charles VI. sur-Reign of named the Well-beloved, who, at the time of his acces-son to the throne, was only 12 years of age. The duke of Anjou, eldest brother to the late king, had been appointed guardian during the minority of the prince; but he being totally unfit for the office, and distin-

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late king, in order to support his ambitious enterprises. At that time Joan, infamous for her profigacy, reigned in Naples. She had appointed one Charles Durazzo, who was her relation, to succeed her in the throne; but the inhuman wretch murdered his benefactress, who with her last breath revoked her grant of the kingdom to him, and bestowed it upon the duke of Anjou. His influence at the French court enabled him to waste the treasures of the kingdom in support of his pretensions; though he proved ultimately unsuccessful, his forces being constantly defeated, and his designs frustrated by the superior skill of his adversary. The duke of Burgundy, instead of instructing his partizans in the virtue of warfare, indulged them in every kind of vicious pleasure, hoping thereby to gain his favour afterwards. The citizens of Paris, oppressed by taxes, broke out into tumults, and were quelled with difficulty; while the mal-administration of Philip the duke of Burgundy soon involved the nation in hostilities with the Flemings. Philip invaded their country at the head of an army of 80,000 men, along with whom was the young king, accompanied by the principal nobility of France. The first operations of war were favourable to the Flemings; but they were at length totally defeated on the banks of the river Lys, where their leader, with 25,000 of his followers, perished. This victory was followed by the submission of the whole country; but the satisfaction of the king at this event was disturbed by new seditions and revolts in the city of Paris, and other great towns of the kingdom. His return, however, at the head of a victorious army, soon reduced them to their duty, and several of the revolted cities were severely punished; at the same time that the death of the duke of Anjou saved freedom of his kingdom. From the immediate dependence on his tutor, he assumed the reins of government into his own hands in the year 1384.

The genius which Charles began to display in his early years, raised the hopes of the nation; but these were soon overcast, and greater misfortunes than ever were now about to ensue. The young king, whose marriage began to be a subject of attention to the council, refused to comply with the forms in use among his predecessors, and insisted upon seeing the person designed for his consort. An interview was accordingly contrived between him and Isabella daughter to the duke of Bavaria; where he fell in love with that princess, and afterwards married her. His administration was for some time prudent and vigorous. He conciliated the affections of his people by restoring their privileges, punishing their oppressors, and relieving them from the taxes which had been imposed in his minority. He reduced the Flemings to submission, and the authority of the duke of Burgundy. He gathered 10,000 archers and 1,000 men at arms to assist the Scots in their incursions into England; and in 1385 fitted out a prodigious armament against England. A vast fleet was assembled in the harbour of Sluys, and a very numerous army in the neighbourhood. According to some writers, the armament consisted of 1200 ships, 20,000 foot differently armed, 20,000 cavalry, and 20,000 cross-bow-men. There besides a vast wooden edifice or floating town, which was contrived for the protection of the soldiers when landed: but all these preparations were at last brought to nothing through the obstinacy of the duke of Berry; who, having been originally against this measure, carried on his part of the armament so slowly, that he did not arrive at Sluys till the middle of September, when the season was so far advanced, that no invasion was practicable. A storm that happened soon after, drove the greatest part of the fleet on shore, and beat the wooden edifice all to pieces; the remains of which the king bestowed on the duke of Burgundy, to whom he gave also the port of Sluys, which was then very commodious, and of the utmost importance.

The destruction of the French fleet was only a prelude to calamities of a more extraordinary nature. The Sieur de Craon, a profligate nobleman, had been instigated by the court of France with a considerable sum of money for the support of the duke of Anjou, at the time he was reduced to distress by his Italian expedition. This money he had dissipated at Venice; but, by the credit of the duke of Orleans, the king's brother, he had obtained his pardon, and returned to court. Here he attempted to gratify his private resentment by the assassination of Oliver Clisson the constable, whom he suspected of having promoted his disgrace. This veteran hero was attacked, on his return from the hotel de St. Pol, by a band of 20 ruffians, against whom he defended himself with wonderful intrepidity, when at last he fell, after receiving more than 50 wounds. Happily, however, he recovered notwithstanding being mangled in this manner; while the assassin, to screen himself from vengeance, fled for protection to the duke of Brittany. The king demanded the assassin to be given up to him in chains; but the duke, answered, that he knew nothing of him: to which the king giving no credit, marched with all his forces into his territories. When the army arrived at Mans, the king was seized with a slow fever: but could not be prevailed upon to rest or take physic. On the 4th of August 1391, having marched all day in the heat of the sun, a miserable, ragged, wild-looking fellow darted from behind a tree, and laying hold of the bridle of his horse, cried out "Stop! where are you going, king? You are betrayed:" and immediately withdrew again into the wood. The king passed on not a little disturbed: and soon after one of the pages, who rode behind and carried his lance, overcame with heat, fell asleep, and let it fall upon the helmet which was carried by the other. The king hearing the noise, looked about; and perceiving the page lifting the lance, killed him immediately: then riding furiously with his sword drawn, he struck on every side of him, and at every person, till he broke his sword: upon which one of his gentlemen leaped up behind him and held his arm. He fell soon after, and in such a way that if he had been dead, he would have taken up and bound in a waggon, he was carried back to Mans, where he lay two days in a lethargy, after which he came a little to himself, and expressed great concern at the blood he had shed in his delirium. The people, who had expressed the greatest concern for his distemper, were equally rejoiced at the news of his recovery; but unfortunately it was soon discovered, that he no longer possessed that strength of judgment and understanding for which he had formerly been remarkable. Hence a regency became indispensably necessary; and
nistration was vested in the queen and a council composed of princes of the blood.

The two rival dukes, thus prohibited from interfering in public affairs, exercised themselves in committing hostilities against the English, with whom the truce had been lately concluded. They were encouraged to this infraction of the treaty by the unsettled situation of the affairs of Henry IV; but their attempts proving unsuccessful, the truce was renewed after obtaining restoration of the princes, who had been married to Richard II. as has already been mentioned. The failure of their enterprises produced a new scene of discord between the dukes, who mutually threw the blame upon each other. By the entreaties of the duke of Berry they were apparently reconciled; but the duke of Burgundy pretended friendship only in order to take the more signal vengeance. To this he was now further inflamed by jealousy. Having hired a band of ruffians to execute his bloody purpose, the duke was one evening attacked by eighteen of them while attended only by two pages. A Norman gentleman whom the duke had deprived of an employment, headed the assassins, and in person attacked the duke. At the first blow he cut off his hand, at the second he struck him from his mule, and at the third put an end to his life. His wife Valentina was so deeply affected with his death, that she died soon after. The duke of Burgundy escaped to Flanders; and the whole nation was rent into two factions, called the Burgundians and Armagnacs; the latter being the title of the party of the duke of Orleans, from Armagnac the father-in-law of that prince. A dreadful confusion ensued: the duke of Burgundy soon returned to France, and extorted a pardon from the unhappy king, who was now no longer able to resist him: and we may have some notion of the state of the kingdom in general from being told, that 7,000 people perished in one tumult in the capital. The king himself was alternately the prisoner of each party, and alternately transferred the power from the one to the other as he happened to fall into their hands. This therefore was thought by Henry V. of England, a favourable opportunity to recover from France those grants that had been formerly given up by treaty. But previously, to give his intended expedition the appearance of justice, he sent over ambassadors to Paris, offering a perpetual peace and alliance, on condition of being put in possession of all those provinces which had been ravished from the English during some former reigns, and of espousing Catharine, the French king's daughter, in marriage, with a suitable dowry. Though the French court was at that time extremely averse to war, yet the exorbitance of these demands could not be complied with; and Henry very probably made them in hopes of a denial. He therefore assembled a great fleet and army at Southampton; and having allured all the military men of the kingdom to attend him, from the hopes of conquest and profit to son, and landed at Harfleur, at the head of an army of 6,000 men-at-arms, and 24,000 foot, mostly archers.

His first operations were upon Harfleur; which being pressed hard, promised at a certain day to surrender unless relieved before that time. The day arriving, and the garrison, unmindful of their engagement, still resolving to defend the place, Henry ordered an assault to be made, took the town by storm, and put all the garrison to the sword. From thence the victor advanced farther into the country, which had been already rendered desolate by faction, and which he now totally laid waste. But although the enemy made a feeble resistance; yet the climate seemed to fight against the English; a contagious dysentery carrying off three parts of Henry's army. In this situation he had recourse to an expedient common enough in that barbarous age, to inspire his troops with confidence in their general. He challenged the dauphin, who commanded in the French army, to single combat, offering to stake his pretensions on the event. This challenge, as might naturally be expected, was rejected; and the French, though disagreeing internally, at last seemed to unite at the appearance of the common danger. A numerous army of 14,000 men-at-arms, and 40,000 foot, was by this time assembled under the command of Count Albert, and was now placed to intercept Henry's weakened forces on their return. The English monarch, when it was too late, began to repent of his rash inroad into a country where disease and a powerful army everywhere threatened destruction; he therefore thought of retiring into Calais. In this retreat, which was at once both painful and dangerous, Henry took every precaution to inspire his troops with patience and perseverance; and showed them in his own person the brightest example of fortitude and resignation. He was continually harassed on his march by flying parties of the enemy; and whenever he attempted to pass the river Somme, across which his march lay, he saw troops on the other side ready to oppose his passage. However, he was so fortunate as to seize by surprise a passage near St. Quentin, which had not been sufficiently guarded; and there he safely carried over his army.

But the enemy was still resolved to intercept his retreat; and after he had passed the small river of Terrois at Blangy, he was surprised to observe from the heights the whole French army drawn up in the plains of Agincourt; and so posted, that it was impossible for him to proceed on his march, without coming to an engagement. A battle accordingly took place, in which the English gained a victory, the most remarkable perhaps of any recorded in history; an account of which is given under the article Agincourt.

This victory, gained on the 23rd of October 1415, was however attended with no immediate effects. Henry still continued to retreat, after the battle of Agincourt, out of the kingdom; and carried his prisoners to Calais, and thence to England. In 1417, he once more landed an army of 25,000 men in Normandy; and prepared to strike a decisive blow for the crown of France, to which the English monarchs had long made pretensions. That wretched country was now in a most deplorable situation. The whole kingdom appeared as one vast theatre of crimes, murder, injustice, and devastation. The duke of Orleans was assassinated by the duke of Burgundy; and the duke of Burgundy, in his turn, fell by the treachery of the dauphin. At the same time, the duke's son, desirous of revenging his father's death, entered into a secret treaty with the English; and a league was immediately concluded at Arras, between Henry and the young duke of Burgundy, in which the king promised
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misled to revenge the murder of the late duke; and
the son seemed to insist upon no further stipulations.
Henry, therefore, proceeded in his conquests without
much opposition from any quarter. Several towns and
provinces submitted on his approach; the city of Rouen
was besieged and taken; and he soon became master
of Pontoise and Gisors. He even threatened Paris by
the terror of his power, and obliged the court to re-
move to Troyes. It was at this city that the duke of
Burgundy, who had taken upon him the protection of
the French king, met Henry in order to ratify that
treaty which was formerly begun, and by which the
crown of France was to be transferred to a stranger.
The imbicycle into which Charles had fallen, made
him passive in this remarkable treaty; and Henry dic-
tated the terms throughout the whole negotiation.
The principal articles of this treaty were, that
Henry should espouse the princess Catharine; that King Charles
should enjoy the title and dignity of king for life; but
that Henry should be declared heir to the crown,
and should be intrusted with the present administration
of the government; that France and England should for
ever be united under one king, but should still retain
their respective laws and privileges; that Henry should
unite his arms with those of King Charles and the duke of
Burgundy, to depress and subdue the dauphin and
his partisans.

He marries

the prin-

cess Catha-

rine.

It was not long after this treaty, that Henry mar-
rried the princess Catharine; after which he carried his
father-in-law to Paris, and took a formal possession
of that capital. There he obtained from the estates of
the kingdom a ratification of the late compact; and
then turned his arms with success against the adhe-
rents of the dauphin; who, in the mean time, wan-
dered about a stranger in his own patrimony, and to
his enemies successes only opposed fruitless expostu-
lations.

Henry’s supplies were not provided in such plenty as
to enable him to carry on the war without returning in
person to prevail upon his parliament for fresh succours;
and, upon his arrival in England, though he found his
subjects highly pleased with the splendour of his con-
quests, yet they seemed somewhat doubtful as to the ad-
vantage of them. A treaty, which in its consequences
was likely to transfer the seat of empire from England,
was not much relished by the parliament. They there-
fore, upon various pretences, refused him a supply equal
to his exigencies or his demands; but he was resolved
on pursuing his schemes; and, joining to the supplies
granted at home, the contributions levied on the con-
quered provinces, he was able once more to assemble an
army of 28,000 men, and with these he landed safely at
Calais.

In the mean time, the dauphin, a prince of great pru-
dence and activity, omitted no opportunity of repairing
his ruined situation, and to take the advantage of Hen-
ry’s absence from France. He prevailed upon the re-
gent of Scotland to send him a body of 8000 men from
that kingdom; and with these, and some few forces of
his own, he attacked the duke of Clarence, who com-
manded the troops in Henry’s absence, and gained a
complete victory.

This was the first action which turned the tide of
success against the English. But it was of short du-
ration: for Henry soon after appearing with a consid-
erable army, the dauphin fled at his approach; while
many of the places, which held out for the dauphin
in the neighbourhood of Paris, surrendered to the con-
queror. In this manner, while Henry was everywhere
victorious, he fixed his residence at Paris; and while
Charles had a small court, he was attended with a
very magnificent one. On Whitsonday 1421, the two
kings and their two queens with crowns on their heads
dined together in public; Charles receiving apparent
homage, but Henry commanding with absolute au-
thority.

In the mean time, the dauphin was pursued beyond
the Loire, and almost totally dispossessed of all the
northern provinces. He was even pursued into the
south, by the united arms of the English and Burgun-
dians, and threatened with total destruction. In this
exigence, he found it necessary to spin out the war, and
to evade all hazardous actions with a rival who had
been long accustomed to victory. His prudence was
everywhere remarkable; and, after a train of long per-
secutions from fortune, he found her at length willing
to declare in his favour, by the death of the king of
England.

Charles VI. died a short time after; and Charles VII. Deatb of
succeeded his father to a nominal throne. Nothing Henry and
could be more deplorable than the situation of that mo-

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monarch on assuming his title to the crown. The Eng-

lish were masters of almost all France; and Henry VI.

though yet but an infant, was solemnly invested with
regal power by legates from Paris. The duke of Bed-

ford was at the head of a numerous army, in the heart

of the kingdom, ready to oppose every insurrection;
while the duke of Burgundy, who had entered into a
firm confederacy with him, still remained steadfast,
and seconded his claims. Yet notwithstanding these fa-

Desparate
desirable appearances, Charles found means to break
the league formed against him, and to bring back his
subjects to their natural interests and their duty.

However, his first attempts were totally destitute of
success. Wherever he endeavoured to face the enemy
he was overthrown, and he could scarcely rely on the
friends next his person. His authority was insulted
even by his own servants; advantage against advantage
was gained against him; and a battle fought near Ver-

neuil, in which he was totally defeated by the duke of
Bedford, seemed to render his affairs altogether des-
perate. But from the impossibility of the English keep-
ing the field without new supplies, Bedford was obliged
to retire into England; and in the mean time, his vigi-

lant enemy began to recover from his late consternation.

Dumois, one of his generals, at the head of 1000 men,
compelled the earl of Warwick to raise the siege of
Montargis; and this advantage, slight as it was, began
to make the French suspect that the English were not
invincible.

But they soon had still greater reason to triumph in
The French

their change of fortune, and a new revolution was pro-

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As an accident ensued soon after, which, though it promised to promote the English cause in France, in the end served to render it odious, and conduced to the total evacuation of that country. The duke of Burgundy, at the head of a powerful army, had laid siege to Compiegne; and the Maid of Orleans had thrown herself into the place, contrary to the wishes of the governor, who did not desire the company of one whose authority would be greater than his own. The governor, however, were rejoiced at her appearance, and believed themselves invincible under her protection. But their joy was of short duration; for Joan, having the day after her arrival headed a sally, and twice driven the enemy from their entrenchments, she was at last obliged to retire, placing herself in the rear, to protect the retreat of her forces. But in the end, attempting to follow her troops into the city, she found the gates shut, and the bridge drawn up by order of the governor, who is said to have long wished for an opportunity of delivering her up to the enemy.

Nothing could exceed the joy of the besiegers, in having taken a person who had been so long a terror to their arms. The service of Te Deum was publicly celebrated on this occasion; and it was hoped, that the capture of this extraordinary person would restore the English to their former victories and successes. The duke of Bedford was no sooner informed of her being taken, than he purchased her of the Constable Vendôme, who had made her his prisoner, and ordered her to be committed to close confinement. The credulity of both nations was at that time so great, that nothing was too absurd to gain belief that coincided with their passions. As Joan but a little before, from her successes, was regarded as a saint, she was now, upon her captivity, considered as a sorceress, forsaken by the demon who had granted her a fallacious and temporary assistance. Accordingly it was resolved in council to send her to Rouen to be tried for witchcraft: and the bishop of Beauvais, a man wholly devoted to the English interest, presented a petition against her for that purpose. The university of Paris was so mean as to join in the same request. Several prelates, among whom the cardinal of Winchester was the only Englishman, were appointed as her judges. They held their court at Rouen, where Henry then resided; and the Maid, clothed in her former military apparel, but loaded with chains, was produced before the tribunal. Her behaviour was no way disgrace her former gallantry; she betrayed neither weakness nor womanish submission, but appealed to God and the pope for the truth of her former revelations. In the same, she was found guilty of heresy and witchcraft; and sentenced to be burnt alive, the common punishment for such offences.

But previous to the infliction of this dreadful sentence upon her, they were resolved to make her abjure her former errors; and at length so far prevailed upon her, by terror and rigorous treatment, that her spirits were entirely broken by the hardships she was obliged to suffer. Her former visionary dreams began to vanish, and a gloomy distrust to take place of her late inspirations. She publicly declared herself willing to recant, and promised never more to give way to the vain delusions which had hitherto misled her, and imposed on the people. This was what her oppressors desired; and willing to show some appearance of mercy, they changed her sentence into perpetual imprisonment, and to be fed during life on bread and water. But the rage of her enemies was not yet sated. Suspecting that the female dress which she had consented to wear, was disagreeable to her, they purposely placed her in her apartment a suit of men's apparel, and watched for the effect of their temptation upon her. Their cruel artifices prevailed. Joan, struck with the sight of a dress in which she had gained so much glory, immediately threw off her penitent robes, and put on the forbidden garment. Her enemies caught her equipped in this manner; and her imprudence was considered as a relapse into her former transgressions. No recantation would suffice, and no pardon would be granted. She was condemned to be burnt alive in and cruelly put to death.

One of the first misfortunes which the English felt after this punishment, was the defection of the duke of Burgundy; who had for some time seen the error of his conduct, and wished to break an unnatural connection, that only served to involve his country in ruin. A treaty was therefore begun and concluded between him and Charles, in which the former agreed to assist him in driving the English out of France. This was a mortal blow to their cause; and such was its effect upon the populace of London when they were informed of it, that they killed several of the duke of Burgundy's subjects, who happened to be among them at the time. It might perhaps also have hastened the duke of Bedford's death, who died at Rouen a few days after the treaty was concluded; and the earl of Cambridge was appointed his successor to the regency of France.

From this period, the English affairs became totally affairs of irretrievable. The city of Paris returned once more to a sense of its duty. Lord Willoughby, who commanded it for the English, was contented to stipulate for the safe retreat of his troops to Normandy. Thus ground was continually, though slowly, gained by the French; and notwithstanding their fields were laid waste, and their towns depopulated, yet they found protection from the weakness and divisions of the English. At length both parties began to grow weary of a war, which, though carried on but feebly, was yet a burden greater than either could support. But the terms of peace insisted upon by each were so wide of each other, that no hopes of an accommodation could quickly be expected. A truce, therefore, for twenty-two months, was concluded in 1443, which left every thing on the present footing between the parties. No sooner was this agreed upon, than Charles employed himself with great industry and judgment in repairing those numberless ills to which his kingdom, from the continuance of wars both foreign and domestic, had so long been exposed. He established discipline among his troops, and justice among his governors. He revived agriculture, and repressed faction. Thus being prepared once more for taking the field, he took the first favourable occasion of breaking the truce; and Normandy was at the same time invaded by four powerful
was soon augmented to more than 100,000 men, they were unable to make themselves masters of the city.

At last a treaty was set on foot betwixt Louis and the count of Charolois; by which the latter obtained the towns which had been formerly ceded, with the districts of Boulogne, Guisne, Peronne, Mondevi, and Roye, as a perpetual inheritance for himself. By granting favours to the other confederates, the league was broken at the moment that Louis was so self-confident, he proposed against the whole treaty in the presence of some confidential members of parliament, as contrary to the interest of the crown; and therefore waited the first favourable opportunity to crush one by one those who had been ready by their united efforts to destroy himself. The duke of Bourbon, one of the most able of the confederates, was gained over, by bestowing upon him in marriage, Jane the natural daughter of Louis himself, with the dowry of Usson in Auvergne; together with Moras, Beaupré, and Cormillon in Dauphiny; while, by the discontent betwixt the dukes of Brittany and Normandy, he was enabled to secure the neutrality of the former, and to recover from the latter some territories which he had unwillingly ceded to him.

In 1467, Philip duke of Burgundy, from his amiable qualities renowned The Good, died, and left his dominions to his son Charles count of Charolois. That fiery and impetuous prince, jealous of the growing power of France, and an implacable enemy of Louis, had entered into a secret treaty with Francis; but Louis had driven the Bretons from the posts they occupied in Normandy before the duke of Burgundy could pass the Somme. The king, however, alarmed at the power of the confederates, concluded a peace with Brittany; and, confiding in his talents for negotiation, determined to have a personal interview with the duke of Burgundy.

This memorable interview took place in the year 1468; and Peronne, a city of Picardy, but belonging to the duke of Burgundy, was appointed as the place of rendezvous. To this place the politic Louis repaired with a slender train, and attended only by Cardinal Baleux, the duke of Bourbon, and the count de St Pol, constable of France; seemingly without reflecting that he was entering a hostile city, where he might be confined for any length of time, or treated at the pleasure of the duke, who was his mortal enemy. Indeed he had not long been in the place when he began to see the error of his conduct; and by the daily concourse of Burgundian lords and other persons of rank, who were his avowed enemies, he became alarmed for his personal safety. His fear now suggested to him a worse measure than even the former; and he requested apartments in the castle, where it was in the power of his rival in a moment to make him a close prisoner. This event accordingly took place, and that through the arts and machinations of Louis himself. His design had been from the beginning to keep the duke of Burgundy constantly employed in domestic wars. For this purpose he had, before his interview with Charles, excited the inhabitants of Liege, who were subject to the duke of Burgundy, to revolt. It is most probable, that he did not imagine the effects of this treachery would so soon begin to appear. At the very time, however, that Louis was

in the castle of Peronne, the people of Liege revolted, seized the bishop and governor; and having massacred great numbers of the adherents of Charles, retired with the prisoners they had made to the capital. Charles was soon informed of this massacre, with the additional circumstance, that the ambassadors of Louis were seen animating the insurgents to their work of destruction. He then flew into a transport of rage; and ordered the gates of the castle to be shut and strictly guarded; denouncing the severest vengeance on the perfidious monarch who had so often deceived him. Louis, however, though greatly, and no doubt very justly, alarmed, did not neglect to take the proper methods for securing himself. He distributed large sums of money among those officers to whom he imagined the duke was most inclined to pay any regard, and by splendid promises and presents endeavoured to allay the resentment of his other enemies. At last the resentment of Charles having subsided, he entered into a treaty with the king, and concluded it upon much the same terms as those which had been agreed upon before. His resentment, however, still manifested itself so far, that he insisted upon Louis being present at the punishment he inflicted upon the inhabitants of Liege for the massacre they had committed, and of which we have already taken notice. This was agreed to: the two princes formed the siege of the city in conjunction; and, notwithstanding the obstinate defence of the people, it was at last taken by storm, and the inhabitants massacred. It was not long, however, before the new alliance was dissolved. A confederacy against Louis, whom neither promises nor treaties could bind, was formed betwixt his own brother the duke of Normandy and the duke of Burgundy; but before their measures were ripe for execution, Louis had already commenced hostilities. The duke of Burgundy, as a peer of France, was summoned to parliament; and on his refusal, the constable St Pol made himself master of St Quentin. Several other cities were soon after reduced; and Baldwin, the natural brother of Charles, corrupted by Louis, deserted his cause; and the haughty spirit of the duke was thus at last obliged to condescend to solicit a peace. This, however, was of no long duration. Charles, encouraged by the success of Edward IV. of England his brother-in-law, began once more to league against Louis with the dukes of Brittany and of Guise; the latter being the king's brother, formerly duke of Normandy, but who had exchanged that dukedom for the territory of Guise. But while the affairs of the confederates seemed to be in a prosperous way, their prospects were suddenly overcast by the death of the duke of Guise, which was universally supposed to have been occasioned by poison, and Louis was as universally looked upon as the author. The abbot of St Joan d'Angeli was fixed upon as the immediate perpetrator of the deed; but on the day appointed for his trial he was found strangled in his cell; and this also was with great probability supposed to have been the deed of Louis, who after the death of his brother instantly seized on the territory of Guise, and annexed it to the dominions of France.

By this unheard-of conduct of the French monarch, Charles was exasperated to such a degree, that he vowed the most dreadful vengeance against the unhappy people.
circumstances as rendered it evidently impracticable.

The disparity of age was very great, the dauphin being only eight years old, and the princess twenty: the Flemings were besides very much averse from submitting to a prince whose powerful resources would enable him to oppress their liberties; but notwithstanding these unsurmountable difficulties, Louis chose to insist upon the match, at the same time that he endeavoured to make himself master of her dominions by force of arms. He addressed circular letters to the principal cities of Burgundy; representing that the duchy had been given by King John to the male heirs of his son Philip; and that now, when these were extinct by the death of Charles, the territory reverted of course to the crown. To render this argument more effectual, he corrupted the governors of some towns; seduced the inhabitants of others to rise against their governors; whilst he himself at the head of an army, prepared to enforce obedience from those who could not be worked upon by other methods. Thus the province of Burgundy was entirely reduced; but Flanders could not be brought under submission either by fair means, force, or fraud. In his conduct for this purpose, indeed, Louis displayed the most detestable as well as the meanest treachery and falsehood. To render Mary odious to her subjects, he negotiated with her ministers, and prevailed upon them to disclose to him some of the most important state secrets; after which he communicated their letters to the states of Flanders. This double treachery, however, did not at present answer his purpose. The two ministers whom he had betrayed were indeed put to death without mercy, and that even in the presence of their sovereign: but Mary herself was thus induced to bestow herself upon the emperor Maximilian; and Louis had the mortification to find that all his arts had contributed only to aggravate a rival power, whom he had already sufficient cause to dread. To remedy this oversight, he entered into an alliance with Edward IV. of England, whom he had inspired with a jealousy of his brother Clarence, in order to prevent a match betwixt that nobleman and the princess Mary, which had also been in agitation. Thus a peace was concluded between the two monarchs, to continue during the life of each, and a year after.

The marriage of Mary with Maximilian effectually secured the independence of Flanders; while the return of the prince of Orange to the party of that princess extended the flames of war once more to the cities of Burgundy. The French were on the point of being totally expelled from that country, when Maximilian unexpectedly made proposals of peace. A truce was on this concluded between the two princes, but without any term limited for its duration, or without any conditions stipulated in favour of the Burgundians; so that the whole country was quickly after reduced by Louis.

The king now freed from the apprehensions of foreign enemies, turned his vindictive disposition against his own subjects; over whom, under pretence of former rebellion, he exercised the most insupportable tyranny. The principal victim to his sanguinary disposition on this occasion was James d’Armagnac, duke of Nemours, one of the first noblemen in the kingdom, but who had formerly appeared a zealous confederate against him in the league in which Edward and Charles were concerned. The unfortunate nobleman, knowing that vengeance was determined against him, fled to a fortress named Court, situated among the mountains of Auvergne. Here he was besieged by the Seigneur de Beaujeu, who had married Anne the daughter of Louis. The place, however, was almost impracticable to any force; so that his enemies were obliged to make the most solemn promises of safety in order to induce him to surrender himself. By these he was at last persuaded to trust himself in the hands of the faithless tyrant: who no sooner had him in his power than he shut him up in the Bastile in an iron cage, and reprimanded the judges because they had released him from this close confinement during the time of his examination. The judges reluctantly condemned him to be beheaded: but the king’s cruelty extended beyond the sentence: and he ordered the two young sons of the duke, though yet in early childhood, to be placed directly under the scaffold, that they might be covered with the blood of their father. Four thousand persons are supposed to have perished upon this occasion without any form or trial: and were it not for the concurrent testimony of the historians of that age, the inhumanities and barbarities of this monarch are not likely to be credited. By these he broke the spirits of the French nobility, and gradually extended the power of the crown beyond all bounds; so that at last it was limited only by the sovereign’s pleasure. Amidst all the perfidy and cruelty, however, for which this monarch is so justly to be detested, we may on some occasions remark a kind of magnanimity and generosity which we cannot but applaud. An instance of this was his supporting the house of Medici against Pope Sixtus, whom he obliged to desist from his attacks, and to recall his sentence which he had fulminated against him.

In 1479, the emperor Maximilian, who had lightly abandoned the duchy of Burgundy, when he might unsuccesfully have reduced it, now renewed his claims when it was invaded by no longer in his power to enforce them. After a variety of actions of lesser note, and the destruction of Flanders, cities on both sides, a decisive battle was fought at Guinegate. Here the Flemings were routed, and the French pursued with too great ardour, the infantry of the enemy rallied, and the battle was renewed with great slaughter on both sides. A more decisive advantage was afterwards gained by the capture of 80 Flemish vessels, which induced that commercial people to think of peace. In the meantime, however, Louis, after a life spent in continual deceit, hypocrisy, and cruelty, received warning of his approaching end by a fit of apoplexy with which he was seized in the year 1480. He lay speechless and motionless for two days; after which he recovered in some degree, but never completely regained his health and strength. His illness, however, neither prevented him from pursuing the schemes of his ambition, nor from using the same methods as before to attain them. He seized, without any pretence, the estates of the duke of Bourbon, the only nobleman in the kingdom whose power could give him any cause of suspicion; yet, notwithstanding his assiduity for the interest of the dauphin, he kept him a kind of prisoner in the castle of Amboise, permitting none but his own servants, or per-
France. They raised an army of 60,000 men. By these means the French were compelled to abandon the siege of Nantz; but this proved only a transient gleam of success. Anne persevered in her design of completing the conquest of the country, and the state of Europe at that time favoured the design. Of all the European states, England alone was then capable of affording any effectual assistance; and the slow caution of Henry prevented him from giving the assistance which for his own interest he ought to have done. Thus the Bretons were left to defend themselves the best way they could; and having ventured a battle, they were entirely defeated, and most of their leaders taken prisoners. A small body of English, under the command of Lord Woodville, who assisted them, were entirely cut in pieces. The duke soon after died by a fall from his horse, leaving his dominions to his daughter Anne, at that time only 13 years of age. A marriage was negotiated between this princess and Maximilian king of the Romans, who had been married to Mary of Burgundy; but by reason of the poverty of that prince it was never completed. The lady Beaujeu, then finding that the absolute conquest of Brittany would still be a difficult matter, determined to conclude a marriage between the young king of France and the duchess, though the former had already been married to Margaret of Austria, the daughter of Maximilian. This marriage indeed had not been consummated by reason of the tender age of the princess; but she had been sent to Paris for her education, and had for several years been treated as queen of France. In 1491, however, Margaret was sent back to her father: Anne of Brittany for a long time refused to violate the engagements into which she had entered; but at last, finding herself distressed on all sides, and incapable of resisting the numerous forces of France with which she was pressed, she reluctantly consented to the match, and the nuptials were celebrated the same year at Langres in Touraine.

Maximilian, whose poverty had prevented him from giving any assistance to his bride, or even from coming to see her, enraged at the double disgrace he had suffered, began, when too late, to think of revenge. France was now threatened with an invasion from the united forces of Austria, Spain, and England. But this formidable confederacy was soon dissipated. Henry, whose natural avarice had prevented him from giving the necessary assistance, was bought off with money: the immediate payment of 745,000 crowns, and the promise of 25,000 annually ever after, persuaded him to retire into his own country. Ferdinand, king of Spain, had the counties of Roussillon and Cerdaigne restored to him, while Maximilian was gratified by the cession of part of Artois, which had been acquired by Louis XI.

The young king of France agreed to these terms on the condition, that he was impatient to undertake an expedition into Italy, in order to conquer the kingdom of Naples, to which he claimed a right. Most of his counsellors were against the expedition; but the king was inflexible, even though Ferdinand king of Naples offered to do homage for his kingdom, and pay him a tribute of 50,000 crowns a year. He appointed Peter duke of Bourbon regent in his absence; after which he set out on his expedition with very few troops and very little money. By the way he fell ill of the smallpox, but in a short time recovered, and entering Italy with only 6000 horse and 12,000 foot, he was attended with the most surprising success, traversing the whole country in six weeks, and becoming master of the kingdom of Naples in less than a fortnight. Such extraordinary good fortune seemed miraculous; and he was reckoned an instrument raised up by God to destroy the execrable tyrants with which Italy was at that time infested. Had Charles made use of this prepossession in his favour, and acted up to the character generally given him, he might have raised his name as high as any hero of antiquity. His behaviour, however, was of a very different nature. He abused himself with feasts and shows; and leaving his power in the hands of favourites, they abandoned it to whoever would purchase titles, places, or authority, at the rates they imposed; and the whole force he proposed to leave in his new conquered dominions amounted to no more than 4000 men.

But while Charles was thus losing his time, a league was concluded against him at Venice, into which entered the pope, the emperor Maximilian, the archduke Philip, Ludovic Sforza, and the Venetians. The confederates assembled an army of 40,000 men, commanded by Francis marquis of Mantua; and they waited for the king in the valley of Fornano, in the duchy of Parma, into which he descended, with 9000 men. On the 6th of July 1495 he attacked the allies; and, notwithstanding their great superiority, defeated them, with the loss of only 80 of his own men. Thus he got safe to France; but his Italian dominions were lost almost as soon as he departed. Some schemes were proposed for recovering these conquests; but they were never put in execution, and the king died of an apoplectic fit in 1498.

The premature death of this monarch in the 28th year of his age, was supposed to have been owing to his irregular life, and particularly his attachment to women; which had for some time impaired his health, and brought on evident symptoms of his approaching dissolution. At last he relinquished his irregularities, and retired with the queen to the castle of Ambloise. Here in passing through a low door he struck his head with violence against the top. No unfavourable symptom appeared at the time; but soon afterwards, as he conversed with his confessor, and avowed his design of observing the nuptial fidelity he owed to the queen, he suddenly fell backwards in a fit of apoplexy. He recovered his voice three times, and uttered some expressions of devotion; but instantly relapsed, and in a short time expired, notwithstanding every assistance that could be given. He was greatly celebrated for his sweet temper and agreeable disposition, which procured him the surnames of the Amable and Courteous. Two of his domestics are said to have died of grief after his death, and his widow abandoned herself to the most pungent sorrow for two years.

By the death of Charles VIII. the throne of France passed from the direct line of the house of Valois, and Louis duke of Orleans succeeded to the throne. At the time of his accession he was in his 36th year, and had long been taught prudence in the school of adversity. During the administration of the lady Beaujeu, he had been, as we have already observed, constantly in disgrace; and after his connexions with the
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Milanese also made their way back again as well as they could. Henry VIII. under the influence of Cardinal Wolsey, resolved not to oppress the oppressed; he therefore assured the regent that she had nothing to fear from him; and at the same time advised her not to consent to any treaty by which France was to be dismembered. To the emperor, however, he used another language. He told him, that the time was now come when this puissant monarchy lay at their mercy; and therefore, that so favourable an opportunity should not be let slip: that, for his part, he should be content with Normandy, Guienne, and Gascony, and hoped the empire would make no scruple of owning him king of France: adding, that he expected the emperor would make a right use of his victory, by entering Guienne in person; in which case he was ready to bear half the expense of the war. He foresaw what fell out; the emperor was alarmed at these conditions, and did not care to have him for a neighbour; for which reasons he agreed to a truce with the regent for six months. In Picardy the Flemings were repulsed; and the count de Guise, with the duke of Lorras, had the good fortune, with a handful of troops, to defeat and cut to pieces the German peasants.

In the mean time, Francis was detained in captivity in Italy: but being wearied of his confinement in that country, and the princes of Italy beginning to cabal for his deliverance, he was carried to Madrid; where, on the 14th of January 1525, he signed a treaty, the principal articles of which were, That he should resign to the emperor the duchy of Burgundy in full sovereignty; that he should desist from the homage which the emperor owed him for Artois and Flanders; that he should renounce all claim to Naples, Milan, Asti, Tournay, Lille, and Hesden, &c.; that he should persuade Henry d'Albert to resign the kingdom of Navarre to the emperor, or at least should give him no assistance; that within 40 days he should restore the duke of Bourbon and all his party to their estates; that he should pay the king of England 500,000 crowns which the emperor owed him; that when the emperor went to Italy to receive the Imperial crown, he should lend him 12 galleys, four large ships, and a land army, or instead of it 200,000 crowns.

All these articles the king of France promised on the word and honour of a prince to execute; or, in case of non-performance, to return prisoner into Spain. But, notwithstanding these professions, Francis had already protested before certain notaries and witnesses in whom he could trust, that the treaty he was about to sign was against his will, and therefore null and void. On the 21st of February, the emperor thought fit to release him from his prison, in which he had been closely confined ever since his arrival in Spain; and after receiving the strongest assurances from his own mouth, that he would literally fulfil the terms of the treaty, sent him under a strong guard to the frontiers, where he was exchanged for his two eldest sons, who were to remain as hostages for his fidelity.

When the king returned to his dominions, his first care was to get himself absolved by the pope from the oaths he had taken; after which he entered into a league with the pontiff, the Venetians, the duke of Milan, and the king of England, for preserving the peace of Italy. In the month of June, he publicly received remonstrances from the states of Burgundy; in which they told him, without ceremony, that by the treaty of Madrid he had done what he had no right to do, in breach of the laws and his coronation oath; adding, that if he persisted in his resolution of throwing them under a foreign yoke, they must appeal to the general states of the kingdom. At these remonstrances the viceroy of Naples and the Spanish ministers were present. They perceived the end which the king aimed at, and therefore expostulated with him in pretty warm terms. At last the viceroy told him, that he had now nothing left but to keep his royal word in returning to the castle of Madrid, as his predecessor John had done in a like case. To this the king replied, that King John acted rightly; that he returned to a king who had treated him like a king; but that at Madrid he had received such usage as would have been unbecoming to a gentleman: that he had often declared to the emperor's ministers, that the terms they extorted from him were unjust and impracticable: but that he was still willing to do all that was fit and reasonable; and to ransom his sons at the rate of two millions of gold, in lieu of the duchy of Burgundy.

Hitherto the treaty for the tranquillity of Italy had been kept secret, in hopes that some mitigation of the treaty of Madrid would have been obtained; but now it was judged expedient to publish it, though the viceroy of Naples and the Spanish lords were still at the French court; and the emperor was to be admitted into it, provided he accepted the king's offer of two millions for the release of his children, and left the duke of Milan and other Italian princes in quiet possession of their dominions. It is the common misfortune of all leagues, that the powers who enter into them keep only their own particular interests in view, and thus defeat the general intention of the confederacy. This was the case here. The king's great point was to obtain his children upon the terms he had proposed; and he was desirous of knowing what hopes there were of that, before he acted against the emperor, in whose power they were. Thus the duke of Milan and the pope were both sacrificed. The former was obliged to surrender to the duke of Bourbon, and the latter was surprised by the Colonnas; both of which disasters would have been prevented if the French succours had entered Italy in time. See Italy.

According to an agreement which had been made between Francis and Henry, their ambassadors went into Spain, attended each of them by a herald, in order to summon the emperor to accept the terms which had been offered him; or, in case of refusal, to declare war. It seems the emperor's answer was foreseen in the court of France; and therefore the king had previously called together an assembly of the notables; that is, persons of the several ranks of his people in whom he could confide. To them he proposed the great question, Whether he was bound to perform the treaty of Madrid? or, Whether if he did not perform it, he was obliged in honour to return to Spain? To both these questions, the assembly answered in the negative; they said, that Burgundy was united to the crown of France, and that he could not separate it by his own authority; that his person also was the property of the public, of which therefore he could not dispose; but for the two millions, which they looked upon...
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Frances court the admiral Coligni, who was the head of the Protestant party; and cajoled him so, that he was lulled into a perfect security, notwithstanding the many warnings given him by his friends, that the king's fair speeches were by no means to be trusted; but he had soon reason to repent his confidence. On the 23d of August 1572, as he was walking from the court to his lodgings, he received a shot from a window, which carried away the second finger of his right hand, and wounded him grievously in the left arm. This he himself ascribed to the malice of the duke of Guise, the head of the Catholic party. After dinner, however, the king went to pay him a visit, and amongst others made him this compliment: "You have received the wound, but it is I who suffer:" desiring at the same time that he would order his friends to quarter about his house, and promising to hinder the Catholics from entering that quarter after it was dark. This satisfied the admirals of the king's sincerity; and hindered him from complying with the desires of his friends, who would have carried him away, and who were strong enough to have forced a passage out of Paris if they had attempted it.

In the evening, the queen mother, Catherine de Medicis, held a cabinet council to fix the execution of the massacre of the Protestants, which had been long meditated. The persons of which this council was composed, were, Henry duke of Anjou, the king's brother; Gonzaga duke of Nevers; Henry of Angoulême grand primate of France, and bastard brother of the king; and marshal de Tavannes; and Albert de Condé, count de Retz: the direction of the whole was given to the duke of Guise, to whom the administration had been entirely confided during the former reign. The guards were appointed to be in arms, and the city officers were to dispose the militia to execute the king's orders, of which the signal was the ringing of a bell near the Louvre. Some say, that when the hour approached, which was that of midnight, the king grew undetermined: that he expressed his horror at shedding so much blood, especially considering that the people whom he was going to destroy were his subjects, who had come to the capital at his command, and in confidence of his word; and particularly the admiral, whom he had detained so lately by his caresses. The queen mother, however, reproached him with his cowardice, and represented to him the great danger he was in from the Protestants; which at last induced him to consent. According to others, however, the king himself urged on the massacre; and when it was proposed to him to take off only a few of the heads, he cried out, "If any are to die, let there not be one left to reproach me with breach of faith."

As soon as the signal was given, a body of Swiss troops of the Catholic religion, headed by the duke of Guise, the chevalier d'Angoulême, accompanied by many persons of quality, attacked the admiral's house. Having forced open the doors, the foremost of the assassins rushed into the apartment; and one of them asked if he was Coligni? To this he answered that he was; adding, "Young man, respect these gray hairs:" to which the assassin replied by running him through the body with a sword. The duke of Guise and the chevalier growing impatient below stairs, cried out to know if the business was done; and being told that it was, commanded that the body should be thrown out at the window. As soon as it fell on the ground, the chevalier, or (as some say) the duke of Guise, wiping the blood off the face, kicked it with his foot. The body was then abandoned to the fury of the populace; who, after a series of indignities, dragged it to the common gallows, to which they chained it by the foot, the head being cut off and carried to the queen mother; who, it is said, caused it to be embalmed and sent to Rome. The king himself went to see the body hang upon the gibbet; where a fire being kindled under it, part was burnt, and the rest scorched. In the Louvre, the gentlemen belonging to the king of Navarre and the prince of Condé were murdered under the king's eye. Two of them, wounded and pursued by the assassins, fled into the bedchamber of the queen of Navarre and jumped upon her bed, beseeching her to save their lives; and as she went to ask this favour of the queen mother, two more, under the like circumstances rushed into the room, and threw themselves at her feet. The queen mother came to the window to enjoy these dreadful scenes; and the king, seeing the Protestants who lodged on the other side of the river, flying for their lives, called for his long gun, and fired upon them. In the space of three or four days, many thousands were destroyed in the city of Paris, by the most cruel deaths which malice itself could invent. Peter Ramus, professor of philosophy and mathematics, after being robbed of all he had, his belly being first ripped open, was thrown out of a window. This so much affected Denis Lamblin, the king's professor, that, though a zealous Catholic, he died of terror. The first two days, the king denied it was done by his orders, and threw the whole blame on the house of Guise: but, on the 31st of August, he went to the parliament, avowed it, was complimented upon it, and directed a process against the admiral, by which he was stigmatized as a traitor. Two innocent gentlemen suffered as his accomplices in a pretended plot against the life of the king, in order to set the crown on the head of the prince of Condé. They were executed by torch light; and the king and the queen mother (with the king of Navarre and the prince of Condé by force) were spectators of this horrid deed; and they also assisted at the jubilee to thank God for the execution of such an infamous design.

The massacre was not confined to the city of Paris alone. On the eve of St. Bartholomew, orders had been sent to the governors of provinces to fall upon the Protestants themselves, and to let loose the people upon them; and though an edict was published before the end of the week, assuring them of the king's protection, and that he by no means designed to exterminate them because of their religion, yet private orders were sent, of a nature directly contrary; in consequence of which, the massacre, or (as, in allusion to the Sicilian vespers, it is now styled) the Matins of Paris, were repeated in Meaux, Orleans, Troyes, Angers, Toulouse, Rouen, and Lyons; so that in the space of two months 30,000 Protestants were butchered. The next year Rochelle, the only strong fortress which the Protestants held in France, was besieged, but was not taken without the loss of 24,000 of the Catholics who besieged it. After this a pacification ensued on terms favourable.
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Sicily to the Venetians; Milan to the duke of Savoy, who, by his acquisition, was to become king of Lombardy; the Austrian Low Countries were to be added to the Dutch republic; Franche Comté, Alsace, and the country of Trent, were to be given to the Swiss. With a view, is in now thought, of executing this grand project, but under pretence of reducing the exorbitant power of the house of Austria, Henry made immense preparations both by sea and land; but if he really had such a design, he was prevented by death from attempting to execute it. He was stabbed in his coach by one Ravilli on the 12th of May 1608.

On the death of Henry IV. the queen mother assumed the regency. Ravilli was executed, after suffering horrid tortures. It is said that he made a confession, which was so written by the person who took it down, that not one word of it could ever be read, and thus his instigators and accomplices could never be discovered. The regency, during the minority of Louis XIII. was only remarkable for cabals and intrigues of the courtiers. In 1617, the king assumed the government himself, banished the queen mother to Blois, caused her favourite Marshal d'Ancre to be killed, and chose for his minister the famous Cardinal Richelieu. In 1620, a new war broke out between the Catholics and Protestants, which was carried on with the greatest fury on both sides; and we may judge of the spirit which actuated both parties by what happened at Negrepelisse, a town in Quercy. This place was besieged by the king's troops, and it was resolved to make an example of the inhabitants. The latter, however, absolutely refused to surrender upon any terms. They defended themselves, therefore, most desperately; and the city being at last taken by storm, they were all massacred, without respect of rank, sex, or age, except ten men. When these were brought into the king's presence, he told them they did not deserve mercy: they answered, that they would not receive it; that the only favour they asked, was to be hanged on trees in their own gardens; which was granted, and the place reduced to ashes. Both parties soon became weary of such a destructive war; and a peace was concluded in 1621, by which the edict of Nantz was confirmed. This treaty, however, was of no long duration. A new war broke out which lasted till the year 1628, when the edict of Nantz was again confirmed; only the Protestants were deprived of all their provincial towns, and consequently of the power of defending themselves in time to come. This put an end to the civil wars on account of religion in France.

Historians say, that in these wars above a million of men lost their lives, that 750,000 livres were spent in carrying them on; and that 9 cities, 400 villages, 2000 churches, 2000 monasteries, and 10,000 houses, were burnt or otherwise destroyed during their continuance. The next year, the king was attacked with a slow fever which nothing could ally, an extreme depression of spirits, and prolix swellings in his stomach and belly. The year after, however, he recovered, to the great disappointment of his mother, who had been in hopes of regaining her power. She was arrested; but found means to escape into Flanders, where she remained during the rest of his reign. Richelieu, by a masterly train of politics, though himself was next to no enthusiast for popery, supported the Protestant of Germany and Gustavus Adolphus against the house of Austria; and after quelling all the rebellions and conspiracies which had been formed against him in France, he died some months before Louis XIII. in 1643.

Louis XIV. surnamed le Grand, succeeded to the throne when he was only five years of age. During his minority, the kingdom was torn in pieces under the administration of his mother, Anne of Austria, by the factions of the great, and the divisions between the court and parliament, for the most trifling causes and upon the most despicable principles. The prince of Condé flamed like a blazing star; sometimes a patriot, sometimes a courtier, and sometimes a rebel. He was opposed by the celebrated Turenne, who from a Protestant had turned Papist. The nation of France was involved at once in civil and domestic wars; but the queen mother having made choice of Cardinal Mazarin for her first minister, he found means to turn the arms even of Cromwell against the Spaniards, and to divide the domestic enemies of the court so effectually among themselves, that when Louis assumed the reins of government into his own hands, he found himself the most absolute monarch that had ever sat upon the throne of France. He had the good fortune, on the death of Mazarin, to put the domestic administration of his affairs into the hands of Colbert, who formed new systems for the glory, commerce, and manufactures of France, all which he carried to a surprising height. The king himself ignorant and vain, was blind to every patriotic duty of a king, promoting the interests of his subjects only that they might the better answer the purposes of his greatness; and by his ambition he embroiled himself with all his neighbours, and wantonly rendered Germany a dismal scene of devastation. By his impolitic and unjust revocation of the edict of Nantz in the year 1685, with the dragee of the Protestants that followed it, he obliged them to take shelter in England, Holland, and Germany. Different parts of Germany, where they established the silk manufactories, to the great prejudice of their own country. He was so blinded by flattery, that he arrogated to himself the divine honours paid to the Pagan emperors of Rome. He made and broke treaties for his convenience: and in the end he raised against himself a confederacy of almost all the other princes of Europe; at the head of which was King William III. of England. He was so well served, that he made head for some years against this alliance; and France seemed to have attained the highest pitch of military glory, under the conduct of those renowned generals Condé and Turenne. (See United Provinces). At length, having provoked the English by his repeated infidelities, their arms under the duke of Marlborough, and those of the Austrians under Prince Eugene, rendered the latter part of Louis's life a miserable one, at the beginning of it was splendid. His reign, from the year 1702 to 1711, was one continued series of defeats and calamities; and he had the mortification of seeing those places taken from him, which, in the former part of his reign, were acquired at the expense of many thousand lives. (See Britain, No. 342, &c.)—Just as he was reduced, old as he was, to the desperate resolution of collecting his people and dying at their head, he was saved by the English Tory ministry de-
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The last years of Louis XIV. were also embittered by domestic calamities; which, added to those he had already endured of a public nature, impressed him with a deep melancholy. He had been for some time afflicted with a fastula; which, though successfully cut, ever afterwards affected his health. The year before the peace, his only son, the duke of Burgundy, died, together with the duchess and their eldest son; and the only remaining child was left at the point of death. The king himself survived till the month of September 1715; but on the 14th of that month expired, leaving the kingdom to his great grandson Louis, then a minor.

By the last will of Louis he had devolved the regency during the minority of the young king, upon a council, at the head of which was the duke of Orleans. That nobleman, however, disgusted with a disposition which gave him only a casting vote, appealed to the parliament of Paris, who set aside the will of the late king, and declared him sole regent. His first acts were extremely popular, and gave the most favourable ideas of his government and character. He restored to the right which had been taken from them of remonstrating against the edicts of the crown, and compelled those who had enriched themselves during the calamities of the former reign to restore their wealth. He also took every method to efface the calamities occasioned by the unsuccessful wars in which his predecessor had engaged; promoted commerce and agriculture; and, by a close alliance with Great Britain and the United Provinces, seemed to lay the foundation of a lasting tranquillity. This happy prospect, however, was soon overcast by the intrigues of Alberoni the Spanish minister, who had formed a design of recovering Sardinia from the emperor, Sicily from the duke of Savoy, and of establishing the Pretender on the throne of Britain. To accomplish these purposes, he negotiated with the Ottoman Porte, Peter the Great of Russia, and Charles XII. of Sweden; the Turks intending to resume the war against the emperor; the two latter to invade Great Britain. But as long as the duke of Orleans retained the administration of France, he found it impossible to bring his schemes to bear. To remove him, therefore, he fomented divisions in the kingdom. An insurrection took place in Brittany; and Alberoni sent small parties into the country in disguise, in order to support the insurgents, and even laid plots to seize the regent himself. All of a sudden, however, the Spanish minister found himself disappointed in every one of his schemes. His partizans in France were put to death; the king of Sweden was killed at Frederickshall in Norway; the Czar, intent on making new regulations, could not be persuaded to make war upon Britain; and the Turks refused to engage in a war with the emperor, from whom they had lately suffered so much. The cardinal, nevertheless, continued his intrigues; which quickly produced a war betwixt Spain on the one part, and France and Britain on the other. The Spaniards, unable to resist the union of two such formidable powers, were soon reduced to the necessity of suing for peace; and the terms were dictated by the regent of France; and of these the dismission of Alberoni the Spanish minister was one. A double marriage was now set on foot: the duke of Orleans gave his own daughter, Mademoiselle Montpensier, to Don Lewis prince of Asturias, while the infanta of Spain was betrothed to her cousin the king of France. From this time the house of Bourbon continued united; both princes being convinced, that it was their interest not to waste their strength in wars against each other.

The spirit of conquest having now in a great measure subsided, and that of commerce taken place throughout the world in general, France became the scene of as remarkable a project in the commercial way as ever was known in any country. One John Law, a Scotchman, who had been obliged to leave his own country, laid the plan of a company which might by its notes pay off the debt of the nation, and reimburse itself by the profits. Law had wandered through various parts of Europe, and had successively endeavored to engross the attention of various courts. The proposal was made to Victor Amadeus king of Sicily; but he dismissed Law with a reply, that "he was not rich enough to ruin himself." But in France it was looked upon in a more favourable light; the nation being at this time involved in a debt of 200 millions, and the regent, as well as the people in general, very fond of embarking in new schemes. The bank, thus established, proceeded at first with some degree of caution; but having by degrees extended their credit to more than 80 times their real stock, they soon became unable to answer the demands made upon them; so that the company was dissolved the very same year in which it had been instituted. The confusion into which the kingdom was thrown by this fatal scheme, required the utmost exertions of the regent to put a stop to it; and scarcely was this accomplished when the king, in 1723, took the government into his own hands. The duke then became minister; but did not take the long enjoy this post. His irregularities had broken government into his own hands. The minister, therefore, at last consented that the princess should be sent back; an affront so much resented by the queen her mother, that it had almost produced a war betwixt the two nations.

The dissolution of the marriage of Louis was the last act of Condé's administration; and the procuring of a new match was the first act of his successor Cardinal Fleury. The princess pitched upon was the daughter of Stanislaus Leczinski, king of Poland, who had been deposed by Charles XII. of Sweden. Marriage. The princess was destitute of personal charms, but of with an amiable disposition; and though it is probable that she never possessed the love of her husband, her excellent qualities could not but extort his esteem; and the birth
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The birth of a prince soon after their marriage removed all the fears of the people concerning the succession.

Cardinal Fleury continued the pacific schemes pursued by his predecessors; though they were somewhat interrupted by the war which took place in the year 1733. Notwithstanding the connexion between that monarch and the French nation, however, Fleury was so parsonachious in his assistance, that only 1500 soldiers were sent to relieve Dantzig, where Stainislaus himself resided, and whom the throne besieged by the Czar. The peace, instead of being more friendly towards Poland, was soon overwhelmed by a multitude of Russians; and Stainislaus was at last obliged to renounce all thoughts of the crown of Poland, though he was permitted to retain the title of king; and that this title might not be merely nominal, the king of France consented to bestow upon him the duchies of Bar and Lorraine; so that, after the death of Stainislaus, these territories were indissolubly united to the dominions of France.

Fleury steadily pursued his pacific plans, and the disputes between Spain and England in 1737 very little affected the peace of France; and it must be remembered to his praise, that instead of fomenting the quarrels between the neighbouring potentates, he laboured incessantly to keep them at peace. He reconciled the Genoese and Corsicans, who were at war; and his mediation was accepted by the Ottoman Porte; who at that time carried on a successful war with the emperor of Germany, but made peace with him at the intercession of the cardinal. All his endeavours to preserve the general peace, however, proved at last ineffectual. The death of the emperor Charles VI. in 1740, the last prince of the house of Austria, set all Europe in a flame. The emperor's eldest daughter, Maria Theresa, claimed the Austrian succession, which comprehended the kingdoms of Hungary and Bohemia, the duchy of Silesia, Austrian Suabia, Upper and Lower Austria, Stiria, Carinthia, Carniola; the four forest towns; Burgaw; Brissag; the Low Countries; Friuli; Tyrol; the duchy of Milan; and the duchies of Parma and Piacentia. Among the many competitors who pretended a right to share, or wholly to inherit, these extensive dominions, the king of France was one. But as he wished not to awaken the jealousy of the European princes by preferring directly his own pretensions, he chose rather to support those of Frederick III. who laid claim to the duchy of Silesia. This brought on the war of 1740; and of which an account is given under the articles BRITAIN and FRANCE. It was terminated in 1748 by the treaty of Aix-la-Chapelle; but to this Louis, who secretly meditated a severe vengeance against Britain, only consented, that he might have time to recruit his fleet, and put himself somewhat more upon an equality with this formidable power. But while he meditated great exploits of this kind, the internal tranquillity of the kingdom was disturbed by violent disputes betwixt the clergy and parliaments of France. In the reign of Louis XIV. there had been violent contests betwixt the parliaments the Jansenists and Jesuits concerning free will and other obscure points of theology; and the opinions of the Jansenists had been declared heretical by the celebrated papal bull Unigenitus; the reception of which was enforced by the king, in opposition to the parliaments, the archbishop of Paris, and the body of the people. The archbishop, with 15 other prelates, protested against it as an infringement of the rights of the Gallican church, of the laws of the realm, and an insult on the rights of the people themselves. The duke of Orleans favoured the bull by inducing the bishops to submit to it; but at the same time stopped a persecution which was going on against its opponents. Thus matters passed over till the conclusion of the peace; a short time after which, the jealousy of the clergy was awakened by an attempt of the king to impose into the wealth of individuals of their order. To prevent this, they revived the contest about the bull Unigenitus; and it was resolved, that confessional notes should be obtained of dying persons; that these notes should be signed by priests who maintained the authority of the bull; and that, without such notes, no person could obtain a viaticum, or extreme unction. On this occasion the new archbishop of Paris, and the parliament of that city, took opposite sides; the latter imprisoning such of the clergy as refused to administer the sacraments excepting in the circumstances above mentioned. Other parliaments followed the example of that of Paris; and a war was instantly kindled betwixt the civil and ecclesiastical departments of the state. In this dispute the king interfered, forbade the parliaments to take cognizance of ecclesiastical proceedings, and commanded them to suspend all prosecutions relative to the refusal of the sacraments; but instead of acquiescing, the parliaments presented new remonstrances, refused to attend the ministers of justice, and resolved that they could not obey this injunction without violating their duty as well as their oath. They cited the bishop of Orleans before their tribunal; and ordered all writings, in which its jurisdiction was disputed, to be burnt by the executioner. By the assistance of the military, they enforced the administration of the sacraments to the sick, and ceased to distribute that justice to the subject for which they had been originally instituted. The king, enraged at their obstinacy, arrested and imprisoned four of the members who had been most obstinate, and banished the remainder to Bourges, Poitiers, and Auvergne; while, to prevent any impediment from taking place in the administration of justice by their absence, he issued letters patent, by which a royal chamber for the prosecution of civil and criminal suits was instituted. The counsellors refused to plead before these new courts; and the king, finding at last that the whole nation was about to fall into a state of anarchy, thought proper to recall the parliament. The banished members entered Paris amidst the acclamations of the inhabitants; and the archbishop, who still continued to encourage the priests in refusing the sacraments, was banished to his seat at Chartres; the bishops of Orleans and Troyes were in like manner banished, and a calm for the present restored to the kingdom.

The tranquility thus established was of no long duration. In the year 1756, the parliaments again fell under the displeasure of their king by their imprudent persecution of those who adhered to the bull Unigenitus. They proceeded so far in this opposition as to refuse to register certain taxes absolutely necessary for the carrying on of the war. By this Louis was so provoked, that he suppressed the fourth and fifth chambers of inquests, the members of which had distinguished themselves in stopping the bull Unigenitus; and as a supplementary provision, the king ordered the parliament to meet in an extraordinary capacity and with extraordinary powers, to pass such laws as the state should require. The parliaments, represented by their president MM. de Ferriol and de Sourches, declared that they did not take it upon themselves to decide whether the king had power to do this or not, but that they would act always in obedience to the king and parliament.
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France. guished themselves by their opposition to his will. He commanded the bull Unigenitus to be respected, and prohibited the secular judges from ordering the administration of the sacraments. On this 15 councillors of the great chamber resigned their offices, and 124 members of the different parliaments followed their example; and the most grievous discontents took place throughout the kingdom. An attempt was made by a fanatic, named Damien, to assassinate him; and the king was actually wounded, though slightly, between the ribs, in the presence of his son and in the midst of his guards. The assassin was put to the most exquisite tortures; in the midst of which he persisted, in the most obstinate manner, to declare that he had no intention to kill the king; but that his design was only to wound him, that God might touch his heart, and incline him to restore peace to his dominions, &c. These expressions, which undoubtedly indicated insanity, had no effect on his merciless judges, who consigned him to one of the most horrid deaths the ingenuity or cruelty of man could invent. This attempt, however, seems to have had some effect upon the king; for he soon after banished the archbishop of Paris, who had been recalled, and once more accommodated matters with his parliament.

The unfortunate event of the war of 1755 had brought the nation to the brink of ruin, when Louis implored the assistance of Spain; and on this occasion the celebrated Family Compact was signed; by which, with the single exception of the American trade, the subjects of France and Spain are naturalized in both kingdoms, and the enemy of the one sovereign is invariably to be looked upon as the enemy of the other. At that time, however, the assistance of Spain availed very little; both powers were reduced to the lowest ebb, and the arms of Britain were triumphant in every quarter of the globe. See the article BRITAIN.

The peace concluded at Paris in the year 1763, though it freed the nation from a most destructive and bloody war, did not restore its internal tranquillity. The parliament, eager to pursue the victory they had formerly gained over their religious enemies, now directed their efforts against the Jesuits, who had obtained and enforced the bull Unigenitus. The order, however, was now on the brink of destruction. A general detestation of its members had taken place throughout the whole world. A conspiracy formed by them against the king of Portugal, and from which he narrowly escaped, had roused the indignation of Europe, and this was still farther inflamed by some fraudulent practices of which they had been guilty in France. Le Valette, the chief of their missionaries at Martinico, had, ever since the peace of Aix-la-Chapelle, carried on a very extensive commerce, inasmuch that he even aspired at monopolizing the whole West India trade when the war with Britain commenced in 1755. Leonay and Gouffre, merchants at Marseilles, in expectation of receiving merchandise to the value of two millions from him, had accepted of bills drawn by the Jesuits to the amount of a million and a half. Unhappily they were disappointed by the vast number of captures made by the British; in consequence of which they were obliged to apply to the Society of Jesuits at large: but they, either ignorant of their true interest, or too slow in giving assistance, suffered the merchants to stop payment; and this not only to bring ruin upon themselves, but to involve, as is usual in such cases, a great many others in the same calamity. Their creditors demanded indemnification from the Society at large; and on their refusal to satisfy them, brought their cause before the parliament of Paris. That body, eager to revenge themselves on such powerful adversaries, carried on the most violent persecutions everywhere against them. In the course of these, the volume containing the constitution and government of the order itself was appealed to, and produced in open court. It then appeared, that the order of Jesuits formed a distinct body in the state, submitting implicitly to their chief, who alone was absolute over their lives and fortunes. It was likewise discovered that they had, after a former expulsion, been admitted into the kingdom upon conditions which they had never fulfilled; and to which their chief had obstinately refused to subscribe; consequently that their existence at that time in the nation was merely the effect of toleration. The event was, that the writings of the Jesuits were pronounced to contain doctrines subversive of all civil government, and injurious to the security of the sacred person of sovereigns: the attempt of Damien against the king was attributed to them, and every thing seemed to prognosticate their speedy dissolution. In this critical moment, however, the king interfered, and by his royal mandate suspended all proceedings against them for a year; a plan of accommodation was drawn up, and submitted to the pope and general of the order: but the latter, by his ill-timed haughtiness, entirely overthrew the hope of reconciliation. The king withdrew his protection, and the parliament redoubled their efforts against them. The bulls, briefs, constitutions, and other regulations of the Society, were determined to be enroached on authority, and abuses of government; the society itself was finally dissolved, and its members declared incapable of holding any clerical or municipal offices; their colleges were seized; their effects confiscated, and the order annihilated ever since.

The parliament having gained this victory, next Contention made an attempt to set bounds to the power of the king himself. They now refused to register an edict which Louis had issued for the continuance of some taxes which should have ended with the war, and likewise to conform to another by which the king was enabled to redeem his debts at an inadequate price. The court attempted to get the edicts registered by force, but the parliaments everywhere seemed inclined to resist to the last. In 1766, the parliament of Brittany refused the crown a gift of 700,000 livres; in consequence of which they were singled out to bear the weight of royal vengeance; but while matters were on the point of coming to extremities, the king thought proper to drop the process altogether, and to publish a general amnesty. The parliaments, however, now affected to despise the royal clemency; which exasperated the king to such a degree, that he ordered the counsellors of the parliament of Brittany (who had refused to resume the functions of which he deprived them) to be included in the list of those who were to be drafted for militia; and those upon whom the lot fell were immediately obliged to join their respective regiments;
ments; the rest being employed in forming the city guard. The parliament of Paris remonstrated so freely upon this conduct of the king, that they also fell under his censure; and Louis in the most explicit manner declared, that he would suffer no earthly power to interfere with his will; and the parliaments were for the present intimidated into submission.

The interval of domestic tranquility which now took place, was employed by the king in humbling the pride of the pope, who refused to recall a brief he had published against the duke of Parma. On this the French monarch reclaimed the territories of Avignon and Venetia; and while the pontiff denounced his unavailing censures against him, the marquis de Rochechouart, with a single regiment of soldiers, drove out the troops of the pope, and took possession of the territories in question.

A more formidable opposition was made by the natives of the small island of Corsica; the sovereignty of which had been transferred to France by the Genoese, their former masters, on condition that Louis should re-establish them in the possession of the island of Capraia, which the Corsicans had lately reduced. These islanders defended themselves with the most desperate intrepidity; and it was not till after two campaigns, in which several thousands of the bravest troops of France were lost, that they could be brought under subjection.

The satisfaction which this unjust conquest might afford to Louis, was clouded by the distress of the nation at large. The East India Company had totally failed, and most of the capital commercial houses in the kingdom were involved in the same calamity. The minister, the duc de Choiseul, by one desperate stroke, reduced the interest of the funds to one half, and at the same time took away the benefit of the survivorship in the tontines, by which the national credit was greatly affected; the alteration betwixt the king and his parliaments revived, and the disensions became worse than ever. The duc de Choiseul attempted in vain to conciliate the differences; his efforts tended only to bring misfortunes upon himself, and in 1771 he was banished by the king, who suspected him of favouring the popular party too much; and this was soon after followed by the banishment of the whole parliament of Paris, and that by the banishment of a number of others; new parliaments being everywhere chosen in place of those who had been expelled. The people where by no means disposed to pay the same regard to these new parliaments that they had done to the old ones; but every appearance of opposition was at last silenced by the absolute authority of the king. In the midst of this plenitude of power, however, which he had so ardently desired, his health daily declined, and the end of his days was evidently at no great distance. As he had all along indulged himself in sensual pleasures to the greatest excess, so they now proved the immediate means of his destruction. His favourite mistress Madame de Pompadour, who for a long time governed him with an absolute sway, had long since been dead, and the king had for some time been equally enslaved by the charms of Madame du Barre. At last even her beauty proved insufficient to excite desire; and a succession of mistresses became necessary to rouse the languid appetites of the king. One of these, who was infected with the smallpox, communicated the disease to the king; who in a short time died of it, notwithstanding all the assistance that could be given him by the physicians.

The new king Louis XVI. grandson to the former, ascended the throne in the year 1774, in the 20th year of his age; and to secure himself against the disease which had proved fatal to his predecessor, submitted to inoculation, with several others of the royal family. Their quick and easy recovery contributed much to extend that practice throughout the kingdom, and to remove the prejudices which had been entertained against it.

The king had no sooner regained his health, than he applied himself diligently to extinguish the differences which had taken place betwixt his predecessor and the people. He removed those from their employments who had given cause of complaint by their arbitrary and oppressive conduct; and he conciliated the affection of his subjects by removing the new parliaments and recalling the old ones.

But though the prudence of Louis had suggested to him these compliances, he endeavoured still to preserve pure and entire the royal authority. He explained his intentions by a speech in the great chamber of parliament. "The step that he had taken to ensure the tranquillity and happiness of his subjects, ought not (he observed) to invalidate his own authority; and he hoped, from the zeal and attachment of the present assembly, an example of submission to the rest of his subjects. Their repeated resistance to the commands of his grandfather had compelled that monarch to maintain his prerogative by their banishment; and they were now recalled, in the expectation that they would quietly exercise their functions, and display their gratitude by their obedience." He concluded with declaring, "That it was his desire to bury in oblivion all past grievances; that he should ever behave with extreme disapprobation whatever might tend to create divisions and disturb the general tranquillity; and that his chancellor would read his ordinance to the assembly, from which they might be assured he would not suffer the smallest deviation to be made." That ordinance was conceived in the most explicit terms, and was immediately registered by the king's command. The articles of it limited within very narrow bounds the pretensions of the parliament of Paris: The members were forbidden to look upon themselves as one body with the other parliaments of the kingdom, or to take any step, or assume any title, that might tend towards or imply such an union: They were enjoined never to relinquish the administration of public justice, except in cases of absolute necessity, for which the first president was to be responsible to the king; and it was added, that on their disobedience the grand council might replace the parliament, without any new edict for the purpose. They were still, however, permitted to enjoy the right of remonstrating before the registering of any edicts or letters patent which they might conceive injurious to the welfare of the people, provided they preserved in their representations the respect due to the throne. But these remonstrances were not to be repeated; and the parliament, if they proved ineffectual, were to register the edict objected to within a month at farthest from the first day of its being
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Diligently continued through the kingdom, he replied, that at a time when the seas were covered with English fleets and American cruisers, and when such armies were sent to the New World as had never before appeared there, it became prudent for him also to arm for the security of the colonies and the protection of the commerce of France. The king was not ignorant at the same time, that the remonstrances of Great Britain, and the importunities of the agents of the United States, would soon compel him to adopt some decisive line of conduct. This was hastened by a new event disastrous to Britain; the failure of General Burgoyne's expedition, and the capture of his army. The news of that event was received at Paris with unbounded exultation. M. Sartine, the marine superintendent, was eager to measure the naval strength of France with that of Great Britain; the queen, who had long seconded the applications of the American agents, now espoused their cause with fresh ardour; and the pacific inclinations of Louis being overborne by the suggestions of his ministers and the influence of the queen, it was at length determined openly to acknowledge the independence of the United States.

Dr Franklin and Silas Deane, who had hitherto acted as private agents, were now acknowledged as public ambassadors from those states to the court of Versailles; and a treaty of amity and commerce was signed between the two powers in the month of February 1778. The duke of Noailles, ambassador to the court of London, was in the month of March instructed to acquaint that court with the above treaty. At the same time he declared, that the contracting parties had paid great attention not to stipulate any exclusive advantages in favour of France, and that the United States had reserved the liberty of treating with every nation whatever on the same footing of equality and reciprocity. But this stipulation was treated by the British with contempt; and the recall of Lord Stormont, their ambassador at Versailles, was the signal for the commencement of hostilities. The events produced by this war are related under the articles AMERICA, FRANCE, and INDIA. Here our chief business is with domestic transactions, the measures of the cabinet, and the internal economy of the state.

In the year 1780 new changes in the French ministry took place. M. Bertin had resigned the office of secretary of state; the prince de Montbaray had retired from the post of secretary at war, and was succeeded by the marquis de Segur. But the most important removal was that of M. Sartine, who had for several years presided over the marine department, and whose unwaried application and ability had raised the naval power of France to a height that astonished Europe; but his colleagues in the cabinet loudly arraigned a profusion, which would have diverted into one channel the whole resources of the kingdom; and his retreat opened a road to the ambition of the marquis de Castries, who was appointed to supply his place.

This year, the king fixed on the anniversary of his birth day to render it memorable by a new instance of humanity: and he abolished for ever the inhuman custom of putting the question, as it was called, by torture; a custom which had been so established by the practice of ages, that it seemed to be an inseparable part of the constitution of the courts of justice in France. At the same time, to defray the charges of war, he continued to diminish his own expenditure; and sacrificing his magnificence to the ease of his subjects, dismissed at once above 400 officers belonging to his court.

Unhappily, however, the popular discontents were to be removed next year by the dismissal of their favourite minister, M. Necker. He had conceived the arduous but popular project of supporting a war by loans without taxes; and the rigid economy which he had introduced into all the departments of the royal household, and the various resources that presented themselves to his fertile genius, had supported him amidst the difficulties that attended this system. But his austerity of temper had not rendered him equally acceptable to the sovereign and his subjects; and the repeated reforms he had recommended were represented as inconsistent with the dignity of the crown: he was therefore in 1782 dismissed from his office of comptroller-general; and M. Joli de Fleuri, counsellor of state, was appointed to that important department. The defeat of the count de Grasse happened next year, and impressed the kingdom with general grief and consternation. Im immense preparations were, however, made for the operations of 1783; and in conjunction with the courts of Madrid and the Hague, Louis was determined this year to make the most powerful efforts to bring the war to a conclusion. But in the midst of these preparations, the voice of peace was again heard; and Louis was induced to listen to the proffered mediation of the two first powers in Europe, the emperor of Germany and the tsar of Russia. The count de Vergennes, who still occupied the post of secretary of foreign affairs, was appointed to treat with Mr Fitzherbert, the British minister at Brussels, but who had lately proceeded to Paris to conduct this important negociation. The way was already smoothed for the restoration of public tranquillity, by provisional articles signed at the conclusion of the last year between the states of America and Great Britain, and which were to constitute a treaty of peace finally to be concluded when that between France and Great Britain took place. Preliminary articles were accordingly agreed upon and signed at Versailles; these were soon after succeeded by a definitive treaty; and France, throughout her extensive dominions, beheld peace once more established. Though the late war had been attended by the most brilliant success, and the independence of America seemed to strike deep at the source of her rival's power, yet France herself had not been entirely free from inconvenience. The retreat of M. Necker, had, as we have already observed, diminished the public confidence; three different persons who had since transiently occupied his post, increased the jealousies of the people; and the failure of the celebrated Caisse d'Escompte, completed the universal consternation.

That bank had been established in the year 1776. The plan of it was formed by a company of private adventurers, and its capital was fixed at 500,000 sterling. The professed design of the Company was to discount bills at short dates, at the rate of four per cent. per annum; but as this interest could never be an equivalent for the capital sunk by the proprietors, they were intrusted with the additional power of issuing notes to the amount of their capital, which, as they...
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apart for that purpose, the entire interest of the national debts, whether in stock or annuities, together with an additional sum of 120,000l. The annuities that would be extinguished every year were estimated at 50,000l.; and in that proportion, the sum set apart for the redemption of the national debt would annually increase. The operation of this new fund was limited to the term of 25 years; and during that term the annual receipt of the Caisse d'Amortissement is declared unalterable, and incapable of being diverted to any other object.

The principal measure of the next year was the establishment of a new East India Company, (the constitutions of which have been already detailed: see Company);—a measure not equally commendable with the preceding, and which did not fail to excite violent complaints. The time, however, was now approaching, when the necessities of the state would compel him to measures still more unpopular, and destined to undergo a severer scrutiny. Although peace had been re-established throughout Europe for three years, yet the finances of France seemed scarce affected by this interval of tranquillity, and it was found requisite to close every year with a loan. The public expenditure of 1785 might probably seem to sanction this measure. It had been thought proper to fortify Cherbourg upon a large and magnificent scale; the claim of the emperor to the navigation of the Scheldt had obliged the French to increase their land forces, either to form a respectable neutrality, or to assist effectually their Dutch allies; and the marquis de Castries, fond of war, and profuse in his designs, had not suffered the navy, which M. Sartine had surrendered into his hands, to decline during the interval of peace. The treaty of commerce concluded in the year 1786 with Great Britain was a new source of discontent—though regarded by the English manufacturers as far from advantageous, it excited in France still louder murmurs. It was represented as likely to extinguish those infant establishments, which were yet unable to vie with the manufactures of England that had attained to maturity; and the market that it held out for the wines and oils of France was passed over in silence, while the distress of the artisan was painted in the most striking colours. But when the edict for registering the loan at the conclusion of the last year, and which amounted to the sum of three millions three hundred and thirty thousand pounds, was presented to the parliament of Paris, the murmurs of the people, through the remonstrances of that assembly, assumed a more legal and formidable aspect. The king, however, signified to the select deputation that were commissioned to convey to him their remonstrances, that he expected to be obeyed without further delay. The ceremony of the registering accordingly took place on the next day; but it was accompanied with a resolution, importing, "that public economy was the only genuine source of abundant revenue, the only means of providing for the necessities of the state, and restoring that credit which borrowing had reduced to the brink of ruin."

The king was no sooner informed of this step, than he commanded the attendance of the grand deputation of parliament; when he erased from their records the resolution that had been adopted; and observed, that though it was his pleasure that the parliament should communicate, by its respectful representations, whatever might concern the good of the public, yet he never would allow them so far to abuse his clemency as to erect themselves into the censors of his government. At the same time, more strongly to mark his displeasure at their expostulations, he superseded one of their officers, who had appeared most active in forwarding the obnoxious resolution.

M. de Calonne, however, though gratified by the approbation of his sovereign, could not but feel himself deeply mortified by the opposition of the parliament. His attempts to conciliate that assembly had proved ineffectual; and he experienced their inlexible aversion at the critical juncture when their acquiescence might have proved of the most essential service. An anxious inquiry into the state of the public finances had convinced him that the expenditure by far exceeded the revenue. In this situation, to impose new taxes was impracticable; to continue the method of borrowing was ruinous; to have recourse only to economical reforms, would be found wholly inadequate; and he hesitated not to declare, that it would be impossible to place the finances on a solid basis, but by the reformation of whatever was vicious in the constitution of the state.

To give weight to this reform, M. de Calonne was sensible that something more was necessary than the royal authority; he perceived that the parliament was neither a fit instrument for introducing a new order into public affairs, nor would submit to be a passive machine for sanctioning the plans of a minister, even if those plans were the emanations of perfect wisdom. Though originally a body of lawyers, indebted for their appointments to the king, there was not an attribute of genuine legislative assembly but what they seemed desirous to engross to themselves; and they had been supported in their pretensions by the plaudits of the people, who were sensible that there was no other body in the nation that could plead their cause against royal or ministerial oppression. To suppress, therefore, the only power of control that remained, and to render the government more arbitrary, was deemed too perilous a measure: yet to leave the parliament in the full possession of their influence, an influence that the minister was convinced would be exerted against him, was at once to render his whole system abortive.

In this dilemma, the only expedient that suggested itself was to have recourse to some other assembly, more dignified and solemn in its character, and which should in a greater degree consist of members from the various orders of the state and the different provinces of the kingdom. This promised to be a popular measure; it implied a deference to the people at large, and might be expected to prove highly acceptable. But the true and legitimate assembly of the nation, the States General, had not met since the year 1614; nor could the minister flatter himself with the hope of obtaining the royal assent to a meeting which a despotic sovereign could not but regard with secret jealousy.

Another assembly had occasionally been substituted in Assembly the room of the States General: this was distinguished by the title of the Notables; and consisted of a num-

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Upon which M. de Calonne resigns.

In the midst of these transactions at home, Louis's attention was also called to the state of affairs in the republic of Holland, his new and close ally. The prince of Orange had been stripped of all authority by the aristocratic party; and, retiring from the Hague, maintained the shadow of a court at Nimoguen. His brother-in-law, however, was the new king of Prussia, and his endeavours to promote the interests of the stadtholder, and, having offered, in concert with France, to undertake the arduous task of composing the differences which distracted the republic, the proposal was received with apparent cordiality by the court of Versailles. At the same time it could scarce be expected that France would become the instrument of restoring the prince of Orange to that share of power which he had before occupied, and thus abandon one of the longest and most favourite objects of her policy, the establishing a supreme and permanent control in the affairs of Holland. In fact, the conditions which were framed by the Louvestein faction, as the basis of reconciliation, were such as plainly indicated their design to reduce the influence and authority of the stadtholder within very narrow limits. On his renouncing his right of filling up the occasional vacancies in the town senates, he was to be restored to the nominal office of captain-general, but he was to be restrained from marching the troops in or out of any province, without leave from the respective provinces concerned; and he was also to subscribe to a resolution passed some time before by the senate of Amsterdam, that the command should at all times be revocable at the pleasure of the states. Had the prince acquiesced in these preliminaries, France would have completely attained the object of her long negotiations, and by means of the Louvestein faction have acquired the ascendency that she had repeatedly sought in the councils of Holland. But under the difficulties that surrounded him, the prince of Orange was admirably supported and assisted by the genius, the spirit, and the abilities of his consort: she firmly rejected every measure tending to abridge any rights that had been attached to the office of stadtholder; and M. de Bayeux, the French negotiator, having in vain endeavoured to overcome her resolution, broke off the correspondence between the Hague and Nimoguen, and returned to Paris about the middle of January 1787.

But the republican party were totally disappointed in their hopes from France. The court of Versailles had indeed long trusted to the natural strength of this party, and had been assiduous during the whole summer in endeavouring to second them by every species of succours that could be privately afforded. Crowds of French officers arrived daily in Holland; and either received commissions in the service of the states, or acted as volunteers in their troops. Several hundreds of tried and experienced soldiers were selected from different regiments, and being furnished with money for their journey, and assurances of future favour, were despatched in small parties to join the troops, and help to discipline the burghers and volunteers. A considerable corps of engineers were also directed to proceed silently and in disguise towards Amsterdam, and to assist in strengthening the works of that city. These aids, which might have proved effectual had the contest been confined to the states of Holland and the stadtholder, were overwhelmed in the rapid invasion of the Prussians; and the court of Berlin had taken its measures with so much celerity, and the situation of the republicans was already become so desperate, that it was uncertain whether their affairs could be restored by any assistance that France was capable of immediately administering. Yet on Great Britain fitting out a strong squadron of men of war at Portsmouth to give confidence to the operations of the king of Prussia, the court of Versailles also sent orders to equip 16 sail of the line at Brest, and recalled a small squadron which had been commissioned on a summer's cruise on the coast of Portugal. But in these preparations Louis seemed rather to regard his own dignity, than to be actuated by any hopes of effectually relieving his allies. All opposition in Holland might be already considered as extinguished. The states assembled at the Hague had officially notified to the court of Versailles, that the disputes between them and the stadtholder were now happily terminated; and as the circumstances which gave occasion for their application to that court no longer existed, so the succours which they had then requested would now be unnecessary.

Under these circumstances, France could only wish to extricate herself from her present difficulty with honour. She therefore readily listened to a memorial from the British minister at Paris: who proposed, in order to preserve the good understanding between the two crowns, that all warlike preparations should be discontinued, and that the navies of both kingdoms should be again reduced to the footing of a peace establishment. This was gladly acceded to by the court of Versailles; and that harmony which had been transiently interrupted between the two nations was restored.

Though the French king could not but sensibly feel Dommestie the mortification of thus relinquishing the ascendency concerns of which he had attained in the councils of Holland, the state of his own domestic concerns and the internal situation of his kingdom furnished matter for more serious reflection. The dismissal of M. de Calonne had left France without a minister, and almost without a system; and though the king bore the opposition of the notables with admirable temper, yet the disappointment that he had experienced sunk deep into his mind. Without obtaining any relief for his most urgent necessities, he perceived too late that he had opened a path to the restoration of the ancient constitution of France, which had been undermined by the crafty Louis XI. and had been nearly extinguished by the daring and sanguinary counsels of Richelieu under Louis XIII. The notables had indeed demeaned themselves with respect and moderation, but at the same time they had not been deficient in firmness. The appointment of the archbishop of Thoulose, the vigorous adversary of M. de Calonne, to the office of comptroller-general, probably contributed to preserve the appearance of good humour in that assembly; yet tables still the solved.

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This requisition of the parliaments to re-establish the national council, or states general, was the more honourable, as the former assemblies must have sunk under the influence of the latter, and returned to their original condition of mere registrars and courts of law. The confidence and attachment of the people of consequence rose in proportion to this instance of disinterestedness; their murmurs were openly expressed in the streets of the capital, and the general dissatisfaction was augmented by the stop that was put to public business by the exile of the parliament.

The cabinet at the same time was apparently weak, disunited, and fluctuating; and continual changes took place in every department of the state. Louis, averse to rigid counsels, wished to allay the growing discontent by every concession that was consistent with his dignity; but it was generally believed, that the queen strongly dissuaded him from any step that might tend to the diminution of the royal authority. The influence of that princess in the cabinet was undoubtedly great; but the popularity which once had accompanied her was no more; and some imputations of private levity, which had been rumoured through the capital, were far from rendering her acceptable to the majority of the people; while the Comte d'Artois, the king's brother, who had expressed himself in the most unguarded terms against the conduct of parliament, stood exposed to all the consequences of popular hatred.

Nor was it only in the capital that the flame of liberty once more burst forth; it blazed with equal strength in the provincial parliaments. Among various instances of this nature, the parliament of Génevois passed a decree against lettres de cachet, the most odious engine of arbitrary power; and declared the execution of them within their jurisdiction, by any person, and under whatever authority, to be a capital crime.

The king had endeavoured to soothe the Parisians by new regulations of economy, and by continual retrenchments in his household: but these instances of attention, which once would have been received with the loudest acclamations, were now disregarded under their affliction for the absence of their parliament. His majesty, therefore, in order to regain the affections of his subjects, consented to restore that assembly; aban
doning at the same time the stamp duty, and the territoial impost, which had been the sources of dispute. These measures were, however, insufficient to establish harmony between the court and the parliament. The necessities of the state still continued; nor could the deficiency of the revenue be supplied but by extraordinary resources, or a long course of rigid frugality. About the middle of November 1787, in a full meeting of the parliament, attended by all the princes of the blood and the peers of France, the king entered the assembly, and proposed two edicts for their appro
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Previous to their removal, however, they had presented a remonstrance on the late measures of government, and the alarming state of public affairs. In stating their opinions on taxes, they declared, that neither the parliaments, nor any other authority, excepting that of the three estates of the kingdom collectively assembled, could warrant the laying of any permanent tax upon the people; and they strongly enforced the renewal of those national assemblies, which had rendered the reign of Charlemagne so great and illustrious.
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On this occasion, the king delivered himself in a

speech of uncommon length, filled with professions of

good with freedom, and couched in the most animated lan-
guage, they boldly reprehended the late acts of arbitrary

violence, and demanded the entire liberation of the

persons against whom they had been exerted. We

have already noticed the fluctuating counsels of the
court of Versailles; and that Louis, as often as he

was left to pursue his own inclinations, adopted mea-
sures of reconciliation. On the present occasion, in

Orleans, the beginning of the year 1788, he recalled the
duke of Orleans to court, who soon after obtained

leave to retire to England; and he permitted the re-

turn of the Abbé Sabatier and M. Fretateau to the ca-
pital.

The parliament, however, had not confined their

demands to the liberation of those gentlefolk; but had

also echoed the remonstrances of the parliament of

Grenoble, and had loudly inveighed against the execu-
tion of lettres de cachet. These repeated remonstran-
tces, mingled with personal reflections, seconded most

probably the suggestions of the queen, and Louis was

once more instigated to measures of severity. Messrs.
d'Epremey and Monsambert, whose bold and point-

ed harangues had pressed most closely on the royal di-

gnity, were doomed to experience its immediate re-

sentment. While a body of armed troops surrounded

the hotel in which the parliament were convened, Colen

Degout entered the assembly, and secured the per-

sons of the obnoxious members, who were instantly

conducted to different prisons. This new instance

of arbitrary violence occasioned a remonstrance from

parliament, which in boldness far exceeded all the

former representations of that assembly. They de-

clared they were now more strongly confirmed, by

every proceeding, of the entire innovation which was

aimed at in the constitution. "But, sire," added

they, "the French nation will never adopt the des-

potical measures to which you are advised, and whose

effects alarm the most faithful of your magistrates;

we shall not repeat all the unfortunate circumstances

which afflict us; we shall only represent to you with

respectful firmness, that the fundamental laws of the

kingdom must not be trampled upon, and that your au-

thority can only be esteemed so long as it is tempered

with justice."

Language so pointed and decisive, and which assert-
ed the controlling power of the laws above the regal of the Ne-

authority, could not fail of seriously alarming the tables.

Accordingly, about the beginning of May,

Louis appeared in that assembly: and after com-

plaining of the excesses in which the parliament of

Paris had indulged themselves, and which had drawn

down his reluctant indignation on a few of the mem-

bers, he declared his resolution, instead of annihi-

lating them as a body, to recall them to their duty

and obedience by a salutary reform. M. de la

Moignon, as keeper of the seals, then explained his

majesty's pleasure to establish a cour plenier or su-

preme assembly, to be composed of princes of the

blood, peers of the realm, great officers of the crown,

the clergy, marquisal of France, governors of pro-

vinces, knights of different orders, a deputation

of one member from every parliament, and two mem-

bers from the chambers of council, and to be summoned as

often
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The transactions which have marked the progress of this singular and terrible revolution, it may be worth while to take a short view of the internal situation of France previous to this period, and the more obvious political causes, the operation of which seems to have contributed to the production of this great event.

The moral history of man is always more important than the mere recital of any physical occurrences that may take place in his lot. It is not the fall of a mighty monarch and the dispersion of his family; it is not the convening of diets inDiens, and the means of human blood which have been shed, that render the French revolution peculiarly interesting. Such events, however deplorable, are far from being without example in the history of mankind. In the populous regions of the east, where superstition and slavery have always prevailed, they are regarded as forming a part of the ordinary course of human affairs; because an intrepid and skilful usurper finds it easy to intimidate or ensnare millions of weak and credulous men. In Europe the case is very different; no adventurer can advance far without encountering thousands as artful and as daring as himself. Events are not the result either of blind hazard or of individual skill; conspiracies or plots produce little effect. Like other arts, the art of government has been brought to much perfection; and an established constitution can only be shaken by the strong convulsion produced by national passions and efforts. The wonderful spectacle which we are now to contemplate, is that of a mild and polished people becoming in an instant savage and fierce; a well-established government, celebrated for its dexterity and skill, overturned almost without a struggle; a whole nation apparently uniting to destroy every institution which antiquity had hallowed, or education taught them to respect; a superstitious people treating the religion of their fathers with contempt; a long-enslaved people, whose very chains had become dear to them, occupied in their public councils in the discussion of refined and even visionary schemes of freedom; in short, 25,000,000 of persons suddenly treasuring under foot every sentiment and every prejudice that they themselves had once regarded as sacred and venerable.

Like the other nations of Europe, France was anciently governed by a barbarous aristocracy, whose different members were feebly united by the authority of a succession of kings destitute of power or influence. The nobles, within their own territories, enjoyed privileges entirely royal: they made peace and war; they coined money; they were judges in the last resort; their vassals were their slaves, whom they bought and sold along with the lands; the inhabitants of cities, although freemen, were depressed and poor, depending for protection upon some tyrannical baron in their neighbourhood. At length, however, by the progress of the arts, the cities rose into considerable importance, and their inhabitants, along with such freemen of low rank as resided in the country, were considered as entitled to a representation in the states-general of the kingdom, under the appellation of tiers estate, or third estate; the clergy and the nobles forming the two first estates. But the sovereign having speedily become despotic, the meetings of the states-general were laid aside. This absolute authority, on the part of the crown, was not acquired, as it was in England by the house of Tudor, by abolishing the pernicious privileges of the nobles and elevating the commons; but by skilful encroachments, by daring exertions of prerogative, and the use of a powerful military force. In France, therefore, the monarch was absolute, yet the nobles retained all their feudal privileges, and the ecclesiastical hierarchy did the same. The following was, in a few words, the state of that country during these two last centuries.

The kingdom of France, previous to the revolution, was never reduced to one homogeneous mass. It consisted of a variety of separate provinces acquired by different means; some by marriage, some by legacy, and others by conquest. Each province retained its ancient laws and privileges, whether political or civil, as expressed in their capitularies or conditions by which they were originally acquired. In one part of his dominions the French monarch was a count, in another he was a duke, and in others he was a king; the only bond which united his vast empire being the strong military force by which it was overawed. Each province had its barriers; and the intercourse between one province and another was often more restrained by local usages than the intercourse of either with a foreign country. Some of the provinces, such as Bretagne and Dauphine, even retained the right of assembling periodically their provincial states; but these formed no barrier against the power of the court.

The clergy formed the first estate of the kingdom. The clergy in point of precedence. They amounted to 130,000, formed the higher orders of them enjoyed immense revenues; first estate was the seigneurs or great body of acting clergy seldom possessed more than about 28l. sterling a-year, and their vicaires about half that sum. A few of their dignified clergy were men of great piety, who resided constantly in their dioceses, and attended to the duties of their office; but by far the greater number of them passed their lives at Paris and Versailles, immersed in all the intrigues and dissipation of a gay and corrupted court and capital. They were almost exclusively selected from among the younger branches of the families of the most powerful nobility, and accounted it a kind of dishonour to the order of bishops for any persons of low rank to be admitted into it. The lower clergy, on the contrary, were persons of mean birth, and had little chance of preferment. At the same time, we find several respectable exceptions to this last rule. The clergy, as a body, independent of the tithes, possessed a revenue arising from their property in land, amounting to four or five millions sterling annually; at the same time they were exempt from taxation. The crown had of late years attempted to break through this privilege. To avoid the danger, the clergy presented to the court a free gift of a sum of money somewhat short of a million sterling every five years.

The nobility was nominally the second order of the nobility, but it was in reality the first. The nobles amounted to no less than 200,000 in number. The title and condit rank descended to all the children of the family, but the property to the eldest alone: hence vast multitudes of them were dependent on the bounty of the court. They regarded the useful and commercial arts as dishonourable, and even the liberal professions of the law and physic as in a great measure beneath their dignity, disdaining.
France

was unknown to the jealous inquisition of the police. Men were seized by lettres de cachet when they least expected it, and their families had no means of discovering their fate. The sentence of a court of law against a nobleman was usually reversed by the minister. No book was published without the license of a censor-general appointed by the court, and the minister was accountable to none but the king. No account was given of the expenditure of the public money. Enormous gratifications and pensions were given as the reward of the most infamous services. The supreme power of the state was usually lodged with a favourite mistress, and she was sometimes a woman taken from public prostitution. This was not indeed the case under Louis XVI. but it was nevertheless one of the misfortunes of his life that he was far from being absolute in his own family. Still, however, with all its faults, the French court was the most splendid and polished in Europe. It was more the resort of men of talents and literature of every kind, and there they met with more ample protection, than anywhere else. The court was often jealous of its productions, but they met with the most distinguished attention from men of fortune and rank; insomuch that for a century past the French have given the law to Europe in all questions of taste, of literature, and of every polite accomplishment. The gay elegance that prevailed at court diffused itself through the nation; and amidst much internal misery, gave it to a foreigner the appearance of happiness, or at least of levity and vanity.

Such as it was, this government had stood for ages, and might have continued, had not a concurrence of causes contributed to its overthrow. The inferior orders of clergy, excluded from all chance of preferment, regarded their superiors with jealousy and envy, and were ready to join the laity of their own rank in any popular commotion. The inferior provincial noblesse beheld with contempt and indignation the vices and the power of the courtiers, and the higher nobility wished to diminish the power of the crown. The practising lawyers, almost entirely excluded from the chance of becoming judges, wished eagerly for a change of affairs, not doubting that their talents and professional skill would render them necessary amidst any alterations that could occur. Accordingly, they were the first instruments in producing the revolution. The moneyed interest wished eagerly for the downfall of the ancient nobility. As for the great mass of the common people, they were too ignorant, too superstitiously attached to old establishments, and too much depressed, to have any conception of the nature of political liberty, or any hope of obtaining it. We have already stated the leading circumstances which led to the French revolution (see No. 184, &c.); but there were other circumstances which contributed in an equal degree both to its commencement and its progress.

For 40 years the principles of liberty had been disseminated with eagerness in France by some men of great talents, as Rousseau, Helvétius, and Raynal, to whom the celebrated Montesquieu had led the way. Besides these, there was in France a vast multitude of what

were called men of letters, or persons who gave this account of the manner in which they spent their time. All these were deeply engaged on the side of some kind of political reform. The men of letters in Paris alone are said to have amounted to 20,000. One of the last acts of the administration of the archbishop of Toulouse was, on the 9th July 1788, to publish a resolution of the king in council, inviting all his subjects to give him their advice with regard to the state of affairs. This was considered as a concession of an unlimited liberty of the press; and it is scarcely possible to form an idea of the infinite variety of political publications which from that period diffused among the people a dissatisfaction with the order of things in which they had hitherto lived.

The established religion of France had for some time past been gradually undermined. It had been solemnly assaulted by philosophers in various elaborate performances; and men of wit, among whom Voltaire took the lead, had attacked it with the dangerous weapon of ridicule. The Roman Catholic religion is much exposed in this respect, in consequence of the multitude of false miracles and legendary tales with which it abounds. Without discriminating betwixt the respectable principles on which it rests, and the superstitious follies by which they have been defaced, the French nation learned to laugh at the whole, and rejected instead of reforming the religion of their fathers. Thus the first order in the state had already begun to be regarded as useless, and the minds of men were prepared for important changes.

The immense population of the city of Paris, amounting upwards of 800,000 souls, rendered it an important engine in the hands of the conductors of the revolution. An overgrown capital has always proved dangerous to a government that is or attempts to be despotic, as appears from the history of ancient Babylon and Rome, as well as of modern Constantinople, of London under Charles I. and Paris under several of its kings.

We cannot here avoid mentioning a physical event, which assisted not a little in producing many of the convulsions attending the revolution, a general scarcity of grain, which occurred about that period. On Sunday the 13th of July 1788, about nine in the morning, without any eclipse, a dreadful darkness suddenly overspread several parts of France. It was the prelude of such a tempest as is unexampled in the temperate climates of Europe. Wind, rain, hail, and thunder, seemed to contend in impetuosity; but the hail was the great instrument of rain. Instead of the rich prospects of an early autumn, the face of nature in the space of an hour presented the dreary aspect of universal winter. The soil was converted into a morass, the standing corn beaten into the quagmire, the vines broken to pieces, the fruit trees demolished, and unmetalled hail lying in heaps like rocks of solid ice. Even the robust forest trees were unable to withstand the fury of the tempest. The hail was composed of enormous, solid, and angular pieces of ice, some of them weighing from eight to ten ounces. The country people, beaten down in the fields on their way to church, amidst this concussion of the elements, concluded that the last day was arrived; and scarcely attempting to extricate themselves,
Moreover, from the first period of their assembling, the commons made every effort to augment their own natural popularity. They admitted all persons promiscuously into the galleries, and even into the body of their hall. No restraint was attempted to be laid upon the most vehement marks of popular applause or censure; lists of the voters names were publicly taken and sent to Paris upon every remarkable occasion; and the members suddenly found themselves become, according to their political sentiments, the objects of general execration or applause. The new and bold notions of liberty that were daily advanced by the leaders of the tiers et at were received with acclamation by their hearers. The capital became interested in the issue of every debate; and the political fervor was eagerly imbibed by the nation with that vivacity which is so peculiar to the French. The commons accused the nobles of obstinately impeding the business of the state, by refusing to verify their powers in one common assembly. The accusation was swallowed by the multitude, who saw not, or were unwilling to see, that the attack was made by their own favourite order. In the mean time the nobles became rapidly more and more unpopular. Their persons were insulted, new publications daily came forth, and were greedily bought up, which reviled their whole order, and represented them as an useless or pernicious body of men, whose existence ought not to be tolerated in a free state. Whoever adhered to them was branded with the odious appellation of Aristocrat. The clergy, from the influence of the parish curés or parson, seemed ready to desert their cause. They were even opposed by a minority of their own body, which derived lustre from having at its head the duke of Orleans the first prince of the blood. Still, however, the majority of the nobles remained firm; well aware, that if they once consented to sit in the same assembly, and to vote promiscuously, with the ambitious and more numerous body of the commons, their whole order, and all its splendid privileges must speedily be overthrown.

The leaders of the commons saw the change that was taking place in the minds of men; and they at length regarded the period as arrived when they ought to emerge from their inactivity, and execute the daring and necessary project of seizing the legislative authority in their own country. They declared that the representatives of authority; the nobles and the clergy were only the deputies of particular incorporations whom they would allow to sit and vote along with themselves; but who had no title in a collective capacity to act as the legislators of France. For conducting business with more facility, they appointed 20 committees. In consequence of a proposal by the Abbé Sieyes, a final message was sent to the privileged orders, requiring their attendance as individuals, and intimating that the commons, as the deputies of 96 out of every hundred of their countrymen, were about to assume the exclusive power of legislation. None of the nobles obeyed this summons; but three curés, Messrs Cesve, Ballard, and Jallot, presented their commissions, and were received with loud acclamations. They were next day followed by five more, among whom were Messrs Gregoire, Dillon, and Bodineau. After some debate concerning the appellation which they ought to assume, the commons, with such
to join the commons. This request was immediately complied with, although many of the nobility disapproved of the measure.

The situation of France was now become truly alarming. When the king retired from the assembly after the royal session, he was followed by more than 6,000 citizens, from whom loud clamours and every mark of disapprobation broke forth. All Versailles was speedily in an uproar. M. Necker had repeatedly solicited his dismissal, and the report of this had increased the popular clamour. The court was in consternation. The king probably discovered, with no great satisfaction, that his minister was more popular than himself. At six o'clock in the evening the queen sent for M. Necker. When he returned from the palace, he assured the crowd that waited for him that he would not abandon them; upon which they retired satisfied. At the same time the news of the royal session had thrown the city of Paris into violent agitation. The peace of that capital was at this time deranged by a variety of causes. A dreadful famine raged through the land, which in a great city is usually most severely felt. This prepared the minds of men for receiving unfavourable impressions of their political state. Every effort was moreover made to disorganize the government, and produce a dislike to the ancient order of things. The press poured forth incomprehensible publications, filled with new and seducing, though generally impracticable, theories of liberty. These were distributed gratis among the bulk of the people of Paris, and dispersed in the same manner through the provinces. Philip duke of Orleans, presumptive heir to the crown, failing the children and brothers of the king, is with good reason believed to have supplied this expense out of his more than royal revenues. In the gardens of the Palais Royal at Paris, which belonged to him, an immense multitude was daily assembled, listening from morning to night to orators who descended upon the most violent subjects of popular politics. Many of these orators were suspected to be in his pay. It was even believed that his money found its way into the pockets of some of the most distinguished leaders in the national assembly.

But the government was, if possible, still more dangerously assaulted by the methods now generally used to seduce the military. Every officer of the French army belonged to the order of the nobles, and from that quarter, therefore, it might have been imagined that there was little danger. But this very circumstance became the means of disorganizing that great engine of despotism. As the soldiers could not avoid imbibing some of the new opinions, their own officers became the first objects of their jealousy; especially in consequence of that impolitic edict of Louis XVI., which required every officer to produce proofs of four degrees of nobility; and thus insulted, by avowedly excluding the private men from promotion. Perhaps with a view to what might happen, the instructions to the deputies of the tiers état had recommended an increase of the pay of the soldiers. And now at Paris every art was used to gain them to the popular cause. They were conducted to the Palais Royal, and were there caressed and flattered by the populace, while they listened to the popular harangues. These arts were successful. On the 23d of June they first refused to fire on the mob in a riot. Some of them were on the 30th reported to be in confinement for this offence; a crowd instantly collected, and rescued them, the dragons that were brought to suppress the tumult grounding their arms. A deputation of the citizens solicited of the assembly the pardon of the prisoners. The assembly applied to the king, who pardoned them accordingly.

All these events, together with the tumultuous state of the capital, which was daily increasing, made it necessary for the king to call out the military force to restore, if possible, the public peace. That his intentions were pure, the then state of affairs will permit no man but a democrat to doubt; but the aristocracy, with the Count d'Artois at their head, were bringing forward other measures, which ultimately contributed to the ruin of themselves, the king, and the kingdom. Crowds of soldiers were collected from all parts of the kingdom around Paris and Versailles. It was observed that these consisted chiefly of foreign mercenaries. Camps were traced out. Marshal Broglie, a tried veteran, was sent for and placed at the head of the army. The king was supposed to have entirely yielded to new counsels, and every thing bore the appearance of a desperate effort to restore the energy of the ancient government. This is the most important period of the French revolution; yet the specific designs of the leading actors have never been clearly understood. It was rumoured at the time, that Paris was to be subdued by a siege and bombardment; that the assembly was to be dissolved, and its leaders put to death. These are incredible exaggerations; but the crisis of French liberty was universally regarded as at hand, and also the existence of the national assembly as an independent body; or at least upon any other footing than that proposed by the king on the 23d of June.

An able and eloquent address to the king against the assembly of foreign troops in their neighbourhood by address was brought forward by Mirabeau, and voted by the king to remove the assembly. The king properly replied, that the state of the capital was the cause of the presence of the troops, and which is offered to transfer the state-general to Noyon or Soissons. "We will neither remove (exclaimed Mirabeau) to Noyon or to Soissons; we will not place ourselves between two hostile armies, that which is besieging Paris, and that which may fall upon us through Flanders or Alsace; we have not asked permission to run away from the troops; we have desired that the troops should be removed from the capital."

Thirty-five thousand men were now stationed in the neighbourhood of Paris and Versailles. The posts were occupied which commanded the city, and camps were marked out for a greater force. The Count d'Artois and his party regarded their plan as ripe for execution; and M. Necker received a letter from the king, requiring him to quit the kingdom in 24 hours. That popular minister took the route of Brussels on the following day, when his departure was made public. In his dismissal the popular, or, as it was now called, the democratic party, thought they saw the resolution adopted to accomplish their ruin. The assembly again addressed the throne; they requested anew the removal of the troops, offering to be responsible for the public peace, and to proceed in a body to Paris to encourage...
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But the person of the monarch was still beloved. Early next morning the king went to the assembly, but with none of the usual solemnities. He "regretted the commotions of the capital, dissuaded any knowledge of an intention against the persons of the deputies, and intimated that he had commanded the removal of the troops." A deep and expressive silence prevailed for a few moments; this was succeeded by vehement and universal shouts of applause. The king rose to depart, and instantly the whole assembly crowded around, attended to him at his palace. The queen appeared at a balcony with the dauphin in her arms; the music played the pathetic air of "Où peut on être misère qu'on soit refn de sa famille." The enthusiasm of loyalty communicated itself to the surrounding multitudes, and nothing was heard but acclamations of joy.

On the following day, the king declared his resolution to visit the city of Paris in person. Accordingly that prince, who never wanted personal courage, however deficient he might be in political steadfastness, set out, attended by some members of the assembly and by the militia of Versailles. He was met by the celebrated M. de la Fayette, at the head of a body of the national guard, of which he had now been chosen commander in chief. M. Bailly, in whose person the ancient office of mayor of Paris had been revived, received the king at the gates, and delivered to him the keys. All this while no shout was heard from the crowd of innumerable spectators but that of "Vive la nation." The king advanced to the Hotel de Ville, where the new cockade was presented to him, which he put on, and presented himself with it at the window. At the sight of this badge of patriotism an universal shout of "Vive le Roi" burst forth from every quarter; and he returned to Versailles amidst general triumph and applause.

Much confusion still prevailed in the capital; but in which there was more appearance of regularity than could have been expected at the conclusion of such important events. This arose from a casual concurrence of circumstances. To conduct with ease the elections to the states general, Paris had been divided into 60 districts, each of which had a separate place of meeting. The people did not elect the members to the states-general; but they chose delegates, who under the name of electors, voted for the members. At the commencement of the disturbances, the electors, at the request of their fellow-citizens, assumed a temporary authority; of which however they were soon weary, and as soon as possible procured the public election of 120 persons as municipal officers for the government of the city. The citizens having got the habit of assembling in their districts, grew fond of it: they assembled frequently, made rules for their own government, and sent commissioners to communicate with other districts. The tumultuous nature of these meetings, and the vehemence of debate which prevailed in them, will best be conceived from the ludicrous contrivance of one of their presidents, who stationed a drummer at the back of his chair, and when the confusion and noise became altogether unanswerable, gave the signal for beating the drum, which speedily overpowered every other noise. These meetings, however, gradually ripened into clubs, in which much dexterity and intrigue were exerted.

The whole of the late ministry escaped excepting M.

Foucet.
Foulon. His character, it may well be imagined, was extremely unpopular; for he is said to have asserted, that he would "make the people of Paris eat hay." He had retired to the country, but was seized by his own vassals, and brought to Paris with a bundle of hay tied on his back. In spite of every effort made by M. M. Bailly and Fayette to procure him a fair trial at least, he was carried to the Place de Grève, and hanged on a lamp-iron by the enraged multitude. His son-in-law, M. Berthier, attempting to defend himself against a similar fate, fell, covered with wounds. Their heads were carried round on poles; and thus the populace became accustomed to the sight of blood and murder: they were even taught by popular songs to glory in such actions, and particularly by the well-known song 

_Cu-ira._

In consequence of an invitation from the king, M. Neckar returned to France. He was received by the assembly with great applause, and in Paris with infinite solemnity and triumph. He here, however, committed a political error that made some noise. In deploiring the late excesses and murders, and taking notice of the arrest of M. Bezenval, an officer of the Swiss guards, he requested of the electors at the Hotel de Ville, in a solemn harangue, that the past should be forgotten; that proscriptions should cease, and a general amnesty be proclaimed. In a moment of enthusiasm this was agreed to, and the electors decreed what unquestionably exceeded their powers. The districts of Paris were instantly in commotion; the electors alarmed, declared that they only meant that "henceforth the people would punish no man but according to law!" and at the same time, to prove that they themselves were free from ambition, they formally renounced all their own powers. The assembly took up the question. Lally Tolendal, Mounier, Clermont Tonnerre, Carat junior, and others, declared that no person ought to be arrested without a formal accusation; while Mirabeau, Robespierre, Barnave, and Gleizene, alleged, on the contrary, that the people were entitled to lay hold of any man who had publicly appeared at the head of their enemies. The debate ended, by admitting the declarations of the electors, and by a declaration that it was the duty of the assembly to see justice executed in all cases.

The commotions and enthusiasm of the capital were speedily communicated to the provinces. In every quarter the people seized upon all the arms that could be found, and the military uniformly refused to act against them. Many acts of outrage were committed in Brittany, at Strasbourg, in the Lyonnais, and elsewhere, in which the nobility were the sufferers. The miscarriages that occurred were usually magnified at a distance; but that very circumstance was an additional evil. For example: It was stated in the National Assembly that M. de Mesmay, lord of Quincey, invited a number of patriots, among whom were the officers of a neighbouring garrison, to a splendid entertainment at his house, to celebrate the happy union of the three orders: That in the midst of the feast the master of the house contrived to withdraw unnoticed, and to set fire to the building previously laid, which communicated with a quantity of gunpowder in the cellars, in consequence of which, the whole company, by a sudden explosion, were blown into the air. It was found on inquiry, that there was not one word of truth in the whole story. But before this inquiry could be made, all France had resounded with accounts of the pretended bloody tragedy; and the whole nobility of the kingdom suffered in a less or greater degree, from the prejudices excited by this unhappy report, the origin of which has never been well explained. It would be vain to state all the idle rumors to which at this time the blased credulity of the multitude gave currency. At one time, the aristocrats were cutting down the green corn; at another time they were burying flour in common sewers, or casting loaves into the Seine. One report was no sooner proved to be false than another arose, and the whole nation was agitated by suspicion and alarm. The National Assembly were engaged in framing their celebrated declaration of the rights of man, which was to form the basis of the new constitution, when the alarming accounts received from all quarters, of the state of anarchy into which the kingdom was falling, obliged them suddenly to turn their attention to objects of practical necessity. The privileged orders found themselves become the objects of universal jealousy and hatred; and that something must instantly be done to save their families and property, which were menaced on every side with persecution and pillage. Regarding the popular torrent as now become irresistible, to save something they resolved to sacrifice a part.

On the afternoon sitting of the 4th of August, the Viscount de Noailles, seconded by the Dukes d'Aguilhe, d'Aguilhe, Noailles and Duke d'Aguilhe, proposed that those noblemen stated, that the true cause of the commotions which convulsed the kingdom existed in the misery of the people, who groaned under the double oppression of public contributions and of feudal services. For three months (said M. de Noailles) the people have beheld us engaged in verbal disputes, while their own attention and their wishes are directed only to things. What is the consequence? They are armed to reclaim their rights, and they see no prospect of obtaining them but by force." He therefore proposed to do justice, as the shortest way of restoring tranquillity, and for that purpose to decree, that henceforth every tax should be imposed in proportion to the wealth of the contributors, and that no order of the state should be exempted from the payment of public burdens; but that such claims as consisted of personal services on horses, the part of the vassal should be abolished without compensation, as contrary to the impracticable rights of man. The extensive possessions of the noblemen who made these proposals added much lustre to the disinterested sacrifice which they afforded. Their speeches were received with the most enthusiastic applause by the Assembly and the galleries, and their proposals were decreed by acclamation without a vote. No nation is so much led by the influence of sudden emotions as the French. The patriotic contagion now spread fast through every breast, and a contest of generosity ensued. The hereditary jurisdictions possessed by the nobility over the provinces within their own territories were next sacrificed. All places and pensions granted by the court were suppressed, unless granted as the reward of merit or of act.
was speedily to burst forth in a bloody tempest.—In the present case, the people of Paris became most eagerly interested. Rumours of plots were spread through the country, and a new storm was obviously gathering, when the question was thus got quit of. M. Mounier remarked, that the executive power could possess no negative against the decrees of the present assembly, which had been nominated by the nation with supreme powers for the express purpose of framing a constitution, which was to remain binding over all orders of men in the state; and with regard to future legislation, the king declared by a message, that he wished to possess no more than a suspensive veto. It is remarkable that the popular Mirabeau concluded a speech in favour of the absolute veto of the crown with these words, "That it would be better to live in Constantinople, than in France, if laws could be made without the royal sanction." This political adventurer is, however, accused of having taken care to circulate in Paris a report that he had opposed the veto with all his influence; and to give credit to the story, he is said to have quitted the assembly just before the division, that his vote might not appear on record against it.

The month of August was spent in the debates about the veto; and in the beginning of September a new constitutional question was presented to the assembly by one of its numerous committees. This was, Whether the legislative body, ought to consist of one or two chambers? Mounier, Lally Tollendal, Clermont Tonnere, and others, who were zealous lovers of freedom upon what were then accounted moderate principles, supported eagerly the idea of establishing two independent chambers in imitation of the British constitution; but they were deserted both by the democratic and aristocratic parties. The first of these regarded an upper house or senate as a refuge for the old aristocracy, or as the cradle of a new one; while the higher nobles and clergy feared lest such an arrangement might prevent the future re-establishment of the ancient division into three orders. Of 10000 members who voted, only 89 supported the proposal for dividing the legislature into two chambers.

Soon after this the king gave his sanction to the important decrees of the 4th of August, but not without some hesitation, and expressing doubts of the wisdom of some of them in a letter to the assembly. At the same time the inviolability of the person of the monarch was decreed, the indivisibility of the throne, and its hereditary descent from male to male in the reigning family. But we shall not here attempt to enter into a detail of the various articles of the new constitution as connected with the circumstances under which they became the subject of debate. We shall only state those more remarkable circumstances which tend to ascertain the peculiar changes which the sentiments of the nation underwent in the progress of a revolution the most remarkable that occurs in human history.

In consequence of the debates upon the questions of the veto and the two chambers, the minds of parties had become much irritated. Paris wore the same threatening aspect that it had done in the months of June and of July preceding; and every thing seemed tending towards an important crisis. The aristocratic party accused their antagonists of a design to excite new insurrections; and the charge was retorted, by circumscribing a report that a plot for conveying the king to Meiz was already ripe for execution.

From the period of the defection of the French guards, who were now in the pay of the capital, the protection of the royal family had been entrusted to the militia or national guard of Versailles, together with the regiment of the gardes du corps, which was composed entirely of gentlemen. Upon the circulation of the report of the intended flight of the king, the French guards began to wish to be restored to their ancient employment of attending his person, for the purpose of preventing any attempt of this nature. This idea was eagerly cherished by the capital; and, in spite of every effort used by M. de la Fayette, the obvious appearance of approaching disturbances could not be prevented. The popular party saw the advantages which they would derive from placing the assembly and the king in the midst of that turbulent metropolis which had given birth to the revolution, and upon the attachment of which they could most securely depend. Every encouragement was therefore given by the most active leaders of what was now called the Republican party to the project of establishing the court at Paris. The ministry were under no small degree of alarm; and the count d'Estaing, who commanded the national guard of Versailles, requested the aid of an additional regiment. The regiment of Flanders was accordingly sent for: its arrival caused no small degree of anxiety; and every effort was instantly made to gain over both officers and soldiers to the popular cause.

On the first of October the gardes du corps, probably for the purpose of ingratiating themselves with the newly arrived regiment, and perhaps to attach them more steadily to the royal cause, invited the officers of the regiment of Flanders to a public entertainment. Several officers of the national guard, and others of the military were invited. The entertainment was given in the opera house adjoining to the palace; several loyal toasts were drunk: but it is asserted, that when the favourite popular toast The Nation was given, it was rejected by the gardes du corps. In ordinary cases, such a trifling circumstance as this, or even any other of the transactions of a night of festivity, would justly be regarded as unworthy of notice in recording the more remarkable events in the history of a great nation; but such was now the singular state of affairs, that the most trivial occurrences were instrumental, by their combination, in the production of important consequences. The queen, having seen from a window of the palace the gaiety which prevailed among the military, prevailed with the king, who was just returned from hunting, to visit them along with herself and the dauphin. Their sudden appearance in the saloon kindled in an instant the ancient enthusiasm of French loyalty. The grenadiers of the regiment of Flanders along with the Swiss chasseurs, had been admitted to the dessert; and they, as well as their officers, drank the health of the King, Queen, and Dauphin, with their swords drawn. The royal family having bowed with politeness to the company, retired. Of all nations, the French are most liable to the influence of sudden impressions: the music played the favourite air, O, Ricard! O mon Ross! L'univers s'abandonne, "O Richard! O my king! the world abandons thee." In the eagerness of loyalty
to lay their complaints before the king. His majesty received the whole with great politeness, and readily agreed to go into any measures for the supply of the capital that could be suggested. The report of this behaviour had such an effect upon the multitude collected around the palace, that they began to disperse; but they were speedily succeeded by another crowd not less numerous. A sudden resolution of flight seems now to have been proposed by the court; for the king's carriages were brought to the gate of the palace which communicates with the orangery: but the national guard of Versailles refused to allow them to pass, and the king himself refused to remove, or to allow any blood to be shed in his cause.

La Fayette with his army at length arrived about 10 o'clock at night, and found the assembly in a very unpleasant situation. Their hall and galleries were crowded by the Parisian fish-women and others of the Versailles mob, who, at every instant, interrupted the debates at night.

La Fayette waited upon the king, and informed him of the proceedings of the day, planted guards in every quarter; and after a scantly breakfast was prepared for the multitude, he prevailed with the assembly to close their sitting for the night. In this last part of his conduct M. la Fayette has been much censured, and probably not without reason; for it could scarcely be expected that such a night would be spent in peace by the immense assemblage of turbulent characters that were now brought together. All was quiet, however, till about six in the morning of the 6th, when a great number of women and desperate persons rushed forward to the palace, and attempted to force their way into it. Two of the gardes du corps were killed; the crowd ascended the stair leading to the queen's apartment, but were bravely resisted by M. Miemandre a sentinel, who gave the alarm, and defended his post till he fell covered with wounds, of which, however, he afterwards fortunately recovered. The ruffians, reeking with his blood, rushed into the chamber of the queen, and perring with bayonets and poniards the bed whence this persecuted woman had but just time to fly almost naked, and, through ways unknown to the murderers, had escaped to seek refuge at the feet of the king, who was already alarmed, and had gone to seek her.

The tumult became more violent every moment, and the royal sudden death seemed to threaten the royal family; but La Fayette was by this time at the head of his troops, whom he besought earnestly to save the gardes du corps from massacre. In this he was successful; some that had been taken prisoners were surrounded by the grenadiers of the French guards, who protected them, and the retreat of the whole corps was easily secured. The crowd was speedily driven from the different quarters of the palace, which they were already beginning to pillage; and the royal family ventured to show themselves at a balcony. A few voices now exclaimed, "Le Roi à Paris," "the King to Paris." The shout became general; and the king, after consulting with La Fayette, declared that he had no objection to take up his residence at Paris, provided he was accompanied by the queen and his children. When the proposal was reported to the assembly, the popular leaders expressed much satisfaction. They ordered a deputation of 100 members to attend the king thither; they voted the national assembly inseparable from the king. His majesty set
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The National Assembly being now, however, in tolerable security, pursued in the arduous attempt of forming a free constitution for the great empire of France. The king dividing the kingdom into 83 departments, of about 3,241,3 square leagues, and each department into several districts, and each district into cantons of four square leagues in extent. Thus the whole of the ancient divisions of the kingdom into governments, generalities, and bailiwicks, was in an instant obliterated. An attempt was also made to simplify in an equal degree the relative situation of individuals in civil life, by a decree which put an end to all distinction of orders and immunities, as far as any privileges whatsoever were concerned. At the same time, a bold and most important measure was adopted, which has since proved the organ of those terrible efforts which France has been enabled to make against the rest of Europe. This was the confiscation of the whole of the lands belonging to the church, for the purpose of supplying the exigencies of the state. In this transaction, all regard to justice was thrown aside. The lands of the church were as certainly the property of the then possessors of them as any entailed estate among us is the property of him who occupies it. The state may have had a right to appropriate to itself the church lands upon the death of the incumbents; but it might with equal justice, and perhaps greater propriety, have seized the enormous revenues of the duke of Orleans, as it has confiscated a single acre belonging to the most useless abbot without his own consent. This nefarious measure was proposed by the bishop of Autun, M. Talleyrand-Périgord, a man of no religion, who had been promoted to the bench in a most irregular manner to serve this very purpose. The mode in which this property was to be expended was by issuing assignats (assignements) upon it; which assignments were to be received by the state for the payment of taxes, or for the purchase of church lands when set up to sale. A provision was at the same time made for the national clergy, who were for the future to be paid by the state. On the day following that on which this important measure was adopted, a decree was passed, suspending the parliaments of the kingdom from the exercise of their functions.

Decrees, in which the interests of so vast a multitude of individuals were involved, could not be carried into effect without much murmuring and opposition. The parliaments, in particular, began to exert themselves with vigour, and, by protests and other publications, attempted to invalidate the decrees of the assembly as illegal; but these privileged bodies, who had often been accustomed to contend with some success against the despotic administration of their country, and on that account had been for ages the objects of public applause, now found themselves utterly forsaken, and unable to resist the mandate of a popular assembly. After a few fruitless struggles, they were all of them under the necessity of submitting to their fate.

Nothing remarkable now occurred for some time. The assembly proceeded to organize the kingdom by the establishment of municipalities, and by reforming the jurisprudence of the country. It is to be observed, however, that when the parliament of Paris was abolished,
During the whole of this winter the king had been very strictly watched by numerous guards placed round his palace, insomuch that the other nations of Europe considered him as in a state of captivity. To do away this impression, if possible, and to make their king appear a voluntary agent in the measures that had lately been adopted, was now regarded as a matter of some importance. Every effort was therefore made to prevail with him to come to the assembly suddenly, as it were, of his own voluntary motion, there to declare his adherence to the measures that had lately been adopted. For some time he resisted this proposal; but at length, on the 4th of February, he did suddenly appear in the national assembly, where he complained of the attempts that had been made to shake the new constitution. He declared his wish "that it should be universally known that the monarch and the representatives of the nation were united, and their wishes were the same; that he would defend the constitutional liberty of the state; that, in conjunction with the queen, he would early form the sentiments of his son for that new order of things which the circumstances of the empire had introduced." This declaration disquieted the aristocratic party in no small degree, and increased that unhappy tendency of looking for aid from foreign countries which they had always been too apt to indulge.

On the 15th of February, monastic establishments were suppressed, and their lands confiscated; but the present friars and nun were allowed pensions for their subsistence, and to continue the observance of their monastic vows, if they thought fit. We may observe here, that, in consequence of the evacuation of the monasteries, it is probable that about this time the Breton committee began to assume the appellation of the Jacobin Club, from the hall belonging to the Jacobin friars at Paris, in which their meetings were now held.

An event occurred at this time which tended in no small degree to increase the odium under which the old government already laboured. This was the publication of the Red Book, or list of pensions and donations granted by the crown. In consequence of the most pressing instances, it had been communicated by M. Necker to a committee of the assembly, after many entreaties, and the most solemn promises of secrecy. It afforded, however, too striking an advantage to the popular party not to be made use of, and in a few days M. Necker, to his no small surprise, saw this register publicly sold by every bookseller in Paris. He ought not, indeed, to have been surprised; and the giving up of this list is one of the many proofs which the transactions of that period afford of his great unfitness for the offices which he held. With much indignation, however, he demanded why the committee had published it without the permission of the assembly or the king? But he was told by the committee, that "as to the assembly, they were sure of its approbation; and as to the king, they were not his representatives." To give an idea of the effect of this publication, it is only necessary to remark, that, under the short administration of M. Calonne, the two brothers of the king had received from the public treasury, independent of their legitimate income, nearly two millions sterling, and that 600,000l. had been granted to an individual, because he was the husband of Madame de Polignac. M. Necker's opposition to this publication tended in no small degree to injure his popularity, and the rest of the ministry began to lose the confidence of the public. Indeed, at this time, fertile causes of alarm prevailed on all sides. The clergy were attempting to revive in the provinces the ancient animosities between the Roman Catholics and the Protestants, ascribing the late decrees of the assembly to the latter. The German princes who possessed property in the north of France were complaining loudly of the violation of their rights by the abolition of the feudal system, although the national assembly had voted to them a compensation. The most melancholy intelligence was received from their colonies in the West Indies. In regulating these, the assembly had not recognized the right of the free negroes to enjoy the same privileges with other citizens; at the same time, they did not go the length of denying these privileges. This uncertain conduct produced infinite calamities. The whites contended with those commonly called people of colour. These again sometimes stood in opposition to the free negroes, or to the slaves; and hence it sometimes happened that no less than three hostile assemblies were held at the same time in the same colony, which made war upon each other with the most inveterate fury. Each party found protectors in the national assembly of the parent state. Those who favoured or opposed the existence of distinctions at home, in general followed out the same principle with regard to the colonies.

On the 14th of May, M. de Montmorency communicated to the national assembly the preparations for the royal war in which England and Spain were engaged. This power, he brought forward the constitutional question, "Who declares war?" Peace and war. The Count Clermont Tonnerre, Mesers de Serent, Vien, and Dupont, supported the royal prerogative; while on the other side, the exclusive right of the legislative body to exercise this important prerogative was supported by Messrs d'Aignillon, Garat, jun. Freteau, Jelis, Charles Lambert, Sillery, Pétion, Robespierre, &c. M. Pétion proposed a decree "that the French nation renounced for ever all idea of conquest, and confined itself entirely to defensive war;" which was passed with universal acclamation. The Comte de Mirabeau at length successfully proposed that peace and war should be declared by the king and the legislative body in conjunction; and the decree that was passed on the subject is a strange sarrage of contradictions and absurdities. It enjoined the king to "guard the state from external attacks." But how could this be done without repelling any attack that might be made upon it? This, however, he could not do, without previously informing the national assembly; and if that body-chanced
not to be sitting at the time, he was bound to let the enemy advance without opposition, till he had convened his orators, dispersed over 20,000 square leagues, and listened to their metaphysical quibbles in Paris.

On the 16th June, a very singular farce was acted in the assembly. A Prussian refugee, who called himself Anarchas CIsouts, and who was struggling hard to bring himself into public notice, on an evening sitting (which, it is to be observed, was generally ill attended by the persons of the highest rank), introduced to the assembly a number of persons dressed in the different habits of all the different countries that could be thought of. In a formal harangue, he told the assembly that he was come, as the orator of the human race, at the head of the representatives of all nations, to congratulate them upon the formation of their new constitution. He was answered by the president with abundance of solemnity, and retired with his motley group. This fantastical piece of folly, which in any other country than France would scarcely, perhaps, have excited a smile, was treated by the assembly in a serious light.

Alexander Lambeth proposed, that the figures of different nations exhibited in chains at the feet of Louis XIV. should be destroyed as an insult upon mankind.

M. Lambet, a lawyer, at this moment proposed the abolition of all hereditary titles. He was supported by La Fayette, St Fargeau, and the Viscount de Noailles.

The decree was passed, along with another suppressing all armorial bearings. It is our intention at present rather to state facts than to hazard any political opinion concerning the wisdom or folly of the transactions which we record. It may here, however, be remarked, that no part of the proceedings of the French national assembly was received by persons of rank upon the continent of Europe with so much indignation as this.

The feudal system had been overturned, and the property of the church wrested from it, with little comparative notice; but when those nominal distinctions were attacked which antiquity had sanctioned, and personal vanity rendered dear, the surrounding nations were instantly alarmed, and beheld with terror the levelling precedent. We may likewise add, that no part of their proceedings was more injudicious to the power and practical freedom. To preserve a perfect equality of ranks is impossible. In a commercial nation, industry will procure wealth, and wealth in every where procure dependents. Now nothing more contributes to keep within some tolerable bounds the insolence of newly acquired wealth, than the rank attached to birth and nobility, which time and prejudice have conspired to make respectable. It is not a little remarkable, that all the king's ministers, Necker alone, a plebeian, a republican, born and bred in a democracy, advised his majesty to refuse his assent to this foolish decree, as a violent but useless encroachment upon the prejudices of a powerful order of the state.

In the mean time, the capital was entirely engrossed by hurry and bustle. M. Bailly had proposed a plan for commemorating the anniversary of the taking of the Bastille. It was adopted, because it flattered the vanity of the people, by presenting them with a splendid spectacle in commemoration of their own exertions.

The army had been much disorganized; and it was resolved to attempt to unite all its branches, as well as the whole departments of the state, in one common attachment to the new order of things, by collecting into one place deputations, for the purpose of swearing fidelity to the new constitution. In the middle of the Champ de Mars an altar was erected, at which the civic oath, as it was called, was to be taken. Around the altar an amphitheatre was thrown up capable of containing 400,000 spectators: 2000 workmen were employed in this operation; and the people of Paris fearing lest the plan might not be completed, assisted in the labour. All ranks of persons, the nobles, clergy, and even ladies, with the eagerness for novelty so peculiar to that people, united their efforts. Crowds of foreigners as well as natives hurried to the capital to be present at this solemnity, which was called the Confederation. The long expected 14th of July at length arrived. At six o'clock in the morning the procession was arranged on the Boulevards, and consisted of the electors of the city of Paris, the representatives of the commons, the administrators of the municipality, a battalion of children, with a standard, inscribed "The hopes of the nation;" deputies from the troops of France wherever quartered, and of every order, along with deputies from all the departments; and these were added immense detachments of the military, and of the national guards, along with an almost infinite multitude of drums, trumpets, and musical instruments. The procession was extremely splendid, as every district had its peculiar decorations. The national assembly passed through a grand triumphal arch, and the king and queen, attended by the foreign ministers, were placed in a superb box. After a solemn invocation to God, the king approached the altar, and, amidst the deepest silence, took the following oath: "I the king of the French do swear to the nation, that I will employ the whole power delegated to me by the constitutional law of the state, to maintain the constitution, and enforce the execution of the law." The president of the national assembly then went up to the altar, and took the civic oath, "I swear to be faithful to the nation, the law, and the king; and to maintain with all my powers the constitution decreed by the national assembly, and accepted by the king." Every member of the assembly standing up, said, "That I swear." La Fayette then advancing, took the oath for himself; the other deputies of the national guards pronouncing after him, "That I swear;' and these words were solemnly pronounced by every individual of this immense assembly. Te Deum was then sung. The performance was sublime beyond the powers of description. Never perhaps before was there such an orchestra, or such an audience: their numbers baffled the eye to reckon, and their shouts in full chorus rent the skies. It is impossible to enumerate all the means which were employed to add splendor to this day. It ended with a general illumination, and no accident disturbed the public tranquillity.

The assembly now proceeded in the formation of the new constitution with considerable tranquillity; which, however, was disturbed by an unhappy event at Nancy. Most of the officers of the army were unfriendly to the late revolution, and every means had been employed by them to disgust the soldiers with it. At Nancy, in particular, necessaries had been denied them, and their pay was kept back, under pretence that this was the will of the national assembly. Driven to despair, the regiments in garrison threw off their allegiance, and demanded
manded loudly the regimental accounts. They seized
at the same time the military chest, and sent a deputa-
tion to state their case at Paris to the national assembly.
But the officers were before-hand, and prepossessed with
the minister of war against them; upon whose representa-
tion a decree was passed, authorising the commander in
chief of the province, M. Bouillé, to reduce the insur-
gents by force. This was no sooner known, than the
national guard of Nancy assembled, and sent a deputa-
tion to give a fair statement of facts. But Bouillé,
without waiting the result of an explanation, hastened
to Nancy at the head of all the troops he could sudden-
ly collect; and having fallen upon the regiments of
Chasteauiux and Mastre de Camp, after putting an
immense multitude to the sword, he took 400 pri-
soners.

The king's regiment was prevented from acting
against Bouillé by the intrepidity of a young officer of
the name of Dessiles, who, however, died of the wounds
which he received on the occasion. The news of these
events filled Paris with indignation. The assembly af-
terwards reversed its own decrees against the insurgents
at Nancy. Public honours were decreed to the
memory of Dessiles; but Bouillé could not be punished,
because he had only acted in obedience to authority.

M. Neckar's popularity had been gradually declin-
ing, as he was unwilling to go all the lengths that the
ruling party wished. He gave in his resignation on
the 4th of September, and speedily thereafter left the
kingdom. He was regarded by no party. He was re-
garded, on the one side, as having conducted the king-
dom to its ruin, by the concessions which he originally
advised the king to make in favour of the tiers état; while
he was despised by the opposite party as a lukewarm
politician, of narrow views, and a feeble mind.
He departed, however, with the unblemished reputa-
tion of strict integrity. M. Neckar does not seem to
have penetrated deeply into the characters of men, or
to have had any conception of the effects of that ter-
rible and restless energy which is called forth in a na-
tion which attempts to make important changes in its
ancient manners and government. Having no concep-
tion of the important era which was about to open up
on that country of which he was the minister, he was
far from being qualified to direct or control it amidst
the convulsions which it was destined to encounter.
 Unable to brook the loss of his popularity, he peevishly
retired to Switzerland, where he published a work,
which shews to the conviction of every unprejudiced
reader the integrity of the French king, and the wick-
ed projects of the leading democrats, whom he himself
had armed with power.

The remaining part of this year was occupied in at-
ttempts to introduce some degree of subordination into
the navy of France, which had been much disorganised,
and in farther regulating the affairs of the clergy. It
was now declared, that such clergyman as should not
take the following oath, which had been prescribed
some months before, should be considered as ejected
from their benefices: "To watch carefully over the
faithful in the parish or diocese which was entrusted to
his care; to be faithful to the nation, the law, and the
king; and to maintain in the utmost of his power the
new constitution of France, and particularly the decrees
relative to the civil constitution of the clergy." This
decree rendered the situation of conscienctious men ex-
tremely perplexing; especially as the pope testified in
marked terms his disapprobation of the oath. The
people were reduced to the dilemma of choosing be-
tween their new political and their old religious preju-
dices, and the result was extremely unfavourable to the
interest of religion.

The assembly commenced the new year with a decree,
announcing the termination of its session, which was to take place as soon as it should have finished the discus-
sion of a list of constitutional articles. In the mean-
time, on the side of Germany, Spain, Italy, and Savoy,
hostile appearances began to be exhibited, and bodies
of troops advanced around the French frontier. The
emperor Leopold was, however, too cautious to an-
ounce his intentions; and the king soon communicat-
ed a letter to him, containing protestations of amici-
cable dispositions, but adding, that "the innovations
occasioned by the decrees of the 4th of August ought
to be done away." The king treated this merely as
an official measure on the part of the emperor, that he
might not appear to renounce the claims of certain Ger-
man princes connected with Lorraine and Alsace. But
the assembly expressed some alarm, and voted an aug-
mentation of the national force. About this period
several new efforts were made by the disaffected clergy
in various parts of the kingdom to excite disturbances,
which it is unnecessary to mention in detail. On the 20th
depart...
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with a death's head, surrounded by a laurel wreath, on one cuff, and a sword on the other; with the motto, "Conquer or die." The king was also surrounded by crowds of non-juring priests and other disaffected persons. Thus, that popular jealousy which in every period of the revolution has strikingly marked the French character, was kept on the alarm. On the 18th of April, therefore, when the royal family was preparing to go to St Cloud to pass some days, a report was instantly spread that the king was about to fly from the country. The carriages were immediately surrounded by people. La Fayette drew out the national guard, but they refused to act. "We know (exclaimed they) that we are violating the laws, but the safety of our country is the first law." The king instantly went to the assembly, and with much spirit complained of the insult. He was answered respectfully by the president, and continued his journey. As the royal family had enjoyed a considerable degree of freedom for some time past, which was demonstrated by the unsuccessful opposition made to this journey—the present opportunity was embraced for intimidating foreign courts by accepting the constitution; and all obnoxious persons were dismissed from about the person. The breach of discipline on the part of the national guard on this occasion was so much resented by La Fayette, that he resigned his command. Paris was thrown into consternation; and it was not till after the most universal solicitation that he was prevailed upon to resume his office.

About this time M. de Bouillé, to whom the protection of the frontiers was entrusted, was employing, as it is now said, every means in his power to render the country defenceless. The garrisons were left unprovided; disunion was spread among the national troops; they were removed from the frontiers, and their place was occupied by foreigners, wherever it could be done. The emigrants abroad, and their friends at home, were lying in wait for an opportunity of revolt;—when suddenly, on the 21st of June, it was announced from the Thüleries, that the king, the queen, the dauphin, with monsieur and madame, had quitted the palace and the capital, without leaving any information of their intention or their route. The emotion excited by this news among the multitude was a mixture of consternation and rage. The national assembly, however, acted with much coolness. They instantly took upon themselves the government, and decreed their sittings permanent. They sent messengers, at the same time, in all directions, to attempt to lay hold of the fugitives. These had taken different routes. Monsieur and madame arrived safely at Brussels on the 23rd. The king, queen, and their children, when they came to a considerable distance from the capital, were furnished by Bouillé with a guard of dragoons, under pretence of protecting treasure for the pay of the troops. At the distance of 35 miles, and when only a few leagues from the frontiers, they were arrested at St Menelshoul by the postmaster, M. Drouet, formerly a dragoon in the regiment of Condé. At half past seven o'clock in the evening the carriages stopped to change horses at his house; he thought he recollected the queen, and imagined that the king's face resembled the impressions stamped upon assignats. The escort of dragoons increased the suspicion. He suffered them to depart at 11 o'clock without notice; but taking a companion with him, he went by a shorter road to Varennes. With the assistance of the postmaster there he gave the alarm, and overthrew a carriage on the bridge, which detained the royal travellers till the national guard of the place had assembled, and the arrest was effected without bloodshed. They were brought back to Paris by a deputation from the assembly. At his departure, the king had imprudently left behind him a memorial, in which he declared, that he never had thought any sacrifice too great for the restoration of order; but that the destruction of the kingdom, and the triumph of anarchy, being the only reward of all his efforts, he thought it necessary to depart from it. He then takes a review of the faults of the new constitution, the grievances he has suffered; and protests against every thing that he had been compelled to do during his captivity.

Different parties were very differently affected by this ill-conducted and unfortunate flight of the king. One was convinced of the necessity of the flight, and during the king's absence, attempts were made to induce the populace at large to consider the royal authority as no longer existing. But the minds of men were by no means prepared for the reception of this new doctrine. The idea, however, having been thus publicly proposed, left some impressions, which in time contributed to give rise to important events. By far the greater number of leading men, however, were at present convinced, that it was impossible to conduct a great empire like France, well and prosperously, without the assistance of an hereditary chief. They therefore determined to pass over the affair with as much silence as possible, and to hasten the period when their new constitution should be complete. But there is reason to believe, that this journey was at the long-run highly instrumental in producing very fatal effects to the personal safety of the monarch.

His flight seemed a signal for emigration. Many of the aristocratic party sent in resignations of their seats in the national assembly. Others were invited on the frontiers in the king's name; who took care, however, to disavow any connection with such a procedure. Bouillé emigrated, and afterwards sent to the assembly a furious threatening letter: "You shall answer (says he) for the lives of the king and of the queen to all the monarchs of the universe. Touch but a single hair of their heads, and not one stone shall be left upon another in Paris. I know the roads. I will conduct the foreign armies. This letter is but the forerunner of the manifesto of the sovereigns of Europe."

A considerable calm throughout France followed these events, and it might be regarded as in a state of tranquillity. It contained, indeed, parties entertaining much animosity against each other, and many citizens had withdrawn to foreign countries; but the peace was not broken, and moderate men hoped that much prosperity would follow from the late agitations. But this calm was delusive; and in the midst of it those projects were formed which were afterwards to prove so fatal to the peace of France and of Europe. Towards the close of this summer, a convention took place at Plinitz, Saxony, between the emperor Leopold and the king of Prussia. Its object was not known at the time, but it gradually came into view, and is now by many understood.
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stood to have been intended for the purpose of concluding a league for the invasion of France, the new-modeling of its government, and the partition of some of its fairest provinces. The following paper has been repeatedly published as the copy of a treaty concluded and signed at Pavia, and is generally understood to have been identical with, and therefore known by, the name of the Treaty of Pavia. We are far from vouching for its authenticity. It may have been fabricated by the French assembly, to unite all parties in the nation against the foreign powers which threatened to invade them. But in stating the events of this revolution, it is perhaps still more necessary, for the purpose of rendering the actions of men comprehensible, to give an account of what was at the time believed to have occurred, than it now is to ascertain what was actually true.

Partition Treaty between the Courts in Concert, concluded and signed at Pavia, in the month of July 1791.

His majesty the emperor will take all that Louis XIV. conquered in the Austrian Netherlands, will give them to his serene highness the elector Palatine; so that these new possessions, added to the Palatinate, may hereafter have the name of Austrasia.

His majesty will preserve for ever the property and possession of Bavaria, to make in future an indivisible mass with the domains and hereditary possessions of the house of Austria.

Her serene highness the archduchess Maria Christina shall be, conjointly with his serene highness her nephew the archduke Charles, put into hereditary possession of the duchy of Lorraine.

Alsace will be restored to the empire; and the bishop of Strasbourg, as well as the chapter, shall recover their ancient privileges, and the ecclesiastical sovereigns of Germany shall do the same.

If the Swiss Cantons consent to accede to the coalition, it may be proposed to them to annex to the Helvetic league the bishopric of Porencrui, the defiles of Franche Comte, and even those of Tyrol, with the neighbouring bailiwicks, as well as the territory of Versey, which intersects the Pays de Vaud.

Should his majesty the king of Sardinia subscribe to the coalition, La Bresse, Le Bugey, and the Pays de Gex, usurped by France from Savoy, shall be restored to him.

In case his Sardinian majesty can make a grand diversion, he shall be suffered to take Dauphiné, to belong to him for ever as the nearest descendant of the ancient dauphins.

His majesty the king of Spain shall have Roussillon and Bearn, with the island of Corsica; and he shall have the French part of the island of St Domingo.

Her majesty the empress of all the Russias shall take upon herself the invasion of Poland, and at the same time retain Kaminiech, with that part of Podolia which borders on Moldavia.

His majesty the emperor shall oblige the Porte to give up Chosia, as well as the small forts of Servia, and those on the river Luma.

His majesty the king of Prussia, by means of the above-mentioned invasion of the empress of all the Russias into Poland, shall make an acquisition of Thorn and Danzig, and unite the Palatinate on the east to the confines of Silesia.

His majesty the king of Prussia shall besides acquire Lusatia; and his serene highness the elector of Saxony shall in exchange receive the rest of Poland and occupy the throne as hereditary sovereigns.

His majesty the present king of Poland shall abdicate the throne on receiving a suitable annuity.

His royal highness the elector of Saxony shall give his daughter in marriage to his serene highness the youngest son of his royal highness the grand duke of all the Russians, who will be the father of the race of the hereditary kings of Poland and Lithuania. (Signed) LEOPOLD, PRINCE NASSAU. COUNT FLORIDA BLANCA. BISCHOFFSWERDER.

In the mean time, the national assembly was hasten. The new constitution was finished on the 3d of September, and presented to the king. It begins with the following declaration of the rights of a man and a citizen: and thereafter follows the different branches; the chief of which are here translated.

I. All men are born, and remain, free and equal in rights; social distinctions cannot be founded on common utility.

II. The end of all political associations is the preservation of the natural and imprescriptible rights of man: these rights are liberty, property, security, and resistance against oppression.

III. The principle of sovereignty resides essentially in the nation: no body of men, no individual, can exercise an authority that does not emanate expressly from that source.

IV. Liberty consists in the power of doing every thing except that which is hurtful to another: hence the exercise of the natural rights of every man has no other bounds than those that are necessary to ensure to the other members of society the enjoyment of the same rights: those bounds can be determined by the law only.

V. The law has a right to forbid those actions alone that are hurtful to society. Whatever is not forbidden by the law, cannot be hindered; and no person can be constrained to do that which the law ordaineth not.

VI. The law is the expression of the general will: all the citizens have a right to concur personally, or by their representatives, to the formation of the law: it ought to be the same for all, whether it protect, or whether it punish. All citizens being equal in the eye of the law, are equally admissible to dignities, places, and public offices, according to their capacity, and without any other distinction but that of their virtue and their talents.

VII. No man can be accused, arrested, or detained, except in cases determined by the law, and according to the forms which the law hath prescribed. Those who solicit, dispatch, execute, or cause to be executed, arbitrary orders, ought to be punished; but every citizen that is summoned or seized in virtue of the law, ought to obey instantly—he becomes culpable by resistance.

VIII. The law ought to establish such punishments only as are strictly, and evidently necessary; and no person can be punished but in virtue of a law established and proclaimed prior to the offence, and legally applied.

IX. Every man being presumed innocent till such time.
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In order to form a legislative national assembly, the active citizens shall convene, in primary assemblies, every two years in the cities and cantons.

"The primary assemblies shall meet of full right on the first Sunday of March, if not convoked sooner by the public officers appointed to do so by the law."

To be an active citizen, it is necessary,

To be a Frenchman, or to have become a Frenchman;

To have attained 25 years complete;

To have resided in the city or the canton from the time determined by the law;

To pay in any part of the kingdom a direct contribution, at least equal to the value of three days labour, and to produce the acquittance;

Not to be in a menial capacity, namely, that of a servant receiving wages;

To be inscribed in the municipality of the place of his residence in the list of the national guards;

To have taken the civic oath.

The primary assemblies shall name electors in the proportion of the number of active citizens residing in the city or canton.

There shall be named one elector to the assembly, or not, according as there shall happen to be present 100 active citizens.

There shall be named two, when there shall be present from 150 to 250, and so on in this proportion.

The electors named in each department shall convene, in order to choose the number of representatives, whose nomination shall belong to their department, and a number of substitutes equal to the third of the representatives.

The assemblies shall be held of full right on the last Sunday of March, if they have not been before convoked by the public officers appointed to do so by law."

All active citizens, whatever be their state, profession, or contribution, may be chosen representatives of the nation.

Excepting, nevertheless, the ministers and other agents of the executive power, &c.

The members of the legislative body may be re-elected to a subsequent legislature, but not till after an interval of one legislature.

No active citizen can enter or vote in an assembly if he is armed.

The representatives shall meet on the first Monday of May, in the place of the sitting of the last legislature.

The royalty is indivisible, and delegated hereditarily to the race on the throne from male to male, by order of primogeniture, to the perpetual exclusion of women and their descendants.

Nothing is prejudged on the effect of renunciations in the race on the throne.

The person of the king is inviolable and sacred; his only title is king of the French.

If the king put himself at the head of an army, and direct the forces of it against the nation, or if he do not oppose, by a formal act, any such enterprise undertaken in his name, he shall be held to have abdicated.

If the king having gone out of the kingdom, do not return to it, after an invitation by the legislative body, within the space which shall be fixed by the prov.

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clamation, "and which cannot be less than two months," he shall be held to have abdicated the royalty.

After abdication, express or legal, the king shall be in the class of citizens, and may be accused and tried like them, for acts posterior to his abdication.

The nation makes provision for the splendour of the throne by a civil list, of which the legislative body shall fix the sum at the commencement of each reign, for the whole duration of that reign.

The king is a minor till the age of 18 complete; and during his minority there shall be a regent of the kingdom.

The regency belongs to the relation of the king, next in degree according to the order of succession to the throne, who has attained the age of 25; provided he be a Frenchman resident in the kingdom, and not presumptive heir to any other crown, and having previously taken the civic oath.

The presumptive heir shall bear the name of Prince Royal.

"The members of the king's family called to the eventual succession of the throne, shall add the denomination of French Prince to the name which shall be given them in the civil act proving their birth; and this name can neither be patronymic nor formed of any of the qualifications abolished by the present constitution.

"The denomination of prince cannot be given to any individual, and shall not carry with it any privilege or exception to the common right of all French citizens."

To the king alone belong the choice and dismissal of ministers.

The members of the present national assembly, and of the subsequent legislatures, the members of the tribunal of appeal, and those who shall be of the high jury, cannot be advanced to the ministry, cannot receive any place, gift, pension, allowance, or commission of the executive power or its agents during the continuance of their functions, or during two years after ceasing to exercise them; the same shall be observed respecting those who shall only be inscribed on the list of high jurors as long as their inscription shall continue."

No order of the king can be executed if it be not signed by him, and countersigned by the minister or comptroller of the department.

In no case can the written or verbal order of a king shelter a minister from responsibility.

The constitution delegates exclusively to the legislative body the powers and functions following:

To propose and decree laws—The king can only invite the legislative body to take an object into consideration;

To fix the public expences;

To establish the public contributions, to determine the nature of them, the amount of each sort, the duration, and mode of collection, &c.

War cannot be resolved on but by a decree of the national assembly, passed on the formal and necessary proposition of the king, and sanctioned by him.

During the whole course of war, the legislative body may require the king to negotiate peace; and the king is bound to yield to this requisition.

It belongs to the legislative body to ratify treaties of peace,
The judicial power can in no case be exercised either by the legislative body or the king.

Justice shall be gratuitously rendered by judges chosen from time to time by the people, and instituted by letters patent of the king, who cannot refuse them.

"The public accuser shall be nominated by the people."

"The right of citizens to determine disputes definitively by arbitration, cannot receive any infringement from the acts of the legislative power."

In criminal matters, no citizens can be judged except on an accusation, received by jurors, or decreed by the legislative body in the case in which it belongs to it to prosecute the accusation.

After the accusation shall be admitted, the fact shall be examined, and declared by the jurors.

The person accused shall have the privilege of challenging 20, "without assigning any reason."

The jurors who declare the fact shall not be fewer than 12.

The application of the law shall be made by the judges.

The process shall be public; "and the person accused cannot be denied the aid of counsel."

No man acquitted by a legal jury can be apprehended or accused on account of the same fact.

For the whole kingdom there shall be one tribunal of appeal, established near the legislative body.

A high national court, composed of members of the tribunal of appeal and high jurors, shall take cognizance of the crimes of ministers, and the principal agents of the executive power; and of crimes which attack the general safety of the state, when the legislative body shall pass a decree of accusation.

It shall not assemble but on the proclamation of the legislative body; "and at the distance of 30,000 liasses at least from the place of meeting of the legislative body."

The national guards do not form a military body, or an institution in the state; they are the citizens themselves called to assist the public force.

Officers are chosen for a time, and cannot again be chosen till after a certain interval of service as private.

None shall command the national guard of more than one district.

All the parts of the public force employed for the safety of the state from foreign enemies are under the command of the king.

Public contributions shall be debated and fixed every year by the legislative body, and cannot continue in force longer than the last day of the following session, if they are not expressly renewed.

"Detailed accounts of the expenses of the ministerial departments, signed and certified by the ministers or comptrollers-general, shall be printed and published at the commencement of the sessions of each legislature."

"The same shall be done with the statements of the receipt of the different taxes, and all the public revenues."

The French nation renounces the undertaking of any war with a view of making conquests, and will never employ its forces against the liberty of any people.

The constituting national assembly declares, "That the
the nation has the imprescriptible right of changing its constitution; and nevertheless considering that it is more conformable to the national interest to employ only by means provided in the constitution itself, the right of reforming those articles of it, of which experience shall have shown the inconveniences, decrees, that the proceeding by an assembly of revision shall be regulated in the form following:

"When three successive legislatures shall have expressed an uniform wish for the change of any constitutional article, the revision demanded shall take place.

"The next legislature, and the following, cannot propose the reform of any constitutional article.

"The fourth legislature, augmented with 249 members, chosen in each department, by doubling the ordinary number which it furnishes in proportion to its population, shall form the assembly of revision."

The French colonies and possessions in Asia, Africa, and America, "though they form part of the French empire," were not included in the present constitution.

With respect to the laws made by the national assembly which are not included in the act of constitution, and those anterior laws which it has not altered, they shall be observed, so long as they shall not be revoked or modified by the legislative power.

On the 13th of September the king announced, by a letter to the president of the assembly, his acceptance of the constitution. This event was ordered to be notified to all the foreign courts, and the assembly decreed a general amnesty with respect to the events of the revolution. On the following day the king repaired in person to the national assembly; and being conducted to a chair of state prepared for him at the side of the president, he signed the constitutional act, and took an oath of fidelity to it. He then withdrew, and was attended back to the Thilleries by the whole assembly, with the president at their head. On the 30th of September, this national assembly, which has since been known by the name of the Constituent Assembly, dissolved itself, and gave place to the succeeding Legislative National Assembly, which had been elected according to the rules prescribed by the new constitution.

On the character and the labours of the Constituent Assembly, we shall only remark, that it contained many men of talents, and, in all probability, a considerable number of men of integrity. Towards the close of its session, it assumed a very striking character of moderation, and appears to have been completely monarchical, although its jealousy of the ancient aristocracy prevented it from sufficiently guarding the throne against popular violence: for a very striking defect in the new constitution soon appeared. The king possessed a veto, or negative, upon the resolutions of the legislative body; but this negative he was bound to exercise in person, without responsibility, and without the intervention of his ministers. He had no senate, or upper chamber, to stand between him and popular violence; and there was something apparently absurd in setting the vote of an individual in opposition to the collective wisdom and will of a whole nation. In consequence of this, he was reduced to the hard alternative of yielding to every vote of the national assembly, or of exposing himself personally to public odium.

The new assembly was opened by the king on the 9th of October, with much apparent union on all sides. His speech, recommending unanimity and confidence between the legislative and executive powers, was received with unbounded applause. The character of the men who composed the new national assembly was unsuspicious to the Court. At the commencement of the assembly, the great body of the people at a distance from the capital were little interested in those projects of freedom which occupied the more enlightened or more turbulent inhabitants of Paris. They had, however, been roused from their lethargy. The variety of powers conferred by the new constitution upon the people at large, and the multiplicity of offices of which it gave them the patronage, had kindled in the minds of men a love of dominion, and a wish to interfere in public affairs. This attached them to the new order of things. The love of power, which is the least disguised passion in the human heart, and equally strong in the breast of the meanest and of the highest of mankind, was thus, under the name of liberty, become a leading passion throughout this wide empire. They who flattered it most, and were most loud in praise of the rights of the people, became speedily the favourites of the public. The consequence of this was, that the new national assembly was chiefly composed of country gentlemen, of principles highly democratic, or of men of letters who had published popular books, or conducted periodical publications. The members of the constituent assembly had been excluded by their own decree from holding seats in the new legislature. The members of the latter, therefore, had little regard for a constitution which they themselves had not framed, and which was not protected by the venerable sanction of antiquity.

When this assembly first met, it showed a very trifling attention to formalities, and a peevish jealousy of the ministers of the crown. In the mean time, the treaty of Piltitz, already mentioned, began to be rumoured abroad, and France was thrown into a state of anxious jealousy for the safety of its newly-acquired liberties. Although the Prussians and Germans (the elector of Mentz alone excepted) all continued to temporize, the northern powers, Sweden and Russia, entered into strict engagements to restore the old despotism of France. On the 9th of November, a decree was passed, that the emigrants, who, after the first of January next, should be found assembled, as at present, in a hostile manner, beyond the frontiers, should be considered as guilty of a conspiracy, and suffer death; that the French princes, and public functionaries, who should not return before that period, should be punished in the same manner, as their property forfeited during their own lives. On the 10th, a series of severe decrees was also passed against such of the ejected clergy as still refused to take the civic oath. To both these decrees the king opposed his veto, or negative. The moderate party, who were attached to the constitution, rejoiced at this as a proof of the freedom of their sovereign. But, on the other side, it excited a most violent clamour, and became the means of exciting new suspicions of the wishes of the court. At this time answers were received from the different foreign courts to the notification sent them of the king's veto from acceptance of the new constitution. These were general, usually conceived in a style of caution, and avoided giving powers.
open offence. The emperor even prohibited all assemblies of emigrants within his states; and the king intimated to the assembly that he had declared to the elector of Treves, that unless the emigrants should cease before the 1st of January to make hostile preparations within his territories, he would be considered as the enemy of France. All this, however, did not prevent the court from suspicion; for although the different foreign courts had openly declared pacific intentions, yet the French emigrants boldly asserted that all Europe was actually arming in their favour. Accordingly they ceased not to solicit their equals in rank, who still remained within the country, to leave it to join with them in what they called the royal cause.—The unhappy Louis, placed between a republican party that was gradually gathering strength, and an aristocratic party that was rousing Europe to arms against a nation of which he was the constitutional chief, and a combination of princes justly suspected of wishing to seize upon a part of his dominions, stood in a situation which would have perplexed the most skilful statesman, and it is no proof of incapacity that he fell a sacrifice to circumstances which might have overwhelmed any known measure of human ingenuity. Addresses were crowding into the assembly, disapproving the conduct of the court. M. Montmorin resigned; M. Delessart succeeded him; and M. Cahier de Gerville became minister of the interior. M. du Portail resigned also, and M. Narbonne succeeded him as minister of war. In the month of November, M. Bailly's mayoralty terminated; and the once popular La Fayette appeared as a candidate to succeed him. But he was successfully opposed by M. Petion, a violent Jacobin, and a declared republican, who was elected mayor of Paris by a great majority.

At this period the moderate men, who were friends of the constitution, attempted to counteract the influence of the Jacobin club by the establishment of a similar one. It derived its name from the vacant convent of the Écuyers, in which it assembled. The most active members of the Constituent Assembly belonged to it, such as M. M. D'Andre, Barnave, the Lameths, Du Port, Rabaud, Sieyes, Chapelier, Thouret, Laprade, Talleyrand, Montesquiou, Beaumetz, &c. The Jacobins contrived to excite a riot at the place of their meeting, which was in the vicinity of the hall of the National Assembly. This afforded a pretext for applying to the assembly for the removal of the new club. The assembly showed their disposition, by complying with this request.

At the end of this year, the kingdom of France was by no means prosperous. The public revenue had fallen far short of the expenditure. The emigrant nobility had carried out of the kingdom the greater part of the current coin; and a variety of manufacturers, who depended upon their ostentatious luxury, were reduced to much distress. The dispositions of foreign courts appeared very doubtful. The new year, however, opened with delusive prospects of tranquillity.—The German princes appeared satisfied with the mode of compensation which the French had offered for the loss of their possessions in Alsace and Lorraine. The prince of Lowenstein accepted of an indemnification.—The princes of Hohenlohe and Salm-Salm declared themselves ready to treat upon the same terms. Prince Maximilian, and the dukes of Wirtemberg and Dux-Ponts, freely negotiated. It is unnecessary to state in detail the subterfuges employed, in the mean time, by the crafty Leopold, for amusing the French with the appearances of peace. M. Delessart, minister for foreign affairs, fell a sacrifice to them, and probably to the undecided character of Louis. He was accused by M. Brisot of not having given timely notice to the National Assembly of the dispositions of foreign powers, and of not pressing proper measures for securing the honour and safety of the nation. A decree of accusation passed against him in his absence. He was apprehended, tried by the high national court at Orleans, and executed in consequence of its sentence.

The sudden death of Leopold on the first of March gave rise to a transient hope that peace might still be preserved. A suspicion of poison fell upon the French, but it was removed by the detail of his disease that was speedily published. On the 16th of the same month, the king of Sweden was wounded by a nobleman of the name of Ankerstrum, and died on the 29th. This enterprising prince had overturned the constitution of his own country, and he had formed the project of conducting in person his troops to the frontiers of France, and of commanding or accompanying the combined armies of Europe in their attempt to avenge the cause of insulted royalty. It was in a great measure to counteract this scheme that he was assassinated.

The sudden fall, however, of these two enemies, the emperor collapsed and returned the meditated hostilities. The emperor accelerated the process of his own destruction. The young king of Hungary, who succeeded to the empire, made no secret either of his own intentions or of the existence of a concert of princes against France. M. Dumourier was now at the head of the war-office, termis. M. Roland was minister of the interior, and M. Claviere minister of finance. The Jacobins were all-powerful. The court gave way to the torrent. The property of the emigrants was confiscated, reserving the rights of creditors. The Imperial minister, Prince Kaunitz, demanded three things of France; 1st, The restitution of their feudal rights to the German princes; 2dly, To restore Avignon to the Pope, the inhabitants of which had some time before thrown off their allegiance, and prevailed with the constituent assembly to receive their country as a part of France; and lastly, Prince Kaunitz demanded, that "the neighbouring powers should have no reason for apprehension from the present weakness of the internal government of France." On receiving these demands, the king proposed a declaration of war, which was decreed by the National Assembly on the 20th of April, against the king of Hungary and Bohemia.

The French immediately began the war, by attack. And theing in three different columns the Austrian Netherlaanders. M. theobald Dillon advanced from Lisse to Tournay. Netherlaanders are unsuccessfully attain the fire of regular soldiers, were instantly thrown into confusion, and fled even to the gates of Lisse. The Frenchcry of treason resounded on all sides; and their commander, an experienced and faithful officer, was murdered by his own soldiers and the mob. A second division of 10,000 men, under Lieutenant General Biron, took possession of Querain on the 29th, and marched towards Mons. General Biron was here attacked by
the Austrians, whom he repulsed. Hearing, however,
of the defeat of Dillon, he retreated. A third party
advanced to Furnes, but afterwards withdrew. La
Fayette at the same time advanced towards Bouvines,
half way to Namur, from which he afterwards retreated.
The whole of these expeditions were ill contrived, in as
much as they divided the French undisciplined troops,
and exposed them in small bodies to the attack of ve-
teran forces. The Austrians were some time before
they attempted to retaliate. At length, however, on the
15th of June, they attacked M. Gouvion, who
commanded the advanced guard of La Fayette’s army
near Maubeuge. M. Gouvion was killed by a rolling
bullet; but La Fayette himself having come up, the
Austrians abandoned the field. In the mean time,
matters were hastening in Paris towards a violent crisis.
Two parties, both of which were hostile to the present
constitution, had gradually been formed in the state.
The one wished to give more effectual support to the
royal authority, by establishing a senate or two cham-
bers, to prevent the king’s vote from being the sole
check upon popular enthusiasm. The other party
wished to set aside royalty altogether, and to hazard the
bold experiment of converting France into a republic.
These last were supported by the Jacobin club, which
had now contrived to concentrate in itself an immense
mass of influence. Innumerable popular societies
were established in every town and village throughout
the provinces. With these a regular correspondence was
kept up by writing and by emissaries. Thus schemes
and notions were instantaneously propagated through a
great empire, and all the violent spirits which it con-
tained were enabled to act in concert: But the more
immediate engine of the republican party consisted of
the immense population of the metropolis, whom they
now endeavoured to keep in constant alarm. For this
purpose they alleged, that an Austrian committee, that
is to say, a conspiracy in favour of the enemies of the
country, existed among the friends of the court. M.
M. Genonne and Brissot even offered in the assembly to
prove the existence of this pretended Austrian com-
mittee. A report was next circulated, that the king
intended to abscond from the capital on the 23d of
May. His majesty publicly contradicted these accusa-
tions as calumnies, but they made no small impression
upon the minds of the public. New decrees were now
made against the refractory clergy, but these his majesty
refused to sanction. A proposal was also made and de-
creed in the assembly to form a camp of 20,000 men
under the walls of Paris, and that for this levy every
canton in the kingdom should contribute one horseman
and four infantry. The national guard of Paris dis-
liked the proposal, and the king gave it to his negative.
Indeed at this time the king seems to have come to a
resolution of standing out against the Jacobin party, to
which he had for some time yielded. The ministry
were therefore dismissed, excepting M. Dumasnier, and
others were appointed in their stead. By this event
Dumasnier lost the confidence of the Jacobin club. He
saw his error, resigned his office, and joined the army.
In the mean time a decree had been passed, authorising
the manufacture of pikes for the purpose of arming
cheaply the lower class of citizens. All means were
used to render the king odious by inflammatory writings
and harangues; and in both of these the noted inca-
dency Marat took the lead.

On the 20th of June, M. Roederer, the procureur
general synod informed the national assembly, that
contrary to law, formidable bodies of armed men were
preparing to present petitions to the king, and to the
constitutional assembly. A part of them speedily appeared the assem-
blies with St. Haruge and Santerre a brewer at their head.

They marched through the ball in a procession that
lasted two hours, at four o’clock in the afternoon, to
the number of about 40,000. They surrounded the
Thuileries. The gates were thrown open; and on an
attempt to break the door of the apartment where the
king then was, he ordered them to be admitted. His
sister the princess Elizabeth never departed from his
side during four or five hours that he was surrounded
by the multitude, and compelled to listen to every in-
dignity. All this while Petion, the mayor of Paris,
was unaccountably absent. He at length, however,
arrived, and also a deputation from the assembly. The
queen, with her children and the princess de Lamalle,
were in the mean time in the council-chamber, where,
though protected from violence, they were yet exposed
to much insult. At last, in consequence of the approach
of evening, and of the entreaties of Petion, the multi-
tude gradually dispersed.

The indignities suffered on this day by the royal The most
family were in some respects not unfavourable to their
cause. A great number of the most respectable inha-
babitants of the capital were ashamed of such proceedings.
They complained of them severely in a petition to the
assembly, and addresses to the same purpose were re-
ceived from several departments. The directory of
the department of Paris, at the head of which were M.
Rochefoucault and M. Talleyrand, published a declara-
tion disapproving of the conduct of the mayor, and of
M. Manuel the procureur of the commune, whom they
afterwards suspended from their offices, although they
were speedily restored by a decree of the assembly. At
the same time, La Fayette leaving his army suddenly,
appeared on the 25th at the bar of the national assem-
blies. He declared that he came to express the indigna-
tion which the whole army felt on account of the
events of the 20th: he called upon the assembly to
punish the promoters of these events, and to dissolve
the factional clubs. The sudden appearance of La Fayette
threw the Jacobins into consternation, and from that
time they never ceased to caluminate him.

On the 1st of July, on the motion of M. Jean de Brie, the assembly ordered a proclamation to be made, of Prussia that the country was in danger. On the 6th, the king marched against France. With 52,000 men to co-operate against France. The French arms were at this time somewhat successful in the Austrian Netherlands; but the cabinet speedily thought it necessary to order the armies to retreat: a measure which was afterwards publicly censured by Marshal Luckner.

On the 7th, a singular scene occurred in the national moderate
assembly. At the instant that M. Brissot was about to
begin an oration, M. L’ammouron, bishop of Lyon requested to be heard for a few minutes. He expatiated on the necessity of union among the members of the assembly, and of sacrificing their passions and pre-
judices.
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The royal family was massacred. In the mean time, the commissioners, were, in the mean time, sent on the same evening to give to the army a false and favourable account of these transactions. The royal family were sent to the old palace of the Temple in the midst of the city, to remain there under a strict guard; and all persons of rank who had been attached to them were seized and committed to the different prisons.

To give an idea of the temper of the people of Paris at this time, it is proper to remark, that at the same instant when the multitude with a bloody fury was massacring the menial servants in the palace, and could scarcely be restrained from offering violence to the Swiss who were made prisoners, they would suffer no act of pillage to pass unpunished. Several attempts of this kind were accordingly followed by the instant death of the criminals. The plate, the jewels, and money found in the Thilleries were brought to the national assembly, and thrown down in the hall. One man, whose dress and appearance bespoke extreme poverty, cast upon the table an hat full of gold. But the minds of these men were elevated by enthusiasm; and they conceived themselves at this moment the champions of freedom, and objects of terror to the kings of the earth.

In the mean time, the situation of France was ex-ceedingly critical, and it appeared very doubtful if the union of new convention would ever be restored to the whole kingdom. La Fayette had hurriedly got speedy notice of the events of the 10th of August. He advised the magistrates of the town of Sedan to imprison the commissioners from the national assembly, as soon as they should arrive there; which was accordingly done. He, at the same time, published an address to his army, calling upon them to support the king and the constitution; but La Fayette finding that they were not to be depended upon, on the 10th of August he left the camp in the night, accompanied only by his staff and a few servants. They took the route of Rochefort in Liege, which was a neutral character country; but were met by a party of the enemy, who took them prisoners, and La Fayette was detained for several years in Prussian and Austrian dungeons. The severe treatment of this man was probably a considerable error in policy on the part of the allies. His fidelity to his king is very generally admitted; though some have entertained strong suspicions of his having acted a very base part to that unfortunate monarch; and in the British house of commons he has been called an abandoned Russian. The expression is certainly too strong. His errors seem to have been those of the head rather than of the heart; and at all events, he should have been protected by the allies, if for no other reason than to encourage subsequent desertions among the officers of the republican army.

To return from this digression. The commissioners were soon set at liberty at Sedan, and received with applause by the army of La Fayette. General Arthur Dillon at first entered into the sentiments of La Fayette; but the politic Dumourier diverted him from his purpose, and by this means regained his credit with the Jacobins, and was appointed commander in chief. The other generals, Biron, Montesquiou, Kellerman, and Custine, made no opposition to the will of the national assembly.

Meanwhile, the combined armies of Austria and Prussia had entered France. The duke of Brunswick's army
army was above 50,000 strong. General Clairfait had joined him with 15,000 Austrians, and a considerable body of Hessians, along with 20,000 French emigrants; amounting in all to 90,000 men. To oppose these, Dumourier had only 17,000 men collected near the point from which the enemy were apprised of the Luxemburg. The French emigrants had given the duke of Brunswick such an account of the distracted state of their own country, and of the pretended disaffection of all orders of men towards the ruling faction in Paris, that no resistance of any importance was expected. When the combined troops, consisting either of steady Austrian or Hungarian battalions, or of those well disciplined Prussians which the great Frederick had inured to the best military discipline, were reviewed in Germany before setting out on their march, it is said that the spectators, among whom the French cause was not unpopular, beheld them with anxiety and regret, and pitied the unhappy country against which this irresistible force was directed. The soldiers and their officers regarded themselves as departing for a hunting match, or an excursion of pleasure; and many of the usual accommodations of an army were ill attended to, such as hospitals, &c. The beginning of their progress into France justified these expectations. Longwy surrendered after a siege of 15 hours, although well fortified, possessed of a garrison of 3,500 men, and defended by 71 pieces of cannon. The news of this event irritated the assembly so much, that they decreed, that, when retaken, the houses of the citizens should be razed to the ground; and, distrustful of the officers of the army, they decreed that the municipal officers of a town should hereafter have power to Control the deliberation of the council of war. Verdun was next summoned; and here the municipality compelled the governor M. Beaurepaire to surrender. That officer, disappointed and enraged, shot himself dead with a pistol in presence of the council, and on the 2d of September the Prussian troops entered the town.

The news of this second capture, and of the approach of the Prussians, spread an instant alarm through Paris. It was proposed to raise a volunteer army, which should set out immediately to meet the enemy. The common council, which was now led by Robespierre, Danton, Marat, and others of the most sanguinary character, ordered the alarm-guns to be fired, and the populace to be summoned to meet in the Champ de Mars to enroll themselves to march against the enemy. The people assembled, and either in consequence of a premeditated plan, or, which is not very probable, of an instantaneous movement, a number of voices exclaimed, that "the domestic foes of the nation ought to be destroyed before its foreign enemies were attacked."

Parties of armed men proceeded without delay to the prisons where the non-juring clergy, the Swiss officers, and those confined since the 10th of August on account of practices against the state, were detained in custody. They took out the prisoners one by one, gave them a kind of mock trial before a jury of themselves, acquitted some few, and murdered the rest. Among these last was the princess de Lamballe. She was taken from her bed before this bloody tribunal, and massacred; her head was carried by the populace to the Temple, to be seen by the queen, whose friend she was. These massacres lasted for two days, and upwards of 1000 persons were put to death. There is scarce any thing in history that can be represented parallel to them; they were committed, it is said, by less than 300 men, in the midst of an immense city, which turned them with horror, and in the vicinity of the national assembly, which, being going in a body, could have put an end to them. But such was the confusion and dismay of these two disgraceful days, that no man dared to stir from his own house; and everybody believed that the whole city, excepting his own street, was engaged in massacre and bloodshed. The national guard were all ready at their respective posts, but no man directed them to act: and there is too much reason to suspect that Santerre and the chiefs of the commune connived, at least, at the transaction.

In the mean time, General Dumourier was taking the best measures to procure the march of the enemy from the army of Kellerman, consisting of 20,000 men, could join him from Lorraine, and that of Bournonville from Flanders, amounting to 13,000; together with whatever new levies Luckner might be able to send him from Chalons. The forest of Argonne extends from north to south upwards of 40 miles; it lay directly in the route of the duke of Brunswick, who must either force his way across it, or make a circuit of 40 miles by the pass of Grandpré on the north, or by Bazoches on the south. The pass that lay directly in his route was that of Biesme. After surveying Dillon's position here, he left a party of 20,000 men to watch it; and with the main body of his army took the circuitous route by Grandpré on the north. Here Du- mourier awaited to receive him, and was attacked on the 12th and 13th without success: but on the 14th, the attack of the Prussians was irresistible, and Dumourier retreated, gave up the pass. On his march he was 600 low up violently pressed by the advanced cavalry of the Prussians, that his army, at one time, was seized with a panic, and fled before 1,500 men; who, if they had pushed their advantage, might have dispersed it. On the 15th, however, Dumourier encamped at St Menoult, and began to fortify it. Bournonville's army joined Dumourier on the 17th. The duke of Brunswick formed a plan of attacking Kellerman before his junction could be completed. That general arrived on the 15th within a mile of Dumourier's camp; the projected attack took place; the Prussians manoeuvred with their usual coolness and address; they attempted to surround Kellerman's army, but this could not be accomplished. The French troops preserved excellent order, while the national vivacity was constantly showing itself in their shouts and patriotic songs: 400 French were killed, and 500 wounded; the loss of the Prussians was much greater: and, in the face of the enemy, Kellerman joined Dumourier at the end of the engagement without opposition. At the time that the attack was made on the army of Kellerman, an attempt was made to force Dillon's camp at Biesme by the 90,000 men that had been left in its vicinity, but without success; and this large detachment was thus prevented from crossing the forest of Argonne and joining the duke of Brunswick. It is to be observed, that in these engagements the French owed their superiority chiefly to the excellence of their artillery; a circumstance which served to convince their enemies that they had
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speeches you made on the 9th, 12th, and 14th of July to the deputies of the constituent assembly, shew what were your intentions; and the massacres of the Tuileries rise in evidence against you. -What have you to answer?

Louis. "I was master at that time to order the troops to march; but I never had an intention of shedding blood.

Pres. "After these events, and in spite of the promises which you made on the 13th in the constituent assembly, and on the 17th in the town-house of Paris, you have persisted in your projects against national liberty. You long clung the execution of the decrees of the 12th of August, respecting the abolition of personal servitude, the feudal government, and tythes: you long refused acknowledging the rights of man: you doubled the number of the life-guards, and called the regiment of Flanders to Versailles: you permitted, in argies held before your eyes, the national cockade to be trampled under foot, the white cockade to be hissed, and the nation to be slandered. At last, you rendered necessary a fresh insurrection, occasioned the death of several citizens, and did not change your language till after your guards had been defeated, when you renewed your perfidious promises. The proofs of these facts are in your observations of the 18th of September, in the decrees of the 11th of August, in the minutes of the constituent assembly, in the events of Versailles on the 6th and 9th of October, and in the conversation, you had on the same day with a deputy of the constituent assembly, when you told them you would enlighten yourself with their councils, and never recede from them. -What have you to answer?"

Louis. "I have made the observations which I thought just on the two first heads. As to the cockade, it is false; it did not happen in my presence.

Pres. "You took an oath at the federation on the 9th of July, which you did not keep. You soon tried to corrupt the public opinion, with the assistance of Talon who acted in Paris, and Mirabeau who was to have excited counter-revolutionary movements in the provinces. -What have you to answer?"

Louis. "I do not know what happened at that time; but the whole is anterior to my acceptance of the constitution."

Pres. "You lavished millions of money to effect this corruption, and you would even use popularity as a means of enslaving the people. These facts are the result of a memorial of Talon, on which you have made your marginal comments in your own hand-writing, and of a letter which Laporte wrote to you on the 10th of April, in which, recapitulating a conversation he had with Riche, he told you, that the millions which you had been prevailed upon to throw away had been productive of nothing. For a long time you had meditated on a plan of escape. A memorial was delivered to you on the 28th of February, which pointed out the means for you to effect it; you approve of it by marginal notes. -What have you to answer?"

Louis. "I felt no greater pleasure than that of relieving the needy: this proves no design."

Pres. "On the 28th a great number of the nobles and military came into you apartments in the castle of the Tuileries to favour that escape you wanted to quit Paris on the 10th of April to go to St Cloud.—What have you to answer?"

Louis. "This accusation is absurd."

Pres. "But the resistance of the citizens made you sensible that their distrust was great; you endeavoured to discard it by communicating to the constituent assembly a letter, which you addressed to the agents of the nation near foreign powers, to announce to them that you had freely accepted the constitutional articles, which had been presented to you; and, notwithstanding, on the 21st you took flight with a false passport. You left behind a protest against these self-same constitutional articles; you ordered the ministers to sign none of the acts issued by the national assembly; and you forbade the minister of justice to deliver up the seals of state. The public money was lavished to insure the success of this treachery, and the public force was to protect it, under the orders of Bouillé, who shortly before had been charged with the massacre of Nancy, and to whom you wrote on this head, "to take care of his popularity, because it would be of service to you." These facts are proved by the memorial of the 23d of February, with marginal comments in your own hand-writing; by your declaration of the 20th of June, wholly in your own hand-writing; by your letter of the 4th of September 1790 to Bouillé; and by a note of the latter, in which he gives you an account of the use he made of 993,000 livres, given by you, and employed partly in trepanning the troops who were to escort you. -What have you to answer?"

Louis. "I have no knowledge whatever of the memorial of the 23d of February. As to what relates to my journey to Varennes, I appeal to my declaration to the commissioners of the constituent assembly at that period."

Pres. "After your detention at Varennes, the exercise of the executive power was for a moment suspended in your hands, and you again formed a conspiracy. On the 17th of July the blood of citizens was shed in the Champ de Mars. A letter, in your own hand-writing, written in 1790 to La Fayette, proves that a criminal coalition subsisted between you and La Fayette, to which Mirabeau acceded. The revision began under these cruel auspices; all kinds of corruptions were made use of. You have paid for libels, pamphlets, and newspapers, designed to corrupt the public opinion, to discredit the assigns, and to support the cause of the emigrants. The registers of Septeul show what immense sums have been made use of in these libidinose manoeuvres. -What have you to answer?"

Louis. "What happened on the 17th of July has nothing at all to do with me. I know nothing of it."

Pres. "You seemed to accept the constitution on the 14th of September; your speeches announced an intention of supporting it, and you were busy in overturning it, even before it was completed. A convention was entered into at Pilsitz on the 24th of July, between Leopold of Austria and Frederic-William of Brandenburgh, who promised themselves to re-erect in France the throne of absolute monarchy, and you were silent upon this convention till the moment when it was known by all Europe. -What have you to answer?"

Louis. "I made it known as soon as it came to my knowledge; besides, every thing that refers to this subject concerns the minister."

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with Prussia; you answered, on the 10th, that 50,000
Prussians were marching against us, and that you gave
notice to the legislative body of the formal acts of the
pending hostilities, in conformity to the constitution.
What have you to answer?"

Louis. "It was only at that period I had know-
ledge of it: all the correspondence passed with the
ministers."

Pres. "You entrusted Dabancourt, the nephew of
Calonne, with the department of war; and such has
been the success of your conspiracy, that the posts of
Longwy and Verdun were surrendered to the enemy at
the moment of their appearance.—What have you to
answer?"

Louis. "I did not know that Dabancourt was M.
Calonne's nephew. I have not divested the posts. I
would not have permitted myself such a thing. I know
nothing of it, if it has been so."

Pres. "You have destroyed our navy—a vast num-
er of officers belonging to that corps had emigrated;
there scarcely remained any to do duty in the harbours;
meanwhile Bertrand was granting passports every day;
and when the legislative body represented to you his
criminal conduct on the 8th of March, you answered,
that you were satisfied with his services.—What have
you to answer?"

Louis. "I have done all I could to retain the offi-
cers. As to M. Bertrand, since the legislative assembly
presented no complaint against him that might have
put him in a state of accusation, I did not think proper
to turn him out of office."

Pres. "You have favoured the maintenance of abso-
late government in the colonies; your agents fom-
ten troubles and counter-revolutions throughout them,
which took place at the same epoch, when it was to
have been brought about in France, which indicates
plainly that your hand was laid this plot.—What have
you to answer?"

Louis. "If there are any of my agents in the colo-
ies, they have not spoken the truth: I had nothing to
do with what you have just mentioned."

Pres. "The interior of the state was convulsed by
fanatics; you avowed yourself their protector, in mani-
festing your evident intention of recovering by them
your ancient power.—What have you to answer?"

Louis. "I cannot answer to this; I know nothing
of such a project."

Pres. "The legislative body had passed a decree
on the 20th of January against the factious priests;
you suspended its execution.—What have you to an-
swer?"

Louis. "The constitution reserved to me the free
government of the sanctity of the decrees."

Pres. "The troubles had increased; the minister
declared, that he knew no means in the laws extant to
arraign the guilty. The legislative body enacted a fresh
decree, which you likewise suspended. What have you
to say to this?"

[Louis replied in the same manner as in the preced-
ing charge.]

Pres. "The uncitizen-like conduct of the guards
whom the constitution had granted you, had rendered it
necessary to disband them. The day after, you sent
them a letter expressive of your satisfaction, and con-
tinued their pay. This fact is proved by the treasurer
of the civil list.—What have you to answer?"

Louis. "I only continued them in pay till fresh
ones could be raised, according to the tenor of the de-
cree."

Pres. "You kept near your person the Swiss
guards; the constitution forbade you this, and the legis-
lateive assembly had expressly ordained their departure.
—What have you to answer?"

Louis. "I have executed all the decrees that have
been enacted in this respect."

Pres. "You had private companies at Paris, charg-
ed to operate movements useful to your projects of a
counter-revolution. Dangremont and Gilles were two
of your agents, who had salaries from the civil list.
The receipts of Gilles, who was ordered to raise a com-
pany of 60 men, shall be presented to you.—What have
you to answer?"

Louis. "I have no knowledge whatever of the pro-
jects laid to their charge: the idea of a counter-revol-
ution never entered into my mind."

Pres. "You wished to suborn, with considerable
sums, several members of the legislative and constitu-
ten assemblies. Letters from St Leon and others evisce
the reality of these deeds.—What have you to an-
swer?"

Louis. "Several persons presented themselves with
similar decrees, but I have waved them."

Pres. "Who are they that presented you with those
projects?"

Louis. "The plans were so vague that I do not re-
collect them now."

Pres. "Who are those to whom you gave money?"

Louis. "I gave money to nobody."

Pres. "You suffered the French name to be reviled
in Germany, Italy, and Spain, since you omitted to
demand satisfaction for the bad treatment which the
French suffered in those countries.—What have you to
answer?"

Louis. "The diplomatical correspondence will prove
the contrary; besides, this was a concern of the minis-
ters."

Pres. "You reviewed the Swiss on the 10th of Au-
gust at five o'clock in the morning; and the Swiss were
the first who fired upon the citizens."

Louis. "I went on that day to review all the troops
that were assembled about me; the constituted authori-
ties were with me, the department, the mayor, the mu-
icipality; I had even invited thither a deputation of the
National Assembly, and I afterwards repaired into
the midst of them with my family."

Pres. "Why did you draw troops to the castle?"

Louis. "All the constituted authorities saw that the
castle was threatened; and as I was a constituted au-
uthority, I had a right to defend myself."

Pres. "Why did you summon the mayor of Paris
on the night between the 9th and 10th of August to the
castle?"

Louis. "On account of the reports that were circu-
lated."

Pres. "You have caused the blood of the French to
be shed."

Louis. "No, Sir, not I."

Pres. "You authorized Septeuil to carry on a
considerable
Considerable trade in corn, sugar, and coffee, at Hamburg. This fact is proved by a letter of Septeul.

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Louis. "I know nothing of what you say."

Pres. "Why did you affix a veto on the decree which ordained the formation of a camp of 20,000 men?"

Louis. "The constitution left to me the free right of refusing my sanction of the decrees; and even from that period I had demanded the assembling of a camp at Soissons."

President, addressing the convention. "The questions are done with." (To Louis) — "Louis, is there anything that you wish to add?"

Louis. "I request a communication of the charges which I have heard, and of the pieces relating thereto, and the liberty of choosing counsel for my defence."

Valazé, who sat near the bar, presented and read to Louis Capet the pieces, viz. The memoir of Laporte and Mirabeau, and some other, containing plans of a counter-revolution.

Louis. "I disown them."

Valazé next presented several other papers, on which the act of accusation was founded, and asked the king if he recognized them. These papers were the following.

Valazé. "Letter of Louis Capet, dated June 29th 1790, settling his connexion with Mirabeau and La Fayette to effect a revolution in the constitution."

Louis. "I reserve to myself to answer the contents." (Valazé read the letter.) — "It is only a plan, in which there is no question about a counter-revolution; the letter was not to have been sent."

Valazé. "Letter of Louis Capet, of the 22d of April, relative to conversations about the Jacobins, about the president of the committee of finances, and the committee of domains; it is dated by the hand of Louis Capet."

Louis. "I disown it."

Valazé. "Letter of Laporte, of Thursday morning, March 31, marked in the margin in the handwriting of Louis Capet with March 31 1791, implying a pretended rupture between Mirabeau and the Jacobins."

Louis. "I disown it."

Valazé. "Letter of Laporte without date, in his handwriting, but marked in the margin by the hand of Louis Capet, containing particulars respecting the last moments of Mirabeau, and expressing the care that had been taken to conceal from the knowledge of men some papers of great concern which had been deposited with Mirabeau."

Louis. "I disown it as well as the rest."

Valazé. "Plan of a constitution, or revision of the constitution, signed by Lafayette, addressed to Louis Capet, April 6th 1790, marked in the margin with a line in his own handwriting."

Louis. "These things have been blotted out by the constitution."

Valazé. "Do you know this writing?"

Louis. "I do not."

Valazé. "Your marginal comments?"

Louis. "I do not."

Valazé. "Letter of Laporte of the 19th of April, marked in the margin by Louis Capet April 19, 1791, mentioning a conversation with Rivarol."

Louis. "I disown it."

Valazé. "Letter of Laporte, marked April 16, 1791, in which it seems complaints are made of Mirabeau, the abbé Perigord, André, and Beaumetz, who do not seem to acknowledge sacrifices made for their sake."

Louis. "I disown it likewise."

Valazé. "Letter of Laporte of the 23d of February 1791, marked and dated in the handwriting of Louis Capet; a memorial annexed to it, respecting the means of his gaining popularity."

Louis. "I know neither of these pieces."

Valazé. "Several pieces without signature, found in the castle of the Thurières, in the gap which was shot in the walls of the palace, relating to the expenses to gain that popularity."

President. "Previous to an examination on this subject, I wish to ask a preliminary question: Have you caused a press with an iron door to be constructed in the castle of the Thurières, and had you your papers locked up in that press?"

Louis. "I have no knowledge of it whatever."

Valazé. "Here is a day-book written by Louis Capet himself, containing the pensions he has granted out of his coffers from 1776 till 1792, in which are observed some douceurs granted to Acluque."

Louis. "This I own, but it consists of charitable donations which I have made."

Valazé. "Different lists of sums paid to the Scotch companies of Noailles, Gramont, Montmorency, and Luxembourg, on the 9th of July 1791."

Louis. "This is prior to the epoch when I forbade them to be paid."

Pres. "Louis, where had you deposited those pieces which you own?"

Louis. "With my treasurers."

Valazé. "Do you know these pension-lists of the life-guards, the one hundred Swiss, and the king's guards for 1792?"

Louis. "I do not."

Valazé. "Several pieces relative to the conspiracy of the camp of Jales, the original of which are deposited among the records of the department of L'Arrêche."

Louis. "I have not the smallest knowledge of them."

Valazé. "Letter of Bouillé, dated Mentz, bearing an account of 993,000 livres received of Louis Capet."

Louis. "I disown it."

Valazé. "An order for payment of 168,000 livres, signed Louis, indorsed Le Bonnevis, with a letter and billet of the same."

Louis. "I disown it."

Valazé. "Two pieces relative to a present made to the wife of Polignac, and to Lavanguy and Choisel."

Louis. "I disown them as well as the others."

Valazé. "Here is a note signed by the two brothers of the late king, mentioned in the declaratory act."

Louis. "I know nothing of it."

Valazé. "Here are pieces relating to the affair of Choisel Coussier at Constantinople."

Louis. "I have no knowledge of them."
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June 26, 1793. Louis. "Here is a letter of the late king to the bishop of Clermont, with the answer of the latter, of the 16th of April 1793."

President. "Do you not acknowledge your writing and your signet?"

Louis. "I do not."

President. "The seal bears the arms of France."

Louis. "Several persons made use of that seal."

Valence. "Do you acknowledge this list of sums paid to Gilles?"

Louis. "I do not."

Valence. "Here is a memorandum for indemnifying the civil list for the military pensions; a letter of Dumaresq St Leon, which relates to it."

Louis. "I know none of those pieces."

He is allowed to nominate his own counsel;

When the whole had been investigated in this manner, the president, addressing the king, said, "I have no other questions to propose—have you any thing more to add in your defence?"—"I desire to have a copy of the papers (replied the king), and of the papers on which it is founded. I also desire to have a counsel of my own nomination." Barrere informed him, that his two first requests were already decreed, and that the determination respecting the other would be made known to him in due time.

It would have been an excess of cruelty to refuse a request so reasonable in itself; it was therefore decreed that counsel should be allowed to the king, and his choice fell upon M. M. Tronchet, Lamoignon, Maleherbes, and Deszeze; he had previously applied to M. Target, who excused himself on account of his age and infirmity. On the 26th of December, the king appeared for the last time at the bar of the convention; and M. Deszeze read a defence which the counsel had prepared, and which was equally admired for the solidity of the argument and the beauty of the composition.

When the defence was finished, the king arose, and holding a paper in his hand, pronounced in a calm manner, and with a firm voice, what follows:—"Citizens, you have heard my defence; I now speak to you, perhaps for the last time, and declare that my counsel have asserted nothing to you but the truth; my conscience approaches me with nothing. I never was afraid of having my conduct investigated; but I observed with great uneasiness, that I was accused of giving orders for shedding the blood of the people on the 16th of August. The proofs I have given through my whole life of a contrary disposition, I hoped would have saved me from such an imputation, which I now solemnly declare is entirely groundless."

The discussion was fatally closed on the 16th of January. After a sitting of near 34 hours, the punishment of death was awarded by a small majority of the convention, and several of these differed in opinion from the rest, respecting the time when it should be inflicted; some contending that it should not be put in execution till after the end of the war, while others proposed to take the sense of the people, by referring the sentence to the primary assemblies.

M. Deszeze then solemnly invoked the assembly in the name of his colleague, to consider by what a small majority the punishment of death was pronounced against the dethroned monarch. "Do not afflict France (added this eloquent advocate) by a judgment that will appear terrible to her, when five voices only were presumed sufficient to carry it." He appealed to eternal justice, and sacred humanity, to induce the convention to refer their sentence to the tribunal of the people. "You have either forgotten or destroyed (said the celebrated M. Tronchet) the lenity which the law allows to criminals, of requiring at least two-thirds of the voices to constitute a definitive judgment."

The sentence was ordered to be executed in twenty-four hours.

The king and his family had been for some time kept separate from each other; but he was now allowed to see them, and to choose an ecclesiastic to attend him. The meeting, and, above all, the separation from his family, was tender in the extreme. On Monday the 21st January, at eight o'clock in the morning, the unfortunate monarch was summoned to his fate. He ascended the scaffold with a firm air and step. Raising his voice, he said, "Frenchmen, I die innocent; I pardon all my enemies; and may France"—at this instant the inhuman Sanseres ordered the drums to beat, and the executioners to perform their office. When they offered to bind his hands, he started back as if about to resist; but recollected himself in a moment, and submitted.

When the instrument of death descended, the priest exclaimed, "Son of St Louis, ascend to heaven." The bleeding head was held up, and a few of the populace shouted Vive la Republique. His body was interred in a grave that was filled up with quicklime, and a guard placed around till it should be consumed.

Thus fell Louis XVI. He possessed from nature a good understanding, which, however, was blunted by the unfortunates of a court. He had a strong sense of justice, and his humanity was perhaps extreme. One defect rendered his virtues of little value, which was the possession of an irresolute and unsteady character. Unambitious, and easily advised, he was without difficulty induced to change his purposes, especially by his queen, whose connexion with the house of Austria had always tended to render his counsels unpopular. Whether he was or was not connected with the foreign invaders of his country, posterity must decide; but all men of sense and moderation must be convinced of whose was murdered by a band of ruffians. Indeed a sentence so infamous, and in all respects unjust, is not to be found in the records of history. The greater part of the charges brought against him were trivial. Those which seem to be of importance relate to conduct authorized by the constitution under which he acted; and that constitution declared his person inviolable. The severest punishment that he could incur by law, was not death, but deposition; and there is no doubt, that in putting him to death the French nation broke the social compact which their representatives made with him. In a political view, this tragic event was injurious to the republican cause throughout Europe. No man out of France ventured to justify it; and in all countries it excited the most violent indignation against the rulers of the new republic.

New enemies were now hastening to join the general league against France. We do not mean here to enter into a detail of the political struggles that occurred in any other country, that is, in the narrative of whose revolution we are now engaged. It will therefore only be necessary to remark in general, that the British government at this time thought itself endangered by the propagation of those speculative opinions which had overturned...
overturned the French monarchy. Almost all the men of property in the kingdom concurred with the ministry in thinking a war with France necessary for the purpose of securing the constitution at home. After the 10th of August the British minister had been recalled; but the new republic still suffered the former ambassador from France, M. Chauvelin, to remain in England.

The ostensible grounds of quarrel on the part of Great Britain were chiefly two; the decree of the 15th of November 1792, by which it was truly observed that encouragement to rebellion was held out to the subjects of every state, and that war was thereby waged against every established government. Of this decree the French executive council gave explanations, denying the fairness of the interpretation put upon it, and alleging, that the intention of the convention was only to give aid to such countries as had already acquired their freedom, and by a declaration of the general will requested aid for its preservation. But this explanation cannot be admitted. The decree expressly says, that the French nation will grant assistance to all who wish to procure liberty; and when it is considered what their notions of liberty are, it cannot be doubted but that their intention was to excite rebellion in foreign nations. The second point of dispute referred to the opening of the Scheldt. This river runs from Brabant through the Dutch territory to the sea. The Dutch had shut up the mouth of it, and prevented any maritime commerce from being carried on by the people of Brabant by means of the river. To render themselves popular in Brabant, the French had declared that they would open the navigation of the Scheldt. But Great Britain had some time before bound herself by treaty with the Dutch to assist them in obstructing this navigation, and now declared to the French, that the project of opening the Scheldt must be renounced if peace with Great Britain was to remain. The French alleged, that by the law of nations navigable rivers ought to be open to all who reside on their banks; but that the point was of no importance either to France, as it was of very little importance to her commerce, or to Holland; that if the people of Brabant themselves chose to give it up, they would make no objection. It has been thought remarkable, that the Dutch gave themselves no trouble about the matter. They did not ask the assistance of England; and with that coolness which is peculiar to their character, the merchants individually declared, that if the Scheldt was opened, they could manage their commerce as well at Antwerp as at Amsterdam. But in all this there is nothing strange. Among the Dutch were many republicans, who wished for the downfall of the stadtholder. These rejoiced at every thing which distressed him, or had a tendency to render his office useless in the eyes of the people. Others, who thought differently, were afraid to speak their sentiments, as Dumourier was in their neighbourhood with a victorious army. The result of the whole was, that M. Chauvelin was commanded by the British government to leave this country. The French executive council gave powers to another minister, M. Mare, to negotiate, and requested a passport for him; but he was not suffered to land. The haughty republicans having thus far humbled themselves before the British government, at last, on the 1st of February 1793, on the motion of Brissot, the national convention decreed, among other articles, that "George king of England had never ceased since the revolution of the 10th of August 1792 from giving to the French nation proofs of his attachment to the concert of crowned heads; that he had drawn into the same lake the stadtholder of the United Provinces; that, contrary to the treaty of 1783, the English ministry had granted protection to the emigrants and others who have openly appeared in arms against France; that they have committed an outrage against the French republic, by ordering the ambassador of France to quit Great Britain; that the English have stopped divers boats and vessels laden with corn for France, whilst, at the same time, contrary to the treaty of 1786, they continue the exportation of it to other foreign countries; that to thwart more efficaciously the commercial transactions of the republic with England, they have by an act of parliament prohibited the circulation of assignats. The convention therefore declare, that in consequence of these acts of hostility and aggression, the French republic is at war with the king of England and the stadtholder of the United Provinces."

The absurdity of pretending that any treaty with France made in 1783 could be violated by protecting the emigrants who fled from the fury of the convention, must be obvious to every reader. The convention was itself a rebellious usurpation of the government with which such a treaty was made. The prohibition of assignats was certainly contrary to no law, and was sanctioned by every motive of expediency, unless the convention could prove that all nations were bound by the law of nature to risk their own credit upon the credit of the French republic. About a fortnight after this absurd declaration against Great Britain, war was likewise declared against Spain; and Spain in the course of the summer France was at war with all Europe, excepting only Switzerland, Sweden, Denmark, and Turkey.

In the mean time General Dumourier, who was proceeding agreeable to his orders, made an attack upon Holland; but in doing this he dispersed his troops in such a manner as to expose them much to any attack on the side of Germany. He commanded General Miranda to invest Maestricht, while he advanced to block up Breda and Bergen-op-Zoom. The first of these places, viz. Breda, surrendered on the 24th of February; Klundert was taken on the 26th; Gertruydenberg on the 4th of March. But here the triumphs of Dumourier ended. The sieges of Williamstad and Bergen-op-Zoom were vigorously but unsuccessfully pressed. On the 1st of March General Clairfait having passed the Roer, attacked the French posts, and compelled them to retreat with the loss of 2000 men.

The following day the archduke attacked them anew with considerable success. On the 31 the French were driven from Aix-la-Chapelle, with the loss of 4500 men killed and 1600 taken prisoners.

The siege of Maestricht was now raised, and the French retreated to Tongres, where they were also attacked, and forced to retreat to St Tron. Dumourier here joined them, but did not bring his army along with him from the attack upon Holland. After some skirmishes, a general engagement took place at Neerwinden. It was fought on the part of the French with great obstinacy; but they were at length overpowered by the number of their enemies, and perhaps also by the treachery of their commander. This defeat was fatal. The French lost 3000 men, and 6000 immediately
About the middle of March they advanced against France to the amount of 40,000. In the beginning of April they defeated the republicans in two pitched battles, and possessed themselves of 50 leagues of country. They even threatened by their own efforts to shake the new republic to its foundation. On the 9th Congress of April a congress of the combined powers assembled at Antwerp. It was attended by the prince of Orange and his two sons, with his excellency Vander Spelen on the part of Holland; by the duke of York and Lord Auckland on the part of Great Britain; by the prince of Sax Cobourg, Counts Monteurich, Staremburg, and Mercy Dargenteau, with the Prussian, Spanish, and Neapolitan envoys. It was here determined to commence active operations against France. The prince of Cobourg's proclamation was recalled, and a scheme of conquest announced.

Commissioners from the convention now set up the standard of the republic anew, and the scattered battalions flocked around it. General Dampierre was appointed commander, and on the 13th he was able to resist a general attack upon his advanced posts. On the 14th, his advanced guard yielded to superior numbers, but on the 15th was victorious in a long and well-fought battle. On the 23d, the Austrians were again repulsed, and on the 1st of May General Dampierre was himself repulsed in an attack upon the enemy. On the 8th, another engagement took place, in which the French general was killed by a cannon ball. On the 24th, a very determined attack was made by the allies upon the French fortified camp of Fornars, which covered the town of Valenciennes. The French were overcome, and in the night abandoned their camp. In consequence of this the allies were enabled to commence the siege of Valenciennes; for Condé had been blockaded from the first of April.

About the same time General Custine on the Rhine made a violent but unsuccessful attack upon the Prussians, in consequence of which they were soon enabled to lay siege to Mentz. The Corsican general Paoli revolted at this period; and the new republic, assaulted from without by the whole strength of Europe, was undermined by treachery and faction within.

While the country was in a state verging upon utter ruin, parties in the convention were gradually waxing more in their animosity; and regardless of what was passing at a distance, they seemed only anxious for revolution—the extermination of each other. In the month of May tribunals were established for the purpose of trying crimes committed against the state; and the Girondist party, the mildness of whose administration had contributed not a little to increase the evils of their country, began to see the necessity of adopting measures of severity. But the public calamities, which now rapidly followed each other in succession, were ascribed by their countrymen to their imbecility or perfidy. This gave to the party of the Mountain a fatal advantage. On the 15th of April the commune of the 48 sections of Paris presented a petition, requiring that the chiefs of the Girondists therein named should be impeached and expelled from the convention. This was followed up on the 1st of May by another petition from the suburb of St Antoine. The Girondist party in the mean time impeached Marat, but he was acquitted by the jury at his trial. The
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Prince Cobourg and General Clairfait in the mean time unsuccessfully attempted to besiege Cambrai and Bouchain. Queuesy was, however, taken by General Clairfait on the 11th of September; and here finally terminated for the present campaign the success of the allies in the Netherlands.

A considerable part of the French army of the north took a strong position near Maubeuge, where they were blockaded by Prince Cobourg; but upon the 15th and 16th of October he was repeatedly attacked by the French troops under General Jourdan, who succeeded Houchard. The French had now recovered their vigour. They brought into the field a formidable train of artillery, in which were many 24 pounders. Commissioners from the convention harassed the soldiers, threatened the fearless, and applauded the brave. Crowds of women, without confusion, went through the ranks, distributing spirituous liquors in abundance, and carrying off the wounded. The attacks were repeated and terrible on both sides; but the Austrians had considerably the disadvantage, and Prince Cobourg retired during the night. The French now menaced maritime Flanders. They took Furnes and besieged Nieuport. A detachment of British troops ready to sail to the West Indies were hastily sent to Ostend, and prevented for the present the farther progress of the French.

Such was the multiplicity of the events that now occurred in France, that it is difficult to state the outlines of them with any tolerable perspicuity. We have already mentioned the extensive dissensions that occurred throughout the republic in consequence of the triumph of the Mountain party on the 31st of May. The department of Calvados was first in arms against the convention, under the command of General Felix Wimpfen; but before the end of July the insurrection was quieted, after a few slight skirmishes. But the federal Lyon became the scene of the cities of Marseilles, Lyons, and Toulon, still besieged. Lyons was attacked on the 8th of August by the conventional troops. Several actions followed, and which were attended with great loss both on the part taken of the assailants and of the besieged. The city was reduced almost to ruins; but it held out during the whole month of September. The besieging general Kellerman was removed from his command, on account of his supposed inactivity; and the city surrendered on the 9th of October to General Doppet, a man who had lately been a physician. Such was the rage of party Unrestrained at this time, that the walls and public buildings on either of the conquerors of Lyons were ordered to be destroyed, and its name changed to that of Ville Affranchie. Many hundreds of its citizens were dragged to the scaffold on account of their alleged treasonable resistance to the convention.

The victorious party, wearied by the slow operation of the guillotine, at last destroyed their prisoners in multitudes, by firing grape-shot upon them. Such indeed was the unrelenting character of the Mountain at this time, not only here but through the whole republic, that they themselves pretended not to excuse it, but declared that terror was with them the order of the day.

In the end of July General Carteaux was sent against the Marbellese. In the beginning of August he gained several some successes over the advanced federalist troops. On the 24th he took the town of Aix, and the Marbellese submitted.
Louis XVII. General Wurzner refused to accept of it upon these terms, insisting upon an absolute surrender to his Imperial Majesty. In consequence of the delay occasioned by disagreement, the negotiation was discovered, and the citizens of Strasbourg, engaged in the plot were seized by St Just and Lebas, commissioners from the convention, and brought to the scaffold. Prodigious efforts were now made by the French to recover their ground in this quarter. General Kremberg was shot at the head of the army on the 9th of November, upon a charge, probably ill-founded, of treachery in the affair of the lines of Weissembourg. On the 14th, however, Fort Louis was taken by the allies, not without suspicion of treachery in the governor. But here the success of General Wurzner might be said to terminate. On the 21st the republican army drove back the Austrians, and penetrated almost to Hagenaus. An army from the Moselle now advanced to co-operate with the army of the Rhine. On the 27th the Prussians were defeated near Sarbruck. Next day their camp at Blescadel was stormed, and the French advanced to Deux Ponts. On the 29th and 30th the French were repulsed with great loss in two violent attacks made on the duke of Brunswick near Lautern. But it now appeared that the French had come into the field with a determination to conquer whatever it might cost. Every day was a day of battle, and torrents of blood were shed on both sides. The allies had the advantage of possessing the ground, which, in that quarter, at such a late season of the year, is very strong on account of its inequalities and morasses. In military skill, the French officers and those of the allies were perhaps nearly equal; but the French army was by far the most numerous; and although not a match in point of discipline, yet it derived no small superiority from the enthusiasm with which the troops were animated. On the 8th of December, under the command of General Pichegru, the French carried the redoubts which protected Hagenaus by means of the bayonets.

This modern instrument of destruction, against which no defensive weapon is employed, is always most successful in the hands of the most intrepid; and it was now a dreadful engine in the hands of French enthusiasm. The finest troops that ever Europe produced were unable to withstand the fury of the republicans, which seemed only to increase in proportion to the multitude of companions that they lost. On the 22d the allies were driven with immense slaughter from Hagenaus, notwithstanding the immense works they had thrown up for their defence. The entrenchments on the heights of Reishoffen, Jaudershoffen, &c. were considered as more impregnable than those of Jemappes. They were stormed by the army of the Moselle and the Rhine, under Generals Hochie and Pichegru. On the 23d and 24th, the allies were pursued to the heights of Wrotte. On the 26th, the entrenchments were forced by the bayonet, after a desperate conflict. On the 27th, the republican army arrived at Weissembourg in triumph. General Wurzner retreated across the Rhine, and the duke of Brunswick hastily fell back to cover Mentz. The blockade of Landau, which had lasted four months, was raised. Fort Louis was evacuated by the allies, and Kaiserslatter, Germersheim, and Spires, submitted to the French.—During this last month of the year 1793, the loss of men on both sides in this quarter was immense, and unsurpassed in the history of modern war. It is even said that it might amount to more than 70,000 or 80,000 men.

Thus far we have attended to the military affairs of the republic for some time past. Very violent efforts were in the mean time made at Paris by the new administration, established under the auspices of the Jacobin party, club, and of the party called the Mountain. The new republican constitution had been presented to the people in the primary assemblies, and accepted. The business, therefore, for which the convention was called together, that of forming a constitution for France, was at an end; and it was proposed that they should dissolve themselves, and ordain a new legislative body to assemble, according to the rules prescribed by that constitution. This was, no doubt, the regular mode of procedure; but the ruling party considered it as hazardous to convene a new assembly, possessing only limited powers, in the present distracted state of the country. It was indeed obvious, that France at this time stood in need of a dictatorship, or of a government possessed of more absolute authority than can be enjoyed by one that acts, or even pretends to act, upon the moderate principles of freedom. It was therefore determined that the convention should remain undissolved till the end of the war; and that a revolutionary government, to be conducted by its members, should be established, with uncontrolled powers. Committees of its own body were selected for the purpose of conducting every department of business. The chief of these committees was called the committee of public safety. It superintended all the rest, and gave to the administration of France all the secrecy and dispatch which have been accounted peculiar to a military government, together with a combination of skill and energy hitherto unknown among mankind. A correspondence was kept up with the all Jacobin clubs throughout the kingdoms. Convenues from the convention were sent into all quarters, with unlimited authority over every order of persons. Thus a government possessed of infinite vigilance, and more absolute and tyrannical than that of any single despot, was established; and the whole transactions and resources of the state were known to the rulers. On the 23rd of August, Barrere, in name of the committee of public safety, procured the celebrated decree to be passed for placing the whole French nation in a state of requisition for the public service. "From this moment (says the decree) till that when all enemies shall have been driven from the territory of the republic, all Frenchmen shall be in permanent readiness for the service of the army. The young men shall march to the combat; the married men shall forge arms, and transport the provisions; the women shall make tents and clothes, and attend in the hospitals; the children shall make list of old linen; the old men shall cause themselves to be carried to the public squares, to excite the courage of the warriors, to preach hatred against the enemies of the republic; the cellars shall be washed to procure saltpetre; the saddle-horses shall be given up to complete the cavalry; the unmarried citizens, from the age of 18 to 25, shall march first, and none shall send a substitute; every battalion shall have a banner, with this inscription, The French nation risen against tyrants." The decree also regulates the mode of organizing this mass. A decree more tyrannical
France.

France.

1794.

A piece of silver coin weighing a centime, and a
franc of silver, according to the former standard, will
be worth 40 sols 10½ deniers. The milliare, or thou-
sand metres, is substituted for the mile; and the ard
are for the argent in land-measure. The latter two are
to each other as 49 to 25. The astronomical circles
with which M. M. de Borda and Cassini made the ob-
servations, are divided according to this plan. The
quadrate contains 100 degrees, and each degree 100
minutes. Hence the minute of a great circle on our
globe is equal to a milliare, or to the French mile. If,
for the reduction of this measure, we estimate the Paris
toise, according to the comparison made with the stand-
ard kept in the Royal Society of London, at 6.3925
English feet, the milliare or minute will be equal to
1003.653 yards, and the metre 3.270899 feet.

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A new kalender formed.

At the same period a new calendar was formed.—
By it the year is made to begin with the automnal
equinox, and is divided into 12 months. These are
called Vindemiaire, Brumaire, Primaire, Nivose, Vente-
ose, Pluviouse, Germinal, Floréal, Prairial, Messidor,
Thermidor, and Fructidor. The months consist of 30
days each, and are divided into three decades. The
days of each decade are known by the names of Pri
des, Duodecim, Triduum, etc. to Decies; and the day of rest is
appointed for every tenth day, instead of the seventh.
The day (which begins at midnight) is distributed into
ten parts, and these are decimally divided and subdi-
vided. Five supernumerary days are added every year
after the 30th of Fructidor. To this is given the
absurd appellation of Sans Calendres, a word borrowed
from a term of reproach (sans culotte), which had
often been bestowed on the republican party from the
meanness of their rank and fortune; but which that
party now attempted to render honourable and popular.
The childish folly of this innovation has struck every
person with surprise, as it can serve no good purpose
whatever. It is a wonderful instance of the wayward-
ness of the human mind, which can occupy itself one
moment with deeds of savage barbarity, and the next
with a matter so unimportant as the artificial division
of time.

Decay of religion.

The religion of France had been gradually losing its
influence; and on the 7th of November, Gobet, bishop of
Paris, along with a great multitude of other ecclesi-
sastics, came into the hall of the convention, and solemn-
ly resigned their functions and renounced the Christian
religion. All the clergymen, whether Protestant or
Catholic, that were members of the convention, followed
this example, excepting only Greigore, whom we for-
merly mentioned as having been one of the first priests that
joined the Tiers État after the meeting of the States General.
He had the courage to profess himself a Christian, although he said that the emoluments of his bishopric were at the service of the republic. With the acclamations of the convention, it was decreed that the
only French deities hereafter should be Liberty, Equality, Reason, &c. and they would seem to have conse-
crated these as a kind of new objects of worship.—

What political purpose the leaders in the convention
intended to serve by this proceeding does not clearly
appear; unless, perhaps, their object was to render the
French manners and modes of thinking so completely
new, that it should never be in their power to return to
the state from which they had just emerged, or to unite
in intercourse with the other nations of Europe. The
place, however, could not at once relinquish entirely
the religion of their fathers. The commune of Paris
ordered the churches to be shut up, but the convention
found it necessary to annul this order; and Robespierre
gained no small degree of popularity by supporting the
liberty of religious worship on this occasion. Her
t and Fabre d'Églantine, who led the opposite party,
hastened their own fall by this ill-judged contempt of
popular opinion.

For, now that the republic saw itself successful in Quarrels
all quarters, when the Mountain party and the Jacobins
had no rival at home, and accounted themselves in no danger
from abroad, they began to split into factions, and the fiercest
jealousies arose. The Jacobin club was the usual place in which their contests were carried on; and at this time Robespierre acted the part
of a mediator between all parties. He attempted with
great art to turn their attention from private animosities
to public affairs. He spread a report that an invasion
of Great Britain was speedily to take place. He there-
fore proposed that the Jacobin club should set themselves
to work to discover the vulnerable parts of the British
constitution and government. They did so: They
made speeches, and wrote essays without number. And
in this way was the most fierce and turbulent band of
men that ever perhaps existed in any country occupied
and amused for a very considerable time. What is no
less singular, a great number of British subjects favour-
ed the plans of these reforming Atheists, and, under the
spacious appellation of the Friends of the People,
acted in concert with the French Jacobins.

The winter passed away in tolerable quietness, and a provi-
nal military enterprise was undertaken either by the
allies or by the French. On the 1st of February, the
minister of Barrere asserted in the convention that the confederate repub-
lics were willing provisionally to acknowledge this tie by the
French republic, to consent to a cessation of hostilities
for two years, at the end of which a lasting peace should
be ratified by the French people. But this proposal
the convention declared itself determined to reject, as
affording to the other nations of Europe the means of
undermining their new government. In the mean time, Vigorous
the revolutionary government was gradually becoming state of the
more vigorous. Thirty committees of the convention
managed the whole business of the state, without shar-
ing much of the direct executive government, which
was vested in the committee of public safety. These dif-
ferent committees were engaged in the utmost variety of
objects. The ruling party had no competitors for
power. Without confusion or opposition, therefore, the
most extensive plans were rapidly carried into effect.
The convention was little more than a court in which
every project was solemnly registered. In the same ses-
sion 30 decrees would sometimes be passed upon objects
the most widely different. The finances were under
one committee, at the head of which was Cambon. The
French committee found resources for the most lavish
expenditure of
penditure. The assignats were received as money the en-
the whole state; and thus a paper mill was said to
become a more valuable than a mine of gold. Their
ings were under
their real
The credits were regulated by an arbitrary law fixing the nation.
maximum or highest price of provisions, and by the
immense mass of wealth which had come into the hands
of the convention by seizing the church lands, and by
confiscating
The French now commenced their active operations. On the morning of the 26th of April they attacked the duke of York near Cateau in great force. After a severe conflict they were repulsed, and their general Chapuy was taken prisoner. At the same time they attacked the troops under his imperial majesty, but were there also repulsed in a similar manner; losing in all 57 pieces of cannon. On the same day, however, General Pichegru advanced from Lisle, attacked and defeated General Clairfait, with 32 pieces of cannon, and, in the course of a few days, made himself master of Vervic, Menin, and Courtray. On the 29th of April, the garrison of Landrecies surrendered to the allies. When this event was known in the convention, it excited a considerable degree of alarm. It was, however, the last effectual piece of success enjoyed by the allies during this disastrous campaign. General Clairfait was again completely defeated by Pichegru in a general engagement; and it was found necessary to send the duke of York to his assistance. This movement was no doubt unavoidable; but the effect of it was, that it split down the allied army into a variety of portions, capable of carrying on a desultory warfare, but unfit for the vigorous objects of conquest. On the 10th of May the duke of York was attacked near Tournoy by a body of the enemy, whom he repulsed; but he was unable to join Clairfait, upon whose destruction the French were chiefly bent: for at the same time the duke of York was engaged by the attack upon himself. Pichegru fell upon Clairfait with such irresistible impetuosity, that he was compelled to retreat in confusion, and a part of his army appears to have fled to the neighbourhood of Bruges. While Pichegru was thus advancing successfully in West Flanders, General Jourdan advanced in East Flanders from Maubeuge, crossed the Sambre, and forced General Kaunitz to retreat. On the 18th, however, General Kaunitz succeeded in repulsing the enemy in his turn, and they re-crossed the Sambre with considerable loss.

The allies now found that no progress could be made in France while General Pichegru was advancing successfully and occupying West Flanders in their rear. The emperor, therefore, withdrew the greater part of his army to the neighbourhood of Tournoy, and resolved to make a great effort to cut off the communication between Courtray and Lisle, thus to prevent completely the retreat of Pichegru. On the night of the 16th, the army moved forwards in five columns for this purpose. Clairfait was at the same time directed to cross the Lys, to effect a general junction, if possible, and complete the plan. The attempt during that evening seemed to promise success; but, in the course of next day, the division under the duke of York was overpowered by numbers and defeated. The progress of the rest of the columns was stopped, and Clairfait completely defeated. In the confusion of the day, when attempting to rally the different parts of the division which he commanded, the duke of York was separated from his own troops by a party of the enemy's cavalry, and only escaped being made prisoner by the swiftness of his horse. The plan of the allies being thus frustrated, their army withdrew to the neighbourhood of Tournoy.

Pichegru speedily attempted to retaliate against the allies. On the 22d of May he brought down at daybreak his whole force against them. The attack was commenced by a heavy fire of artillery, and all the advanced posts were forced. The engagement soon became general; the attacks were repeatedly renewed on both sides; the whole day was spent in a succession of obstinate battles. All that military skill could do was performed on both sides. The French and the allied soldiers fought with equal courage and equal discipline. At nine o'clock in the evening the French at last reluctantly withdrew from the attack. The day on which a vanquished enemy flies from the field is not always that on which the victory is won. In this engagement the French were unsuccessful in their immediate object; but the weight of their fire, their steady discipline, and their violent obstinacy of attack, raised their military character high in the estimation of the officers and soldiers of the allied army. It was soon perceived, that in addition to these they possessed other advantages. Their numbers were immense; they implicitly obeyed their generals; who, being men newly raised from the rank of subalterns, as implicitly submitted to the directions of the committee of public safety. A combination of efforts was thus produced, whose operation was not retarded by divided counsels. On the other side the numbers of the allies were daily declining; their leaders were independent princes or powerful men, whose sentiments and interests were often very hostile to each other, and their exertions were consequently insufficent.

On the 24th the French again crossed the Sambre, but were driven back with much loss. On the 27th an attempt was made to besiege Charleroi, but the prince of Orange on the 30th compelled them to raise the siege. On the 12th a similar attempt was made, and they were again repulsed. In West Flanders, however, Pichegru was sufficiently strong to commence the siege of Ypres. He was soon attacked by General Clairfait for the purpose of relieving it, but without success. Ypres was garrisoned by 7000 men; reinforcements were therefore daily sent from the grand army to Clairfait for the purpose of relieving it. It is unnecessary to mention the bloody contests in which that unfortunate general was daily engaged with the French. It is sufficient to say, that they were uniformly unsuccessful, and were the means of wasting, in a great degree, the armies of the allies. Ypres held out till the 17th of June, when it capitulated; and such was the discipline of the French army at this time, that no notice could be obtained, for several days, of that event. But in consequence of this and other events, the duke of York found it necessary to retreat to Oudenarde; for Jourdan, after storming the Austrian camp...
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Mountain, by means of whom Robespierre had risen to power, with little satisfaction now found themselves not only disregarded, but ready at every instant to fall a sacrifice to that system of terror which they had contributed to erect. Even the Jacobins themselves, though neither timid nor cautious in the shedding of blood, began to murmur when they saw that awful privilege confined exclusively within a few hands, or rather monopolized by an individual. In this state things remained for some time; and it appeared how possible it was for an individual to govern a great nation, even while the whole of that nation is hostile to his power. The banishment or imprisonment of all foreigners, who had long been rigorously practised, prevents us from possessing much accurate information concerning the internal state of France at this period; but it is certain that one circumstance in particular tended much to accelerate the fall of Robespierre. He had procured a decree to be passed, authorizing the committee of public safety to imprison at its pleasure, and bring to trial, any member of the convention. All the individuals of that body found themselves responsible for this decree, and the hands of a man whose severe and suspicious temper they well knew. Still, however, they were so much surrounded by spies, that it was difficult to form a party or plan of operations; even the majority of the committee of public safety were among the number of the discontented, but they dared not to withstand their chief. At last, on the 25th of July, the convention began to give signs of agitation. It was understood, that in the course of a few days Robespierre would sacrifice a number of the members to his suspicions. On the following day the sitting of the convention was still more tempestuous. In a long speech Robespierre defended his own conduct against those who had reproached him with aspiring to the dictatorship of France. He attacked the party whom he styled Moderates, as wishing to overturn the revolutionary government, and to restore the feeble system of the Brissotines. The result of a long debate was, that Robespierre was apparently victorious, and his speech was ordered to be printed. On the 26th the convention appeared ripe for a change. St Just, a member of the committee of public safety, in attempting to defend Robespierre, was repeatedly interrupted; and Billaud Varennes stood forward, and enumerated the crimes, and proclaimed the tyranny, of Robespierre. The speech was received with bursts of applause. Robespierre in vain attempted to defend himself; he was silenced by shouts of execration from every part of the hall. Tallien seconded the former speaker in his accusation. The sitting was declared permanent, and a decree of arrest was passed against Robespierre and a younger brother of his, along with St Just, Couthon, and Lebas. These men left the convention, and found security in the hall of the commune of Paris; where the municipal officers agreed to protect and stand by them. The tocsin was sounded; the armed force was under their command; an insurrection was therefore attempted against the convention: but the sections of Paris refused their support. Very few of the troops could be collected, and these were not firm; the late tyranny had become odious. The hall of the commune was therefore speedily surrounded; and about three o'clock in the morning of the 28th Robespierre and his associates were made prisoners. They had been outlawed by the convention on account of their resistance. They were not therefore tried, unless for the purpose of identifying their persons; and, in the course of that day, they were executed; 60 of the municipal officers were also executed for joining in the rebellion; and in this way a storm passed over, which at one time threatened to involve the French capital in ruin, and filled all Europe with astonishment. Thus also terminated the career of the most extraordinary man that the French revolution had brought forward. His talents were undoubtedly considerable, and his ambition knew no bounds, bidding defiance to the ordinary feelings of humanity. Had Dumourier possessed his coolness and caution, or had he possessed the military talents of Dumourier, the convention would certainly have been overturned, and we should have seen a second Cromwell on the throne of his murdered sovereign.

After the fall of Robespierre, the convention exhibited no small change of appearance. Instead of that terror and silence which formerly prevailed, all was bustle and noise; all accused each other. There was no longer any leader, and there was no formed party. The former system of terror was declared to be at an end, and a new system of moderatism succeeded. This was carried to such a great height as the system of terror had formerly been; and all means were taken to render popular the fall of their late tyrant. The committees were organized anew, and their members ordered to be frequently changed. The correspondence between the affiliated Jacobin clubs was prohibited, and at last the Jacobin club itself was abolished. This last event was accomplished with ease; and that society which had been the great engine of the revolution, was itself without resistance overturned. Seventy-one deputies of the Girondist party, who had been imprisoned since the 31st of May 1793, were set at liberty. The name of Lyons was restored to it. Some of the agents of Robespierre were punished, particularly the infamous Carrier, whose cruelties in La Vendée we formerly mentioned. Still, however, the convention appeared so little united and so little decided with regard to objects of the first importance, that in all probability they would not have conducted the important struggle against the nations of Europe with more success than the Girondist party had formerly done, if the revolutionary government and the late system of terror had not already accumulated in their hands such vast resources, and traced out such a plan of procedure, as rendered it an easy matter to preserve their numerous armies in the train of success to which they were now habituated.

The allies in their retreat had left strong garrisons in the French towns which had surrendered to them. These were Condé, Valenciennes, Quесnoy, and Lens, strongly defended. They now surrendered to the republican armies with so little resistance, that the conduct of the emperor began to be considered as ambiguous, and he was suspected of having entered into some kind of correspondence with the French. This idea proved erroneous; and as soon as the army which had besieged these towns was able to join the grand army under Pichegru and Jourdan, the operations of the campaign were resumed after a suspension of almost two months. The French army divided itself into two bodies. One of these under Jourdan advanced against General Clairfait, who had succeeded the prince of Cobourg in the command...
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The diet of Ratisbon resolve on peace.

peace could not be obtained with France, while her government was subject to such perpetual changes. For instance, such was the enmity of the Mountain party against the Girondes, that any treaty entered into by the latter would have been trampled upon by the former: and such, it was observed, might continue to be the aspect of affairs in that distracted country for an indefinite length of time.

As the constitution which had been framed in the year 1793, during the tyrannical dominion of Robespierre, was justly deemed impracticable, a committee was appointed to frame one entirely new. It was composed of Sieyes, Cambacères, Merlin of Douai, Thibaudau, Mathieu, Le Sage of Eure and Loire, and Latouche. On the report of Cambacères, the 19th of April, that the committee thought that a commission should be appointed for this important business, a number of qualified persons were accordingly chosen, while all citizens were invited to communicate their sentiments upon the subject, and the committee was to give orders for the best plans to be published. The feelings of the nation at large received additional gratification from the conduct of the convention towards Fonquier Twinville the president, and 15 judges and jurors, of the revolutionary tribunal. They were fully convicted on the 8th of May, and executed on the 10th, launched into eternity amidst the just executions of a vast multitude of spectators.

Although the Jacobins were defeated on the 1st and insurrection of April, they did not consider themselves as entirely subdued. They were plotting a more extensive insurrection, which was not to be confined to the capital, and fixed on the 20th of May as the period of revolt. On the morning of that day, the town was accordingly sounded, and drums beat to arms in the suburb of St Antoine, in which the Jacobins had always enjoyed the greatest influence. Upon this the convention met; and although the insurrection was far from being a secret, the committee of public safety did not appear to have taken any measures to prevent it. It was only at the moment when the insurgents were approaching that General Hoche was appointed to the command of the armed force, and sent to collect the military and citizens for the protection of the convention. The hall was presently surrounded, the guards were overpowered, and the mob forced their way into the midst of the assembly. The multitude of women who met upon this occasion shouted for bread, and the constitution of 1793. Vernier, the president, a man far advanced in years, quitted the chair to Boissy d'Anglas, who kept it with commendable fortitude during the remainder of the day. The mob had cockades with this inscription upon them, "Bread, and the constitution of 1793." One of the party attached to the convention imprudently tore off the hat of one of the insurgents whom the multitude attacked with swords and as he fled towards the chair of the president, he was killed by a musket shot. The majority of the members gradually retired from this scene of lawless intrusion, and left the multitude masters of the hall. Four of the members who remained espoused the cause of the insurgents, whose triumph, however, was of very short continuance. A large body of the military and the peaceable citizens vanquished them in the evening, the powers of the majority were restored, and the four deputes
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certain that vast numbers had confined the two together, and given their approbation accordingly. Such was the rage of many against the convention in consequence of the decrees already mentioned, that it was even proposed to try the whole members before a new revolutionary tribunal, and punish each in proportion to his crime. The sections remonstrated against the decrees to the convention, and the more eager they appeared in the business, the more persuaded was the convention of its own imminent danger. Every remonstrance, however, was disregarded, and the contending parties formed the resolution of settling it by force of arms. About 100 electors of Paris met in the hall of the theatre in the suburb of St Germain before the day of meeting which had been appointed by the convention, and having chosen de Nivernois for their president, began their debates, absurdly concluding that the sovereignty was vested in the hands of the electors, after these had been chosen by the primary sections. A body of troops was sent to dissolve them as an illegal assembly, which was accomplished without any difficulty, the citizens not having been unanimous in their sentiments respecting it.

This, however, did not prevent the sections from presuming that by steady perseverance they would be finally victorious, having always found that the party favourable to the convention of the Parisian populace, had carried their point ever since the commencement of the revolution. The armed force with which the convention was surrounded gave the people very little alarm, as they endeavored to persuade themselves that the military could never be brought to act against the citizens. As the members of the convention also appeared to suspect their fidelity, they applied for assistance to those very Jacobins whom they had bumbled on the 24th of May. If the sections of Paris detested the members for their connexion with the atrocities of Robespierre, the Jacobins admired them from this very circumstance; a set of restless, bloody men, who were never satisfied with wars abroad nor revolutions at home. Hundreds of them were released from prison, and put in a state of requisition for assisting the legislative body.

The sections of Paris having beheld the convention surrounded by men who had justly obtained the apppellations of terrorists and men of blood, they exhibited a desire of engaging them which was altogether unbounded. Their leader designed to make the members prisoners, till they could be conveniently brought to trial, and in the interim conduct public affairs by committees of the sections, till a new legislative body could be chosen. General Miranda was to have the command of the armed force after the overthrow of the convention, but as it was still problematical which party would be triumphant, he retired to the country till the event should declare it, resolving to have the reward of a conquest to which he was to contribute nothing. The superior officers of the convention were unfaithful, yet the subalterns and soldiers might have continued firm, to which they would, no doubt, be strongly exhorted by their Jacobin auxiliaries. What was greatly in favour of the convention was, that the first moments of enthusiasm were permitted to pass away, after which the sections exhibited a conduct both undecided and weak.

Barra was appointed on the 4th of October by the convention to the command of the troops, Generals Menon, Raffet and some others, having been dismissed from office. Barras called in the aid of the most able officers, among whom we find Bruix and Bonaparte, and made speedy preparations for a vigorous defence. Troops with cannon were placed in every avenue leading to the Tuilleries, and masked batteries were placed in situations of a more retired nature, if any of these should happen to be forced. The precaution was also taken of transporting the provisions and military stores to St Cloud, if the convention should be obliged to retreat from Paris. On the 5th of October both parties continued on the defensive for several hours, but about three o'clock in the afternoon, overtures were made by the general of the insurgents, Danican, in which he declared that the intention of the citizens was for peace, only they apprehended a massacre to be begun by the armed terrorists surrounding the convention, and that if these were removed they would return to their duty; but it was resolved to try the issue of the dispute at the point of the sword, as the Jacobin party in the convention were now more fully persuaded of ultimate success. On this occasion the armed Jacobins without are generally understood to have been the first aggressors. The citizens on the south side of the river made an effort to reach the convention by the Quay de Voltaire, but were completely prevented by the cannon of the convention, while the conflict was extremely obstinate on the other side of the river, near the convention. After an engagement of four hours contiguity, the sections were repulsed, and driven to the post of St Roche, which being also taken after an obstinate resistance, the insurgents fled to their head quarters at the section of Pelletier; but the troops of the convention were, about midnight, in possession of the whole city.

The victors attributed this insurrection to the in-fan-ty of the royalists; and whether they were right Jacobins in their judgment or not, it is certain that the cause of the lead.
of the republic were conducted in silence along an unguarded quarter of the shore, and surprised one of the posts, where they found the artillerists asleep. They extinguished the lantern which was intended to give the British fleet the alarm, and seized on their matches. Some of the emigrants threw down their arms and joined the republicans, while others maintained an obstinate contest before they surrendered. Count de Sombreuil was taken and put to death, together with the bishop of Dol and his clergy, none being spared but such as pretended that their appearing against the republicans was purely owing to compulsion.

But to return to the affairs on the continent. The fort of Luxembourg surrendered on the 7th of June, after having been besieged since the preceding campaign, which put the French in possession of the whole left bank of the Rhine, Mentz only excepted, because the Austrians could conveniently supply it with every necessary from the opposite bank of the river. The republicans therefore determined to cross the river, to invest it on every side; but for some time the attempt was delayed, till the result of the Quiberon expedition should be fully known. The passage of the Rhine at Dusseldorf was effected by General Jourdan in the month of August, as commander of what was denominated the army of the Sambre and Meuse. Having driven three Austrian posts before him, he crossed the Maine, and invested Mentz and Cassel, and Pichegru at the same time took possession of Manheim, having crossed the river near that city with the army of the Rhine and Moselle. A strong detachment of this army having driven Marshal Wurmser from an important post, began to plunder, and consequently run into confusion, of which the Austrians took a proper advantage, returned to the charge, and the republicans were vanquished. Jourdan was pursued by Clairfait to Dusseldorf, where the former general made a stand, and Pichegru recrossed the Rhine near Manheim, leaving a garrison in that city of 8000 men, which, after a vigorous siege, surrendered to the Austrians; and the republicans were driven from the vicinity of Mentz. Little more was either lost or won by the contending parties at this time, and they mutually agreed to an armistice of three months.

The landgrave of Hesse Cassel entered into a treaty of peace with France on the 28th of August, which was agreed to, on condition that he would furnish Britain with no more troops during the war. Peace upon similar terms was granted to the elector of Hanover: and the duke of Wirtemberg and some other princes of the German empire began to treat; but the negotiations were broken off in consequence of the reverse of fortune which the French now experienced.

The directory, however, still resolved to prosecute the war with vigour, and therefore made vast preparations during the winter for another campaign. The Mountain party being again possessed of power, soon began to discover their restless, turbulent disposition, which could not long submit peaceably to any government whatever, and became disgusted with that very directory which they themselves had established. They were perpetually disturbing the public tranquillity. The people of Paris, after the 7th of October, durst not openly avow their abhorrence of the Jacobins, but it was understood that their wearing green cravats was a token of contempt. This piece of dress was prohibited by the directory as a mark of attachment to royalty. Of this they were soon ashamed, and recalled their edict in a few weeks. In the southern parts of France, the present authority of the Jacobins produced very serious effects. Freron, by whom they had been abandoned after the death of Robespierre, returned to their cause before the 5th of October, and was sent to Toulon with full powers of administration. He dismissed the municipality which had been chosen by the people, restored the Jacobin clubs, and every person whom he suspected he caused to be imprisoned. The directory was alarmed at the numerous complaints which were made from every quarter against the conduct of those turbulent and bloody men, and resolved to obtain the confidence and affection of the people by deserting them entirely. Freron was recalled from Toulon, and more moderate men were made choice of to succeed the restless, sanguinary Jacobins.

The directory also made a public declaration that its confidence had been abused. The police minister was charged with the removal from Paris of the members of former revolutionary tribunals, and such as were active leaders of the Jacobins. Ten thousand men, called the legion of police, who acted against the Parisians on the 7th of October, and were decidedly the favourers of the Jacobins, received orders from the directory and legislative body to join the armies on the frontier, which orders they refused to obey, but were compelled to submit by the interference of other troops brought from a distant quarter to provide against that event. This led the violent Jacobins to concert a plan for the ruin of the directory and the majority of the councils, who had now abandoned them. But as they were a considerable time in being ready for action, their designs were discovered and completely defeated. The guards were increased on the 10th of May, and bodies of cavalry were stationed round the Luxembourg and Thulleries. The council of five hundred was informed by the directory, that a terrible plot was ready to burst forth on the ensuing morning. The conspirators, at the ringing of the morning bell, were to proceed in small parties of three or four men each, to the houses of those persons whom they had singled out for destruction. Having murdered these, they were then to unite in one body against the directory, whose guard they conceived themselves qualified to vanquish. The Jacobins in the mean time had nominated a new directory and legislature, from among the most turbulent and abandoned of their own persuasion. Some of the leaders of this conspiracy were arrested, among whom was Drouet the postmaster of Varennes, who stopped the unfortunate Louis on his way to the frontiers, and with him ten others, who were condemned at Vendome, but Drouet made his escape.

These defects which the Jacobins experienced, and moderate the disgrace into which they were again brought, determined the moderate party in the two councils to attempt to procure the repeal of the concluding decrees of the convention, which had granted them an amnesty, and confirmed the laws against emigrants, excluding their friends from succeeding them. A number of days were employed in the discussion of these topics, but the moderate party gained nothing in favour of the emigrants, and nothing against the Jacobins but this, that such as owed their preservation to the amnesty, should
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Defiles of Millesimo forced by Angereau.

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France.
Such was the fame of Bonaparte as a general, on account of the victories he obtained over the Austrians, that his countrymen, the Corsicans, discovered an inclination to throw off the British yoke, and be united to France. They became of course, so mutinous, that the viceroy deemed it necessary to evacuate the island, the submission of Italy to the republic having greatly diminished its value. The imperial subjects of Italy, together with the inhabitants of Bologna, Ferrara, and Modena, now began to form themselves into republics, under the patronage of General Bonaparte; they sent deputies to the convention, raised troops, and abolished all orders of nobility.

The emperor soon after endeavoured to relieve Mantua, by sending another army into Italy, under the command of General Alvinzzi, who having crossed the Piava, was met by the republicans, and compelled to repass the river. Davidevitch with his division having driven the French down the Adda towards Verona, General Bonaparte found it necessary to concentrate his forces. He therefore left General Vaubois as a check to the progress of Davidevitch, and marched in person against General Alvinzzi, and was met by the Austrians at the village of Arcole. As this village could not be turned speedily, on account of a canal, the French were obliged to attempt the passage of a narrow bridge in the face of the Austrian fire. Their officers rushed to the head of the column which had undertaken it, but in vain endeavoured to rally them. Angereau advanced to the end of the bridge with a standard; but he was followed by none, when the commander in chief hastened to the bridge and exclaimed, Grenadiers, follow your general! They followed till within thirty yards of the bridge, when they were intimidated by the tremendous fire of the Austrians, and Bonaparté judged it proper to fall back. In the evening General Gueiux took the village at the head of 2000 men, but again left the Austrians in possession of it. On the 16th of November a desperate engagement took place in the vicinity of Arcole, and next day the Austrians pressing on the centre of the republican army, were unexpectedly taken on their flank by the left wing of the enemy, which was lying in ambush. Bonaparté sent a party of horse and 25 trumpeters round to the rear of the Austrians, who concluded from the terrible noise, that they were surprised, and fled on all sides in the utmost confusion.

Having driven Alvinzzi across the Brenta, Bonaparté returned; the positions of Rivoli and La Corona were resumed, and Davidevitch driven back into Tyrol. General Wurmser still defended Mantua during the remaining part of the year; so that nothing farther may be said to have been gained by so many victories, but to consider Bonaparté as their only invincible commander.

During these transactions in the field of battle, Great Britain made a laudable effort to negotiate with France. Passports were obtained from the directory, and Lord Malmesbury set out as ambassador to Paris. He began the negotiation with De la Croix, the minister for foreign affairs; but his lordship soon found that the directory had no serious intention of concluding a treaty with Britain. While the British ministry, as individuals, did not approve of a peace at that time, yet officially they considered it as proper, if it could be obtained up on honourable terms. It was proposed by Lord Malmesbury, that the principle of mutual restrictions should be agreed upon as the basis of the treaty, and the directory wished that the objects should be specified. Lord Malmesbury therefore said, that the French should give up the Austrian Netherlands, for which Britain would give up the foreign settlements belonging to the republic. Many of the Dutch possessions abroad were also to be relinquished, on condition that the authority of the stadtholder should be acknowledged. He was next required to give in the ultimatum of his conditions in 24 hours; and on complaining of this demand, he was informed on the 19th of December, that the directory would agree to no conditions repugnant to the French constitution; and he was informed that his farther residence was unnecessary.

During this year Great Britain maintained her customed superiority at sea. The Cape of Good Hope was taken by Admiral Elphinstone on the 16th of September 1795, which the Dutch were extremely anxious to recover, for which purpose they advanced money to the French to fit out a squadron to combine with them in an attempt to reduce it. Seven ships of war were sent to take the Cape, under the command of Admiral Lucas, but having been caught between two fires, he could not effect his escape, and therefore he surrendered to the British admiral without firing a gun.

Although Britain was superior by sea, yet an invasion of Ireland was attempted by the French in the end make an of 1796; but as fully seemed to have concerted the unsuccessful attempt on Ireland.

The French negociations between Britain and France.
FRANCE.

It was necessary that Bonaparte should once more force his way over the Alps, that immense chain of mountains which rises in the neighbourhood of Toulon, and stretching northward, obtains the names of Piedmont and Savoy. It then takes an easterly direction, forming the countries of Switzerland, Tyrol, Carinthia, and Carniola. The three last of these passing along the Adriatic, constitute the frontier, in this quarter, of the hereditary states of Austria. The fertile and level country, which belonged to Venice, lies between the mountains and the sea. It is crossed by many streams which are increased by the melting snows of the Alps, and whose peculiar characteristic is this, that they are greatest in summer, and least in winter.

The archduke, instead of making a stand in the defiles of the mountains, was sent into the plain to guard the passages of the rivers; a very important blunder which entered into the plan of defence adopted by the council of war at Vienna.

While Bonaparte continued to advance to the territories of the pope, the arrangement of the Austrian army was going forward along the eastern bank of the Piava. The republicans were on the opposite side, and Bonaparte, after quitting the papal territories, hastened to join them. Having effected the passage of the Piava on the 12th of March, the Austrians retired, skirmishing for some days, till they crossed the Tagliamento, where they halted with their whole force. The republican army reached, on the 17th, Valvesone, on the opposite side of the river, which after some hesitation they determined to cross. The stream having been diminished by the frost, the French crossed it in columns at different points. Joubert with the left wing received orders to pass along the valley of the river Drave, beyond the highest chain of the Noric Alps. Massena, at the head of the centre division, passed into the defiles of these mountains, and the right division, commanded by Bonaparte, marched along the coast of the Adriatic.

On the 19th, the town of Gradasca, with the river Lisonza, surrendered to the right wing of the army; and its garrison, consisting of 3000 men, were made prisoners. The same division entered Gorizia on the 21st, where it found the principal magistrate and hospitals belonging to the Austrians. Triesa was taken on the 23d, and materials worth 2,000,000 of lire were sent off by the French from the quicksilver mines of Ydria. On the 24th a large body of Austrians was confined by Massena, and a part of the right wing commanded by General Guieu; but they having procured reinforcements from the archduke, engaged the French next day, and were defeated, losing 500 prisoners and 400 baggage wagons. Equal success attended the left wing under Joubert, Baraguay d' Hilliers, and Delmas. Four thousand Austrians were taken on the banks of the Lavis, and they were defeated at Clauzen, with the loss of 1500 prisoners. This division then directed its march eastward, along the valley of the Drave, towards Clagenfurth, the metropolis of Carinthia, where it was met by General Massena, that officer having obliged the archduke to evacuate his headquarters, and proceed nearer to the capital of the empire, which now began to be in danger. In 15 days General Bonaparte took 20,000 prisoners, and effected the passage of the Alps, after which there was no place of sufficient strength to arrest his progress to Vienna.

Yet it must be confessed that his own situation was not free from danger, and therefore he prudently embraced this moment of unprecedented success to make overtures of peace. He wrote to the archduke on the 31st of March, deprecating the continuance of the war, and entreating him to use his influence for putting a period to its ravages. This prince evasively replied, that it did not belong to him to investigate the principles on which the war was carried on, and that he had no power to negotiate.

The Austrians raised the peasantry in the Tyrol, to Partial resumption of the rear of the French army, by which they gained some advantages under General Languis, and drove out the republican troops which had been left at Botzen and Brixen. The people of the Venetian states acted a similar part against the troops left in them, and with the assistance of 10 Scavonian regiments, they murdered every Frenchman they could find, not sparing even the sick in the hospitals, of whom 500 were massacred at Verona. The Austrians attempted to surround the invading army; but Bonaparte knew that the embassation of the court of Vienna was at least equal to his own. He was at the head of 95,000 men, bolder and irresistible; and the Austrians could not but know that to surround his army was not to vanquish it, on which account he persisted in advancing. On the 2d of April, after a bloody conflict, he forced the strong defiles between Freisch and Neumark, making 600 prisoners. His advanced guard reached Husmark on the 4th, where they again defeated the Austrians, which induced the cabinet of Austria to treat for peace, there being no place where the army of the archduke could make a stand, till it came to the mountains in the neighbourhood of Vienna. Bellegarde and Morved requested a suspension of hostilities from Bonaparte, while care was taken to remove the public treasures and effects into Hungary. The French commander consented, on condition of getting possession of Gratz and Leoben, about 50 miles from Vienna. This was on the 7th of April, and the armistice, which was to expire on the 15th, was afterwards renewed for a longer period. A preliminary treaty followed this on the 19th, by which the French were to retain the Austrian Netherlands, and the republic of Lombardy should be called the Cisalpine republic, comprehending the Milanese, Mantua, Modena, Ferrara, and Bolognese. Bonaparte consented to return to Italy, if his army should be supplied with provisions during its march, and all farther disputes were to be settled by a definitive treaty of peace. He brought an accusation against the Venetian government for conniving at the murder of the French during his absence, and having possessed himself of the city and territories, he dissolved that ancient aristocracy.

During the approach of Bonaparte towards Vienna, Peace con. the republican armies on the Rhine were pressing on the stabbed be- tween Austrians, that they might not have it in their power to send reinforcements against him. An armistice was offered by the Austrians, but since the French required Ehrenbreitstein as a compensation, both parties resolved to prosecute the war. The left wing of the army of General Hoche proceeded from Dusseldorf, while the centre and right wing crossed the river near Coblenz. On the 18th of April a fierce contest took place between France and Austria.
FRANCE.

1799.

It was refused by the French commander. Being driven from Capua, the only remaining post of any consequence in the territory of Naples, and being in the greatest danger from the disaffection of his troops, he surrendered himself and the officers of his staff to the republican general. The governor of Naples offered a contribution of money if the French troops would not enter that city, which was agreed to, and they remained at Capua. General Serrurier, at the head of a French column, drove the Neapolitans out of Leghorn, and took possession of that place.

Such is the mildness of the climate in the southern parts of Italy, that the people can subsist with fewer efforts of industry than in almost any other country of Europe. This naturally begets an indolent disposition, which is cherished by a number of charitable institutions originating from the Catholic religion. In Naples there had long been a body of men called Lazaroni, or beggars, amounting to the astonishing sum total of nearly 40,000, who entirely subsisted on charity. They frequently threatened the state if they did not receive an immediate supply of their wants, which procured them very liberal contributions. Having been informed that the French, wherever they came, destroyed all monasteries and other sources of charity, they determined to oppose them to the utmost of their power, and appear the advocates for royal government. In the beginning of January 1799, they exhibited marks of discontent, and at last broke out into an open insurrection. They appointed Prince Militoni their commander in chief, who made many fruitless efforts to restrain their violence and love of plunder. They declared war against the French, forced the prisons open, and murdered all who had been incarcerated for disaffection to the kingly government. Their ravages now became so dreadful and boundless, that Prince Militoni abandoned them, set out to Capua, and requested Championet to take possession of the city, in order to rescue it from utter destruction. It was agreed that a column of French troops should take a circuitous route, and enter the city from the opposite quarter. Before this plan could be carried into execution, two thirds of the Lazaroni marched out on the 15th and 20th of January, with the daring resolution to attack the French in the fortifications of Capua. Multitudes of them perished by the French artillery; and in order to favour the capture of Naples by the party sent on that expedition, Championet made no salvo upon them, but continued on the offensive. The Lazaroni being informed on the 21st that a French column had marched for Naples, returned to the city; and although Championet closely pursued them, they arrived in time to barricade the streets, and prepare for the defence of different quarters. A terrible conflict now commenced, which lasted from the morning of the 22d to the evening of the 23d of January. Having been driven from street to street, they finally rallied at one of the gates of the city, where they were almost totally cut off. It is certainly a reproach to the Neapolitan government, not to have been able to give a better direction to the undaunted courage of such men.

We may view this triumph as the last which the directory enjoyed, for the consequences of their past conduct were now rapidly gathering around them. They were with the greatest justice unpopular at home, both from their mode of conducting public affairs, and their repeated violations of the constitution of their country. Their profusion was unlimited, as well as the exorbitant demands which they made upon conquered countries. Championet was so ashamed of them, that in Italy he endeavoured to restrain them, in consequence of which he was deprived of his command, and thrown into prison; Scherer, the war minister, being appointed his successor. Under him the incapacity of the government, and the embezzlement of the public stores, were carried as high as possible. Yet France still continued to be dreaded by foreign nations, to whom the true state of internal affairs was but obscurely known. An army of 45,000 Russians had arrived to the assistance of Austria, yet that cabinet was at a loss whether to declare war or not. Britain solicited the aid of Prussia, with an offer of large subsidies; but Sieyes, the plenipotentiary at Berlin, artfully contrived to defeat the negotiation, and counteract the unpopularity of his country in Germany, by giving to the world the secret convention of Campo Formio. This determined the greater number of the German princes to maintain their neutrality under the guardianship of Prussia.

A note was presented to the congress at Rastadt on the 2d of January by the French plenipotentiaries resident there, intimating, that if the entrance of Russian troops into Germany was not prevented, it would be considered as tantamount to a declaration of war. To this no satisfactory answer was returned. The strong fortress of Ehrenbreitstein surrendered on the 26th of that month, after being blockaded since the treaty of Campo Formio. This possession, together with Mentz and Dusseldorf, made the French a very powerful enemy on the Rhine. Switzerland also belonged to them, and all the fortified places of Italy, on which account they were qualified to commence active operations. At this period Jourdan commanded on the Upper Rhine from Mentz to Hungen; the eastern frontier of Switzerland was occupied by General Massena; Scherer had the chief command in Italy; Moreau acted under him, and Macdonald commanded the troops in the territories of Rome and Naples. Yet all these armies, scattered, did not exceed 170,000 men, a force greatly inferior to that of Austria, altogether independent of the Russian army. The directory, however, trusting to the unity of its own plans, the wavering politics of the court of Vienna, and the slow movements of the imperial armies, was anxious to renew the war, a declaration of which against the emperor of Germany and the grand duke of Tuscany, was made on the 13th of March. Jourdan had actually crossed the Rhine at Strasburg on the 1st of that month, and occupied many strong positions in Swabia. Maulheim was taken, and General Berneaudt summoned Philippsburg to surrender, while General St Cyr entered Stutgard. In order to oppose the march of this army, the archduke Charles crossed the Leach on the 4th of March; Massena marched into the territory of the Grisons, and surprising a strong body of Austrians, made the whole of them prisoners, together with their general, and the whole of his staff, in consequence of which the country of the Grisons was reduced.

The republican plan of procedure was not completed without the junction of Massena's and Jourdan's armies, to accomplish which it was necessary to carry the im-

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Russian general was at Turin, his advanced posts at Susa, Pignerol, and the Col d’Asiette, while General Hohenzollern was stationed at Modena with a considerable force, and General Ott at Reggio with 10,000 men. General Macdonald began his operations on the 12th of June, when his advanced divisions attacked and defeated Hohenzollern, taking 2000 of his men prisoners. General Ott was attacked at the same time, and being compelled to retreat, the French made their entry into Parma on the 14th. He was again attacked on the 17th, and forced to retire towards Giovanni, where the progress of General Macdonald was arrested.

The French defeated Suvarrow.

Suvarrow having received information of his approach, and of his successes, left Turin on the 15th of June, at the head of 20,000 men, and came up with Macdonald on the banks of the Tidone. The centre and right wing of Suvarrow’s army were commanded by Rosenberg and Foerster, the Austrian General Mathes commanded the left wing; Prince Frohna was at the head of the advanced guard, and Prince Lichtenstein of the reserve. An action immediately commenced, which was fought with desperate fury on both sides for three successive days, when victory declared in favour of Suvarrow. Driven from Tidone to the Trebbia, the French were finally vanquished on the 19th, after a greater slaughter on both sides than the oldest officer present recollected to have witnessed. Victory remained doubtful, till General Krat arrived with large reinforcements from the army besieging Mantua, and, in direct contempt of his orders, decided the fate of the day.

The republicans retreated during the night, and the next day they were pursued by the army of Suvarrow in two columns. Seldom could the French be overtaken in a march, but the army of Suvarrow accomplished this, when he surrounded the rear-guard of the fugitives, and obliged them to lay down their arms. The rest of the army defended themselves in the passes of the Appenines and territory of Genoa, after losing, it is said, no fewer than 17,000 in killed, wounded, and prisoners. Moreau, in the mean time, gave battle to the Austrians under Bellegarde, and though far superior to him in numbers, they were totally defeated. This temporary advantage, however, availed little, in consequence of the rapid return of Suvarrow from the pursuit of Macdonald. The fortresses in Italy surrendered in close succession, and it appeared as if the combined powers would soon be able to enter the territory of France.

The affairs of the republic became equally critical in Palestine. After having defeated the Mamelukes, made himself master of Alexandria and Cairo, and avowed himself a Mahometan in Egypt, Bonaparte led an army into Palestine, to take possession of Jerusalem, and by rebuilding the temple, and restoring the Jews, to give the lie to the prophecies of the Christian religion. At the head of 12,000 men, with officers eminently skilled in the art of war, he reached the town of Acre on the sea-coast, 28 miles south of Tyre, and 37 north of Jerusalem. He laid siege to this town in due form, which was but indifferently fortified, and defended by a small garrison of Musulmans, which the governor would have unconditionally surrendered, had he not been advised to make a vigorous resistance by an English naval officer. Sir Sidney Smith having received the command of the garrison, detained Bonaparte before Acre 60 days, although the number of the allies by whom it was defended did not exceed 2000 men. The French commander made eleven attempts to carry it by assault, all of which proved unsuccessful. He was at last obliged to raise the siege, after he had lost eight of his generals, 85 inferior officers, and almost one half of his army. His unsuccessful attempt upon Acre must indeed appear important, especially to Britain, if it be true that the Druses, to the number of 60,000 men, had promised to join him on the reduction of that town. Had this junction been effected, it is believed that Constantinople would have become their prey, which was first to have been plundered, and then reduced to ashes.

While France experienced such reverses abroad, she was much disturbed also by internal commotions, and the directory found itself in a very critical situation. New elections were still unfriendly to their interest; and they could no longer secure a majority in the councils, they were sunk into such contempt. When they sought money, they obtained reproaches on account of their own profusion, and the agents they employed. Insurrections in the west and south were formed by the friends of royalty, and these were with difficulty subdued, on account of the absence of the military. In the midst of all these difficulties, the occurrence of one event seemed to promise the directory the return of their former influence. On the 28th of April, the French plenipotentiaries received orders to quit Rastadt in 24 hours. Having demanded a passport from Colonel Barbasye, they received for answer that none could grant it but the commander in chief. They at last began their journey, the three ministers, Bonnier, Roberstot, and Jean Debruy, were in separate carriages, Roberstot having his wife, and Jean Debruy his wife and daughters along with him, attended by the ministers of the Cisalpine republic. At a short distance from Rastadt they were met by 50 Austrian horsemen, who stopped the carriage of Jean Debruy, and demanded his name. Of this he informed them, adding that he was a French minister returning to France. He was immediately torn from his carriage, desperately wounded with sabres, and thrown into a ditch for dead. Bonnier and Roberstot were murdered on the spot. When the ruffians departed, and the carriages returned to Rastadt, Jean Debruy wandered all night in the woods, and next day returned to Rastadt. He demanded the restitution of the papers which the hired assassins had carried off when they plundered the carriages, but they were refused. Rastadt and its vicinity was occupied by French troops during the long sitting of congress, of which the Austrians had obtained possession but a few days before. The discipline, therefore, of the Austrian army was severely reproached by this event; but it is probable that more than the want of subordination was at the bottom of a crime so atrocious, unprecedented, and totally repugnant to the laws of nations. It is true, the archduke lost no time to declare his utter ignorance of the matter in a letter to Massena; but this was far from giving satisfaction to the French directory. In a message to the councils on
the 5th of May, they made it the premeditated act of the Austrian government, to insult France by the murder of her ambassadors.

A violent opposition to the directory commenced by the introduction of the new third of this year. Sieyes, who was ambassador at Berlin, and had possessed considerable influence over all parties, was elected a member of the directory. This station, we have already seen, he refused to occupy at the first establishment of the constitution, and therefore his acceptance of it at such a critical juncture, excited great surprise. Treibhard was removed from the directory, as it was said he had held an office in the state within less than a year previous to his election. Merlin and Reveillere were under the necessity of resigning, to avoid an impeachment which was threatened to be brought against them; but Barras still retained his station. Mounins, Cohier, and Ducos, men who were but very little known, and far from being leaders of the contending parties, were chosen members of the directory. The public spirit was attempted to be revived by the establishment of clubs, a liberty of which the restless Jacobins first took advantage. They soon proposed violent measures, and began to denounce the members and the conduct of government. But their imprudence having justly alarmed the directory, they obtained permission from the council to suppress their meetings, before they had time to corrupt the public mind.

The directory now employed every effort to augment the armies which had lately suffered such dreadful diminutions. In the beginning of August their army in Italy amounted to 45,000 men, of which General Joubert had the chief command. Turin, Alessandria, Milan, Peschiera, and Ferrara, were captured by the allies with astonishing rapidity. Turin sustained a bombardment of only three days, Alessandria held out seven, and Mantua only fourteen, in which last place there were 13,000, who were dismissed on their parole. The combined powers next laid siege to Tortona, and General Joubert resolved on its relief, which object he expected to accomplish before the arrival of Kray with assistance to Suvarrow. The whole of the Austrian posts were driven in by the republicans on the 17th of August, who took possession of Novi. On the 27th those were attacked by Suvarrow, who by that time had received troops from Mantua under General Kray. The right wing was commanded by this officer, its left by Melas, and its centre by Prince Procracion and Suvarrow in person. The engagement commenced about five o'clock in the morning, soon after which, while General Joubert was urging his troops forward to charge with the bayonet, he received a musket shot in his body, and falling from his horse, he immediately expired. Moreau assumed the command, and after a bloody conflict, the allied army gave way in all directions. The Russians in particular suffered severely, from the obstinate manner in which they fought. The French line was attacked at three in the afternoon, but remained unbroken; and the whole would have terminated in the defeat of the allies, if General Melas had not turned the right flank of the republican line; and following up his advantages, he got possession of Novi, when the French army began to retreat under the command of General Moreau.

The Austrians say that the French upon this occasion lost 400 men killed, and the same number taken prisoners; confessing that their own loss was equal to this; but the loss of the Russians was never published. We have reason to believe that it was the greatest of the whole, since they will rather stand and be cut to pieces than think of retreat. The French lost all hope of being able to defend Genoa, and therefore proceeded to evacuate that city and territory. It was now the apprehension of the directory that the south of France would immediately be invaded, but in this they were happily deceived. The conquered army was astonished to find itself un molested after so signal a defeat, and in a few days ventured to send back parties to reconnoitre the movements of the allies. Championet, the successor of Joubert, was amazed to find that they had rather retreated than advanced, on which account he resumed the positions held by his army before the battle of Novi.

So far from prosecuting the advantages they had obtained in Italy, Suvarrow was persuaded to abandon marches to that country with his Russian troops, and march to the relief of Switzerland from the yoke of France. The army of Massena in this quarter amounted to 70,000 men in the month of August, which not only prevented the archduke from pursuing his advantages, but the French even threatened to endanger his position. Massena's right wing under General Joubert carried Mount St. Gothard, the great pass leading from the eastern parts of Switzerland into Italy. Suvarrow's expectations were no doubt high, having never yet been vanquished, and being called upon to undertake an enterprise in which the Austrians had hitherto failed, even under their most fortunate general. When he was ready to march, the Austrian commander in Italy refused to give him mules for transporting his baggage. This officer had recourse to a most pitiful falsehood, when he asserted that he would be furnished with a competent number at Bellinzona, where Suvarrow could find none. Having no other alternative, he disembarked the cavalry, and made use of their horses to drag along the baggage. In spite of these obstacles, however, he arrived, by forced marches, on the frontiers of Switzerland on the day which he and the archduke had fixed upon.

Saying that it would be more expedient to demand of the house of Austria to serve under a Russian general, or not being daring enough to require the most experienced general in Europe to receive orders from so young a man as the archduke, that prince was sent into Swabia to attack a small body of republicans. He took with him 48,000, some say 60,000 men, although 20,000 would have been more than sufficient for the accomplishment of such an undertaking. It is not an easy matter to conceive upon what principle the council of war at Vienna could imagine, that such an able officer as Massena would continue inactive at the head of an army almost the double of that which was sent to oppose him. The archduke marched against the French in Swabia, who resisted him as much as the small number of their troops would permit; but they were gradually driven towards the Rhine. To carry on the deception, they made a serious stand in the vicinity of Mannheim, where they lost 1200 men, and which the Austrians entered, seemingly determined to cross the Rhine.

Switzerland in the mean time was completely ex-
France.

But Tippoo did not place his sole dependence on assistance from France. He invited one Zemaun Shah from the north-west, whose kingdom was composed of provinces taken from Persia and India, to make an attack upon the British and their allies. In hopes of direct aid from France, which Tippoo expected in consequence of Bonaparte's invasion of Egypt, and the important service which he looked for from the exertions of Zemaun Shah, he remained quiet, and endeavored to temporize with the British. Military preparations on the part of the British being in a considerable degree of forwardness, Lord Mornington, the governor-general, informed Tippoo that he was not ignorant of his hostile designs, and of his connection with France, proposing, however, to send an ambassador for the purpose of bringing about a reconciliation. This was not answered till the 18th of December, although written by his lordship on the 8th of the preceding month. Tippoo simply denied the charge, and refused to admit the ambassador. Unwilling to sport with human blood, his lordship on the 9th of January 1799, again intreated Tippoo to receive the ambassador, to which no answer was returned during a whole month, during which interval 5000 men arrived from England, and General Harris received orders to advance at the head of the Madras army against the kingdom of Mysore. This seemed to bring Tippoo a little more to reason, who now offered to receive the ambassador, on condition he should come without any attendance; but as this was not deemed a satisfactory concession, the army continued to advance. An army from Bombay was also approaching on the opposite side of his dominions, which encountered part of Tippoo's forces, and defeated them; General Harris defeated the remainder of them on the 27th of March, who on the 7th of April sat down before Seringapatam. This officer received a letter from Tippoo on the 9th, in which he mentioned his adherence to treaties, and wished to be informed as to the cause of the war. The only answer he received was a reference to Lord Mornington's letters. He made another attempt on the 20th, and General Harris informed him that he had already been made acquainted with the only conditions which could or would be granted. The half of his dominions was to be surrendered, large sums of money were expected from him; he was to admit an ambassador to his court, to disclaim all connection with the French, and grant hostages for the faithful observance of every stipulation.

Tippoo wrote a letter to General Harris on the 28th, Proposals of desiring leave to treat by ambassadors, which was refused, as he was in possession of the sine qua non of the British government. It was believed that the besieging army would have been more prudent to retreat, had it been possible for Seringapatam to hold out a fortnight longer. On the last day of April the besiegers began to batter the walls of the city, and they got possession of it on the 4th of May. Tippoo hastened from his palace to the attack, when given to understand that a breach was made in the walls, where he fell undistinguished in the general conflict. His treasures and the plunder of the city were immense, with which the besieging army was enriched, after deducting a certain proportion for the British government and the East India Company. His subjects immediately surrendered, and
and that part of the country which formed the ancient kingdom of Mysore, was conferred on a descendant of the former race of its kings, and the remaining territories were divided among the British and their allies. The family of Tippoo were either taken or made a voluntary surrender, being removed from that part of the country, and allowed a decent annuity.

Zamaun Shah in the mean time invaded the country from the north-west, advancing to the vicinity of Delhi, and spreading terror and desolation wherever he came. Satisfied with plunder, however, he soon withdrew his forces; and the French army being detained in Egypt by a war with the Turks, as well as the want of shipping at Suez, Tippoo had to contend singly against the united forces of Britain and her allies in those eastern regions.

The plan of a new constitution was presented to the public by the consuls in the month of December 1799. According to this plan, 80 men, who had the power of nominating their own successors, and were called the conservative senate, had likewise authority to elect the whole of the legislators and executive rulers of the state, while none of these offices could be held by themselves. One man, called the chief consul, possessed the sovereign authority, held his power for ten years, and was competent to be re-elected. Other two consuls were to assist in his deliberations, but had no power to control his will. The legislative power was divided into two assemblies; the tribunate, composed of 100 members, and the conservative senate of 300. When the chief consul thought proper to propose a law, the tribunate might debate upon it, without having authority to vote either for or against it, while the members of the senate might vote, but were not enabled to debate. The consuls and the members of the legislative body, as well as of the conservative senate, were not responsible for their conduct, but ministers of state employed by them were understood to be accountable. The committees which framed the constitution, nominated the persons who were to execute the functions of government. Bonaparte was appointed chief consul, and Cambacères and Lebrun second and third consuls. Sieyes, as formerly, declined taking any active part in the administration of public affairs, and he received, as a gratuity for his services, an estate belonging to the nation, called Crown, in the department of the Seine and Oise.

Bonaparte had not long been in possession of the reins of government, till he sent overtures for negotiating peace with the allied powers at war with France; but it is to be presumed that he did not wish for a general peace. Separate proposals were made to the different belligerent powers, no doubt with a view to dissolve the coalition; but the decrees of the convention, which declared war against all the powers of Europe, were not repealed by him. He departed from the forms sanctioned by the custom of nations in carrying on diplomatic correspondence, but addressed a letter directly to his Britannic majesty, the substance of which was contained in two questions: "whether the war, which had, for eight years, ravaged the four quarters of the globe, was to be eternal?" and "whether there were no means for Britain and France of coming to a good understanding?" Satisfactory, and we think, unanswerable replies, were made to these questions by the British ministry, who dwelt much, and very justly, on the bad faith of revolutionary rulers, and the instability of the governments of France since the subversion of monarchy. The overture transmitted to Vienna was of a similar nature, and it experienced similar treatment; but the emperor of Russia abandoned the coalition, probably on account of the shameful manner in which Swabrow had been treated, while carrying on the war in Italy and Switzerland.

Bonaparte on the 5th of March sent a message to the legislative body, containing his own ideas of the conduct and designs of the British cabinet, and assuring them that he would invoke peace in the midst of battle and triumph, and to bear to fight only for the happiness of France and the repose of the world. This message was followed by two decrees; the one calling, in the name of honour, upon every soldier absent on leave from the armies of Italy and the Rhine, to join them before the 5th of April; and the other appointing a fresh army of reserve of 60,000 men to be assembled at Dijon, under the immediate command of the first consul.

About this time the belligerent powers were nearly ready for opening the campaign in Italy and on the Rhine. The Genoese republic was the only territory of any importance in Italy, which remained in the hands of the French, but the army by which they defended it was very much reduced since the preceding year, and might be considered as in a state of mutiny, from the want of pay, clothes and provisions. The Austrians eagerly wished to obtain possession of Genoa and all its dependencies, in which they could not fail to be seconded by the Genoese themselves, as they looked upon the republic and its army as the destroyers of their commerce. Massena received the command of the army in Genoa, with extraordinary powers, and evinced himself to be a general of consummate abilities. Carrying a reinforcement of troops with him from Lyons and Marseilles, and reducing to order and obedience, by a judicious distribution of rewards and punishments, all whom he found ready to desert their standards, he soon found himself at the head of a force sufficient to check the progress of the Austrians, and keep the Genoese in subjection. After a number of battles had been fought, he was obliged to retire into the city, where he must soon have been compelled to surrender by famine, if General Melas had immediately blockaded it.

The appearance of the British fleet on the 5th of April, was the concerted signal for Melas to make an attack upon Genoa, the communication between which and France was thus cut off. Prior to the arrival of Lord Keith, a quantity of wheat and other provisions had been thrown into the city, by which means the army and the inhabitants were rescued from the consequences of immediate famine. The surrounding country was soon vanquished by the Austrians; but as the gallant Massena still lived in the expectation of supplies from France, he obstinately refused to surrender the city. General Melas having nothing to apprehend from this army blocked up in Genoa, left General Ott to continue the blockade, and went with his own forces against Sauchet, who commanded another division of the French army.

A decisive battle was fought between Ceva and St Lorenzo,
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Lorenzo, on the 7th of May, in which the republicans experienced a total defeat, having lost 1200 prisoners, and 19 pieces of cannon. This soon obliged General Saucet to abandon his strong position of Col di Teoda, where he left behind him four pieces of cannon and 200 prisoners; and marching on towards Nice, the Austrians drove him from one post to another, till he was finally obliged to take refuge behind the Var; by which movements General Melas became master of the whole department of the Maritime Alps. But the campaign on the Rhine did not open in such a favourable manner to the Austrians. The court of Vienna directed the archduke Charles, how he was to command the army to General Kray, who distinguished himself in such an eminent manner in Italy, during the campaign of 1799. Of his military talents there could be only one opinion, and his integrity and zeal had been sufficiently tried; but he had the misfortune not to be so noble as some of the other generals! It is truly ridiculous to behold men contending about trifles, when engaged in matters of such vast importance as the salvation of their country. During the most propitious days of Rome, her greatest generals were plebeians.

It could not be reasonably expected that such a discordant army, commanded by an able officer who had the misfortune not to be a nobleman, would ever be able to make head against the veterans of France, led on by such an extraordinary general as Moreau. The Hungarian troops, finding themselves ready to be sacrificed to the party divisions of their officers, would not fight against the enemy. The council of war at Vienna had sent General Kray instructions at the opening of the campaign, how he was to command the army, and leaving no general under him to support his own opinion, he was under the painful necessity of obeying his instructions, whether he could approve of them or not. Instructions of a similar nature had been transmitted to Moreau by the chief consul, but he indignantly refused to fight under such restraints. He was no doubt conscious that his own knowledge of the military art was as yet equal to that of Bonaparte, while he was infinitely better acquainted with the country, and therefore sent a courier to Paris to acquaint the consul, that if the orders sent him were to be rigidly obeyed, he would feel it his duty to resign his command, and accept of an inferior station. He accompanied his resignation with a plan of the campaign which he had framed for himself, the propriety of which instantly struck the chief consul, and therefore he was ordered to carry on the war, according to his own judgment.

General Moreau being thus wisely left to adopt and execute his own measures across the Rhine, and drove the Austrians from one post to another, till Kray, finding it impracticable to adopt offensive measures with a rebellious army, with disaffected officers to command them, resolved to maintain his position at Ulm, and wait for assistance from Vienna. He was defeated at Stockach, Eugen, and Moskirch, although he exhibited fully the talents of an able general; but what talents were able to counteract the pernicious consequences of treachery? At one time, when 7000 men received orders to advance, they instantly threw down their arms. Kray too plainly perceiving that it was absolutely in vain to attempt anything of an offensive nature, entrenched himself strongly at Ulm, commanding both sides of the Danube, which makes it a place of great importance. Moreau perceiving his intentions, resolved to try the passage of the Danube, and force him to a general engagement, by cutting him off from his magazines at Donauwert. For this purpose he gave orders to Lecourbe with one of the wings of his army, to take possession of a bridge between Donauwert and Dillingen, which was not effected without considerable difficulty. The Austrians having perceived, when too late, that their all was in danger, disputed every inch of ground with the French commander. Between the time of marching to, and of crossing the Danube, Kray sent reinforcements to the left bank to oppose the passage, in consequence of which a battle was fought at Hohenstet, in the vicinity of Blenheim, where victory again declared for the French, who made 4000 of the enemy prisoners, independent of the killed and wounded lost by the Austrians, of which we have seen no estimate.

General Kray, sensible that his situation was perilous, left a strong garrison at Ulm, and marched against the enemy, attacking them at Newburg, which both sides conducted with determined bravery; but the Austrians, after a long contest, fell back on Ingolstadt. It may not improperly be said, that this battle decided the fate of Germany. The electorate of Bavaria was now in the possession of the French, with other territories of less extent; and as they approached the secondary dominions of the emperor, men of republican sentiments beheld with such enmity, as to convince the court, that no dependence could be reasonably placed on armies composed of such men. The imperial family, and the British ambassador, were openly insulted in the theatre, and the cry of peace, peace, was vociferated from different quarters.

The ill success of General Kray alone could not ext—The French cite such a spirit, because at this time the affairs of army at Germany were even in a more deplorable state in Italy than upon the Danube. When the campaign opened unexpectedly, the French opened marches for on the Rhine, the army of reserve under the command of Bonaparte, which was formed at Dijon, began its march. When the French government declared that this army was above 50,000 strong, and receiving daily reinforcements, few could be found who were disposed to give any credit to the report. Such as were friendly to the cause of the allies, were unwilling to allow the French government so much vigour, while it was industriously circulated by the Jacobins of Germany, that it could not amount to more than 6000 men. The first consul set out from Paris on the 3rd of May, to take the command of an army, the strength and destination of which had given rise to so many conjectures, and on receiving the troops cantoned at Dijon, he proceeded towards Genoa. Having been a short time in the Pays de Vaud, he joined the army of reserve at the foot of St Bernard, of which he immediately assumed the command. It is certain that a very insignificant force would have been able to arrest the progress of Bonaparte while ascending the mountain; but either General Melas had heard nothing of its being in motion, or he had implicitly believed the report of the Jacobins. In consequence of this ignorance or credulity, the army of reserve encountered no opposition till it reached the town of Aoste, of which the first consul very

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be immediately followed by a definitive treaty. If the archduke could have had any dependence on his army, although very much weakened, this armistice, in all probability, would not have taken place, for the position of Moreau was perilous in the extreme. In the very heart of Austria, he had behind him on his right, about 30,000 men in the Tyrol, with upwards of 50,000 on his left. But Austrian valor was now almost extinguished by so many sad reverses of fortune, and Austrian officers were not true to their trust.

This armistice was followed by a treaty of peace signed at Lunéville on the 9th of February 1801, between the emperor for himself and the Germanic body, and the first consul of the French republic, in the name of the people of France. By it the emperor ceded the Brissaga to the duke of Modena, for the territories lost by that prince in Italy, and bound himself to find indemnities in the Germanic empire for all those princes whom the fate of war had deprived of their dominions. The grand duke of Tuscany was to renounce his dukedom for ever, with its dependencies, and the island of Elba, to the first consul of France, for which the emperor was to furnish him with an adequate indemnification.

On the 28th of March a treaty of peace was concluded between the French republic and the king of the Two Sicilies, by which his majesty obliged himself to shut all the ports of Naples and Sicily against ships of every description belonging either to the British or the Turks, till these powers should conclude a treaty with the French republic, and till Britain and the northern powers should come to a good understanding. He renounced for ever Porto Longano in the Isle of Elba, his states in Tuscany, and the principality of Piombino, to be disposed of in such a manner as the French republic might think proper.

Great Britain had now none to assist her in the contest with France, but the Turks in Egypt and the Portuguese in Europe, powers which rather diminished than increased her strength, by dividing it. The Spaniards had made an attack upon Portugal at the desire of France, conquering some of its provinces; but a treaty of peace was concluded between them on the 6th of June, by which the king of Spain restored all his conquests except the fortress of Olivenza, and the prince regent of Portugal and Algarve promised to shut the ports of his whole territories against the ships of Great Britain, and to make indemnification to his Catholic majesty for all losses and damages sustained by his subjects during the war.

When the chief consul had made peace with all his other enemies, he threatened Great Britain with an immediate invasion, which gave great uneasiness at first to a considerable part of the nation, but it gradually subsided. In order to diminish this alarm, Lord Nelson was sent to destroy the shipping and harbour of Boulogne. His success in this undertaking fell short of the expectations which many had formed; but he made such an impression on the enemy on the 4th of August, as evinced that Britain could annoy the coast of France with greater facility, than France could molest that of Britain. It was also highly satisfactory to find that the spirit of the British navy was not exclusively attached to the hero of the Nile; for Rear-admiral Saumarez having, in the month of July, come up with a combined squadron of French and Spanish ships of war bound for Cadiz, much superior to his own, he refused not to give them battle, the consequence of which was, that one of them was captured, and two more were burnt.

Attempts were again made by Britain during the British summer of 1801, to negotiate with France. The first consul could not but see, from the total dissolution of the northern confederacy, that it was impossible for him to ruin the British commerce, and consequently that all the treaties he had made for the purpose of excluding our ships from neutral ports would signify nothing. He seemed determined, however, to keep possession of Egypt; and Britain, on the other hand, was as fully resolved to wrest it from him. On this account the negotiations were protracted, till the conquest of that country was known at London and Paris.

When Sir Ralph Abercromby died, General Hutton succeeded to the command of the British forces in Egypt, who was probably acquainted with the plan of his much lamented predecessor, as one spirit seemed to actuate both. Rosetta was taken by the British, which was followed by the conquest of Cairo; and Menou having accepted of similar terms for Alexandria, the whole of Egypt fell into the hands of the allies, and the republican troops and baggage were conveyed to the nearest French ports in the Mediterranean, in ships furnished them by the allies. After these events, the negotiations between Britain and France went on more agreeably; and, on the 1st of October, the preliminaries of peace were signed at London by Lord Hawkesbury on the part of his Britannic majesty, and M. Otto on that of the French republic. By it Great Britain engaged to give up all the conquests made during the continuance of the war, excepting the islands of Ceylon and Trinidade. France was to restore nothing. The Cape of Good Hope was to be free to all the contracting parties; the island of Malta was to be given to the knights of the order of St John of Jerusalem; Egypt was to be given to the Ottoman Porte; Portugal was to be maintained in its integrity, except what was ceded to the king of Spain by the prince regent; Naples and the Roman states were to be evacuated by the British, Porto Ferrajo by the British, with all the ports and islands occupied by them in the Mediterranean; and plenipotentiaries were appointed to meet at Amiens, for the purpose of drawing up and signing the definitive treaty. This was concluded on the 22d of March 1802, in consequence of which the French republic was acknowledged by the whole of Europe.

The restoration of peace, after so long and sanguinary a contest, gave the highest satisfaction to all ranks and denominations of men, with the exception, perhaps, of a few interested individuals; and it was certainly as honourable to Britain as could be well expected from the nature of the war. It was celebrated at Paris, in the cathedral of Notre Dame, with great pomp and magnificence. The celebration of the re-establishment of the Catholic religion in France, to which the majority of the people were warmly attached, gave additional importance to the scene in that country, and the measure evinced the most consummate political wisdom on the part of Bonaparte, whose popularity in consequence of it was very much increased. We shall now notice a few
years, he was deemed competent to be re-elected for the same length of time; but he was afterwards chosen for life, with the strange power conferred upon him of nominating his successor, or, in other words, of governing beyond the grave, than which nothing can be conceived more ridiculous or unjust. Having advanced with such rapidity in the acquisition of power and authority, it was extremely natural to conclude, that the ambition of Bonaparte was not satiated, but that he would afterwards claim to himself, and influence an infatuated people to sanction, still higher degrees of dignity and grandeur. A book was accordingly published, either with his permission, or by his express command, pointing out the propriety and expediency of creating him *First Emperor of the Gauls!* At a subsequent period of the history contained in this article we shall see this extravagant proposition actually carried into effect, and Napoleon I. adorned with imperial honours. This verifies what Dumouroy asserted concerning the French, at a time when such an event was highly improbable; "that a king they would have."

In the capacity of first consul, his power was similar to that of his Britannic majesty, in respect of criminals under sentence of death, that he could grant them at his pleasure a plenary pardon, and admit them to return again to the bosom of society; but his executive authority in almost every other case was dangerously greater, as there was in fact no other power in the state which could possibly control him. While his authority was established thus firmly within his own dominions, he endeavoured to increase his influence over the rest of Europe, by forming an alliance with the court of Petersburgh. At first it was believed to be purely of a commercial nature, but the active part taken by both in dismembering the Germanic body, clearly evinced that such an alliance was of a more interesting nature, notwithstanding the ostensible reason for such conduct was the indemnification of the sufferers during the war.

It will perhaps be admitted, that the state of France, after the dreadful convulsions occasioned by the revolution, required an executive government of considerable promptitude and vigour; yet it was surely possible, and it was no less a sacred duty binding upon him, to consult, in particular circumstances, the happiness and prosperity of the people much more than he did, without endangering in the smallest degree the stability of his government. The French people should not have been deprived of the many blessings resulting from a representative government; and if not ripe for it then, it should have been conferred upon them at a subsequent period. If the hero of Marengo was afraid of facing a free parliament, he thus pronounced himself a tyrant, and if unable to moderate its deliberations, very deficient in political knowledge. He might find it expedient, for instance, to impose some restraints on the licentiousness of the press; but totally to annihilate its liberty was as unjust as it was impolitic. He should have recollected a saying of an historian and philosopher, "that a whisper may circulate as rapidly as a pamphlet."

Towards the termination of the year 1802, Bonaparte was very active in his visitation of the sea-port towns, where the most salutary addresses were presented to him which were ever given to any mortal being. Various conjectures were formed as to the probable design of such visits. It was thought by some that he intended to conciliate the affections of the people, especially the military and the constituted authorities; others imagined that it was to make himself acquainted with the true state of public opinion; while a third class conjectured that it was with a view to increase the navy of France, and acquire an intimate knowledge of the different parts of the coast. Whatever his object was, it is more than probable that it was directed to one point, and that his complicated movements were purposely intended to mislead those who felt an interest in watching him. It is true, he made no secret of his determination to invade Great Britain; but we should greatly diminish that knowledge which he must unquestionably possess, were we to conclude that he ever seriously believed in the practicability of such an undertaking.

His abilities as a soldier will be disputed by no man. Character for when viewed only in this light, he is unquestionably of Bonaparte great; but it would be a most unpardonable breach of truth to call him an able politician. While he promised to restore the commerce of France, it continued to languish, more perhaps after the restoration of peace, than during the continuance of the war. This seems to be a subject fairly beyond his comprehension. Numbers in France drew a great part of their subsistence from the expenditure of such persons from the British dominions, as were disposed, after the return of peace, to pay a visit to the metropolis of the Gallic empire. But while we thus freely animadverted on the conduct of the first consul, and point out his errors or faults without any reserve, we wish not to conceal a single circumstance which redounds to his honour. When Cambaceres, the bishop of Caen, made application to the prefect of Rouen to have the Protestant churches forcibly shut; as soon as the request of the bishop was known to Bonaparte, he sent for the second consul, and told him, that if the bishop had not been his brother, he would have struck him off the list. Such a reply was certainly worthy of a great man.

On the 21st of February 1803, a view of the state of France was laid before the legislative body and the tribune, containing a comprehensive view of the relations of the republic, both with respect to colonies and foreign states; but the most important part of it had a reference to Britain, which was charged with acting improperly in retaining troops in Malta and Egypt, after the signing of the definitive treaty. It divided the inhabitants of it into two parties, representing the one as having sworn implacable enmity to France, and the other as anxious to maintain the relations of peace and amity, concluding with singular bravado, "whatever may be the success of intrigue at London, it will never force other nations into new leagues; and the French government asserts, with just pride, that England alone cannot now contend with France."

It now began to be manifest, that the blessings of peace were not to be long enjoyed. The extensive war-like preparations going forward about this time in the interests of France and Holland, roused the jealousy of the British ministry; for although the ostensible reason was to reduce the revolted colonies to obedience, they could not help apprehending that much more was comprehended in such extensive armaments. We shall still be more inclined to adopt this opinion, if we advert to the following
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In the mean time the republican army in Hanover continued to oppress the inhabitants, and to devour the resources of that electorate. The Dutch were made to suffer almost as much from their new allies and pretend-rians, their commerce with the French, and their conquerors, as the inhabitants of a conquered country. They were dragged into a war, of which they certainly wished to be the unconcerned spectators, compelled to raise and maintain a large body of native troops, to receive garrisons into all their strong towns, to give up their sea-ports to the French, and expose their whole country as a scene of passage and encampment to the armies of the republic. Their trade was ruined, and their ports blocked up by the British at sea, on account of their alliance with France. The inhabitants of the Belgic provinces belonging to France were also severely sufferers by the levies of conscripts, the interruption which their trade and manufactures met with from the war, and the rigour by which they were governed. It was reported that the first consul had 300,000 effectives men in readiness along the coast and the places adjacent, and that 2800 men were incessantly employed, augmenting and repairing the fortifications at Boulogne.

During the month of November 1803, the sea-coasts of Great Britain and Ireland received fresh additions of strength, that if ever troops from France should dare to attempt a landing, they might be assured of meeting with a warm reception. The garrison of Plymouth was augmented to 13,700 landmen, besides 1500 seamen and marines. A battery was erected at Paul Point, for the defence of the Humber, and two others were to be built opposite to it in Lincolnshire. Exercitations equally spirited were continued by sea. Sir Sidney Smith cruised off the Texel, and drove on shore on the coast of Holland, 12 armed ships of the enemy, three of which were captured. During the month of February 1804, the French and Dutch ports continued to be blockaded by the British navy with the utmost vigilance, a measure which the tempestuous nature of the weather frequently rendered hazardous. The preparations for an invasion of this country were still continued on the part of France, but no force of any consequence found it practicable to put to sea, owing to the vigilance of our cruisers. A number of gun-boats were taken at different times off Boulogne, and different other parts of the French and Dutch coasts, which might have convinced the people of these countries of the absurdity of expecting to accomplish any thing decisive against Britain by such inadequate means.

A plan was suggested for filling up the ports of the enemy with stones and the bulks of old vessels, so as to render it difficult, if not wholly impracticable, either for ships or small craft to make their way out of them.

Similar efforts were made to annoy the enemy by sea, and render their designs wholly abortive. To Lord Keith and Admiral Montagu was entrusted the command of the channel fleet; and an attempt was made at Granville to disconcert the preparations of France, by a detachment of ships under the command of Sir James Saumarez, which was so far attended with success as to intimidate the inhabitants, damage a number of houses, and destroy some boats in the harbour. Similar attacks upon Calais and Boulogne also tended to convince the French residing on the coast that they were far from being secure, although total destruction was not the consequence of such exertions. Lord Nelson then guarded the Italian sea, and Sir Edward Pellew and Sir Robert Calder were stationed off Ferrol.

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The idea seems to have been taken from a fact well known, that harbours have been often ruined by the tides and currents of the sea, the deposition of sand from rivers, earthquakes, and other accidents; and therefore it was concluded that similar effects might be produced by artificial means. The accomplishment of such an object, if it were practicable, would be an ample compensation for the greatest expense.

It was the opinion of the discerning part of mankind long before it happened, that the ambition of Bonaparte would not always remain satisfied with the dignity of first consul, even for life; for although he could receive no fresh additions to his power and influence, yet there was reason to believe that the sound of such titles as have always been deemed higher and more dignified still, would be too fascinating for him to resist. Accordingly, on the 25th of April 1804, the following decree was issued by the tribunate of France:

"The tribunate, considering that at the breaking out of the revolution, when the national will had an opportunity of manifesting itself with the greatest freedom, the general wish was declared for the individual unity of the supreme power, and for the hereditary succession of that power:

That the family of the Bourbons, having by their conduct rendered the hereditary government obnoxious to the people, forced them to lose sight of its advantages, and drove the nation to seek for a happier destiny in a democratical form of government:

That France having made a trial of different forms of government, experienced from these trials only the miseries of anarchy:

That the state was in the greatest peril, when Bonaparte, brought back by providence, suddenly appeared for its salvation:

That the consulship for life, and the power granted to the first consul of appointing his successor, are not adequate to the prevention of intrigues at home or abroad, which could not fail to be formed during the vacancy of the supreme power:

That in declaring this magistracy hereditary, conformity is observed at once to the example of all great states, ancient or modern, and the first wish of the nation, expressed in 1789:

That, enlightened and supported by this experience, the nation now returns to this wish more strongly than ever, and expresses it on all sides:

That when France demands for her security an hereditary chief, her gratitude and affection call on Bonaparte:

That France may expect from the family of Bonaparte, more than from any other, the maintenance of the rights and liberty of the people:

That there is no title more suitable to the glory of Bonaparte, and to the dignity of the supreme chief of the French nation, than the title of emperor.

The tribunate have come to the following vote:

That Napoleon Bonaparte, the first consul, be proclaimed emperor of the French, and in that capacity be invested with the government of the French republic:

That the title of emperor and the imperial power be made hereditary in his family in the male line, according to the order of primogeniture."

The foregoing decree having been put to the vote, it was carried by acclamation, with the single exception of the only member (Carnot) who delivered his sentiments against its adoption.

The senate presented an address to the first consul, in which they took great pains to convince him that the safety of France, and the happiness of Europe, depended entirely upon his acceptance of the title of Emperor of the French, and upon its being made hereditary in his illustrious family. The different divisions of the army of course sent addresses to the first consul, internet him to condescend to become emperor of France.

Bonaparte requested them, in his answer, "to make known to him the whole of their thoughts." The senate then desired him to take the imperial and hereditary dignity. Bonaparte consented.

An address was presented by the senate to the first consul, in which they employed many arguments to make him see the necessity of giving the country the advantage of the preservation of France, and the repose of all Europe turned on his acceptance of the dignified title of the emperor of the French, which right to be hereditary in his august family. The different divisions of the army hoped also that he would be graciously pleased to condescend (what an instance of humility!) to become emperor of France. Whether or not it may excite the astonishment of our readers, we can assure them upon the most undoubted authority, that he was so humble as to accept it, and the following is his address to the conservative senate.

"Senators,

Your address of the 6th last Germinal has never ceased to be present to my thoughts. It has been the object of my most constant meditation.

You have judged the hereditary power of the supreme magistracy necessary, in order to shelter the French people completely from the plots of our enemies, and from the agitation which arise from rival ambitions. It even appears to you, that many of our institutions ought to be improved, in order to secure for ever the triumph of equality and public liberty, and present to the nation and to the government the double guarantee they are in want of.

In proportion as I fix my attention upon these great objects, I am still more convinced of the verity of those sentiments which I have expressed to you, and I feel more and more, that in a circumstance as new as it is important, the counsels of your wisdom and experience were necessary to enable me to fix my ideas.

I request you then to make known to me the whole of your thoughts.

The French people can add nothing to the honour and glory with which it has surrounded me; but the most sacred duty for me, as it is the dearest to my heart, is to secure to its latest posterity those advantages which it has acquired by a revolution that has cost it so much, particularly by the sacrifice of those millions of brave citizens who have died in defence of their rights. Fifteen years have past, since, by a spontaneous movement you ran to arms, you acquired liberty, equality, and glory. These first blessings of nations are now secured to you for ever, are sheltered from every tempest, they are preserved to you and your children; institutions conceived and begun in the midst of the storms of interior and exterior wars, developed with constancy, are just terminated in the noise of the attempts and plots of our
our most mortal enemies, by the adoption of every thing which the experience of centuries and of nations has demonstrated as proper to guarantee the rights which the nation had judged necessary for its dignity, its liberty, and its happiness."

The new emperor was allowed to adopt the children or grand-children of his brothers, if arrived at the age of 18 years complete, and he without legitimate children of his own; and this privilege cannot be enjoyed by his successors. Failing both legitimate and adopted heirs, the crown shall be enjoyed by Joseph Bonaparte and his descendants; and failing Joseph and his descendants, it shall devolve on Louis Bonaparte and his descendants, &c. If a successor cannot be found in any of these channels, a Senatus consultum, proposed to the senate by the dignities (we presume it should have been dignitaries) of the empire, and submitted for the acceptance of the people, shall nominate an emperor. It was also decreed that the members of the imperial family should be called French princes, and the eldest son of the family, the imperial prince. Amongst other things it was enacted, that every emperor, two years after he comes to the throne, shall swear to maintain the integrity of the territory of the French republic! We have mentioned this last circumstance, wholly for this reason, that the emperor of a republic is no doubt a rarity to the greater part of our readers.

The trial of the state prisoners commenced at Paris on the 29th of May 1804. They were charged with conspiring against the life and government of Bonaparte; but how great was our astonishment to find the justly celebrated General Moreau included in the number! Envy and jealousy of Bonaparte can alone have implicated this great man in such a charge, as he was heard to say on the arrival of the new emperor from Egypt—"this is the man who is necessary to save France." Georges with 11 of his associates, were condemned and executed on the 24th of June; the gallant Moreau and four more, were sentenced to suffer two years imprisonment, and about 18 were acquitted. Some of those who were condemned were afterwards pardoned by imperial clemency, moved by the fascinating charms of female eloquence and female tears. The sentence of imprisonment against Moreau was commuted to banishment for life to the United States of America.

The coronation of Bonaparte took place in the month of December 1804, which was accompanied on the part of the people by such demonstrations of apparent satisfaction as evinced the degraded state of the public mind in that unfortunate country. After receiving a number of the most fulsome speeches, filled entirely with bombast and falsehood, his imperial majesty delivered the following address. "I ascend the throne, to which the unanimous wishes of the senate, the people, and the army have called me, with a heart penetrated with the great destinies of that people, whom, from the midst of camps, I first saluted with the name of Great. From my youth, my thoughts have been solely fixed upon them (so it appears); and I must add here, that my pleasures and my pains are derived entirely from the happiness or misery of my people. My descendants shall long preserve this throne (a very bold prediction)."
this an armistice was agreed upon. On the 25th the
emperors of Russia and France met on a raft con-
structed on the Niemen, and conferred together for two
hours. Entertainments, reviews, and fêtes followed,
with all the external demonstrations of friendship and
harmony. The peace of Tilsit, signed on the 6th June,
deprived Prussia of all her territories on the left of the
Elbe, and of all her recent acquisitions in Poland:
Dantzic was created an independent town; East Fries-
land was added to Holland; the ceded Prussian terri-
tories in Germany were erected into the kingdom of
Westphalia, the sovereignty of which was bestowed on
Jerome Bonaparte; and the emperor Alexander agreed
to recognize the titles of this new prince, of the kings
of Holland and Naples, and of the new kings belong-
ing to the Rhenish confederation. But what was most
disgraceful to the Russian emperor, he obtained for
himself thecession of a district of Polish Prussia from
his distressed and humbled ally, to redress whose wrongs
he pretended to take up arms. By a secret article
Russia ceded the Ionian islands to France, and engaged
to enforce the French continental system by excluding
British vessels from her ports. In short, never had
France acquired before in one campaign such extraor-
dinary advantages.

Negotiations for peace had been opened in February
1806 between the governments of France and Britain.
The French ministers, however, shifted their ground
again and again, eluded all direct and intelligible pro-
positions, and seemed so anxious to separate the claims
and interests of Britain from those of her ally Russia,
that after some months spent in discussion, no progress
was made, and all hopes of peace were abandoned. Mr
Fox died during the discussions, but it is not probable
that the prolongation of his life would have given a dif-
ferent termination to the negotiations. Shortly after
the treaty of Tilsit, Russia offered her mediation towards
effecting a peace between England and France, but
the offer was couched in terms so offensive to the British
government, that it was promptly declined. In this
state of things the ill-considered expedition to Copen-
hagen was undertaken, and furnished the Russian em-
peror with a most plausible pretext for those hostile
measures to which he was already disposed. He was
no sooner apprised of the defection of the Danish fleet,
than he dismissed the British ambassador, and publish-
ed his resolution to put an end to all commercial inter-
course with England, and to revive the principle of the
armed neutrality. This was received and replied to as
a declaration of war by the British government. The
British property in Russia was forthwith confiscated,
and the most vigorous measures were adopted to ex-
clude our manufactures. The great extent of coast
which Bonaparte now commanded, enabled him to make
his edicts against our commerce operate with signal
effect, and the pressure became very severe upon the
cotton manufacturers and the West India planters.
Parliament appointed a committee to investigate the
subject, but, as might be expected, no means could
be devised to afford any effectual relief. The or-
ders in council issued by the British government, Ja-


January and November 1807, were found to inflame the
evil they were designed to cure.

On Bonaparte's return from the north after such
splendid conquests, congratulations from public bodies
and public functionaries flowed in upon him in unint-
upted succession: the powers of language were ex-
hausted to find expressions, and history was ransacked
to find comparisons, to set forth the glory and grandeur
of his achievements. Now was the moment for his
ambition to pause from schemes of conquest, and for
giving his care to those measures of internal improve-
ment, which he declared should henceforth occupy his
attention. But with such means of conquest in his
hands, new enterprises were sure to tempt his am-
bition. Portugal had hitherto been suffered to enjoy a
neutrality which had been denied to stronger states.
Her trade with Britain, however, was new become an
inexpiable crime; and as she refused to adopt the con-
tinental system, which would have involved her in war
with her ancient ally Great Britain, her subjugation
was resolved on. The government, fully apprised of
the intentions of France, prepared a fleet, and on the
approach of General Junot with a French army, the
prince regent and court set sail for Brazil. As the
means of the country were inadequate to a war with so
powerful an enemy, no resistance was made; and so
rapid was the approach of the enemy, that before the
fleet had got out of the Tagus on the 29th November
1807, the French army was seen upon the heights.

Napoleon was now about to enter on the enter-
prise, more daring in its nature than any he had hitherto
engaged in; and as the event shewed, more difficult
and hazardous in its execution. The imbecile and dis-
organized government of Spain had hitherto been a
passive instrument in his hands, by which he had held
at his disposal the resources of the country, such as
they were. But as he had already given kings to
Holland and Belgium, he was tempted to think that
Spain would consent with the same facility to see the
drowsy and useless figures which misgoverned her
thrust aside, and replaced by a branch of the imperial
family. To pave the way for the meditated change, 16,000
Spanish troops, the flower of the army, were
drawn away to Germany to act as auxiliaries to the
French. And under the pretext of securing possession
of Portugal, bodies of French troops, to the number
of 70,000, were introduced into the north of Spain, and
placed in the fortresses which commanded the roads
into the country. When this immense sheet of prepared,
plot was got up or discovered for killing the old king,
in which his son Ferdinand was implicated; and after-
wards the court was persuaded to embrace the absurd
resolution of emigrating to Mexico. The discovery
of this intention led to a popular tumult. The king
intimidated, dismissed his minister Godoy, and resigned
the crown in favour of his son Ferdinand. Murat
was no sooner informed of these transactions than he ad-
vanced with the French army towards Madrid, and
getting possession of the person of the deposed king,
the latter declared that his resignation was compulsory.
Ferdinand alarmed by the approach of the French, and
the declaration of his father, was prevailed upon in an
evil hour to submit his claims to Napoleon, and to re-
pair to Bayonne to receive his award. When the two
princes were thus within the power of Napoleon, a re-
signation of the crown was extorted from both, from
the father on the 5th, and from the son on the 10th of
May 1808, after which the royal prisoners were
marched into the interior of France.

Murat.
France. 1809.

Murat in the mean time advanced to Madrid, and obtained possession of the city, but the spirit of the Spaniards was roused by the indignities offered to their king. The populace, unaided by the authorities, boldly attacked the French and drove them out with great loss on the 2d of May; but the latter returning in greater force, repelled themselves of the town, and put to death above a hundred of the inhabitants in cold blooded conspirators. The supreme junta, entrusted by Ferdinand with the government, basely repressed the rising spirit of the people; and the holy inquisition did not scruple to lend its aid to a treacherous enemy, and to issue a circular enjoining submission to the French, accusing the people of faction and insubordination, and laying the guilt of the recent bloodshed upon them. When the news of the resignation arrived, it produced a universal burst of indignation. The spirit of resistance spread from province to province: Junta were formed, among which that of Seville peculiarly distinguished itself by its activity and wisdom. Muskets and ammunition were dispatched from Britain; all the unmarried men from 18 to 45 were summoned to arms, and a correspondence was established among the patriots in the different quarters of the country. The first measures of the Spaniards were eminently successful. Five French ships of the line lying in Cadiz were forced to surrender after three days cannonading. General Dupont, who had been dispatched too late to take possession of that port, attacked a superior force of Spaniards at Baylen, but was repulsed with such loss that he was not able to effect his retreat, and surrendered his army of 24,000 men prisoners. In the north Palafox defended Saragossa with astonishing courage and perseverance. The French were defeated with great loss in two attacks upon Valencia; and Joseph Bonaparte, after coming to Madrid with the title of king, backed by the nobles and the inquisition, and with a new constitution in his pocket, was compelled to measure back his steps on the 27th July. Thus, within less than three months Spain was almost cleared of its enemies by the valour and patriotism of its population.

These unexpected reverses had in no respect shaken Bonaparte's purpose. A new levy of 160,000 men was ordered in France; and large reinforcements were poured into Spain. Napoleon, after holding a meeting with Alexander at Erfurt, and receiving additional assurances of his support, joined his army in Spain, which had occupied the line of the Ebro for some months. By a series of persevering attacks, the three principal Spanish armies under Castanos, Blake, and Count Belvedere, were broken, and in a great measure dispersed; and on the 4th December Napoleon entered Madrid, after battering it for two days.

A British army of 30,000 men under Sir Arthur Wellesley landed in Portugal in July to assist the Portuguese, who had begun to rise in arms, in expelling their invaders. Junot advanced from Lisbon to meet them, and on the 21st of August was fought the battle of Vimiera, which ended in the defeat of the French. By the convention of Cintra which followed this battle, the British generals agreed to transport the French army to France; and much dissatisfaction was excited in England when it was found that no decisive victory had not enabled the British commanders to dictate more humiliating terms. The generals were called home to be tried; and Sir John Moore was appointed to command the army. An additional force under Sir David Baird landed at Corunna, and the two armies advancing into Spain joined at Valladolid. Notwithstanding the flattering promises of support they received from the supreme junta, not a single regiment of Spaniards joined them; and the commander-in-chief in cold blooded conspirators. The Britons, under Wellington, learned that Bonaparte was advancing upon them with a force of 70,000 men, they found it indispensable to retreat. As it was now the depth of winter, the retreat was attended with great loss and incredible hardships to the troops. The army reached Corunna on the 12th January 1809, and on the 15th was attacked by the French under Soult. They were repulsed at all points, but the death of General Sir John Moore, who fell early in the engagement, damped the joy of the victors. He was buried the next morning on the ramparts of Corunna. The loss of the British was about 700 in killed and wounded; that of the French about 2000. The British army embarked next day, and returned to England.

The occupation of so large a portion of the French force in Spain seemed to present a favourable opportunity to Austria for recovering some of her losses. She had been silent, but diligently, increasing and improving her military establishment, and re-organizing her finances. Bonaparte, who kept an eye on her proceedings, endeavored to intimidate her; but failing in this object, he prepared for war. He called up the contingents of the Rhinische confederations, and with these, added to some large bodies of French troops, advanced into Bavaria. He attacked and defeated the Austrians at Ebensberg on the 20th, and at Eckmuhl on the 22d April, in which two battles the Austrians lost 40,000 men. These successes laid open the whole of Austria to him, and he reached Vienna on the 10th May, which was surrendered after a trifling resistance.

The archduke Charles retired to Hungary, and took up a position near Fressburg; and on the 21st and 22nd was fought the battle of Aspern, one of the most bloody and obstinately contested engagements which has occurred in modern times. The Austrians were the assailants; and though they did not succeed in their object of driving the French across the Danube, it is yet clear that the latter suffered the greater loss, and had no victory to boast of. Not less than 30,000 men were killed or wounded on each side. The situation of Napoleon had never before been so critical. During the month of June he was assiduously employed in collecting troops. On the 6th July, having completed his preparations, he attacked the Austrians at Wagram, and by superiority of skill, more than numbers, gained a decisive victory. The loss of the Austrians, according to the French accounts, amounted to 40,000 killed and wounded, and 20,000 prisoners. Another defeat at Znaim entirely ruined their hopes; and they now sought peace on the conqueror's terms.

The treaty of Presburg, which was not definitely arranged till October, subjected Austria to less considerable sacrifices than had been expected. To France she gave up Fiume and Trieste, with the whole northern shores of the Adriatic; to Bavaria certain districts between the Alps and the Danube, with the Tyrol; to Saxony she ceded the western part of Galicia, and
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France to Russia the district of Tarnopol on the east of that province. In the Tyrol, and in the north-west of Germany, a desultory war was carried on against the French for a short time; but the resistance in both cases proved vain.

Bonaparte, in the course of this campaign, had annexed the papal territories to the French empire, by a decree dated from Vienna. Parma, Placentia, and Tuscany, had been added some time before.

Soon after the breaking out of the war between France and Austria, the British ministers collected a large force, naval and military, for an expedition, the object of which was kept a profound secret. It sailed from the Downs on the 20th July, and on the 1st August, Flushing, in the island of Walcheren, was invested. The place held out till the 24th, when the garrison of 4000 men surrendered prisoners of war. Antwerp was the main object of the expedition; but the British commander, the earl of Chatham, had neglected to seize some forts which would have facilitated his approach to the place; the French had employed the time lost in the siege of Flushing in strengthening the defences; and the capture of that great naval depot was then judged to be impracticable. The expedition then returned to England, to the great disappointment of the nation, who anticipated some more important result than the occupation of a useless sandy island, from an expedition consisting of 40,000 chosen troops, and 35 sail of the line. The public mortification was increased in the sequel. The ministers resolved to keep possession of Walcheren, apparently for no other reason than that they were ashamed to renounce an object which had cost them so dear. At last, the annual and regular scourge of the place, which broke out among the troops, destroyed or disabled nearly all who remained in it, and ultimately rendered it indispensable to abandon the island.

In the month of April, this year, a most gallant and daring attack was made by Lord Cochrane on the French fleet in Basque roads, by which six ships of the line were driven on shore and rendered useless, and three others, besides frigates, were burnt.

After the expulsion of the British from the peninsula, the Spanish armies were attacked by the French, and defeated in various engagements; but the patriotism of the people soon filled up the ranks again, and kept a respectable force on foot. Saragossa was besieged a second time, and defended with incredible valour and perseverance, till it was reduced to a mass of ruins, and 30,000 of its inhabitants had perished by the sword and disease. Another British army, which had been recently landed in Portugal under Sir Arthur Wellesley, marched into Spain, and joined the Spanish force under General Castaño. The two armies advanced towards Madrid, and at Talavera were attacked by the French under Marshal Victor. The battle continued two days, and terminated in the repulse of the French, who retired in good order. The loss of the latter was estimated at 10,000 men; that of the British and Spaniards at 7000. The rapid advance, however, of Soult and Ney from the south compelled the British general to measure back his steps to Badajoz, and no advantage was reaped from the victory. From the middle of summer to the end of the year a number of actions were fought between the French and Spaniards, in which the former were generally successful, though they sometimes experienced reverses. The battles of Ocana and Alba were peculiarly disastrous to the Spaniards, and broke their confidence so completely, that for a considerable time after they offered little resistance to their enemy, who possessed himself of Seville, and all the most considerable places in the south except Cadiz.

Massena arrived in Spain in the spring of 1810 with large reinforcements, and assumed the command of the French army destined to act against Portugal. After killing Ciudad Rodrigo and Almeida, he advanced to Badajoz, and attacked the British in their strong position there, but was defeated with great loss. The pass by the northern edge of the Sierra, however, being left open by accident, he proceeded through it to Coimbra, and thence to Torres Vedras, where finding the British army posted in an impregnable position, he retired a short distance, and took up his quarters at Santarem. Here he remained from the 1st November to the 3rd of March, when he returned to Spain, continually harassed in his retreat by the British.

In the course of this year, the islands of Guadalupe in the West Indies, and of Mauritius and Bourbon in the Indian ocean, were taken from the French by the British with little loss.

The peace of Fersburg had put it in Bonaparte's power to accomplish an object, on which it is probable his thoughts had long been bent. Possessing a power surpassing that of any sovereign in Europe, he was anxious to ally himself by marriage with some of those royal families, who could add the lustre of ancient renown to the titles which the sword had given him. His marriage with the archduchess Maria Louise took place in March 1810. It was followed by splendid fetes, and multitudes of addresses, couched in the most sickening style of hyperbolical flattery. As if this new alliance had made him more regardless of public opinion, he, about the same time, issued several decrees of a most arbitrary nature, of which one authorized the detention of all such persons as the government might suspect, without bringing them to trial; another ordered the names of all servants, male or female, employed in families, to be registered at the police, obviously for the purpose of perfecting the system of espionage previously established; and several others subjected the press to a rigid censorship, and limited the number of printers and book-sellers. His brother Louis, king of Holland, being found too humane for the rigorous system he had adopted, was set aside; and that unhappy country, as well as Bremen, Hamburg, and Lubeck, with the intermediate sea coast, were added to the French empire. He was now in fact at the acme of his power. Within the empire, if he did not enjoy the love of his subjects, he had dazzled their judgments by his exploits, and commanded their admiration. The conscription furnished him with an inexhaustible supply of soldiers. His revenues were equal to his expenditure; and a crowd of tributary kings and princes, who owed their dignities to him, enabled him to command the resources of all the adjacent countries. Of the only two princes on the continent capable of disturbing his security, the one was his firm supporter, and in some measure the participator in his crimes; the other was closely connected with him by family ties. The countries directly under
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both flanks, till his communication with the Rhine was intercepted, and his position almost surrounded. Napoleon now prepared for the combat, which he saw was unavoidable, by concentrating his troops, and strengthening the weak points of his position with field-works. The decisive battle of Leipzig, the greatest and most eventful in modern times, was fought on the 16th, 17th, and 18th October. On the 16th, the advantage at the close of the day was on the side of the French; the 17th was spent chiefly in preparations for renewing the engagement. Even on the 18th, the success of the allies was not so complete, that it would have been ruinous to Napoleon’s army, had the bridge between Leipzig and Lindenau not been destroyed prematurely, and exposed the divisions of Macdonald and Poniatowsky to destruction. The loss of the French was estimated at 60,000 men, in killed, wounded, and prisoners, and 500 pieces of cannon. Their route to the Rhine was screened with baggage, military, and every species of military wreck. At Hanau they encountered the Bavarian general Wrede, with 33,000 men, but he was not able to stop their march. The remnant of the army crossed the Rhine at Mentz, on the 7th November.

Bonaparte after his first reverses in Russia had weakened his armies in Spain, by drawing troops from that country to Germany. The British and Spanish generals now prepared to avail themselves of this advantage. The French withdrew from Madrid in the end of May, and appeared at first disposed to defend the line of the Ebro. But this intention was soon abandoned, and they continued to retire northward. At Vittoria the British general attacked them on the 20th June, and gained a brilliant victory. A second victory in the heart of the Pyrenees enabled Lord Wellington to lay siege to Pamplona and St Sebastian, both of which were reduced. The war was now carried into France, and after five days’ fighting, the strong lines which the French had formed in the neighbourhood of Bayonne were forced, and the British and Spanish armies advanced to the Adour.

The supports of Napoleon’s power now crumbled down on all sides. The Confederation of the Rhine was entirely dissolved immediately after the battle of Leipzig, and the whole of the German auxiliaries were from that moment lost to the French cause. In his efforts to collect an army, Napoleon had withdrawn almost all the French troops from Holland. The Dutch, who had suffered severely from his antimarriage principles, gladly seized the opportunity to shake off the yoke. A conspiracy was formed at the Hague and in Amsterdam; the Dutch military joined the people; and Holland recovered her independence almost without a struggle. On the 30th November the prince of Orange arrived from England, and was greeted with the liveliest acclamations of the people.

Preparatory to entering France, the allied sovereigns issued a proclamation from Frankfurt (1st December), in which they declared to the French nation, that they had no plans of conquest in view; that they wished France to be great, happy, and free; and that it was solely against the ambition of Napoleon, who held all the neighbouring states in slavery, that they made war. The French emperor called for a new levy of 300,000 men, and by his own authority increased the existing taxes. The legislative body was convoked, and for the first time ventured to speak another language than that of adulation. A deputation of its members drew up a report (28th December), in which they stated the necessity of uniting the nation to the throne, by an open renunciation of projects of aggrandisement, and by maintaining the entire and constant execution of the laws which guarantee liberty, and the free exercise of political privileges. These they considered as the only means of giving energy to the French in their own defence. Napoleon repented the freedom of this statement with the insolence which unbridled power had taught him. He taxed the members of the committee with faction and treason; and without regard to their remonstrances, took measures for recruiting his armies, and raising the nation en masse. But the people, worn out with his endless demands, answered his call to arms with much less zeal than was evinced by the Prussians in a similar case.

The allies passed the Rhine on the 1st January 1814, and spread themselves over the Netherlands and Alsace, without experiencing much resistance. They wisely pressed on, without losing time in besieging fortresses. A last and fruitless effort was made to negotiate, but without suspending hostilities. Commissioners met at Chatillon on the Seine. The basis proposed by the allies was, that France should be reduced within the limits she occupied in 1792; and that Austria, and certain other strong places, should be put immediately into their hands, till the treaty was completed. The French ministers shifted their grounds as the fortunes of their master fluctuated, during the course of hostilities, till the negotiations were closed on the 18th March. It would be tedious to recount the various movements and battles of the different armies, which were now pressing towards Paris as a common centre, and against which Napoleon made head with a very inferior force. It is admitted that he never displayed greater ability than in this short campaign; and that the French troops, though consisting in a great measure of raw levies, never fought with greater intrepidity. No excursions, however, could now avail against the overwhelming force of the allies under Prince Schwarzenberg. Lasso, Rheims, Troyes, Montmiral, Arcis, places within seventy or eighty miles of Paris, were the scenes of sanguinary contests, in which the French often succeeded; but still the loss generally operated more severely upon their small force, than upon the larger masses of the allies. It was on the 22d March that Napoleon made a movement, which suddenly changed the state of the war. Placed between two armies of a hundred thousand men each, with a force not exceeding sixty thousand, he attempted by a desperate effort at Arcis, to disable or defeat one of his antagonists; but failing in his design, and despairing of forcing the position of the Austro-Russian army, he ventured on the daring project of retiring to Vitry, where he was intercepted between the two hostile armies, but where he was in no condition to prevent their approach to the capital, if they chose to follow that course. He calculated that Prince Schwarzenberg would not advance to Paris, while he hung on his rear; but that on the contrary, he would be followed by the Austrian general, who would thus be driven away from the capital, without the expense of a battle. The result, however, disappointed
pointed his calculations. Blucher and Schwarzenburg pushed rapidly forward, leaving a corps to observe Napoleon's motions, and on the 28th March reached the neighbourhood of Paris. The French emperor saw his error too late, and in the first moment of despair, addressed a letter to his father-in-law at Dijon, entreating him to interpose to secure the throne to his daughter's child. But his application was fruitless. On the 29th several of the villages on the north of the capital were taken after a brave defence; and on the 30th the allies drove the French within the barriers, when Marshal Marmont seeing further resistance to be hopeless, proposed a capitulation, which was signed at two in the morning on the 31st March. The allied sovereigns with their troops entered Paris the same day. The inhabitants were assured by proclamations, that they came not as conquerors, but as friends and deliverers; that private property and rights should be religiously respected, and no insult offered to the national feelings. In such circumstances, it was not wonderful that a people so susceptible of sudden emotions as the French, relieved by this liberal conduct from the most appalling apprehensions, should welcome the allied princes with unhindred acclamations. As they passed into the city through the suburbs of St. Martin, strains of long live Alexander, long live Frederic William, long live our Deliverers, were heard on all sides. The Parisians were divided into three parties. The most considerable party in point of numbers was chiefly anxious about the establishment of a free constitution; another party was attached to the existing order of things, and wished to secure the crown to Bonaparte's son; the third and smallest party consisted of Royalists, and desired merely the restoration of the Bourbons. The allies naturally wished to favour the last party; but as Alexander professed his readiness to allow the French to form a constitution for themselves, and to make what conditions they pleased with their prince, the liberal party, with a few exceptions, declared for the Bourbons. The senate assembled, with Talleyrand at its head, decreed on the 2d April, that Napoleon by his various acts of ambition and tyranny had forfeited the throne. A plan of a constitution was immediately afterwards drawn up, and unanimously adopted by that body, under which it was carried, that the crown should be offered to Louis, brother of the late king. By this instrument, the supreme authority was vested in the king, the senate, and legislative body; the king was to possess an absolute veto; the senate was to consist of not less than 150, nor more than 200 members, whose dignities were hereditary; the legislative body was to be elected immediately by the electoral bodies, for a period of five years. The existing nobility were to preserve their titles, and the old nobles to resume theirs. The freedom of the press was guaranteed. While these great changes were taking place in Paris, Napoleon remained at Fontainebleau, from which he sent Marshals Ney and Macdonald to negotiate with the allies, and to endeavour to secure the succession to his son. The restoration of the Bourbons, however, had already been determined on; and the result of the negociation was, that Napoleon was allowed to retire to the island of Elba, with a pension of two millions of francs per annum (80,000l.) and two million francs were assigned to the ex-empress Josephine; two millions and a half to the other branches of the imperial family; and the sovereignty of Parma, Placentia, and Guastalla, was given to the empress Maria Louisa, and to her son in succession. Napoleon was permitted also to take with him to Elba, 400 volunteers as a guard.

While the allies were thus bringing the war to a happy termination in the north of France, Lord Wellington was advancing with uninterrupted success in the south. His lordship passed the Adour, as soon as the cessation of the rains rendered the roads passable, and on the 27th February attacked Soult in his strong position at Orthes. The French army, though much inferior in numbers to the allies, made a most determined resistance, but was at length driven back with the loss of seven thousand men. This victory opened the city of Bourdeaux to the conquerors, where the white flag was immediately displayed, amidst shouts of long live the Bourbons. Soult retired slowly towards Toulouse, under the walls of which he took up a very strong position. He was here again attacked by the allied British and Spanish armies on the 10th April. The French commander availed himself of the advantages of his situation with consummate genius, and baffled his antagonists for many hours; but he was at last overpowered, and compelled to retire, leaving the city to be occupied by the victors. The loss of the British and Spaniards in this battle which terminated the war, amounted to five thousand men; that of the French has not been mentioned, but must of course have been greater. Next day intelligence of the capitulation of Paris arrived, and immediately led to the suspension of hostilities.

Louis left his residence in England, and arrived at Paris on the 3d May, where he was welcomed with the tumultuous acclamations of the populace. The negotiations now proceeded rapidly, and the peace of Paris was signed on the 30th May. The limits of France were re-established as they existed on the 1st January 1792, except that some small additions were made for the sake of rounding the frontier. She received back all her colonies except Tobago, St. Lucia, the Mauritius and its dependencies, and the part she possessed of St. Domingo. The allies discharged her of all pecuniary claims, or claims for compensation, except those of private individuals; and she was allowed to retain the works of art collected in the Louvre from the spoils of Italy and Germany. Considering how wantonly the victors had been provoked, and how much they had suffered from the restless aggressions of Napoleon's government, it must be admitted that the terms they dictated to France were extremely liberal, and that they made a very temperate use of their power.

Louis thus found himself reinstated on the throne of his ancestors without any effort of his own. Though his situation presented considerable difficulties, they were such as prudence and liberal conduct on his part would have surmounted. As his policy was necessarily pacific, he could not hope to detach the affections of the army from the celebrated commander who had been so long their idol. But in these circumstances, it was so much the more incumbent on him to attach the nation firmly to his cause; to unite their interest with his own, by establishing liberal institutions, and by showing the people that their only security for the blessings
**FRANCE.**

1815.

Return of Bonaparte from Elba. 1815.

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number of small craft; and the execution of his design is said to have been hastened by the intelligence he received that the allied princes at Vienna had it in contemplation to transport him to St. Helena. At length, on the 26th February 1815, he left Porto Ferrajo with 900 men, on board of seven vessels, of which one was armed. With this handful of men he was now about to invade a powerful kingdom, defended by an army of 200,000 soldiers. A landing was effected on the 1st March, near Antifer. For five days he received no support, and his situation appeared extremely critical; but a force of 6000 men sent from Grenoble to arrest his progress having joined him, and the garrison of that city having immediately after declared in his favour, his difficulties were in a moment at an end. From this period every regiment sent against him served to swell his army. The people, even those who had insulted him during his journey to Elba, moved by novelty, or disappointed in the conduct of the Bourbons, strewed his path with flowers, and received him as a deliverer with joyful acclamations. In short, his journey to Paris was a continued triumphal procession. He reached that capital on the 20th March, in the evening, and, without shedding one drop of blood, reascended the throne from which he had been driven eleven months before. Louis had left Paris at one o’clock the same morning, accompanied by a few emigrants, without the body of the people testifying the least concern for his misfortunes, or the least regret at his departure. He retired to Ghent in the Netherlands.

Though the whole of France submitted almost instantaneously to Napoleon, he was well aware that vast exertions would be required to establish his power. The great princes assembled at the congress of Vienna, no sooner learned that he had landed in France, than they issued a proclamation, placing him “without the pale of civil and social relations,” and declaring their determination to maintain the dispositions of the treaty of Paris at all hazards. Sensible of the difficulties of his situation, he now endeavoured to unite the national feeling to his cause by a liberal system of government. A new constitutional act was promulgated, establishing a hereditary chamber of peers, and settling a plan of representation, which, though not entirely objectionable, was infinitely preferable to any that had been in operation since the dissolution of the republican government. The two chambers, when they afterwards met, evinced a spirit of independence to which France had been a stranger for 15 years. The censorship was abolished by an imperial decree, and every thing was done to give a popular character to the acts of the government. Deputations called from the electoral colleges, met at Paris, and an assembly, to which the ancient name of a Champ de Mai was given, swore to maintain the constitution. Bonaparte had been all the time sedulously employed in strengthening his army. It was desirable to act before his enemies could concentrate their vast resources; and as soon as his preparations were tolerably advanced, he hastened to the Netherlands. Both the Prussians and British were taken by surprise. The former were attacked and repulsed near Charleroi with considerable loss on the 15th. On the 16th were fought the battles of Quatre Bras and Ligny, in which the Prussians again suffered severely; but the small body of British engaged maintained their ground by astonishing efforts of heroism. Napoleon had now accomplished one object; he had separated the main body of the Prussians from their allies; and the 17th was spent in preparations for a conflict with the British on the following day. The duke of Wellington had taken up a station in a position chosen by himself in the neighbourhood of Waterloo. Here he awaited the attack of the French, which commenced at mid-day on the 18th. It is impossible to do justice within our present limits to this memorable battle. Both generals exerted themselves to the utmost; and never did two armies second the skill of their commanders by a more devoted courage. The immovable firmness of the British troops, defied the tactics, the enthusiasm, and the desperation of their enemies; and on the arrival of the Prussians at sunset, the French, worn out by incessant but fruitless efforts, were at length overthrown with unexampled carnage, and the entire loss of their artillery and baggage. The victory was so decisive, that the flight was a complete rout, the beaten army seemed totally dissolved, and scarcely a semblance of resistance was offered. The total loss of the French in this battle was never accurately ascertained, but has been estimated at 40,000 men in killed, wounded, and prisoners, out of an army of 80,000. Napoleon arrived at Paris on the 20th, and finding that he was now considered as the only obstacle to peace, he resigned the imperial crown in favour of his son. The two chambers conducted themselves with great firmness and wisdom in this trying conjuncture. They formed a provisional government, sent commissioners to treat with the allies for peace, made preparations for defending Paris, and found themselves so warmly seconded by the national spirit of the people and the army, that probably nothing but the extreme difficulties of their situation, from the sudden approach of an overwhelming force, prevented a general rising of the nation to defend its independence. When the cannon were roaring within hearing of the citizens, and a hostile army threatened them with the most fearful calamities, not a single voice was raised in the chamber in favour of the Bourbons. The representatives continued to meet till the 8th July, when the allied troops being in possession of Paris in virtue of a capitulation, the doors of the chamber were shut, and the deputies excluded by an armed force. The allies now acted with less reserve than in the former year. They avowed their determination to replace Louis on the throne by force; and in this measure the British minister concurred, in opposition to the most obvious sense of the treaty between the allied powers of 25th March, and subsequent declarations, which however were found to be nicely adapted to cover such a design by a happy equivocation in their terms (d). In every town which the allies entered they proclaimed Louis XVIII.

(d) "In this war they do not desire to interfere with any legitimate right of the French people. They have no design to oppose the claim of that nation to choose their own form of government, or intention to trench in any respect upon their independence as a great and free people. However general the feelings of the sovereign
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The established religion is that of the church of Rome, but entirely independent of the Holy See; and the revenues of the clergy are not so extensive as to render them formidable to the preservation of the state. Of its political constitution, as that is an ignis fatuus which eludes all description, little need be said.

Subsequent to the revolution, it was perhaps impossible to give a just account of the strength of the French army, for both themselves and their enemies made it more numerous than it really was, although both parties must have been actuated by very different motives. The numerous defeats which the allies experienced, rendered it necessary to speak of their antagonists as a never-
the franchise is illegal and void: or lastly, to have a forest, chase, park, warren, or fishery, endowed with privileges of royalty. See Chasse, Forest, &c.

Franchise is also used for an asylum or sanctuary, where people are secure of their persons, &c. Churches and monasteries in Spain are franchises for criminals; so were they anciently in England, till they were abused to such a degree that there was a necessity for abolishing the custom. One of the most remarkable capiti-lars made by Charlemagne in his palace of Haristal, in 779, was that relating to the franchises of churches. The right of franchise was held so sacred, that even the less religious kings observed it to a degree of scrupu-lousness; but to such excess in time it was carried, that Charlemagne resolved to reduce it. Accordingly he forbade any provision being carried to criminals retir-ed into churches for refuge.

Franchise of Quarters, is a certain space or district at Rome, wherein are the houses of the ambassadors of the princes of Europe; and where such as retire cannot be arrested or seized by the sheriff or serjeants, nor prosecuted at law. The people of Rome look on this as an old usurpation and a scandalous privilege, which ambassadors, out of a jealousy of their power, carried to a great length in the 15th century, by enlarging insensibly the dependencies of their palaces or houses, within which the right of franchise was anciently confined. Several of the popes, Julius III. Pius XIV. Gregory XIII. and Sixtus V. published bulls and ordinances against this abuse; which had rescued so considerable a part of the city from their authority, and rendered it a retreat for the most abandoned persons. At length Innocent XI. expressly refused to receive any more ambassadors but such as would make a formal renunciation of the franchise of quarters.

Francis I. king of France, the rival of the emperor Charles V. and the restorer of learning and politeness in France. See (History of) France.

Francis, Philip, a very ingenious writer, of Irish extraction, if not born in that kingdom. His father was a dignified clergyman in Ireland, being dean of an cathedral; and our author, his son, was also bred to the church, and had a doctor's degree conferred on him. He was more distinguished as a translator than as an original writer. His versions of Horace and Demosthenes have been justly valued: the former is accompanied with notes, and is perhaps as complete and useful a work of its kind as hath yet appeared. He was also a considerable political writer; and in the beginning of the present reign is supposed to have been employed by the government: for which service he was promoted to the rectory of Barrow in Suffolk, and to the chaplainship of Chelsea hospital. He was also the author of two tragedies, Eugenia and Constantia; but as a dramatic writer, not very successful. He died at Bath in March 1773; leaving a son, who was then one of the supreme council at Bengal.

Franciscans, in Ecclesiastical History, are religious of the order of St Francis, founded by him in the year 1209. Francis was the son of a merchant of Assisi, in the province of Umbria, having led a dissolute life, was reclaimed by a fit of sickness, and afterwards fell into an extravagant kind of devotion, that
bound for each other, to see each person of their pledge forthcoming at all times, or to answer for the offence of any one gone away: so that whenever any person offended, it was presently inquired in what pledge he was, and there the persons bound either produced the offender in 31 days, or made satisfaction for his offence.

Frank-Tenement. See Tenure.

Franked Letters. The privilege of letters coming free of postage to and from members of parliament was claimed by the house of commons in 1660, when the first legal settlement of the present post office was made; but afterwards dropped, upon a private assurance from the crown, that this privilege should be allowed the members. And accordingly a warrant was constantly issued to the postmaster general, directing the allowance thereof to the extent of two ounces in weight: till at length it was expressly confirmed by 4 Geo. III. c. 24, which adds many new regulations, rendered necessary by the great abuses which had crept into the practice of franking; whereby the annual amount of franked letters had increased from 23,600 in the year 1715, to 170,700 in the year 1793. Further regulations have since taken place; in particular, franks must be dated (the month written at length), and put into the office the same day; notwithstanding which, the revenue still loses by this privilege a very considerable annual sum.

Franken, Franciscus, commonly called Old Frank, a famous Flemish painter, supposed to have been born about the year 1544; but though his works are well known, very few of the circumstances of his life have been transmitted to posterity. This master painted historical subjects from the Old and New Testaments; and was remarkable for introducing a great number of figures into his compositions, which he had the address to group very distinctly. Vandyck often commended his works, and thought them worthy of a place in any collection.

Franken, Franciscus, distinguished by the name of Young Frank, was the son of the former, born in the year 1580. He was instructed by his father; whose style he adopted so closely, that their works are frequently mistaken. When he found himself sufficiently skilled at home, he travelled into Italy for improvement in colouring; and, on his return, his works were much coveted. The most capital performances of this painter are, a scriptural performance in the church of Notre Dame at Antwerp; and an excellent picture, in a small size, of Solomon's idolatry. Young Frank died in 1642.

Frankendal, a strong town of Germany, in the dominions of the Elector Palatine, situated near the Rhine, about seven miles south of Worms. It was taken by the Spaniards in 1623, by the Swedes in 1632, burnt by the French in 1688, and finally taken by the allies in the year 1794. E. Long. 8. 29. N. Lat. 49. 25.

Frankenia, a genus of plants belonging to the hexandria class; and in the natural method ranking under the 17th order, Colyceanthems. See Botany.

Frankfort, the name of several townships in different places of North America; such as Frankfort, a township in Hancock, and district of Maine, with a few houses regularly built. It contains 851 inhabitants, Frankfort, and lies about 238 miles north-east of Boston. Frankfort, a thriving village in Philadelphia; the name of another in Hampshire, of one in Virginia, and the name of the metropolis of Kentucky.

Frankincense. See Incense.

Franklin, Thomas, D.D. chaplain in ordinary to his majesty, was born in London about the year 1706, and was the son of Richard Franklin, well known as the printer of an anti-ministerial paper called The Craftsman; in conducting which he received great assistance from Lord Bolingbroke, Mr Pulteney, and other excellent writers, who then opposed Sir Robert Walpole's measures. By the advice of the second of these gentlemen, young Franklin was devoted to the church, with a promise of being provided for by the patriots; who afterwards forgot his undertaking, and then entirely neglected him. He was educated at Westminster school; from whence he went to the university of Cambridge, where he became fellow of Trinity college, and was some time Greek professor. In December 1738, he was instituted vicar of Ware and Thundridge; which, with the lectureship of St Paul, Covent Garden, and a chapel in Queen street, were all the preferments he held till he obtained the rectory of Brasted in Kent. This gentleman was possessed of no inconsiderable share of learning and poetical abilities, and was long a favourite in the literary world. His translations of Phalarites, Sophocles, and Lucian, equally evince his learning and his genius, as they are not more distinguished for fidelity in the version, than congeniality with the spirit of the admirable originals. Dr Franklin, like Mr Foote, suffered a translation from the French to be printed in his name; but the Orestes and Electra are supposed to be all that were really by him. It was a translation of Voltaire's works, to which also Dr Smollett's name appears. His own dramatic compositions, of which the principal are the tragedies of The Earl of Warwick and Matilda, are universally known, and deservedly esteemed by the public. He died in March 1784.

Franklin, Benjamin, a philosopher and a statesman of considerable eminence, was born in the year 1706, at Boston in New England. His family derived their origin from Eton in Northamptonshire, where his ancestors had an inconsiderable freehold for many generations. The persecution of the non-conformists in the reign of Charles II. induced his father to take refuge in New England; and in the city of Boston he followed the occupation of a soap-boiler and tallow-chandler. Franklin drew up a history of his own life. From his nativity to the 25th year of his age; but as at that period he had made no very conspicuous figure in the world, it is to be lamented that we have not the assistance of his own pen to the meridian of his career. This defect we have endeavoured to supply in the subsequent narrative from the most authentic materials, avoiding as much as possible the exaggerated panegyric of friends, and the unmerited detraction of enemies.

Our author, from his very infancy, discovered the strongest propensity towards literary pursuits, which determined his father to qualify him for the ministry; but he was thwarted in his designs by a numerous and increasing family,
Franklin family, and therefore Benjamin was taken from school at ten years of age, to take part in the drudgery of his father’s trade. This greatly mortified the aspiring mind of young Franklin, who wished to prefer a seafaring life to such an employment; but from this he was dissuaded by the influence of his father, who was a man of sound knowledge, and possessed a solid understanding.

He made it his chief aim to inspire his children with the love of knowledge and the principles of moral rectitude. He had few books; yet from among these Benjamin selected a number of voyages and travels, as well as different histories, a species of reading for which he had a strong predilection. By going through a course of controversial divinity in this unaided manner, he greatly strengthened his argumentative powers, which was most probably all he had in view. Defoe upon Projects, according to his own account, made such impressions upon his mind as in a great measure directed the subsequent events of his life.

He was now chosen to an employment which accorded much better with the natural bent of his mind than the business of his father’s shop. A brother of his own had a printing-office in Boston, to whom Benjamin was bound apprentice at 12 years of age. With the mechanical part of the business, he was soon acquainted; and the opportunities thus afforded him of procuring new books to read, were eagerly seized, and the greater part of the night frequently spent in the perusal of them. He soon became anxious to imitate the works which he most admired, and his first attempts were of a poetical nature. He composed and printed ballads, which were well received by those who love such a species of reading; yet his father had the address to convince him that nature never designed him for a poet. He therefore turned his whole attention to the cultivation of prose composition, in which he succeeded infinitely better; and he thus became superior to his brethren of the press, and raised himself to stations of public importance. As his passion for reading and writing was very strong, so he became in a short time a powerful disputant, which was strengthened by his intimacy with a young man of a similar disposition. He pursued, with uncommon attention, a translation of Xenophon’s Memorabilia, which enabled him either to consult or converse with him on the subject. It is also certain that he became a sceptic as to the religion in which he had been educated, and propagated his unbelief with zeal and asperity. The fatal consequences which this produced on the departure of some of his intimate companions, at length happily convinced him that it is extremely dangerous to destroy the salutary influence of religion, without being able to substitute anything in its place of equal importance and efficacy. He seems, however, to have continued a sceptic in his own mind, yet he still retained a love for moral rectitude, which led him to adopt honourable means in the prosecution of valuable ends. Much to his honour be it spoken, he acquired, at a very early period of life, that triumph over his sensual appetites, which is so essentially necessary to a life of dignity, usefulness, and virtue. Having read Tyron’s recommendation of a vegetable diet, at 16 years of age, he abandoned the use of animal food; and on offering to his brother to support himself on half the money which was paid for his board, he was allowed to adopt his own plan, by which means he was enabled to save a considerable sum for the purchase of books. Although he relaxed considerably as to a vegetable diet, yet he thus acquired the habit of being satisfied with little, and a contempt of the gratifications of the palate was frequently of singular advantage to him through the whole of life.

When his brother began a newspaper, Benjamin sent a number of pieces on various topics to be inserted, which met with the approbation of the most competent judges—a satisfaction he enjoyed without being known, as they were all anonymous. His brother treated him with the harshness of a master, which he bore with the utmost patience, as the public had already pronounced him to be possessed of merit. The states of America having prohibited James Franklin from publishing this paper, on account of some political offence, the name of Benjamin was employed as publisher, in consequence of which he procured his indentures, although he agreed privately with his brother to serve out his time. But as he did not deem this agreement obligatory, he went to New York by sea, and from that place to Philadelphia, in the seventeenth year of his age. He himself acknowledges this to have been a fault, and therefore has averted that censure which he would otherwise have deserved. At Philadelphia he engaged with a printer of the name of Kimeir, whose affairs he soon placed on a more respectable footing; and here also he became acquainted with several young men of a literary turn of mind, by whose company his taste for knowledge was greatly improved.

He soon after became acquainted with Sir William Keith the governor of that province, who powerfully recommended it to him to commence business on his own account, and promised to give him all the encouragement in his power. Encouraged by this gentleman to adopt such a plan, he set out for Boston on a visit to his parents, in order to procure from them some pecuniary aid; but a welcome reception was all he could obtain. Having returned to Philadelphia, Sir William generously offered to take the whole burden upon himself, and advised Franklin to make a voyage to England, in order to procure every thing necessary for a printing-office. He set sail in the year 1725, and returned with his intimate companion Ralph, whose name has been rendered memorable by being celebrated in the Dunciad. Unfortunately for Franklin, Sir William Keith, on whose letters of recommendation and credit he entirely relied, basely deceived him, and he was obliged to work as a journeyman in London for his immediate subsistence. His friend Ralph could only live by his head, and his income of consequence was extremely circumscribed, as well as precarious, which made him a heavy burden on the pocket of Benjamin. In that dissolute metropolis the one forgot his wife and child in America, and the other the solemn promises of fidelity which he had made to a Miss Read, prior to his departure; another step of his conduct which he himself severely censures. By a dissertation on liberty and necessity, pleasure and pain, he acquired considerable reputation, and it was the means of introducing him to the celebrated Dr. Mandeville, author of the Fable of the Bees. In the second printing-office in which he worked, he laboured incessantly to convince his fellow workmen that a pint of porter does not contain half
Franklin, half so much nourishment as a penny roll, for which he obtained the ludicrous epithet of the American aquatic; yet he was finally enabled to make many converts to his doctrine—a proof that he possessed strong persuasive powers, when we consider the deep-rooted attachment of those with whom he had to treat to their favourite libation.

After eighteen months residence in London, he returned to Philadelphia in the year 1726, and became clerk to a Mr Denham, a man of respectability, who had opened a warehouse in that city. He soon became acquainted with the principles of commerce, and led a very happy life in this new situation, till the connection was dissolved by the death of Mr Denham, which happened the following year. This again obliged him to become journeyman printer, and he was afterwards overseer in the office of Keimer, whom we have already mentioned. Here he acquired great esteem, and at length conceived the idea of setting up for himself, which he accomplished by entering into partnership with one Meredith, a fellow workman, whose father was in circumstances to enable him to advance them some money. His industry was habitual, but the idea that he was now working for himself, and how it additional encouragement. He was chiefly instrumental in the institution of a club which went by the name of the Junto, and which was highly conducive to the intellectual improvement of its members. Before the admission of a candidate, the following questions were put to him: 

"Do you sincerely declare that you love mankind in general, of what profession or religion soever? Do you think any person ought to be harmed in his body, name, or goods, for mere speculative opinions, or his external way of worship? Do you love truth for truth's sake; and will you endeavour impartially to find and receive it yourself, and communicate it to others?"

Franklin and his copartner began a newspaper, which the labours and talents of the former brought into repute, and by them the votes and laws of the assembly came afterwards to be printed. The partnership being dissolved by the departure of Meredith, Franklin, by his own working for himself, and additional encouragement, was enabled to take the whole business upon himself, to which he added the business of a stationer. When the increase of paper money engaged the attention of the American government, Franklin wrote an anonymous pamphlet in defence of the measure, by which he acquired considerable reputation, the countenance of men in power, and it placed his prosperity on a permanent basis.

About this time he kept up a criminal correspondence with different females, chiefly owing, perhaps, to the disappointment he met with in the first object of his love, Miss Read, who by this time was married to another in consequence of his neglect. But we forget the faults of the man in the ingenuous confession of the penitent. A report prevailing that Miss Read's husband was married to another woman, he retired to the West Indies, where he died, and Franklin married the object of his first love in the month of September 1736, being then about 24 years of age. She proved a valuable wife, and in every sense of the word, an "help meet for him."

To him we are to ascribe the establishment of a public library at Philadelphia, which he accomplished in the year 1731, and had the satisfaction of seeing it arrive at that flourishing condition which it has long since attained. His "Poor Richard's Almanac," was begun in 1732, and became remarkable for the many proverbial maxims with which it abounded; and the proverbial manner in which they were expressed made them take fast hold of the memory. His political career commenced in 1736, when he was chosen clerk to the general assembly of Pennsylvania, to which he was re-elected for several years, and at last became a representative. In 1737, he was made postmaster of Philadelphia, and in the subsequent year he greatly improved the police of the city, by the formation of a fire-company, and afterwards an insurance-company against losses by fire. In the war with France, which broke out in 1744, when the best means of defending the province against the inroads of the enemy, and when the militia bill was thrown aside from its being obnoxious to the people, Franklin suggested the idea of a voluntary association for their mutual defence, which was instantly signed by 1200 persons, and 10,000 subscriptions were obtained in a short time by circulating it through the province. By this and similar means America had an opportunity of ascertaining her own strength, and how it might be used for the advantage of the country in cases of necessity.

About this time he began his interesting experiments on electricity, by the result of which he justly acquired a distinguished reputation. The library society of Philadelphia having received from Mr Peter Collinson in the year 1745, an account of the facts respecting electricity which at that time engaged the attention of philosophers in Europe, Franklin set about studying the subject with the greatest assiduity. He gave the account of his researches, the title of "New experiments and observations on electricity, made at Philadelphia in America," and addressed to Mr Collinson in the form of letters, bearing date from 1747 to 1754. They were everywhere read with avidity, and universally admired; Dr Priestley speaks of them in the following terms: "It is not easy to say whether we are most pleased with the simplicity and perspicuity with which the author proposes every hypothesis of his own, or the noble frankness with which he relates his mistakes, and how they were corrected by subsequent experiments." Not to swell this article with a detailed account of all his discoveries on this subject, we shall content ourselves with mentioning that most interesting of the whole, his grand discovery that lightning and electric fire are identically the same. This identity had begun to be suspected, and experiments had been made in France to ascertain the fact; but it was reserved to Franklin to demonstrate this fact by his own experiments. He obtained his first decisive proof of this in the month of June 1752, by setting up a silken kite into the air with a point of iron, and a key fastened to the end of the hempen string by which he held it. In this manner he drew down from a thunder cloud a sufficient quantity of electric fire to emit sensible sparks from the key. By means of an insulated iron rod which he fixed upon his house, he drew down the lightning, and was thus furnished with an opportunity of discovering whether it was positive or negative. As he firmly believed that philosophical discoveries were only valuable in so far as they could be productive of benefit to man, he made them subservient to the protection of buildings from the effects.
Franklin. effects of lightning, which are truly alarming in North America. He applied physics to the purposes of common life, and in 1745 invented his Pennsylvania fireplaces, in which the qualities of an open grate were combined with that of a stove.

He turned his attention very much to the subject of politics, which was extremely natural for a man of a public spirit living under a popular government. He was chosen a representative of the city of Philadelphia for the provincial assembly in 1747. At this time a contest subsisted between the assembly and the proprietaries, as to the claim of the latter to be exempted from public burdens. Franklin took the popular side of the question, by which he acquired great influence, and was regarded as the head of the opposition. This was not the offspring of eloquence, for he seldom spoke, and never in the form of a harangue; but his pointed observations, his unadorned good sense, frequently destroyed the effect of the most elaborate orations.

He drew up the plan of an academy to be founded at Philadelphia, from a conviction that education in a free state is of the utmost importance. It was carried into effect with the year 1750, by virtue of subscription, to which the proprietors afterwards liberally contributed. He discharged the duties of his office as postmaster of Philadelphia with so much punctuality, that he was appointed deputy postmaster general for the British colonies in 1753, and the revenue was soon bettered by his unwearyed exertions. A plan for conciliating the Indians, and forming an alliance with them, was drawn up by Franklin in 1754, to which the commissioners at Albany agreed, and a copy of it was transmitted to the British privy council. It is a singular circumstance, that this plan was rejected by the assemblies as giving too much power to the crown, while the British ministry declared that it gave too much influence to the representatives of the people. In the year 1757, Franklin set sail for London, as agent for Pennsylvania, the assembly of that province being involved in disputes with the proprietary. It was agreed on by the privy council, that landholders should pay their share of the public burdens, on condition Franklin would engage that they should be fairly proportioned. He continued at the British court as agent for his province, and acquired so great reputation, that the same trust was reposed in him for Massachusetts, Maryland, and Georgia. His merit as a philosopher was now justly appreciated in Europe, and he was made a fellow of the Royal Society of London. The degree of L.L.D. was also conferred upon him at St Andrew's, Edinburgh, and Oxford.

In the year 1762 he returned to America, where he received the thanks of the assembly of Pennsylvania, and a handsome recompense in money for his important services. When the stamp act occasioned so much disturbance in America, Dr Franklin was summoned to the bar of the house of commons, to give evidence respecting the dispositions of the people, whether he thought they could be induced to submit to it; and the energy and clearness of his representations were instrumental in procuring the repeal of that obnoxious measure.

On the commencement of hostilities between Great Britain and the colonies in 1775, he returned to America, and was chosen a delegate to congress by the legislature of Pennsylvania. In 1776 he treated with Lord Howe on the subject of a reconciliation, and in one of his letters expressed in strong terms the temper of the British nation, to which he imputed the fatal extremity then arrived. When the question of independence came to be discussed, he was decidedly in favour of the measure, and was highly instrumental in bringing over the public mind to the same opinion. When a negotiation with France was opened, Dr Franklin was chosen one of the personages to reside at that court. His political abilities eminently qualified him for such a station, and his character as a philosopher gained him great esteem in a country where knowledge is revered. He brought about a treaty with France of an offensive and defensive nature in 1778, the immediate consequence of which was a war with Britain. He was one of those who signed the provisional treaty the year following. Prior to his leaving Europe he concluded a treaty with Sweden and Prussia. He was recalled from that active station in 1785, which he had filled with so much ability, and chosen president of the supreme executive council. He was chosen president of a society for alleviating the miseries of prisons, and abolishing slavery. His increasing infirmities made him withdraw from all public business in 1789, and on April the 17th 1790, be terminated his active and useful life, in the 85th year of his age.

Perhaps no man ever exceeded Dr Franklin in that solid practical wisdom which consists in pursuing valuable ends by the most appropriate means. His cool temper and sound judgment secured him from erroneous expectations. He saw things in their true light, and predicted consequences with nearly a prophetic spirit. He said of himself "I have always set a greater value on the character of a doer of good, than any other kind of reputation." In 1779, his "Political, Miscellaneous, and Philosophical pieces," were published in 4to and 8vo. His essays, humorous, moral, and literary, were published after his death, in two small volumes.

He was by no means inattentive to his own interest, of which his rapid advancement in life furnishes an ample proof; yet he never neglected the interest of society, or the good of mankind generally. The delicate situations in which he frequently stood, inevitably exposed him to the censure of his enemies; yet his general conduct has long ago received the approbation of his countrymen, by whom he was considered as the best and most valuable of citizens. When we view him as a philosopher, we must ascribe his chief merit to his electrical discoveries, yet on many other topics, such as meteorology and mechanics, he evinced himself a man of considerable penetration. As a political writer, his great merit is clearness, energy, and simplicity; and as a miscellaneous author he possesses a fund of humour which cannot fail to be at once both entertaining and impressive.

FRANKLIN, the name of several counties in America, such as Franklin county in Pennsylvania, computed to contain 800 square miles, or 512,000 acres. It contains 11 townships, and 15,655 inhabitants. Franklin, a county in Kentucky; the name of one in Halifax, of one in Virginia, and of another in Georgia, which contains 1041 inhabitants, including 165 slaves; it also the name of a township in Massachusetts; of one in Pennsylvania, another in New York, and of another in Connecticut,
This relation is formed by nature, not by choice; and though it has many things in common with, yet it is prior to, the obligations of friendship: consequently nature and reason dictate that there should be a peculiar affection between brethren. We are not obliged, however, to make a brother or sister an intimate or bosom friend in preference to one who is not akin. Diversity of temper, and want of suitable qualifications, may render it unsafe and improper. But where friendship and fraternity meet in the same persons, such a conjunction adds a lustre to the relation.

Among brethren, a hearty benevolence, an ardent concern for each other's welfare, a readiness to serve and promote it, are the peculiar offices of this relation; and though friends are to have their share, yet the claim of kindred is first and ordinarily strongest. "Necessaria praesidia vitae debentur ii maxime (cicero), quos ante dixi, i.e. propiquis: vita antem, vietusque communis, concilia, sermones, &c. in amicitia vigent maxime." De officiis.

FRATERNITY, BROTHERHOOD, the relation or union of brothers, friends, partners, associates, &c.

FRATERNITY, in a civil sense, is used for a guild, association, or society of persons, united into a body, for some common interest or advantage. See COMPANY and GUILD.

FRATERNITY, in the Roman Catholic countries, signifies a society for the improvement of devotion. Of these there are several sorts; as, 1. The fraternity of the rosary, founded by St. Dominic. It is divided into two branches, called the common rosary, and the perpetual rosary; the former of whom are obliged to confess and communicate every first Sunday in the month, and the latter to repeat the rosary continually. 2. The fraternity of the scapular, whom the blessed Virgin, according to the sabbatical bull of Pope John XXII, has promised to deliver out of hell the first Sunday after their death. 3. The fraternity of St. Francis's girdle, are clothed with a sack of a gray colour, which they tie with a cord, and in processions walk barefooted, carrying in their hands a wooden cross. 4. That of St. Austin's leathern girdle comprehends a great many devotees. Italy, Spain, and Portugal, are the countries where one sees the greatest number of these fraternities, some of which assume the name of arch-fraternities. Pope Clement VII. instituted the arch-fraternity of charity, which distributes bread every Sunday among the poor, and gives portions to 40 poor girls on the feast of St. Jerome their patron. The fraternity of death buries such dead as are abandoned by their relations, and causes masses to be celebrated for them.

FRA'TRES ARVALES. See Arvales.

FRA'TRIAGE, the partition among brothers, or coheirs, coming to the same inheritance or succession.

FRA'TRICELLI, in ecclesiastical history, an enthusiastic sect of Franciscans, which rose in Italy, and particularly in the marquisate of Ancona, about the year 1294. The word is an Italian diminutive, signifying fraterculi, or "little brothers;" and was here used as a term of derision, as they were most of them apostate monks, whom the Italians call fratelli, or fraticelli. For this reason the term fraticelli, as a nickname, was given to many other sects, as the Catharists, the Waldenses, &c. however different in their opinions and in their conduct. But this denomination applied to
the austere part of the Franciscans was considered as honourable. See Franciscans.

The founders were P. Maurato, and P. de Fossombroni, who having obtained of Pope Celestin V. a permission to live in solitude, after the manner of hermits, and to observe the rule of St Francis in all its rigour, several idle vagabond monks joined themselves to them, who, living after their own fancies, and making all pretensions to consist in poverty, were soon condemned by Pope Boniface VIII. and his successor, and the inquisitors ordered to proceed against them as heretics: which commission they executed with their usual barbarity. Upon this, retiring into Sicily, Peter John Oliva de Serignan had no sooner published his Comment on the Apocalypse, than they adopted his errors. They foretold the reformation of the church, and the restoration of the true gospel of Christ, by the genuine followers of St Francis, and declared their assent to almost all the doctrines which were published under the name of the abbot Joachim, in the “Introduction to the everlasting Gospel,” a book published in 1520, and explained by one of the spiritual friars whose name was Gerhard. Among other enormities inculcated in this book, it is pretended that St Francis was the angel mentioned in Rev. xiv. 6. and had promulgated to the world the true and everlasting Gospel of God; that the Gospel of Christ was to be abrogated in 1520, and to give place to this new and everlasting Gospel, which was to be substituted in its room; and that the ministers of this great reformation were to be humble and bare-footed friars, destitute of all worldly employments. Some say they even elected a pope of their church; at least they appointed a general, with superiors, and built monasteries, &c. Besides the opinions of Oliva, they held, that the sacraments of the church were invalid; because those who administered them had no longer any power or jurisdiction. They were condemned aforesaid by Pope John XXII. in consequence of whose cruelty they regarded him as the true anticrist; but several of them returning into Germany, were sheltered by Lewis, duke of Bavaria, the emperor.

There are authentic records, from which it appears that no less than 2000 persons were burnt by the inquisition, from the year 1328 to the time of Innocent VI. for their inflexible attachment to the poverty of St Francis. The severities against them were again revived towards the close of the 15th century by Pope Nicholas V. and his successors. However, all the persecutions which this sect endured were not sufficient to extinguish it; for it subsisted until the times of the reformation in Germany, when its remaining votaries adopted the cause and embraced the doctrine and discipline of Luther. And this has led popular writers to charge the Fraticelli with many enormities, some of which are accounted by M. Bayle, art. Fraticelli.

The Fraticelli had divers other denominations: they were called fraticellia, according to some, because they lived in community, in imitation of the primitive Christians, or rather through the humility of the founder of the Franciscan order, to which the Fraticelli originally belonged; Doletini, from one of their doctors; Bisocii, Beguini, and Beghardi.

FRATRICIDE, the crime of murdering one’s brother. See FARRICIDE.

FRAUD, in Law, signifies deceit in grants or conveyances of lands, &c. or in bargains and sales of goods, &c. to the damage of another person.

A fraudulent conveyance of lands or goods to deceive creditors, as to creditors is void in law. And a fraudulent conveyance in order to defraud purchasers, is also to such purchasers void, and the persons justifying or putting off such grants as void, shall forfeit a year’s value of the lands, and the full value of the goods and chattels, and likewise shall be imprisoned. See CHEATING.

FRAUSTADT, a town of Silesia, on the frontiers of Poland, remarkable for a battle gained by the Swedes over the Saxons in 1706. It is 70 miles N. N. W. of Breslau. E. Long. 15° 50. N. Lat. 51° 45.’

FRAXINELLA. See Dictamnus, Botany Index.

—It is remarkable of this odorous plant, that, when in full blossom, the air which surrounds it in a still night may be inflamed by the approach of a lighted candle. Dr Watson doubts whether this inflammability proceeds from an inflammable air which is exhaled by the plant, or from some of the finer parts of the essential oil of the plant being dissolved in the common atmospheric air. The latter is the most probable supposition; for were it the pure inflammable air, as Mr Cavallio observes, it would, on account of its small specific gravity, leave the plant as soon as it was produced. Common air acquires the property of becoming inflammable, by being transmitted through several essential oils.

FRAXINUS, the Ash; a genus of plants belonging to the polygamy class; and in the natural method ranking under the 44th order, Sepiariez. See Botany Index.

FRAY literally signifies to fret; as cloth or stuff does by rubbing, or over much wearing.

Among huntsmen a deer is said to fray his head, when he rubs it against a tree, to cause the skins of his new horns to come off.

FREA, or FRIGGA, the wife of Odin, was, next to him, the most revered divinity among the Heathen Saxons, Danes, and other northern nations. As Odin was believed to be the father, Frea was esteemed the mother of all the other gods. In the most ancient times, Frea was the same with the goddess Hertha, or Earth, who was so devoutly worshipped by the Angli and other German nations. But when Odin, the conqueror of the north, usurped the honours due only to the true Odin, his wife Frea usurped those which had been formerly paid to mother Earth. She was worshipped as the goddess of love and pleasure, who bestowed on her votaries a variety of delights, particularly happy marriages and easy childbeds. To Frea the sixth day of the week was consecrated, which still bears her name.

FREAM, a name given by farmers to ploughed land worn out of heart, and laid fallow till it recover.

FREATS, or FREITS, a term used in Scotland for ill omen, and sometimes denoting accidents supernaturally unlucky. King James VI. in his Daemonologie, MS. pen. Edm. B. I. ch. iv. p. 13. "But I pray you forget not likewise to tell what are the Devil’s rudiments? E. His rudiments f call first in general all that quhilk is called vulgarelie the virtu of woode, herbe,
pointed his governor; his sub-governor was Colonel de Kalkstein, an officer renowned for his courage and experience; he was taught mathematics and fortification by Major Senning; Han de Jendun, a Frenchman, instructed him in other branches of knowledge; and a cadet of the name of Kenzel, taught him his exercise. At eight years of age he was furnished with a small arsenal stored with all sorts of arms proportioned to his age and strength, of which his father left him absolute master. In a short time he was named captain and chief of the corps of cadets; and the young prince performed every day, in miniature, with his little soldiers, all the evolutions with which his father exercised his giants. At last he received the command of a company in his father's regiment, famous throughout all Europe, and which was composed of men of whom scarce one was short of seven French feet.

Born, however, with a taste for the arts, he devoted to their cultivation every moment he could escape from the vigilance of his guardians. He was more particularly fond of poetry and music, and when he could find a moment's leisure, he read French authors, or played on the flute; but his father as often as he surprised him playing or reading, broke his flute and threw his books into the fire. The prince, chagrined at such injurious treatment, and having a great desire to visit Germany, England, France, and Italy, desired permission to travel. This, however, his father would not allow, but permitted him to accompany himself in the little journeys he made from time to time into Germany; and, in 1728, took him to Dresden to see the king of Poland. By these little expeditions the desire of the prince to visit other countries was only the more inflamed, so that at last he formed a design of setting out without his father's knowledge. The design was intrusted to two of the prince's young friends, named Kat and Keit; money was borrowed for the occasion, and the day of their departure fixed, when unluckily the whole project was discovered. The old king, implacable in his resentment, and considering his son as a deserter, determined to put him to death. He was shut up in the fortress of Custrin; and it was with the utmost difficulty that the count de Seekendorf, sent for the purpose by the emperor Charles VI. was able to alter the king's resolution. Certain vengeance, however, was determined on both the intended associates in Frederick's journey. Keit escaped the danger by flying into Holland; but Kat had not that good fortune. The king directed that he should be tried by a court martial; but as they, contrary to his expectation, only sentenced the criminal to perpetual imprisonment, the revengeful monarch by an unheard-of exercise of the royal prerogative, caused him to be beheaded. The execution was performed under the windows of the prince royal, whose head was held towards the scaffold by four grenadiers: but no sooner did he approach the window, and see his friend in the hands of the executioner, than he stretched out his arms towards him, crying out, "Kat! Kat!" and instantly fainted away. During the remainder of his life he considered capital punishments with a great degree of horror, and they were rare throughout the Prussian dominions while he continued to reign. When the emperor had succeeded in preventing the execution of Frederick, the king remarked, that
Frederick. "Austria would one day see what a serpent she had nourished in her bosom." The royal prisoner remained a year at Custrin; during which time his father wished that he should learn the maxims of government and finance. For this purpose, M. de Munchow, president of the chamber of domains and finances, was ordered to make him assist at all their assemblies, to consider him as a simple counsellor, to treat him as such, and make him work like others. The young counsellor, however, though he assisted at their meetings, did not trouble himself with reading acts or copying decrees. Instead of this, he amused himself sometimes with reading French pamphlets, and at others with drawing caricatures of the president or members of the assembly. M. Munchow himself was likewise very favourable to the prince at this time, by furnishing him with books and other articles of amusement, notwithstanding the express prohibition of his father; though in this he certainly ran great risk; for the old king, who set but a very light value on human life, would undoubtedly have put him to death had he received intelligence of his complaisance.

Frederick, after passing the time above mentioned in confinement, was recalled to Berlin, on pretence of being present at the celebration of his eldest sister's marriage with the hereditary prince of Barenth; but the true reason was, that the king had now prepared a match for the prince himself. This was the princess Elizabeth Christina of Brunswick, niece to the empress. Frederick, who was not only totally indifferent to the fair sex in general, but particularly prejudiced against this princess, made some objections; his father, however, overcame all obstacles with "his usual arguments (says the author of the life of Frederick), viz. his cane, and a few kicks."

The coldness which Frederick at this time showed for the fair sex appears not to have been natural; for as early as the year 1723, though then only in the 11th year of his age, he is said to have fallen in love with the princess Anne, daughter of George II. Even at this early period he entered into vows to refuse every other but her for his consort; nor were these ever broken, as far as depended on himself. The marriage perhaps would have taken place, had it not been for some differences which arose between the courts of Prussia and Hanover about a few acres of meadow land, and two or three Hanoverians instilled by the Prussian recruiters. It is supposed, also, that it was intended at one time to marry him to Maria Theresa of Austria; but, as in that case it would have been necessary to change his religion, Frederick derived from thence a plausible pretence for refusing the match. The princess whom he espoused had a large share of beauty; and, what was still better, an excellent heart: but Frederick is said to have suffered so much in his former amours, that certain natural and unaccountable impediments remained to the completing of his marriage with any woman. Scarcely therefore was he in bed with his young spouse, when a cry of Fire! was raised by his friends. Frederick got up to see where the conflagration was: but finding it to be a false alarm, he sent messengers to compose the disturbance; but neither that night, nor any other, did he think proper to disturb her rest.

On occasion of this marriage, Frederick received from his father the county of Rupin. He resided in the capital of this county, named also Rupin, for some time; but afterwards chose Rheinsberg for his place of abode. This is a little town built in the sands, on the confines of Mecklenburg, and at that time containing only 1000 inhabitants; but it was soon greatly improved by Frederick. Having put over the great gate of the castle, however, the following inscription, FREDERICO TRANQUILLITATEM COLENTI, his father was displeased with it, and therefore hurried him from his peaceful retreat into the noise and tumult of war. At this time the succession to the crown of Poland had kindled a general war throughout Europe, and the king of Prussia was to send 10,000 auxiliaries to the Imperial army, then commanded by Prince Eugene. The king conducted his troops in person, and resolved to take this opportunity of giving his son an idea of war. At this time, however, he learnt but little; and only saw, as he himself expresses it, the shadow of the great Eugene. That consummate general, nevertheless, did not overlook his merit; but predicted that he would one day be a great captain. Frederick having gone to reconnoitre the lines at Philippsburg, in his return through a very open wood, was exposed to the cannon of the lines, which thundered incessantly. The balls broke a number of branches on every side of him: notwithstanding which, he never caused his horse to move quicker; nor did his hand which held the bridle ever alter its motion even for a moment. He continued to converse quietly with the generals who attended him, and never showed the smallest sign of apprehension. Being one night at supper with Field-Marshal Grumkow, the conversation turned on the young Prince Eugene who died on the Rhine; and he was asked whether that prince would ever have become a great man? Frederick decided in the negative, on account of young Eugene's not having known at any period of his life how to choose a friend who dared to tell him the truth.

During this campaign the health of the old king was so much impaired, that he was obliged to leave the army; and Frederick, on his return, was for some time intrusted with signing all the orders in his father's name. On the king's recovery the prince was sent to Stettin, under the care of the prince of Dessau, that he might see the fortifications of that town. He was afterwards permitted to go to Konigeburg to see the unfortunate Stanislaus, who had taken refuge in that place, and who was no less remarkable for his philosophy and constancy than for his misfortunes. With him Frederick remained for some weeks, and contracted a friendship which was not dissolved but by the death of Stanislaus. At last he was allowed to return to his peaceful mansion at Rheinsberg, where he remained till the death of his father. In this place his time was occupied alternately by the study of the sciences, the cultivation of the arts, and the pleasures of friendship. Philosophy, history, politics, the military art, poetry, and music, agreeably succeeded each other, and had each its stated period. The prince passed the greatest part of the day in his library; and the remainder in the society of a select company of agreeable and learned men. The principal of these were Chaos, a French officer; Kayserling, a gentleman of Curland, on whom the prince bestowed the name of Caesarion; Jomm, a French refugee; and Knobelstorf, director of the build-
Frederick"'s parks and gardens; but who could converse on all the arts of designing with great taste and judgment. In these meetings, gaiety generally prevailed; there were generals to speak of war, musicians to form concerts, and excellent painters to decorate the apartments. Whilst Knoebeldorf was executing landscapes and laying out the gardens, Pesne was immortalizing himself by his ceilings, and Du Buisson by his pictures of flowers. The two Grauss composed excellent music, or directed the orchestra; and Benda, one of the first violinists of Europe, accompanied the prince, who played extremely well on the flute. The morning was usually dedicated to study; gaiety and agreeable conversation prevailed at every repast; and every evening there was a little concert. In this retreat Frederick conceived that ardent passion for military glory, and the aggrandizement of his kingdom, for which he became at last so remarkable; and here he is supposed to have formed the most sublime and daring projects. He was fired with a desire of imitating the celebrated heroes of antiquity whom he read in the ancient authors, for which he set apart some hours every day. Amongst the works which he read almost every year were Herodotus, Thucydides, Xenophon, Plutarch, Tacitus, Sallust, Livy, Quintus Curtius, Cornelius Nepos, Velarius Maximus, Polybius, Caesar, Vegetius, &c. He never spoke but with enthusiasm of the great warriors of Greece and Rome; and when seated on the throne thought he could never distinguish an able soldier in a more honourable manner than by conferring on him a Roman surname. Hence he distinguished by the name of Quintus Ictilis M. Guichard, who had written some treatises on the military art of the ancients; giving him at the same time a free battalion. This name of Quintus Ictilis was retained by M. Guichard as long as he lived.

In his pursuit of glory Frederick found that it was not improper to cultivate the friendship of celebrated poets, philosophers, and others of the literary class; for which purpose he was flattered, commended, and complimented all the most celebrated literati of Europe at that time. “The philosophers (says the author of his life) answered him as a mad lover writes to his mistress. They wrote to him that he was a great poet, a great philosopher, the Solomon of the north. All these hyperboles were printed; and Solomon was not sorry for it, though he had too much understanding to believe in them. Wolf, Rollin, Gravessande, Maupertuis, Algarotti, Voltaire, were honoured with his correspondence. The last especially, accustomed to offer up incense to the idol of the day, were it transported from the dunghill to the altar, did not fail to exalt as the first man of the universe a prince who was in expectancy of the throne, and who assured him that he was the greatest philosopher of the age and the first poet in the world.”

That Frederick might keep up his character with the literati, or perhaps from a real predilection for his principles, he patronized the Apology of Wolf, and had his principal treatises translated into French. He even prevailed upon his father to relax a little in favour of that philosopher. A commission of reformed and Lutheran theologians was appointed in 1736, to examine into the tenets of that unfortunate philosopher. Wolf was declared innocent, and a letter was sent to him at Marbourg containing an invitation to return; but the philosopher did not think proper to make his appearance till the year 1740, when his protector was seated on the throne.

During his residence at Rheinsberg, Frederick composed his refutation of the principles of Machiavel, under the title of Anti-Machiavel: of which he sent the manuscript to Voltaire to correct, and to get printed.

The old king, now almost worn out with infirmity, saw with regret the predilection his son entertained for men of letters; and, in his peevish fits, often threatened the whole society with confinement in the fortress of Spandau. These threats frequently occasioned a violent alarm among the joyous company at Rheinsberg, which it required all the eloquence of Frederick to quiet. Their apprehensions on this account, however, were soon removed. At the commencement of the year 1740, the king's disorder increased to a great degree, and in the month of May his case became desperate. He lived, however, till the 31st of that month, when he expired, and left the throne to his son Frederick. II.

The acquisition of a kingdom did not abate Frederick's passion for literature, though he was now obliged to superadd the qualities and labours of a great king. A consideration of his transactions in this character falls under the article PRUSSIA, to which we refer: these, indeed, so totally engrossed the remaining part of his life, that little more remains to be said under this article, than to relate some anecdotes by which we may be in some measure able to trace the character of this great and singular personage.

It has already been mentioned, that in the early part of his life, Frederick had conceived a great inclination to travel. This passion seems not to have been extinguished by the splendour of his new situation; for having, soon after his accession, gone into Prussia and Westphalia to receive the homage of the inhabitants, he formed a resolution of proceeding incognito as far as Paris. Being discovered at Strausbourg, however, he laid aside the design of proceeding to Paris, and went to see his states in Lower Germany. Here he wrote the celebrated Voltaire, that he should come incognito to visit him at Brussels; but being seized with an indisposition in the little palace of Meuse, two leagues from Cleves, he wrote again to that philosopher, informing him that he expected he should make the first advances. The following curious account is given by him of his reception, &c. “The only guard I found at the gate was one soldier. The privy counsellor, Bambonet, was cooling his heels in the court: he had large ruffles of dirty linen; a hat full of holes; and an old magisterial peruke, one end of which descended as low as his pockets, and the other scarcely reached his shoulder. I was conducted into his majesty's apartment, where there was nothing but bare walls. I perceived in a cabinet, by the glimmering of a taper, a truckle bed, two feet and a half wide, on which lay a little man muffled up in a night gown of coarse blue cloth. This was the king, in a strong perspiration, and even trembling, under a wretched blanket, in a violent fit of the ague. I bowed to him; and began by feeling his pulse, as if I had been his first physician. The fit over, he dressed himself and sat down to table. Algarotti, Kayserling, Maupertuis, the king's minister to the States General, and myself, were of the party; where we
Frederick wished to have it said that he made verses on the brink of the grave. With this view he wrote a long poetical epistle to the marquis d'Argens, in which he communicated to him his design, and bade him farewell.

Happily, at last, the king's affairs took a better turn, and such desperate thoughts were laid aside. His constitution, however, was irreparably injured by the excessive fatigue he had sustained. Soon after the conclusion of the peace, his body began to bend, and his head to incline to the right side: by degrees he became very infirm; he was tormented with the gout, and subject to frequent indigestions. All his distempers, however, were born with invincible patience; and, till a very short time before his death, he never ceased to attend his reviews, or visit the different provinces of his dominions. He has been known to review his troops, and gallop through all the ranks as if he felt no pain, notwithstanding that an abscess which had broken out upon him, and approached to a suppuration, frequently, upon such occasions, touched the saddle. In August 1786 he impaired his health still further by ascending at a review, where he was exposed without even a cloak to a heavy rain for four or five hours. On his return to Potsdam he was seized with a fever; and, for the first time, became unable to assist at the military exercises of Potsdam, which take place in September. His malady, however, did not prevent him from dictating the disposition of these exercises during the three days they lasted, and he always gave the word in presence of his generals and the foreigners of distinction then at Potsdam. About the end of autumn the fever left him, but was succeeded by a violent cough; and he continued free from the gout which had usually attacked him at this season. He was greatly weakened by the cough, which prevented him from sleeping; but this did not in the least interrupt him in the execution of business. Every morning at four or five o'clock, he ordered the three cabinet secretaries to enter his apartment, where he dictated answers to their papers. It was not till after the dispatch of all his affairs that he saw a surgeon or sometimes a physician, though he had a bad opinion of the physicians in general, whom he consulted on his distemper. In the evening he amused himself from five to eight with some of his society; and after that hour he passed the remainder of the time before he went to rest, in hearing some ancient authors read to him; and thus he continued to employ himself till the very day before he died. On the 17th and 18th of May 1786, he was unable to assist at the ordinary reviews, but still he hoped to be present at those of Silesia. He several times attempted to mount his horse to go to the parade at Potsdam; but finding his powers insufficient, he was obliged to return, after having proceeded a few paces. He made other attempts, but with as little success; and at last his disorder terminated in a dropsey. Being now no longer able to remain in bed, he sat day and night in an arm chair with springs which could be moved at pleasure. For near a month before his death the swelling of his feet gave him violent pain, so that he wished an incision to be made; but the surgeon refused to perform the operation, suspecting that it might hasten his death. Nature, however, accomplished his desires; his right leg opened, and discharged such a quantity of matter, that he was greatly relieved: and those unacquainted with the medical art began to entertain hopes of his recovery. The physicians, however, were of a very different opinion; and the event justified their apprehensions. On the 16th of August 1786 his throat began to rattle violently, and his attendants expected every moment that he would breathe his last. In this situation his three secretaries entered the room for the despatch of business as usual. Even then Frederick made an effort to collect his force, giving them a sign to wait, as if he would speak with them in a short time. This, however, was the last he could make: for he soon after fell into a stupor; though from this he recovered so far as to be able to speak. In the evening he asked what o'clock it was? and on being answered that it was nine, he said, "Well then I am going to rest." His respiration and voice became gradually more feeble; and he expired on Thursday at 19 minutes after two in the morning, without any convulsion or symptom of pain.

This great monarch was of the middle size, had large blue eyes and a piercing look. He spoke German incorrectly, and in a very rough manner; but talked French very fluently, and his voice was then mild and agreeable. His constitution was naturally feeble, but he had greatly improved it by his activity and laborious life. He had the art of relieving every one from that embarrassment which frequently occurred in accosting such a celebrated monarch; and it seems probable that he himself considered on what he should say to any illustrious person who happened to come to his court. His universal knowledge enabled him to converse on all subjects; and thus he talked of war with military men, of verses with the poet, of agriculture with the farmer, jurisprudence with the lawyer, commerce with the merchants, and politics with the Englishman. He had a very retentive memory; was fond of solitude and gardening; and likewise took great pleasure in dogs, of which animals he constantly kept a number about him, giving them little half-covered with leather to play with. In company he was fond of asking questions and jesting; in which last he proceeded such lengths as undoubtedly was unbecoming in a superior towards his inferiors, who would not have failed to resent such jokes from persons more of an equality with them. In military affairs he was excessively severe, not to say cruel; of which the following anecdote may serve as an instance. In the first war of Silesia, wishing to make some alterations in his camp during the night, he forbade every person, under pain of death, to keep, after a certain hour, a fire or other light in his tent. He himself went the rounds; and in passing the tent of a Captain Zietern he perceived a light. Entering the tent, he found the captain sealing a letter to his wife, for whom he had a great affection. "What are you doing there?" (says the king): Do you not know the order?" The captain fell on his knees and asked pardon, but did not attempt to make any excuse. "Sit down (says Frederick), and add a few words I am going to dictate to you." Zietern obeyed; and the king dictated, "To morrow I shall perish on a scaffold." The unfortunate man wrote them, and next day was executed. In matters of domestic legislation, he was more arbitrary than just; of which we have a notable example in the
FREDRICKSHALL, or FREDERICKSTADT, a strong town of Norway, in the prefecture of Agerhuys, where Charles XII. king of Sweden was killed by a musket ball in 1718, when he was besieging this town. It is seated on the coast of the Cattegat, in E. Long. 10° 45. N. Lat. 59° 2′.

FREDERICKSODE, a town of Denmark, in Jutland, taken by the Swedes in 1657, but now subject to Denmark. It is seated near the sea, in E. Long. 99° 44. N. Lat. 55° 35′.

FREDERICKSTADT, a town of Denmark, in South Jutland, built in 1621. It is seated on the river Eyder, in E. Long. 9° N. Lat. 54° 28′.

FREDERICKSTADT, a town of Norway, in the province of Agerhuys, seated on a bay of the sea, near the frontiers of Sweden, in E. Long. 11° 6′ N. Lat. 59° 12′.

FREED, in a general sense, is used in opposition to whatever is constrained or necessitated. When applied to things endowed with understanding, it more peculiarly relates to the liberty of the will.

FREE Bench, signifies that estate in copyhold which the wife, being espoused a virgin, has after the decease of her husband for her dower, according to the custom of the manor.

In regard to this free bench, different manors have different customs: and in the manor of East and West Esbourne in the county of Berks, and in other parts of England, there is a custom, that when a copyhold tenant dies, the widow shall have her free bench in all the deceased husband's lands, *dom sola et custa suavis*, "while she lives single and chaste," but if she is found to be guilty of inconstancy, she shall forfeit her estate. Nevertheless, upon her coming into the court of the manor riding backwards on a black ram, with his tail in her hand, rehearsing a certain form of words, the steward is bound by custom to restore her to her free bench. The words are,

*Here I am,*
*Riding on a black Ram,*
*Like a whore as I am;*
*And for my crinem crinem*
*Have lost my bincum bincum,*
*And for my tail's game*
*Have done this wordly shame:*
*Therefore, pray Mr Steward, let me have my land again.*

FREE or Imperial Cities, in Germany, are those not subject to any particular prince; but governed, like republics, by their own magistrates.

There were free cities (*liberae civitates*) even under the ancient Roman empire: such were those to whom the emperor, by the advice or consent of the senate, gave the privilege of appointing their own magistrates, and governing themselves by their own laws. See CITY.

FREE Fishery. See FREE Fishery.
FREE Warren. See WARREN.
FREE Mason. See MASON.
FREE Stone. A whish stone, dug up in many parts of Cape Coast. It mounts 46 pieces of cannon on four batteries, and formerly belonged to the Prussians, but is now subject to Denmark. W. Long. 1° 15′ N. Lat. 6° 40′.

FREDERICKSBURG, a fort and colony of Brandenburg, on the Gold coast of Guinea, in Africa, near Cape Threepoints, and about 75 miles from...
of Britain, which is hard and durable, and of excellent use in building, &c. It is a kind of the grit stone, but finer sanded and smoother; and is called free, from its being of such a construction as to cut freely in any direction.

The qualities of the several kinds of free stones used in the different parts of Europe are very different. They all agree in this general property, indeed, that they are softer while in the quarry than when they have been some time exposed to the air; but even this general property differs greatly in degree. There is a sort of gray free stone in use at Paris (of which we do not seem to have met with any in this country), which has the above-mentioned quality in so great a degree, that the expense of working it is in a great measure saved.

This stone lies everywhere on the south side of the river Seine, and is of a coarse and large grit. It is so soft when newly taken out of the strata, that they fashion it very conveniently with a sort of broad axe, and form as many stones for building in this manner in an hour, as an equal number of our people do in a day or two. Though this stone is as soft as dry clay when first taken up, it is found to harden so considerably in the air, that it becomes more than equal to our ordinary free stone.

The Portland free stone of Britain of the finest kind, which is white and of a close grit, is very fit for hewing and carving; but it will neither resist water nor fire, which is a very singular instance in so dense a stone; while the free stone of Kent, which is less beautiful to the eye, and is of a grayish colour, and considerably close, though of a larger grain, resisting both air and water very well. The freestone of Derbyshire, on the other hand, is so brittle as to be unfit for any fine working; and so coarse and open in its texture, that it lets water through: yet it bears the fire extremely well, and is fit for ovens, hearths, &c.

FREEBOOTER, or FLIBUSTIER, a name given to the pirates who scour the American seas, particularly such as make war against the Spaniards. See Bucanier.

FREEDOM, in general, the state or quality of being free. See LIBERTY.

FREEDOM of a Corporation, the right of enjoying all the privileges and immunities belonging to it. See CORPORATION.

The freedom of cities, and other corporations, is regularly obtained by serving an apprenticeship; but it is also purchased with money, and sometimes conferred by way of compliment.

FREEDOM of Conscience. See TOLERATION.

FREEDOM of the Soil, that power or faculty of the mind, whereby it is capable of acting in a non-acting, choosing or rejecting whatever it judges proper. Of this every man must be sensible, who finds in himself a power to begin or forbear, continue or end several actions, barely by a thought or preference of the mind.

FREEHOLD, FRANK TENEMENT, (liberum tenementum), is land, or tenement, which a man holds in fee-simple, fee-tail, or for term of life. See FEZ and TAIL.

Freehold is of two kinds, in deed and in law.

The first is the real possession of land or tenement, Vol. IX. Part I.
might have been of terrible consequence. I weighed the sprig of an ash tree, of just three quarters of a pound; the ice on which weighed 16 pounds. Some were frightened with the noise in the air; till they discerned it was the clatter of icy boughs, dashed against each other." Dr. Beale observes, that there was no considerable frost observed on the ground during the whole; whence he concludes, that a frost may be very intense and dangerous on the tops of some hills and plains, while in other places it keeps at two, three, or four feet distance above the ground, rivers, lakes, &c. and may wander about furiously in some places and remiss in others not far off. The frost was followed by glowing heats, and a wonderful forwardness of flowers and fruits.

FREIGHT, in Navigation and Commerce, the hire of a ship, or a part thereof, for the conveyance and carriage of goods from one port or place to another; or the sum agreed on between the owner and the merchant, for the hire and use of a vessel. See Maritime Law.

FREIND, John, a most learned English physician and writer of the 18th century, was born at Croton, Northamptonshire, in 1675. In 1696, he published, in conjunction with Mr. P. Foulkes, an edition of two Greek orations, one of Aeschines against Ctesiphon, and the other of Demosthenes de Corona, with a new Latin version. In 1699, he wrote a letter to Dr. Solane concerning an Hydrocephalus, published in the Philosophical Transactions; and another letter in Latin to the same gentleman, De spasmodiarum historia, printed in the same Transactions. In 1703, his Epistolologia appeared, which gained him great reputation. In 1704, he was chosen professor of chemistry in the university of Oxford. In 1705 he attended the earl of Peterborough to Spain, as physician to the army there; and, upon his return in 1707, published an account of the earl's expedition and conduct. In 1709 he published his Chemical Lectures. In 1712 he attended the duke of Ormond in Flanders, as his physician. In 1716 he was admitted a fellow of the College of Physicians in London. This year he published the first and third books of Hippocrates De morbis popularibus, with a Commentary on FEVERS, written by himself. He sat member for the borough of Lancaster in Cornwall in 1722, where he distinguished himself by his opposition to the administration. March 1722, he was committed to the Tower on a charge of high treason; and while he was under confinement, he wrote a Latin epistle to Dr. Mead, de quibusdam variis dolorum generibus; and began his History of Physics, the first part of which was published in 1725, and the second in 1726. Upon the accession of George II. to the throne, he was appointed physician in ordinary to the queen, who showed the utmost regard and esteem for him. He died at London in 1728. His works were published together in Latin at London, 1733, in folio, and dedicated to the queen.

FREITS. See FREETS.

FRENCH, in general, something belonging to France: thus we say, the French language, French custom, polity, &c.

The French language, as it now stands, is no original or mother language, but a medley of several. Those that prevail most, and which are, as it were, the basis thereof are, 1. The Celtic; whether that were a particular language itself, or whether it were only a dialect of the Gothic, as spoke in the west and north. 2. The Latin, which the Romans carried with them into Gaul, when they made the conquest thereof. And, 3. The Teutonic, or that dialect of the Teutonic spake by the Franks, when they passed the Rhine, and established themselves in Gaul. Of these three languages, in the space of about thirteen hundred years, was the present French formed, such as it is now found. Its progress was very slow; and both the Italian and Spanish were regular languages long before the French.

Pasquier observes, it was under Philip de Valois that the French tongue first began to be polished; and that, in the register of the chamber of accounts of that time, there is a purity seen almost equal to that of the present age. However, the French was still a very imperfect language till the reign of Francis I.; the custom of speaking Latin at the bar, and of writing the public acts and instruments of the courts of justice in this language, had made them overlook the French, their own language. Add that the preceding ages had been remarkable for their ignorance, which was owing, in a good measure, to the long and calamitous wars which France had been engaged in; whereby the French nobility deemed it a kind of merit not to know any thing; and the generals regarded little whether or not they wrote and talked politely, provided they could but fight well.

But Francis I. who was the restorer of learning, and the father of the learned, changed the face of things; and after his time, Henry Stevens printed his book, De la Pecoracelle du Langage Francois. The change had become very conspicuous at the end of the 16th century; and under Henry IV. Amyot, Cochet, and Malherbe, contributed towards bringing it to its perfection; which the Cardinal de Richelieu completed, by the establishment of the French academy; as assembly, wherein the most distinguished persons of the church, the sword, and the gown, have been members. Nor did the long reign of Louis XIV. contribute a little to the improvement of the language; the personal qualities of that prince, his taste for the fine arts, and that of the princes of the blood, rendered his court the politest in Europe. Wit and magnificence seemed to vie; and his generals might have disputed with the Greeks, Romans, &c. the glory of writing well, if they could not that of fighting. From court, the elegance and purity of the language soon spread itself into the provinces; and now there is scarcely anybody there who does not write and speak good French.

One of the characters of the French language is, to be natural and easy. The words are ranged in it much in the same order as the ideas in our minds; in which it differs exceedingly from the Greek and Latin, where the inversion of the natural order of words is reputed a beauty. Indeed the Hebrew surpasses even the French in this point; but then it comes short of it in copiousness and variety.

It must be added, however, that as to the analogy of grammar, and the simplicity wherewith the moods of verbs are formed, the English has the advantage not only over the French, but over all the known languages in
long and soft, otherwise they will raze and raise the painting. The colours should be full, and flowing from the brush; and the design perfect; for in this work you cannot alter or add upon any colour.

FRESH WATER, is that not tinctured or impregnated with salt or saline particles enough to be discovered by the sense. Such generally is that of springs, rains, wells, lakes, &c.

The dulcifying or making of salt water fresh is a secret that has been long sought with great attention. For an account of the principal attempts that have been made with this view, see Sea Water.

Fresh WIND signifies strong, but not violent; hence when the gale increases, it is said to freshen.

FRESHES, in sea language, denotes the impetuosity of an ebb tide, increased by heavy rains, and flowing out into the sea, often discolouring it to a considerable distance, and forming a line that separates the two colours, and which may be distinctly perceived for a great length along the coast.

FRESHES, a local term signifying annual inundations, from the river being swollen by the melted snows and other fresh waters from the uplands, as is the Nile, &c. from periodical or tropical rains. As a sailor's term, it is opposed to marine or salt water floodings, tides, &c. The word is of common use in America, where the inundations so called are of great service. They bring down the soil to the intervals below, and form a fine mould, producing corn, grain, and herbage, in the most luxuriant plenty. They also afford another benefit, in regard to many rivers in America, viz. in equalizing the surface of the stream (where rapid falls, or cascades, obstruct the navigation), so that rafts of timber and other gross produce are then floated down to the sea ports in great quantities.

FRENSNOY, CHARLES ALPHONSE DU, an excellent poet and painter, was born at Paris in 1611. He was instructed there by Perrier and Simon Vouet in painting; but he did not long adhere to Vouet's manner of colouring; for as soon as he fixed himself at Rome, he made the works of Titian the models for his imitation. He was, however, more celebrated as a poet than as a painter; and gave more attention to the theory than to the practice of the pencil. Accordingly he is better known by his incomparable poem De arte graphico, than by his performances on the canvas: and on this poem he bestowed so much pains, that he died in 1665, before it was published. It was printed afterwards with a French prose translation and notes by M. de Piles; and was translated into English by Mr. Dryden, who prefixed to it an original preface containing a parallel between painting and poetry.

FRET, or FRETTE, in Architecture, a kind of knot or ornament, consisting of two lists or small fillets variously interlaced or interwoven, and running at parallel distances equal to their breadth.

FRET, in Heraldry, a bearing composed of six bars, crossed and variously interlaced. Some call it the true-lover's knot. See HERALDRY.

FRET, in Music, signifies a kind of stop on some instruments, particularly bass viol and lutes. Frets consist of strings tied round the neck of the instrument, at certain distances, within which such and such notes are to be found.

FRET-Work, that adorned with frets. It is sometimes used to fill up and enrich flat empty spaces; but it is mostly practised in roofs, which are fretted over with plaster work.

FRETTs, in Mineralogy, a term used by our miners to express the worn side of the banks of the rivers in mine countries, where they search for the shodd stones or graves washed down from the hills, in order from thence to trace out the running of the shoad up to the mine.

FRETTs, Fretts or Freits. See FRETTs.

FREYBERG, or FRIEDBERG, a town in the circle of Upper Saxony, containing upwards of 9000 people. There are mines of copper, tin, lead, and silver, in its vicinity, which afford employment to a considerable number of workmen, and produce an annual revenue of more than 10,000 rix-dollars. The princes of the house of Saxony are usually buried here, where there is also an academy for the study of mineralogy, instituted in the year 1765, and reckoned the most famous for that science of any in Germany. It is situated on a branch of the Mulde, 15 miles south-west of Dresden, in N. Lat. 51, and E. Long. 13 18.

FRIABLE, among naturalists, an appellation given to bodies that are easily crumpled to pieces: such are pumice and all calcined stones.

FRIAR, or FRIER, by the Latins called frater, the Italians frato, and the French frere, that is, brother: a term common to the monks of all orders; founded on this, that there is a kind of fraternity or brotherhood presumed between the several religious persons of the same convent or monastery.

Friars are generally distinguished into these four principal branches, viz. 1. Minoras, Gray friars, or Franciscans. 2. Augustines. 3. Dominicans, or Black friars. 4. White friars or Carmelites. From these four the rest of the orders descend. See Franciscans, Augustines, &c.

FRIAR, in a more peculiar sense, is restrained to such monks as are not priests; for those in orders are usually dignified with the appellation of father.

FRIARS Observant (fratres observantes) were a branch of the Franciscans; thus called, because not combined together in any cloister, convent, or corporation, as the conventuals are; but only agreed among themselves to observe the rules of their order, and that more strictly than the conventuals did, from whom they separated themselves out of a singularity of zeal, living in certain places of their own choosing.

FRIEBURG, a large town of Germany, and capital of Brisow; remarkable for the steeple of the great church, which, next to that of Strasbourg, is the finest in Germany; and for its university. The inhabitants are famous for polishing crystal and precious stones. It has been several times taken and retaken; particularly by the French in 1744, who demolished the fortifications. It was also taken by them in June 1796. It is seated on the river Trislet, ten miles east of Brissach, and 26 south of Strasbourg. E. Long. 7 57. N. Lat. 48 4.

FRIEBURG, a town of Switzerland, and capital of the canton of the same name, seated on the river Sane, in E. Long. 6 48. N. Lat. 46 50. Its situation is most singular and picturesque: "It stands partly in a small plain, partly on bold acclivities on a ridge..."
tenants, had proved ineffectual. What is extraordinary, they do not seem to regard it much; and as there appeared few signs of its destroying effects, probably the climate, and the way of living of these people, greatly abated its virulence. There are two other complaints frequent amongst them; one of which is an indolent firm swelling, that affects the legs and arms, and increases them to an extraordinary size in their whole length. The other is a tumor of the same sort in the testicles, which sometimes exceeds the size of the two fists. But in other respects they may be considered as uncommonly healthy.

Their hair is in general straight, thick, and strong, though a few have it bushy or frizzled. The natural color is black; but the greatest part of the men, and some of the women, have it stained of a brown or purple colour, and a few of an orange cast. They wear it variously cut. Some have it cut off on one side of the head only; others have it entirely cut off except a single lock; the women in general wear it short. The men have their beards cut short; and both men and women strip the hair from the armpits. The men are stained from about the middle of the belly to about half way down the thighs with a deep blue colour. The women have only a few small lines or spots thus imprinted on the inside of their hands. Their rings, as a mark of distinction, are exempted from this custom.

The men are all circumcised, or rather suprised, as the operation consists in cutting off only a small piece of the foreskin at the upper part; which by that means is rendered incapable ever after of covering the glands. This is all they aim at, as they say the operation is practised from a notion of cleanliness.

The dress of both men and women is the same: and consists of a piece of cloth or matting (but mostly the former) about two yards wide and two and a half long; at least as long as to go once and a half round the waist, to which it is confined by a girdle or cord.

It is double before, and hangs down like a petticoat, as long as the middle of the leg. The upper part of the garment above the girdle is plaited into several folds; so that, when unfolded, there is cloth sufficient to draw up and wrap round the shoulders; which is very seldom done. The inferior sort are satisfied with small pieces; and very often wear nothing but a covering made of leaves of plants, or the mare, which is a narrow piece of cloth or matting like a sash. This they pass between the thighs and wrap round the waist; but the use of it is chiefly confined to the men. The ornaments worn by both sexes are necklaces made of the fruit of the pandanus, and various sweet smelling flowers, which go under the general name of kahakia. Others are composed of small shells, the wing and leg-bones of birds, sharks teeth and other things; all which hang loose upon the breast; rings of tortoise shell on the fingers; and a number of these joined together as bracelets on the wrists. The lobes of the ears (though most frequently only one), are sometimes perforated with two holes, in which they wear cylindrical bits of ivory about three inches long.

Cleanliness induces them to bathe in the ponds, which seem to serve for no other purpose. They are sensible that salt water hurts their skin; and when necessity obliges them to bathe in the sea, they commonly have some cocoa nut shells filled with fresh water poured over them to wash it off. People of superior rank use cocoa nut oil, which improves the appearance of the skin very much.

The employment of the women is of the easy kind, and, for the most part, such as may be executed in the house. The manufacturing their cloth is wholly consigned to their care; as is also that of their mats, which are esteemed both for their texture and their beauty. There are many other articles of less note that employ the spare time of their females; as combs, of which they make vast numbers, and little basis, with small teeth; but all finished with such neatness and taste in the disposition of the various parts, that a stranger cannot help admiring their assiduity and dexterity.

The province allotted to the men, as might be expected, is far more laborious and extensive than that of the women. Agriculture, architecture, boat building, fishing, and other things that relate to navigation, are the objects of their care. Cultivated roots and fruits being their principal support, this requires their constant attention to agriculture, which they pursue very diligently, and seem to have brought almost to a great perfection as circumstances will permit. In planting the plantains and yams, they observe so much exactness, that, which ever way you look, the rows present themselves regular and complete. The cocoa nut and bread fruit trees are scattered about without any order, and seem to give them no trouble after they have attained a certain height.

The houses of the lower people are poor huts, and very small; those of the better sort are larger and more moderate. The dimensions of one of a middling size are about 30 feet long, 20 broad, and 12 high. Their house is, properly speaking, a thatched roof or shed, supported by posts and rafters, disposed in a very judicious manner. The floor is raised with earth smoothed, and covered with thick strong matting, and kept very clean. A thick strong mat, about two and a half or three feet broad, bent into the form of a semicircle, and set upon its edge, with the ends touching the side of the house, in shape resembling the fender of a fire heath, encloses a space for the master and mistress of the family to sleep in. The rest of the family sleep upon the floor, wherever they please to lie down; the unmarried men and women apart from each other: Or if the family be large, there are small huts adjoining, to which the servants retire in the night; so that privacy is as much observed here as one could expect. The clothes that they wear in the day serve for their covering in the night. Their whole furniture consists of a bowl or two, in which they make kava; a few gourds; cocoa nut shells; and some small wooden stools, which serve them for pillows.

They display much ingenuity in the building of their canoes, as well as in the navigating them.

The only tools which they use to construct them, which are very dexterously made, are hatchets, or rather thick adzes, of a smooth black stone that abounds at Toofoa; augres, made of sharks teeth, fixed on small handles, and rasps of a rough skin of a fish, fastened on flat pieces of wood, thinner on one side, which also have handles. The eardilage is made from the fibres of the cocoa nut husk, which, though not more than nine or ten inches long, they plait, about the size of a
through the cheeks into the mouth. All these operations convey an idea of such rigorous discipline, as must require either an uncommon degree of affection, or the grossest superstition, to exact. It should be observed, however, that the more painful operations are only practised on account of the death of those most nearly connected.

Their long and general mourning proves, that they consider death as a very great evil. And this is confirmed by a very odd custom which they practise to avert it. They suppose that the Deity will accept of the little finger, as a sort of sacrifice efficacious enough to procure the recovery of their health. They cut it off with one of their stone hatchets. There appeared scarcely one in ten of them who was not thus mutilated in one or both hands. According to Captain King, it is common also for the inferior people to cut off a joint of their little finger on account of the sickness of the chiefs to whom they belong.

They seem to have little conception of future punishment. They believe, however, that they are justly punished upon earth; and consequently use every method to render their divinities propitious. The Supreme Author of all things they call Kalafoootonga; who, they say, is a female residing in the sky, and directing the thunder, wind, rain, and in general all the changes of weather. They believe that when she is angry with them, the productions of the earth are blasted; that many things are destroyed by lightning; and that they themselves are afflicted with sickness and death as well as their hogs and other animals. When this anger abates, they suppose that every thing is restored to its natural order. They also admit a plurality of deities, though all inferior to Kalafoootonga. They have less absurd sentiments about the immateriality and the immortality of the soul. They call it life, the living principle; or, what is more agreeable to their notions of it, Otooa; that is, a divinity or invisible being.

Of the nature of their government no more is known than the general outline. According to the information received, the power of the king is unlimited, and the life and property of the subject are at his disposal; and instances enough were seen to prove that the lower order of people have no property, nor safety for their persons, but at the will of the chiefs to whom they respectively belong. When any one wants to speak with the king or chief, he advances and sits down before him with his legs across; which is a posture to which they are so much accustomed, that any other mode of sitting is disagreeable to them. To speak to the king standing would be accounted here a striking mark of rudeness.

Though some of the more potent chiefs may vie with the king in point of actual possessions, they fall very short in rank and in certain marks of respect, which the collective body have agreed to pay the monarch. It is a particular privilege annexed to his sovereignty, not to be punctured nor circumcised, as all his subjects are. Whenever he walks out, every one whom he meets must sit down till he has passed. No one is allowed to be over his head; on the contrary all must come under his feet; for there cannot be a greater outward mark of submission than that which is paid to the sovereign and other great people of these islands by
Friendship, exhaust my vigour in the pursuit of it: bid me ascend an inaccessible height, I view the vale below with new fondness. Philosophy, as well as superstition and enthusiasm, might in a few instances triumph over the principles of nature; but was it always equally powerful? Were all the disciples of Zeno Cates and Epictetus? Have all the monks and anchorites of the Roman church been holy as the founders of their orders? No: The Greek philosophers who infested Rome, and taught those whimsical doctrines which we hear frequently dignified with the name sublime, were singularly corrupt and licentious in all their manners. If those of the regular clergy of the church of Rome have been always more pure, they have been cruelly calumniated. Ask, then, only what I am capable of performing: If you demand what is above my strength, I sit still in indolence. In its general tendency, the Stoic philosophy was favourable rather to vice than to virtue.

But we have not yet exhausted all the duties of friendship. We have inculcated sincerity, and mutual respect and obligingness of manners; we have also endeavoured to ascertain what degree of mutual confidence ought to take place between friends. But an important question still remains to be considered: how far is an union of interests to take place between friends? Am I to study the interest of my friend in preference to my own? May I lawfully injure others, in order to serve him? Here, too, we must consider the circumstances and the strength of human nature; and let us beware of imposing burdens too heavy to be borne. The greater and more perfect the union which reigns in society, the greater will be its strength and happiness; the closer the union of friends, the more advantages will each of them derive from their union. Where other ties besides those of friendship concur to unite two individuals, their interests will be more closely conjoined than if they were connected by the ties of friendship alone. The order of nature seems here to be,—the husband and wife,—the parent and child,—brothers and sisters, the offspring of the same parents—friends, connected by the ties of friendship alone. And, if we may presume to guess at the intentions of the Author of nature from what we behold in his works and read in his word, the closest union in society ought to be that between the husband and the wife; their interests are altogether the same; they ought mutually to forego convenience and gratification for each other's sake. The interests of parents and children are some what less closely connected; much is due from the one to the other, but somewhat less than in the former relation; their interests may sometimes be separate, but never ought to be opposite. Next come brethren, and other more distant relations; and next, the friend. In these cases, where we suppose the attachment of friendship to operate together with the ties of nature, we perceive that interests are variously united, and various duties are due; scarcely in any of them does it appear that the interests of two can become entirely one. Still less can that be expected to happen, where the ties of friendship act not in concert with those of nature. We give up, therefore, all those romantic notions, which some have so earnestly insisted on, of requiring the friend to consider his friend as himself. We cannot expect any two individuals to possess precisely the same degree of knowledge, to entertain exactly the same sentiments, or to stand in circumstances precisely similar. But till this happen, the interests of two can never be precisely the same. And if we will not, therefore, require the friend to act as layman his friend to himself; nay, we will even allow him to prefer himself to his friend; convinced that such is the design of nature, and that by presuming to counteract the principles of nature we shall be able to serve no useful purpose. But as far as the first principles of human action and the institutions of society permit, we may reasonably require of friends, that they mutually endeavour to contribute each to the other's interest. You will not desert your own family, nor neglect what is absolutely necessary for your own preservation, in order that you may serve a friend. It is not requisite that you be either a Damoc or a Pythias. Away with what is romantic; but scruple not to submit to what is natural and reasonable. When your friend needs your direction and advice, freely and honestly give it: does he need more than advice; your active exertions in his behalf? the laws of friendship require you not to refuse them. Is it necessary for him to receive still more substantial assistance? You may even be expected to aid him with your fortune. But remember, that even the amiable principle of benevolence must be subject to the directions of prudence; if incapable of taking care of ourselves, we cannot be expected to contribute to the good of others; society would not be favourable to the happiness of the human race, if every individual studied the general interest so far as to neglect his own. We are not born to be citizens of the world; but Europeans, Britons, Englishmen or Scotchmen. Let every one, then, seek the interest and happiness of his friends with whom he is connected by the laws of friendship alone, in subordination to his own particular interest and happiness, and to the interest and happiness of those with whom he is connected by the ties of nature and the general institutions of society.

Engage not in the service of your friend, nor lavish your fortune in his behalf, if by that means you are likely to injure either yourself or your family. Still less will you think it requisite to carry your friendship to such romantic excess as to commit crimes in the service of your friend. The ancients, whose ideas of the nature and duties of friendship were romantic and extravagant, have, some of them, required that a friend should hesitate at no action, however atrociously wicked, by which he can be useful to his friend. Have I been guilty of theft or murder, or any other heinous violation of the laws of morality or the institutions of society: when I am brought to justice for my crime, if you, being my friend, are appointed to sit as my judge, the laws of friendship, say those admirable masters of morality, require that you pronounce me innocent, though convinced of my guilt. But we need not declare against the absurdity of enjoining such base deeds as duties of friendship. The idea of a connection, the laws of which are inimical to the order of society, must strike with horror every person who thinks of it. Such a connection is the union of a knot of villains, conspiring against the peace, nay even the existence of society.

Such we apprehend to be the nature of rational friendship; such the circumstances is the order of nature of friendship.
Friendship, which we profess, and which we regard as the revelation of heaven. General benevolence is frequently inculcated through the gospel: Jesus often earnestly entreated his disciples, "to love one another;" and directed them in what manner to display their mutual love, by telling them that "whatever things they could reasonably wish to receive from others, the same ought they to do to them." The writers of the epistles often enlarge on the topics of charity and brotherly love. But private friendship is nowhere recommended in the code of Christianity. Nay, it is so inconsistent with that universal benevolence which the gospel enjoins, that where the one is recommended and enforced, the other may be understood to be tacitly forbidden. But can that religion be true, or can it be favourable to the happiness of its votaries, which is iminical, nay, which is even not friendly to virtuous friendship? Such are the suggestions of Lord Shaftesbury and Soame Jenyns on this head.

We must grant them, that the system of morals or religion, which discourages a connection so noble in its origin, so amiable in its character, and so beneficial in its influence, as virtuous friendship, is rather unfavourable to the happiness and virtue of its votaries. But we must consider the genius of Christianity with more careful attention, before we suffer ourselves to be persuaded that friendship is inconsistent with it. Universal benevolence is, indeed, inculcated in the gospel: we are required to love our neighbour as ourselves: and our Saviour seems to insinuate, in the story of the humane Samaritan, that we ought to regard as neighbours all our brethren of the human race, however separated from us by any of the distinctions of society. But it would be unfair to conclude from this, that, the great Author of the gospel meant to abolish the order of social life, or to oppose the ties of nature. These may still be respected, though the laws of this benevolence be obeyed. The parent is not required to desert his child, in order that he may assist or relieve his neighbour; nor the child to leave his parent to perish under the infirmities of old age; while he hastens to lend assistance to a stranger. The gospel was not intended to dissolve communities, or to abrogate the distinctions of rank. In Jesus, the end of the ceremonial law was accomplished: by him, therefore, that burden of types and ceremonies with which the Jews had been loaded was taken away. But he who abolished the ceremonial law declared, that the obligations of the moral law should be more permanent than heaven or earth: The duties which it enjoined were still to be religiously discharged: The precepts of the gospel were to illustrate and enforce, not to contradict, the institutions of the moral law. The relative duties of parents and children were still to be performed; though men were directed not to confine all their sentiments of benevolence to domestic relations. Jesus, in his conduct, did not set himself to oppose the order of society. In various parts of the New Testament all the social duties are defined and enforced: the mutual duties of parents and children, of husbands and wives, and of masters and servants. The submission of all the members of a community to that power which is vested with the authority of the whole, is also strictly enjoined in the gospel. Jesus, when in his last moments he recommended his mother to the protection of his beloved disciple, chose to ask him to consider her as a parent; and directed friendship to expect from him the respect and kindness of a son. These facts and observations teach us in what sense to understand that universal benevolence which is inculcated in the gospel. Though we are to love all mankind, yet it is not necessary that all the individuals of the human race share our affection alike. Were we powerful, and wise, and benevolent, as the Deity, such extensive benevolence might be required of us: But our sphere of action and observation is narrow; we cannot extend our acquaintance or influence beyond a very limited circle. Were we to endeavour to be equally useful to all mankind, we should become incapable of being useful to any individual. We cannot become citizens of the world in the sense in which some philosophers have affected to call themselves such, without becoming outcasts from every particular society. A son, a brother, a countryman, a stranger, lie around you, each in circumstances of extreme distress; you pity their misfortunes, and would gladly administer relief; but such is your benevolence, that you feel precisely the same degree of compassion for each of them; you cannot determine to whom you should first stretch out an helping hand; and you therefore stand like that venerable ass of the schoolmen, whose tantalizing situation between two bundles of hay has been so long celebrated and lamented by metaphysicians; and suffer son, and brother, and countryman, and stranger, to perish, without relieving any of them by your kind offices. It is therefore the design of the gospel, that we should submit to the laws of nature, and comply with the institutions of society. First, attend to self-preservation; next, perform the duties of a wife or husband, a parent, a child, a brother, a citizen; an individual of the human race. You will do well, indeed, to regard all mankind with benevolence; but your benevolence will be unavailing to the objects of it, if you overlook the distinctions of nature and those institutions which support the union of social life.

But if the spirit of Christianity be not iminical to the institutions and relations of society, neither can it be unfavourable to friendship. If that benevolence which the gospel enjoins admit of any modifications, why not of that particular modification which constitutes private friendship? It is not, indeed, directly enjoined; but neither is it forbidden. It is perfectly consistent with the general tendency and spirit of the gospel system; being favourable to the interests of society, it cannot but be agreeable to our holy religion.

But it is recommended by no direct precept, say those who would represent Christianity as iminical to it; while it has been the favourite theme of the philosophers and moralists of the heathen world.

But why should friendship be recommended by means different from those which the gospel employs for the purpose? Make yourself well acquainted with that admirable system which you so earnestly oppose; you will find that even the duties of private friendship are better explained and more powerfully enforced in the gospel, than by all the heathen philosophers and poets from Hesiod to Plutarch. The gospel makes a distinction between the virtuous and the vicious; it represents one character as more amiable and respectable than another. As it distinguishes between virtue and vice,
FRIEDRICHSTADT; the horses are large, and the cows and sheep prolific. It is divided into three parts; Westerno to the west, Ostergo to the east, and Sevenwarden to the south. The islands of Sheling, Ameland, and other small ones, are dependent on this province. The principal towns are Leuwarden the capital, Franeker, Dokkum, Harlingen, and Stavoren.

FRIESLAND, East, a province of Germany, in the circle of Westphalia, lying near the German ocean. It is bounded on the south by the bishopric of Monster, on the east by the country of Oldenburg, on the west by the province of Groningen, and on the north by the sea, being about 50 miles in length, and 30 in breadth. It belonged to Prussia, but was ceded to Hanover in 1814. It is a very fertile country, and feeds a great number of cattle; but it was greatly damaged by an inundation in 1777, and the repair of the dykes cost an immense sum. The principal towns are Norden, Leer, Esens, Whitmunde, and Aurick. Embden was an imperial city, and the principal place in the country. The inhabitants are Calvinists, with a few Catholics and Baptists.

FRIEGATE, in naval affairs, a ship of war usually of two decks, light built, designed for swift sailing. When it has but one deck, and consequently is of a smaller size, they call her a light frigate. Frigates mount from 20 to 44 guns, and are esteemed excellent cruisers. The name was formerly known only in the Mediterranean, and applied to a long kind of vessel navigated in that sea with sails and oars. The English were the first who appeared on the ocean with these ships, and equipped them for war as well as for commerce.

FRIEGATE-BUILT, denotes the disposition of the decks of such merchant ships as have a descent of four or five steps from the quarter-deck and forecastle into the waist, in contradistinction to those whose decks are on a continued line for the whole length of the ship, which are called golley-built.

FRIEGATOON, a Venetian vessel, commonly used in the Adriatic, built with a square stern, and without any forecast, having only a mainmast, mizenmast, and bowsprit.

FRIEGHT, or TERROR, a sudden and violent degree of fear. See FEAR.

Sudden fear is frequently productive of very remarkable effects upon the human system. Of many instances occur in medical writings. In general, the effects of terror are a contraction of the small vessels and a repulsion of the blood in the large and internal ones; hence proceed a suppression of perspiration, a general oppression, trembling, and anguish of the heart, and lungs overcharged with blood.

Frights often occasion incurable diseases, as epilepsy, stupor, madness, &c. In acute diseases, they have evidently killed many, by the agitation into which they have thrown the spirits, already too much disorder. We have also accounts of persons absolutely killed by terrors when in perfect health at the time of receiving the shock from them: people ordered to be executed, but with private orders for a reprieve, have expired at the block without a wound. Out of many instances of the fatal effects of fear recorded in writers, the following is selected as one of the most singular.

George Grochansky, a Poleander, who had enlisted as a soldier in the service of the king of Prussia, deserted during the war. A small party was sent in pursuit of him; and when he least expected it, they surprised him singing and dancing among a company of peasants, who were got together in an inn and were making merry. This event, so sudden and unforeseen, and at the same time so dreadful in its consequences, struck him in such a manner, that, giving a great cry, he became at once altogether stupid and insensible, and was seized without the least resistance. They carried him away to Glocau, where he was brought before the council of war, and received sentence as a deserter. He suffered himself to be led and disposed of at the will of those about him, without uttering a word, or giving the least sign that he knew what had happened or would happen to him. He remained immovable as a statue wherever he was placed, and was wholly passive with respect to all that was done to him or about him. During all the time that he was in custody, he neither ate, nor drank, nor slept, nor had any evacuation. Some of his comrades were sent to see him; after that he was visited by some officers of his corps, and by some priests; but he still continued in the same state, without discovering the least signs of sensibility. Promises, threats, and treatises were equally ineffectual. The physicians who were consulted upon his case, were of opinion, that he was in a state of hopeless idiocy. It was at first suspected that those appearances were feigned; but these suspicions necessarily gave way, when it was known that he took no sustenance, and that the involuntary functions of nature were in great measure suspended. After some time they knocked off his fetters, and left him at liberty to go whither he would. He received his liberty with the same insensibility that he had showed upon other occasions: he remained fixed and immovable; his eyes turned wildly here and there without taking cognizance of any object, and the muscles of his face were fallen and fixed like those of a dead body. Being left to himself, he passed 20 days in this condition, without eating, drinking, or any evacuation, and died on the 20th day. He had been sometimes heard to fetch deep sighs; and once he rushed with great violence on a soldier, who had a mug of liquor in his hand, forced the mug from him, and having drank the liquor with great eagerness, let the mug drop to the ground."

When a person is affected with terror, the principal endeavour should be to restore the circulation to its due order, to promote perspiration, and to allay the agitation of the patient. For these purposes he may drink a little warm liquor, as camomile tea, &c. the feet and legs may be put into warm water, the legs rubbed, and the camomile tea repeated every six or eight minutes; and when the skin is warm, and there is a tendency to perspiration, sleep may be promoted by a gentle opiate.

But frights have been known not only to cause, but also to cure diseases. Mr. Boyle mentions agues, gout, &c. Works, and sciatica, cured by this means.

To turn from the serious to the ludicrous effects of fear, the following instance of the latter sort, quoted from a French author by Mr. Andrews in his volume of Anecdotes, shows upon what slight occasions this passion may be sometimes excited in a very high degree, even in persons the most unlikely to ent-
FRILL, in Falconry. When a hawk trembles or shivers, they say she frills.

FRINGILLA, a genus of birds belonging to the order of passerers. See Ornithology Index.

FRI, FRIO, a small island on the coast of the Brazils, situated in 33° 2' S. Lat. and 41° 31' 45" W. Long. The land of Frio is high, with a hollow in the middle, which gives it, at a distance, the appearance of two separate islands.

FRIPPERY, a French term sometimes used in our language to signify the trade or traffic of old second-hand clothes and goods. The word is also used for the place where such sort of commerce is carried on, and even for the commodities themselves. The company of frippers, or friperers, at Paris, are a regular corporation, of an ancient standing, and make a considerable figure in that city.

FRIISI, PAUL, an eminent Italian mathematician. See Supplement.

FRIISII, FRISEI, FRISIOES, and FRISONES, in Ancient Geography, a people of Germany, so called either from their ardent love of freedom, or from the fresh and unbroken lands they occupied, contrarily distinguished from the old lands. Tacitus divides them, from their extent of power and territory, into the Maiores, situated on the coasts between the Rhine and the Ems; and into the Minores, occupying the parts above the lakes lying between the channels and the Rhine.

FRIE, or Fritt, in the glass manufacture, is the matter or ingredients whereof glass is to be made, when they have been calcined or baked in a furnace. A salt drawn from the ashes of the plant kali, or from fern or other plants, mixed with sand or flint, and baked together, makes an opaque mass called by glassmen frit; probably from the Italian frittare, to fry; or because the frit, when melted, runs into lumps, like fritters, called by the Italians frielli.

Frit, by the ancients, was called ammonturium, of copper, sand, and niter; under which name it is described by Pliny thus: Fine sand from the Voltegerian seas, mixed with three times the quantity of nitre, and melted, makes a mass called ammonturium; which being rebaked makes pure glass.

Frit, Neri observes, is only the calc of the materials which make glass; which, though they might be melted, and glass be made, without thus containing them, yet it would take up much more time. Thus calcining or making of frit, serves to mix and incorporate the quarts.
FRITILLARIA, FRITILLARY; a genus of plants belonging to the hexandria class; and in the natural method ranking under the 10th order, Coroneae. See Botany Index.

The different species of fritillary were, according to Beckman, introduced into gardens about the middle of the 16th century. The crown imperial (fritillaria imperialis) is supposed by some to be the lily which is much celebrated in sacred scripture; because a figure resembling this splendid plant, they imagine, is found represented on the coins of Herod. Invent. vol. iii.

FRUII, a province of Italy, subject to Austria, and bounded by Carinthia in Germany on the north, by Carniola on the east, by the gulf of Venice on the south, and by the Bellunese and Feltrin on the west.

FRIZE, or FRIZE, in Architecture, a part of the eatablature of columns, more usually written and pronounced freeze. See FREEZE.

FRIZE, or FREEZE, in Commerce, a kind of woollen cloth or stuff for winter wear, being friz'd or knap't on one side; whence, in all probability, it derives its name.

Of frizes, some are crossed, others not crossed; the former are chiefly of English manufacture, the latter of Irish.

FRIZING OF CLOTH, a term in the woollen manufacture, applied to the forming of the nap of cloth or stuff into a number of little hard burrs or prominences, covering almost the whole ground thereof.

Some cloths are only friz'd on the back side, as black cloths; others on the right side, as coloured and mixed cloths, rateens, bays, freezes, &c.

Frizing may be performed two ways. One with the hand, that is, by means of two workmen, who conduct a kind of plank that serves for a frizing instrument. The other is by a mill, worked either by water, or a horse, or sometimes by men. This latter is esteemed the better way of frizing, by reason the motion being uniform and regular, the little knobs of the frizing are formed more equally and regularly. The structure of this useful machine is as follows:

The three principal parts are the frizer or criper, the frizing table, and the drawer or beam. The two first are two equal planks or boards, each about 10 feet long and 15 inches broad; differing only in this, that the frizing table is lined or covered, with a kind of coarse woollen stuff, of a rough sturdy nap; and the frizer is inclosed with a kind of cement composed of glue, gum arabic, and a yellow sand, with a little aqua vitae, or urine. The beam or drawer, thus called, because it draws the stuff from between the frizer and the frizing table, is a wooden roller, beset all over with little, fine, short points or ends of wire, like those of cards used in carding wool.

The disposition and use of the machine is thus: The table stands immovable, and bears or sustains the cloth to be friz'd, which is placed on the side uppermost on which the nap is to be raised; over the table is placed the frizer, at such a distance from it as to give room for the stuff to be passed between them; so that the frizer, having a very slow perpendicular motion, meeting the long hairs or naps of the cloth, twists and rolls them into little knobs or burrs; while at the same time, the drawer, which is continually turning, draws away the stuff from under the frizer, and winds it over its own points.

All that the workman has to do while the machine is a-going, is to stretch the stuff on the table as fast as the drawer takes it off, and from time to time to take off the stuff from the points of the drawer.

The design of having the frizing table lined with stuff of a short, stiff, stubby nap, is that it may detain the cloth between the table and the frizer long enough for the grain to be formed, that the drawer may not take it away too readily, which must otherwise be the case, as it is not held by any thing at the other end. It was unnecessary to say this, any thing particular of the manner of frizing stuffs with the hand, it being the aim of the workmen to imitate, as near as they can with their wooden instrument, the slow, equable, and circular motion of the machine: it needs only be added, that their frizer is but about two feet long and one broad; and that to form the nap more easily, they moisten the surface of the stuff lightly, with water mingled with whites of eggs or honey.

FROBENIUS, JOHN, a famous and learned printer in the 16th century, was born at Hamelburgh in Franconia, and settled at Basil. He had before studied in that university, where he acquired the reputation of being uncommonly learned; and now setting up a printing house in that city, was the first of the German printers who brought that admirable art to any degree of perfection. Being a man of great probity and piety, as well as skill, he was particularly choice in the authors he printed; and would never, for the sake of profit, suffer libels, or any thing that might hurt the reputation of another, to go through his press. The great character of this printer was the principal motive which induced Erasmus to reside at Basil, in order to have his own works printed by him. A great number of valuable authors were printed by Frobenius, with great care and accuracy, among which were the works of St Jerome, Augustine, and Erasmus. He designed to have printed the Greek Fathers; but died in 1527, before he could execute his design. Erasmus wrote his epitaph in Greek and Latin.

John Frobenius left a son named Jerome Frobenius, and a daughter married to Nicholas Episcopius; who, joining in partnership, continued Frobenius's printing house with reputation, and printed correct editions of the Greek Fathers.

FROBISHER, or FROBISHER, SIR MARTIN, an excellent navigator and sea officer in the 16th century, was born near Doncaster in Yorkshire, and was from
his youth brought up to navigation. He was the first
Englishman who attempted to find a north-west pas-
sage to China, and in 1576 he sailed with two barks
and a pinace in order to attempt that passage. In
this voyage he discovered a cape, to which he gave the
name of Queen Elizabeth's Forland, and the next day
discovered a strait to which he gave his own name. This
voyage proving unsuccessful, he attempted the same
passage in 1577; but discovering some ore in an island,
and his commission directing him in this voyage only
to search for ore, and to leave the farther discovery of
the north-west to another time, he returned to England.
He sailed again, with 15 ships and a great number of
adventurers, to form a settlement: but being obstructed
by the ice, and driven out to sea by a violent storm,
they, after encountering many difficulties, re-
turned home, without making any settlement, but
brought a large quantity of ore.—He afterwards com-
manded the Aid in Sir Francis Drake's expedition to
the West Indies, in which St Domingo in Hispaniols,
Carthagena, and Santa Justina, in Florida, were taken
and sacked. In 1588, he bravely exerted himself in
defence of his country against the Spanish armada,
when he commanded the Triumph, one of the largest
ships in that service; and, as a reward for his distin-
guished bravery, received the honour of knighthood
from the lord high admiral at sea. He afterwards
commanded a squadron which was ordered to cruise on
the Spanish coast; and, in 1592, took two valuable
ships and a rich carrack. In 1594 he was sent to the
assistance of Henry IV. king of France against a body
of the Leaguers and Spaniards, who had strongly en-
trenched themselves at Croyzon near Brest; but in an
assault upon that fort, on the 9th of November, Sir
Martin was unfortunately wounded with a ball, of which
he died soon after he had brought back the fleet to
Plymouth, and was buried in that town.

Fromisher's Straits, lie a little to the northward of
Cape Farewell in West Greenland, and were discover-
ed by Sir Martin Frobisher. W. Long. 48. 16. N.
Lat. 63. 12.

FRODSHAM, a town of Cheshire in England,
163 miles from London, is noted for its ancient castle.
It has a stone bridge over the river Weaver near its
confluence with the Mersey, and a harbour for ships of
good burden. By means of inland navigation, it has
communication with the rivers Dee, Ribble, Ouse,
Trent, Derwent, Severn, Humber, Thames, Avon,
&c. which navigation, including its windings, extends
above 500 miles, in the counties of Lincoln, Notting-
ham, York, Lancaster, Westmoreland, Stafford, War-
wick, Leicester, Oxford, Worcestershire, &c.

Frog. See Rana. } ErpEtoLOGY Index.
 Bull Frog. See Rana. 

Frog Fish of Surinam, a very singular animal, of
which a figure is given by Mr Edwards, Hist. of Birds,
vol. i. There is no specimen in the British museum,
nor in any private collection, except that of Dr Fo-
thergill. It was brought from Surinam in South Am-
ericas. Frogs, both in Asia and Africa, according to
Marian, change gradually from fishes to frogs, as
those in Europe; but after many years revert again in
the fishes, though the manner of their change has never
been investigated. In Surinam these fishes are called
judges. They are cartilaginous, of a substance like our
mustals, and exquisite food: they are formed with re-
gular vertebrae, and small bones all over the body di-
vided into equal parts; are first darkish, and then
grey: their scales make a beautiful appearance. Whe-
ther this animal is, in its perfect state, a species of frog
with a tail, or a kind of water lizard, Mr Edwards does
not pretend to determine; but observes, that, when its
size is considered, it should be deemed a tadpole at
first produced from spawn, and in its progress towards a
frog, such an animal, when full grown, if it bears the
same proportion to its tadpole as those in Europe do,
must be of enormous size; for our full grown frogs ex-
ceed the tadpoles at least 50 times. See EnPETOLOGY
Index.

FROME, a river that rises from several springs in the
western parts of Dorsetshire in England, the prin-
cipal of which is near Evershot; and directing its course
almost due west, passes under Frampton bridge, washes
the town of Dorchester, and falls into a bay of the
English channel called Poolehaven, near Wareham.

Frome-See Wood, a town of Somersetshire in England,
150 miles from London. It is the chief town of this
part of the country, which was anciently one great
forest called See woodshire; and in the latter end of
the last century, in those called Frome Woodlands, there
was a considerable gang of money coiners or clippers,
of whom many were taken and executed, and their co-
vert laid open. Though the town is bigger than some
cities, yet it has only one church; but it has six or
seven meeting houses of Protestant dissenters. The
inhabitants amounted to 3493 in 1811, and their chief
manufactory is broad cloth. About 50 years ago,
more wire cards for carding the wool for the spinners
were made at this place than in all England besides,
which was for the most part supplied with them from
hence; for here were no less than 20 master card-
masters, one of whom employed 100 men, women, and
children, in that manufactory, at one time; so that even
children of 7 or 8 years of age could earn half-a-crown
a week. The river here, which abounds with trout,
cells, &c. rises in the woodlands; and runs under its
stone bridge towards Bath, on the east side of which
it falls into the Avon. This town has been a long
time noted for its fine beer, which they keep to a great
age, and is generally preferred in the gentry to the
wines of France and Portugal. It was governed for-
merly by a bailiff, and now by two constables of the
hundreds of Frome, chosen at the court leet of the
lord of the manor.

FRONDESCENTIA, from from, "a leaf," the
precise time of the year and month in which each spe-
cies of plants unfolds its first leaves.

All plants produce new leaves every year; but all do
not renew them at the same time. Among woody
plants, the elder, and most of the honeysuckles; a-
mong perennial herbs, the crocus or tulips, are the first
that push or expand their leaves. The time of sow-
ing the seeds decides with respect to annuals. The
oak and ash are constantly the latest in pushing their
leaves: the greatest number unfold them in spring; the
mosses and firs in winter. These striking differences
with respect to so capital a circumstance in plants as
that of unfolding their leaves, seem to indicate that
each species of plants has a temperature proper or pe-
culiar to itself, and requires a certain degree of heat,
to extricate the leaves from their buds, and produce the appearance in question.

This temperature, however, is not so fixed or constant as it may appear to a superficial observer. Among plants of the same species, there are some more early than others; whether that circumstance depends, as it most commonly does, on the nature of the plants, or is owing to differences in heat, exposure, and soil. In general, it may be affirmed, that small and young trees are always earlier than larger or old ones.

Now the pushing of the leaves is likewise accelerated or retarded according to the temperature of the season; that is, according as the sun is sooner or later in dispensing that certain degree of heat which is suitable to each species.

FRONT, the forehead, or that part of the face above the eyebrows. The word is formed of the Latin frontis; and that from the Greek Φωνή, "to think, perceive;" of φεας, mens, "the mind, thought," Martinus, to make out this etymology, observes, that from the forehead of a person we perceive what he is, what he is capable of, and what he thinks of.

FRONT is also used where several persons or things are ranged side by side, and show their front or fore parts.

FRONT, in Architecture, denotes the principal face or side of a building, or that presented to their chief aspect or view.

FRONTAL, in Architecture, a little fronton or pediment, sometimes placed over a small door or window.

FRONTAL, Frontlet, or Brow-band, is also used in speaking of the Jewish ceremonies. This frontlet consists of four several pieces of veilum, on each whereof is written some text of scripture. They are all laid on a piece of a black calf's leather with thongs to tie it by. The Jews apply the leather with the veilum on their foreheads in the synagogues, and tie it round the head with the thongs.

FRONTIER, the border, confine, or extreme, of a kingdom or province, which the enemies find in front when they would enter the same. Thus we say, a frontier town, frontier province, &c. Frontiers were anciently called marches.

The word is derived from the French frontiere, and that from the Latin frontaria; as being a kind of front opposed to the enemy. Skinner derives frontier from front; inasmuch as the frontier is the exterior and most advanced part of a state, as the front is that of a man.

FRONTIGNAC WINE, is so called from a town of Languedoc in France, situated 16 miles south-west of Montpellier, remarkable for producing it.

FRONTINAC, a fortress in Canada, situated at the head of a fine harbour, on the north-west side of the outlet of Lake Ontario, where vessels of every description may ride in perfect safety. It is 300 miles from Quebec, and in comparison of that place has a very short winter.

FRONTINUS, Sextus Julius, an ancient Roman writer, was of consular dignity, and flourished under the emperors Vespasian, Titus, Domitian, Nerva, and Trajan. He commanded the Roman armies in Britain; was made city praetor when Vespasian and Titus were consuls; and Nerva made him curator of the aqueducts, which occasioned his writing De Aqueductibus urbibus Roma. He wrote four books upon the Greek and Roman art of war; a piece De Re Agraria, and another De Limitibus. These have been often separately reprinted; but were all collected together in a new edition at Amsterdam in 1661, with notes by Robertus Keuchenius. He died under Trajan.

FRONTISPICE, in Architecture, the principal face of a fine building. The word is formed of the Latin frontispicium, q. d., frontis hominis inspectio. Hence also, by a figure, we say, the frontispiece of a book; meaning an ornament with an engraven title on the first page.

FRONTLET. See Frontal.

FRONTO, Marcus Cornelius, was chosen for his eloquence to instruct the emperors Marcus Aurelius and Lucius Verus in rhetoric; in recompense of which he was promoted to the consulate, and a statue was erected to his honour. He taught Marcus Aurelius not only eloquence, but the duty of kings, and excellent morals. Some say he wrote against the Christians. A sect was formed of those who looked upon him as a model of perfect eloquence, and those were called Frontonians. The Civilians, whose names were Fronto, mentioned in the Pandects, were probably descended from him.

FROST, in Physiology, such a state of the atmosphere as occasions the congelation or freezing of water and other fluids. See Cold, Chemistry Index, and Meteorology Index.

Water and other fluids are capable of containing the element of fire or heat in two very different states. In one, they seem to imbibe the fire in such a manner, that it eludes all the methods by which we are accustomed to observe it, either by our sensation of feeling, or the thermometer; in the other, it manifests itself obviously to our senses, either by the touch, the thermometer, or the emission of light.

In the first of these states, we call the body cold; and are apt to say that this coldness is occasioned by the absence of heat. But this manner of expressing ourselves, excepting in a relative degree, is certainly improper; for even those fluids which are coldest to the touch contain a vast deal of heat. Thus vapour, which is colder to the touch than the water from which it was raised, contains an immense quantity of fire, even more than sufficient to heat it red hot. The like may be said of common salt and snow, or ice. If a quantity of each of these substances is separately reduced to the degree of 28 or 30 of Fahrenheit's thermometer, upon mixing them together, the heat which would have raised the thermometer to the degree above mentioned, now enters into the substance of them in such a manner that the mercury falls down to 0. Here an excessive degree of cold is produced, and yet we are sure that the substances contain the very same quantity of heat that they formerly did: nay, they will even seem exceedingly cold, when they must certainly contain a great deal more heat than they originally did; for they absorb it from all bodies around them; and if a small vessel full of water is put into the middle of such a mixture, it will in a short time be full of ice.

It appears, therefore, that our senses, even when assisted by thermometers, can only judge of the state in which the element of fire is with relation to the bodies.
Nine or ten successive frosty nights froze the bare 
ground in the garden six inches and a half deep; and 
in the orchard, where a wall sheltered it from the south 
sun, to the depth of eight inches and a half. He also 
dug in an orchard, near a wall, about a week after- 
wards, and found the frost to have penetrated to the 
depth of 14 inches. In a garden at Moscow, the frost 
in a hard season only penetrates to two feet: and the 
utmost effect that Captain James mentions the cold to 
have had upon the ground of Charleston island, was to 
freeze it to 10 feet deep: whence may appear the dif- 
f erent degrees of cold of that island and Russia. And 
as to the freezing of water at the above-mentioned 
island, the Captain tells us it does not natura lly con-
geal above the depth of six feet, the rest being by ac-
cident. Water also, exposed to the cold air in large 
vessels, always freezes first at the upper surface, the 

ice gradually increasing and thickening downwards; 
for which reason, frogs retire in frosty weather to 
the bottom of the ditches; and it is said, that a sheet 
of fish retire in winter to those depths of the sea and 

rivers where they are not to be found in summer. Wa-

ter, like the earth, seems not disposed to receive any 
very intense degree of cold at a considerable depth or 
distance from the air. The vast masses of ice found 
in the northern seas being only many flakes and frag-
ments, which, sliding under each other, are, by the 
congelation of the intercepted water, cemented toge-

ther.

In cold countries, the frost often proves fatal to 
mankind; not only producing gangrenes, but even 
death itself. Those who die of it have their hands and 
feet first seized, till they grow past feeling it; after 
which the rest of their bodies is so invaded, that they 
are taken with a drowsiness, which, if indulged, they 
awake no more, but die insensibly. But there is no-
other way whereby it proves mortal, viz. by freezing 
the abdomen and viscera, which on dissection are found 
to be mortified and black.

The great power of frost on vegetables is a thing 
sufficiently known; but the differences between the 
frosts of a severe winter, and those which happen in 
the spring mornings, in their effects on plants and 
trees, were never perfectly explained, till by Mess. Du 
Hamel and Buffon in the Memoirs of the Paris Aca-

demy.

The frosts of severe winters are much more terrible 
than those of the spring, as they bring on a privation of 
all the products of the tenderer part of the vegetable 
world; but then they are not frequent, such winters happening perhaps but once in an age; and 
the frosts of the spring are in reality greater injuries to 
us than these, as they are every year repeated.

In regard to trees, the great difference is this, that 
the frosts of severe winters affect even their wood, their 
trunks and large branches; whereas those of the spring 
have only power to hurt the buds.

The winter frosts happening at a time when most of 
the trees in our woods and gardens have neither leaves, 
flowers, nor fruits upon them, and have their buds so 
hard as to be proof against slight injuries of weather, 
especially if the preceding summer has not been too 
et; in this state, if there are no unlucky circum-
stances attending, the generality of trees bear moderate 
 winters very well: but hard frosts, which happen late 
in the winter, cause very great injuries even to those 
trees which they do not utterly destroy. These are,
1. Long cracks following the direction of the fibres. 
2. Parcels of dead wood enclosed round with wood yet 
in a living state. And, 3. That distemper which the 
foresters call the double blee, which is a perfect cir-
cle of bles, or soft white wood, which when the tree is 
 afterwards felled, is found covered by a circle of hard 
and solid wood.

The opinions of authors about the exposition of trees 
to the different quarters, have been very different, and 
most of them grounded on no rational foundation. 
Many are of opinion that the effects of frost are most 
violently felt on those trees which are exposed to the 

north; and others think the south or the west the most 
strongly affected by them. There is no doubt but the 

north exposure is subject to the greatest cold. It does 
not, however, follow from this, that the injury must be 
always greatest on the tree exposed to the north in 
fruits; on the contrary, there are abundant proofs that 
it is on the south side that trees are generally more in-
jured by frost: and it is plain from repeated ex-
periments, that there are particular accidents, under which 
a more moderate frost may do more injury to vegetables, 
than the most severe one which happens to them under 
more favourable circumstances.

It is plain from the accounts of the injuries trees re-
ceived by the frosts in 1799, that the greatest of all 
were owing to repeated false thaws, succeeded by re-
peated new frosts. But the frosts of the spring season 

furnish abundantly more numerous examples of this 

truth; and some experiments made by the Count de 
Buffon at large in his own woods, prove incontestably, 
that it is not the severest cold or most fixed frost that 
does the greatest injury to vegetables.

This is an observation directly opposite to the com-
mon opinion; yet is not the less true, nor is it in any 
way discordant to reason. We find by a number of ex-
periments, that humidity is the thing that makes frost 
fatal to vegetables; and therefore every thing that can 
occur of humidity in them, exposes them to those inju-
ries, and every thing that can prevent or take off an 
over proportion of humidity in them, every thing that 
can dry them though with ever so increased a cold, 
must prevent or preserve them from those injuries. Nu-
merous experiments and observations tend to prove 
this. It is well known that vegetables always feel the 
frost very severely in low places where there are 
fogs. The plants which stand by a river side are fre-
fently found destroyed by the spring and autumnal 
frosts, while those of the same species which stand in 
a drier place, suffer little or perhaps none at all by 
them; and the low and wet parts of forests are well 
known to produce worse wood than the high and drier.

The coppice wood in wet and low parts of common 
woods, though it push out more vigorously at first than 
that of other places, yet never comes to so good a 
growth; for the frost of the spring killing these early 
shoots, obliges the lower part of the trees to throw out 
lateral branches: and the same thing happens in a 
greater or lesser degree to the coppice wood that grows 
under cover of larger trees in great forests: for here 
the vapours not being carried off either by the sun or 
wind, stagnate and freeze, and in the same manner de-
stroy the young shoots, as the fogs of marshy places.

It
FRU [250.] FRU

FRUITS. — A fine elege! and we have no reason to doubt the truth of it.

FRUCTESCENTIA, (from fructus, "fruit," comprehends the precise time in which, after the fall of the flowers, the fruits arrive at maturity, and disperse their seeds.

In general, plants which flower in spring, ripen their fruits in summer, as says; those which flower in summer, have their fruits ripe in autumn, as the vine; the fruit of autumnal flowers ripens in winter, or the following spring, if kept in a store or otherwise defended from excessive frosts. These frosts, says M. Adanson, are frequently so pernicious and violent as to destroy the greatest part of the perennial plants of Virginia and Mississippi, that are cultivated in France, even before they have exhibited their fruit. The plants which flower during our winter, such as those of the Cape of Good Hope, ripen their fruit in spring in our stoves.

FRUCTIFEROUS, signifies properly any thing that produces fruit.

FRUCTIFICATION OR PLANTS, is defined by Linnaeus to be the temporary part of a vegetable appropriated to generation, terminating the old vegetable and beginning the new. It consists of the following seven parts: viz. the calyx, corolla, stamen, pistillum, pericarpium, semen or seed, and receptaculum. See Botany.

FRUIT, in its general sense, includes whatever the earth produces for the nourishment and support of animals; as herbs, grain, pulse, hay, corn, and flax, everything expressed by the Latins under the name frumenti.

FRUIT, in Natural History, denotes the last production of a tree or plant, for the propagation or multiplication of its kind; in which sense fruit includes all kinds of seeds, with their furniture, &c.

FRUITS, in Botany, is properly that part of a plant wherein the seed is contained; called by the Latins fructibus; and by the Greeks σαμαρία. The fruit in the Linnaean system is one of the parts of fructification, and is distinguished into three parts, viz. the pericarpium, seed, and receptacle, or receptaculum semen. See Botany.

Colours extracted from Fruits. See the article Colour-Making.

Bread-Fruit. See Artocarpus, Botany Index. Fruits, with regard to commerce, are distinguished into recent, fresh, and dry.

Recent Fruits are those sold just as they are gathered from the tree, without any farther preparation; as are most of the productions of our gardens and orchards, sold by the fruit sellers.

Dry Fruits are those dried in the sun, or by the fire, with other ingredients sometimes added to them to make them keep; imported chiefly from beyond sea, and sold by the grocers. Such are raisins, currants, figs, capers, olives, cloves, nutmegs, pepper, and other spices; which see under their respective articles.

Under the denomination of dry fruits are also frequently included apples, pears, almonds, filberts, &c.

Fruit-Flies, a name given by gardeners and others to a sort of small black flies found in vast numbers among fruit trees, in the spring season, and supposed to do great injury to them. Mr Leeuwenhoek preserved some of these flies for his microscopical observations. He found that they did not live longer than a day or two, but that the females during this time laid a great number of longish eggs. The gardeners, who suppose that these flies wound the leaves of the trees, are mistaken: it is true that they feed on their juices; but they have no instruments where with they can extract these for themselves; they feed on such as are naturally extravasated; and when there is not a sufficient quantity of these for their purpose, they haunt the places to which the puerulus resort, and feed on the juices which these little creatures extravasate by means of the holes they bore in the leaves with their trunks.

FRUIT-Stones. The mishaps arising from the custom which many people have of swallowing the stones of plums and other fruit are very great. The Philosophical Transactions give an account of a woman who suffered violent pains in her bowels for 30 years, returning once in a month or less. At length a strong purge being given her, the occasion of all these complaints was driven down from the bowels to the anus; where it gave a sensation of distension and stoppage, producing a continual desire of going to stool, but without voiding anything. On the assistance of a careful hand in this case, there was taken out with a forceps a ball of an oval figure, of about ten drachms in weight, and measuring five inches in circumference. This had caused all the violent fits of pain which she had suffered for so many years; and, after voiding it, she became perfectly well. The ball extracted looked like a stone, and felt very hard, but it swam in water. On cutting it through with a knife, there was found in the centre of it a plum stone; round which several coats of this hard and tough matter had gathered. Another instance given in the same paper is of a man, who, dying of an incurable colic, which had tormented him many years, and baffled the effects of medicines, was opened after death; and in his bowels was found a ball similar to that above mentioned; but somewhat larger, being six inches in circumference, and weighing an ounce and a half. In the centre of this, as of the other, there was found the stone of a plum common plum, and the coats were of the same nature with those of the former.

These and several other instances mentioned in the same place, sufficiently show the folly of that common opinion that the stones of fruits are wholesome. For though by nature the guts are so defended by their proper mucus, that people very seldom suffer by things of this kind; yet if we consider the various convulsions of the guts, their valves and cells, and at the same time consider the hair of the skins of animals we feed on, the wool or down on herbs and fruit, and the fibres, vessels, and nerves of plants, which are not altered by the stomach; it will appear a wonder that instances of this sort of mischief are not much more common. Cherry stones, swallowed in great quantities, have occasioned the death of many people; and there have been instances even of the seeds of strawberies collecting into a lump in the guts, and causing violent disorders, which could not be cured without great difficulty.

FRUIT Trees. With regard to these it may be observed, 1. That the cutting and pruning them when young hurt their bearing, though it contributes to the
the richness and flavour of the fruit, as well as to the beauty of the tree. 2. That kernel fruit trees come later to bear than stone fruit trees; the time required by the first, before they come to any fit age for bearing, being one with another five years; but when they do begin, they bear in greater plenty than stone fruit. 3. That stone fruit, figs, and grapes, commonly bear considerably in three or four years, and bear full crops the fifth and sixth year; and hold it for many years, if well ordered. 4. That fruit trees in the same neighbourhood will ripen a fortnight sooner in some grounds than in others of a different temperature. 5. That in the same country, hot or cold summers set considerably forwards, or put backwards, the same fruit. 6. That the fruit on wall trees generally ripen before those on standards, and those on standards before those on dwarfs. 7. That the fruit of all wall trees planted in the south and east quarters commonly ripen about the same time, only those in the south rather earlier than those in the east; those in the west are later by eight or ten days; and those in the north by 15 or 20. For the planting, pruning, grafting, &c. of fruit trees, see Gardening.

FRUITERY, a place for the keeping of fruit, a fruit house, or fruit loft.

A fruitery should be inaccessible to any thing of moisture; and should be as much as possible so, even to frost.

FRUMENTACEOUS, a term applied by botanists to all such plants as have a conformity with wheat, in respect of their fruits, leaves, ears, or the like.

FRUMENTARIUS, a kind of soldiers or archers under the western empire.

The first time we read of these officers is in the reign of the emperor Adrian, who made use of them to inform himself of whatever passed. They did not make any particular corps distinct from the rest of the forces, but there was a certain number of them in each legion. It is supposed, that they were at first a number of young persons, drafted by Augustus throughout the provinces, particularly on all the great roads, to acquaint the emperor, with all expedition, of every thing that happened.

Afterwards they were incorporated into the troops themselves, where they still retained their ancient name. As their principal office was the giving intelligence, they were often joined with the cursi, with whom they agreed in that part of their office.

Their name of frumentarius is derived from their being also a sort of purveyors to the armies, cities, &c. collecting all the corn from the several provinces to furnish the commonwealth.

FRUMENTATION, in Roman antiquity, a large mass of corn bestowed on the people. This practice of giving corn to the people was very ancient among the Romans, and frequently used to soothe the turbulent humours of the populace. At first the number of those to whom this largess was given was indeterminate, till Augustus fixed it at 300,000.

FRUSH, or Running Thrush. See Farnery Index.

FRUSTUM, in Mathematics, a part of some solid body separated from the rest.

The frustum of a cone is the part that remains, when the top is cut off by a plane parallel to the base; and is otherwise called a truncated cone. See Conic Sections.

The frustum of a pyramid is also what remains after the top is cut off by a plane parallel to its base.

The frustum of a globe or sphere is any part thereof cut off by a plane, the solid contents of which may be found by this rule: To three times the square of the semidiameter of the base add the square of its height; then multiply that sum by the height, and this product multiplied by .5 gives the solidity of the frustum.

FRUTEX, a shrub. Shrubs, according to Linnaeus, make a branch of the second family in the vegetable kingdom; and are distinguished from trees, in that they come up without buds. But this distinction is not universal, though it be generally just with regard to those of Europe. Nature hath made an absolute distinction between trees and shrubs. Frutex, in its general acceptation, is a plant whose trunk is perennial, gemmiparous, woody, dividing and subdividing into a great number of branches. In short, it is the epitome of a tree, exemplified in the rose bush.

FRY, in Zoology, signifies the spawn, or rather young, of fish.

FRYING-PAN, a dangerous shoal, which has received this appellation from its figure. It is situated at the entrance of Cape Fear river, in North Carolina, the southern part of which is in long. 75° W. and 35° 22' N. Lat. 24 miles south-east by south of the light house on Bald Head.

FRYTH, John, a martyr to the Protestant religion in the reign of Henry VIII. He was the son of an innkeeper at Seven Oaks in Kent; and educated in King's College, Cambridge, where he took the degree of bachelor of arts. Thence he removed to Oxford, and was made a junior canon of Welsey's college. He had not been long in that university before he became acquainted with William Tyndale, a zealous Lutheran, with whom he conversed frequently on the topics in religion. Fryth became a convert to Lutheranism, and publicly avowed his opinions. He was apprehended, examined by the commissioners, and confined to his college. At length having obtained his liberty, in 1528 he went over to Germany, where he continued about two years; and then returned to England, more than ever determined in his religious sentiments. Finding at that time but few associates, he wandered about from place to place, till at last he was taken up at Reading as a vagrant, and cast in the stocks, where he remained till he was near expiring for want of sustenance. He was at length relieved by the humanity of Leonard Cox, a schoolmaster; who finding him a man of letters, procured his enlargement, and administered to his necessities. Fryth now set out for London, where with more zeal than prudence, he began to make proselytes; but was soon apprehended by order of the chancellor Sir Thomas More, and sent prisoner to the Tower. Refusing to retract his opinions, he was condemned to the flames, and accordingly burnt in Smithfield, on the 24th of July 1535. He left several works behind him, which were printed in folio in 1575.

FUAGE, in old English writers, a tax of .5 to .6 for every fire, levied in the time of Edward III.

FUCINUS Lacus, in Ancient Geography, a lake of Italy.
shallow water on the borders of the lake, he saw thousands of water snakes pursuing and preyng upon a little kind of fish like our thornbacks, but much better armed; though their defensive weapons seemed to avail them but little against such ravenous foes. The opening made by Claudius he describes as still entire, though in many parts filled with earth and rubbish. He went into it with torches as far as he could. It is a covered underground canal three miles long, and part of it cut through a hard rock, and other parts supported by mason work, with wells to give light. Hadrian is said to have let off the waters of the lake: and our author is of opinion, that if the canal were cleared and repaired it would still answer that purpose, and thereby restore a great deal of rich land fit for cultivation.

Fucus, a name given by the ancients to certain dyes and paints. By this name they called a purple sea plant used by them to dye woolen and linen things of that colour. The dye was very beautiful, but not lasting; for it soon began to change, and in time went wholly off. This is the account Theophrastus gives of it.

The women of those times also used something called fuscus, to stain their cheeks red; and many have supposed, from the same word expressing both, that the same substance was used on both occasions. But this, on a strict inquiry, proves not to be the case. The Greeks called every thing fuscus that would stain or paint the flesh. But this peculiar substance used by the women to paint their cheeks was distinguished from the others by the name of riddium among the more correct writers, and was indeed a root brought from Syria into Greece. The Latins, in imitation of the Greek name, called this root radicula; and Pliny very erroneously confounds the plant with the radix lunaria, or stratium of the Greeks.

The word fuscus was in those times become such an universal name for paint, that the Greeks and Romans had a fuscus metallicus, which was the ceruse used for painting the neck and arms white: after which they used the purpristium, or red focus of the riddium, to give the colour to the cheeks. In after-times they also used a peculiar fuscus or paint for the purpose, prepared of the creta argentaria, or silver-chalk, and some of the rich purple dyes that were in use at that time; and this seems to have been very little different from our rose-pink; a colour commonly sold at the colour shops, and used on like occasions.

Fucus, in the Linnaean system of botany, is a genus of the order of alga, belonging to the cryptogamia class of plants.

Fuego, Fuego, one of the Cape de Verd islands, in the Atlantic ocean. It is much higher than any of the rest; and seems at sea to be one single mountain, though on the sides there are deep valleys. There is a volcano at the top which burns continually, and may be seen a great way off at sea. It vomits a great deal of fire and smoke, and throws out huge pieces of rock to a vast height; and sometimes torrents of melted matter run down the sides. The Portuguese, who first inhabited it, brought negro slaves with them, and a stock of cows, horses, and hogs; but the chief inhabitants now are blacks of the Romish religion. W. Long. 24. 20. Lat. 15. 0.
There are still several other kinds of fugues; such as the perpetual fugue, the double fugue, the inverted fugue.

The inverted fugue is a manner of composition, in which the flying part proceeds in a contrary direction to the other fugue, which had been formerly fixed in the same piece of music. Thus, when the first fugitive part is heard in ascending from the tonic to the dominant, or from the dominant to the tonic, the counter fugue ought to be heard in descending from the dominant to the tonic, or from the tonic to the dominant, and vice versa. Its other rules are exactly like those of the common fugue.

FULCRUM, in Mechanics, the prop or support by which a lever is sustained.

FULDA, a considerable town of Germany, in the circle of the Upper Rhine, and in the Buchow, with a celebrated abbey; whose abbot was primate of the abbeys of the empire, perpetual chancellor of the emperor, and sovereign of this small territory, which is now chiefly included in the dominions of Hesse Cassel. It is seated on the river Fulda, 55 miles south of Cassel.

Fulgora, a genus of insects belonging to the order of hemiptera. See Entomology Index.

FULHAM, a village of Middlesex, four miles from London, with 5003 inhabitants in 1811. The Danes in 866 winted here at this place till they retired to the continent. It was in the Conqueror's time held of the king by the canons of St Paul's; and there is an ancient house here, which is moated about, and belongs to the see of London, whose bishop has a palace here, and the demesne has belonged to that diocese from 1067. From this place to Putney there is a wooden bridge over the Thames, where not only horses, coaches, and all carriages, but even foot passengers, pay toll. The church here is both a rectory and a vicarage.

FULICA, the Gallinule and Coot, a genus of birds belonging to the order of gallinace. See Ornithology Index.

FULIGNO, whatever proceeds from a thick sooty smoke, such as lamp black.

FULIGNO, a city of Italy, in the pope's territories, 10 miles north of Spoleto.

FULIGO, in Natural History, a species of punicum-stone. See Pumice.

FULLED, or TREATED, a piece of cloth, involved in a bath of hot water, to straighten it, or to bleach it.

FULLED, a workman employed in the woollen manufactories to mill or scour cloths, serge, and other stuffs, in order to render them more thick, compact, and durable. See Filing.

FULLED'S Earth, in Natural History, a species of clay, of a grayish ash-coloured brown, in all degrees from very pale to almost black, and it has generally something of a greenish cast. It is very hard and firm, of a compact texture, of a tough and somewhat dusty surface that adheres slightly to the tongue. It is very soft to the touch, not staining the hands, nor breaking easily between the fingers. It has a little hardness between the teeth, and melts freely in the mouth. Thrown into water, it makes no effervescence or hissing; but swells gradually in bulk, and falls into a fine soft powder. It makes no effervescence with aquafortis.

The greatest quantity and the finest earth of this kind in the world, is dug in the pits at Wavendon, near Woburn in Bedfordshire. The strata in these pits lie thus: From the surface to the depth of six feet, there are several layers or beds of sand, all reddish, but some lighter coloured than others. Under these there is a thin stratum of a sand-stone, which they break through, and then there is the fuller's earth. The upper stratum of this is about a foot thick: the workmen call it clegate, and throw it aside as useless; being commonly fouled with the sand which originally covered it, and which insinuates itself a good way into it. After this, they come to the fine fuller's earth for sale, which lies to the depth of eight feet more. The matter of this is divided into several layers, there being commonly about a foot and a half between one horizontal fissure and another. Of these several layers, the upper half, where the earth breaks itself, is tinged red; which seems to be owing to the running of the water upon it from among the sands above; some of which are probably of a ferruginous nature, or have ferruginous matter among them. This reddish fuller's earth the workmen call crop; and between the clegate and this there is a thin stratum of matter, of less than an inch, which in taste, colour, and external appearance, resembles the term Japanica of the shops. The lower half of the strata of fuller's earth they call wall-earth. This is untinged with the red colour of the other, and seems the most proper for fulling. Under the fuller's earth there is a stratum of white and coarse stone about two feet thick. They seldom dig through this; but if they do, they find more strata of sand.

This earth is of great use in scouring cloths, stuffs, &c. imbibing all the grease and oil used in preparing, dressing,
dressing, &c. of the wool; for which reason it is made a contraband commodity, and is not to be exported under the penalty of 1s. for every pound weight. See 

FOLLING.

FILLER'S Weed, or Teaste. See DIPSACEA, BOTANY

FULLERY, a place where cloths, &c. are killed. See the next article.

FOLLING, the art or act of cleansing, scouring, and pressing cloths, stuffs, and stockings, to render them stronger, closer, and firmer: called also MILKING. Pliny (lib. vii. cap. 56.) assures, that one Nicia, the son of Hermias, was the first inventor of the art of fulling: and it appears by an inscription, quoted by Sir G. Wheeler, in his Travels through Greece, that this same Nicia was a governor in Greece in the time of the Romans.

Fulling of woollen cloths, depends, like felting, so entirely upon the structure of wool and hair, that those who have read our account of that process, will not find it difficult to comprehend the following observations.

The asperities with which the surface of wool is everywhere surrounded, and the disposition which it has to assume a progressive motion towards the root, render the spinning of wool, and making it into cloth, difficult operations. In order to spin wool, and afterwards convert it into cloth, its fibres must be covered with a coating of oil, which, filling the cavities, renders the asperities less sensible; in the same way as oil renders the surface of a very fine file less rough, when rubbed over it. When the piece of cloth is finished, it must be cleansed from this oil; which would cause it to soil whatever it came in contact with, besides giving it a disagreeable smell, and prevent its taking the colour which is intended to be given to it by the dyer. To deprive it of the oil, it is carried to the fulling-mill, where it is beat with hammers in a trough full of water, in which some clay has been mixed; the clay combines with the oil, which it separates from the cloth, and both together are washed away by the fresh water which is brought to it by the machine; thus, after a certain time, the oil is entirely washed out of the cloth.

But the scouring of the cloth is not the only object in fulling it; the alternate pressure given by the mallets to the piece of cloth, occasions, especially when the scouring is pretty far advanced, an effect analogous to that which is produced upon hats by the hands of the hatter; the fibres of wool which compose one of the threads, whether of the warp or the woof, assume a progressive movement, introduce themselves among those of the threads nearest to them, then into those which follow; and thus, by degrees, all the threads, both of the warp and the woof, become felted together.

The cloth, after having, by the above means, become shortened in all its dimensions, partakes both of the nature of cloth and of that of felt; it may be cut without being subject to ravel, and, on that account, we are not obliged to hem the edges of the pieces of which cloths are made. Lastly, as the threads of the warp and those of the woof are no longer so distinct and separated from each other, the cloth, which has acquired a greater degree of thickness, forms a warmer clothing.

Nail worsted also is, by fulling, rendered less apt to run, in case a stitch should happen to drop in it.

The fulling of cloths and other stuffs is performed by a kind of water-mill, thence called a fulling or scouring mill.

These mills, excepting in what relates to the millstones and bepper, are much the same with corn-mills: and there are even some which serve indifferently for either use: corn being ground, and cloths fullled, by the motion of the same wheel. Whence, in some places, particularly in France, the fullers are called millers; as grinding corn and milling stuffs at the same time.

The principal parts of the fulling-mill are, The wheel, with its trundle; which gives motion to the tree or spindle, whose teeth communicate it to the pestles or stampers, which are hereby raised and made to fall alternately, according as its teeth catch on or quit a kind of latch in the middle of each pestle. The pestles and troughs are of wood; each trough having at least two, sometimes three pestles, at the discretion of the master, or according to the force of the stream of water. In these troughs are laid the cloths, stuffs, &c. intended to be fullled: then, letting the current of water fall on the wheel, the pestles are successively let fall thereon, and by their weight and velocity stamp and press the stuffs very strongly, which by this means become thickened and condensed. In the course of the operation, they sometimes make use of urine, sometimes of fuller's earth, and sometimes of soap. To prepare the stuffs to receive the first impressions of the pestle, they are usually laid in urine; then in fuller's earth and water; and, lastly, in soap dissolved in hot water. Soap alone would do very well, but this is expensive; though fuller's earth, in the way of our dressing, is scarce inferior thereto; but then it must be well cleansed of all stones and grittinesses, which are apt to make holes in the stuff. As to urine, it is certainly prejudicial, and ought to be entirely discarded; not so much on account of its ill smell, as of its sharpness and saltiness, which qualities are apt to render the stuffs dry and harsh.

The true method of fulling with soap is delivered by Mons. Colinet, in an authentic memoir on that subject, supported by experiments made by order of the marquis de Louvois, then superintendent of the arts and manufactories of France; the substance of which we shall here subjoin.

Method of Fulling Cloths and Woollen Stuffes with Soap.—A coloured cloth, of about 45 ells, is to be laid in the usual manner in the trough of a fulling-mill; without first soaking it in water, as is commonly practised in many places. To fill this trough of cloth, 15 pounds of soap are required; one-half of which is to be melted in two pails of river or spring water, made as hot as the hand can well bear it. This solution is to be poured by little and little upon the cloth, in proportion as it is laid in the trough: and thus it is to be fullled for at least two hours; after which it is to be taken out and stretched. This done, the cloth is immediately returned into the same trough, without any new soap, and there fullled two hours more. Then taking it out, they wring it well, to express all the grease and filth. After the second fulling, the remainder of the soap is dissolved as in the former, and cast four different times on the cloth; remembering to take out the cloth every two hours, to stretch it, and undo the plaits and wrinkles it has acquired in the trough.
When a loan is proposed, such terms must be offered to the lenders, as may render the transaction beneficial: and this is now regulated by the prices of the old stocks. If the stocks, which bear interest at 4 per cent. sell at par, or rather above, the government may expect to borrow money at that rate; but if these stocks are under par, the government must either grant a higher interest, or some other advantage to the lenders, in compensation for the difference. For this purpose, besides the perpetual annuity, another annuity has sometimes been granted for life, or for a term of years. Lotteries have frequently been employed to facilitate the loan, by entitling the subscribers to a certain number of tickets, for which no higher price is charged than the exact value distributed in prizes, though their market price is generally 2l. or 3l. higher. Sometimes an abatement of a certain proportion of the capital has been granted, and a lender entitled to hold 100l. stock, though in reality he advanced no more perhaps than 93l.

It belongs to the chancellor of the exchequer to propose the terms of the loan in parliament: and he generally makes a previous agreement with some wealthy merchants, who are willing to advance the money on the terms proposed. The subscribers to the loan deposit a certain part of the sum subscribed; and are bound to pay the rest by instalments, or stated proportions, on appointed days, under pain of forfeiting what they have deposited. For this they are entitled, perhaps, not only to hold their share in the capital, but to an annuity for 10 years, and to the right of receiving a certain number of lottery tickets on advantageous terms. They may sell their capital to one person, their annuity to a second, and their right to the tickets to a third. The value of all these interests together is called omnium; and, in order to obtain a ready subscription, it ought to amount to 10l. or upwards, on 100l. of capital. This difference is called the bonus to the subscribers.

The capital advanced to the public, in the form of transferable stocks, and bearing interest from taxes appropriated for that purpose, is called the funded debt. Besides, there is generally a considerable sum due by government, which is not disposed of in that manner, and therefore is distinguished by the appellation of the unfunded debt. This may rise from any sort of national expense, for which no provision has been made, or for which provision has proved insufficient. The chief branches are,

1st, Exchequer Bills. These are issued from the exchequer, generally by appointment of parliament, and sometimes without such appointment, when exigencies require. They bear interest from the time when issued, and are taken in by the Bank of England, which promotes their circulation.

2d, Navy Bills. The sums annually granted for the navy have always fallen short of what that service required. To supply that deficiency, the admiralty issues bills in payment of victuals, stores, and the like, which bear interest six months after the time issued. The debt of the navy thus contracted is discharged, from time to time by parliament.

In time of war, the public expenses, since the Revolution, have always been much greater than the annual revenue; and large sums have consequently been borrowed. In time of peace, the revenue exceeds the expense, and part of the public debt has frequently been paid off. But, though there have been more years of peace than of war since the funds were established, the debts contracted during each war have much exceeded the payments during the subsequent peace. This will appear by the following abstract of the progress of the national debt.

Debt at peace of Ryswick, 1697 L. 21,515,472
Debt at the beginning of war 1701 16,394,701
Discharged during peace 1697 to 1701 5,121,071
Debt at peace of Utrecht 1714, including the value of annuities afterwards subscribed to South Sea stock 55,282,978
Contracted in war 1701 to 1714 38,888,277
Debt at beginning of war 1740, including 1,000,000l. charged on civil list 47,954,623
Debt at peace of Aix-la-Chapelle, 1748 7,328,355
Contracted during war 1740 to 1748 79,103,313
Debt at beginning of war 1756 31,238,660
Paid off during peace 1748 to 1756 73,289,673
Debt funded at the peace 1753, including 9,839,597l. then owing, which was funded in the subsequent years 133,957,270
Besides this, there was about 6,000,000l. of debt paid off, without ever being funded.
Funded debt, 1775 125,000,000
Paid off during peace 1763 to 1775, besides unfunded debt above mentioned 8,959,270
Funded at the peace 1763 211,303,254

The following is a state of the national debt at a later period.

Amount of funded debt on 5th January 1805 L. 603,925,792
Stock created by loan of 1805 38,700,000

Transferred for the redemption of the land tax 22,000,000

Redeemed by the commissioners for managing the sinking fund 620,925,792

Leaving as the amount of the national debt on the 31st January 1806 L. 507,125,792

The total amount of the public funded debt of the United Kingdom, on the 5th January 1810, according to the finance book, was 903,212,132l. and the annual interest at the same period was 30,947,150l. Of this debt 8,398,155l. consists of loans to Germany and Portugal. The above, however, is the nominal amount of the public debt; but its real amount, or the sum necessary to extinguish it, supposing the average interest received to be 5 per cent. would be about 619,000,000l. The original provision of the sinking fund, of a million per annum, with the additions that have since been made to it; and the dividends on stock, bought up by the commissioners for managing that fund, amount at this time (1820) to fifteen millions per annum. It was calculated that the future rate of accumulation of the sinking fund, continuing the same as hitherto, namely,
Fundamental sonance, to pursue that career which the resolution of
dissonance indispensably prescribes. See Resolution.

5. By the fifth, which is nothing else but a consequence of the former, the fundamental bass ought only to move by consonant intervals; except alone in the operation of a broken cadence, or after a chord of the seventh diminished, where it rises diatonically. Every other motion of the fundamental bass is illegitimate.

6. By the sixth, short, the fundamental bass or harmony ought not to be syntuated; but to distinguish the bars and the times which they contain, by changes of chords properly marked with cadences; in such a manner, for instance, that the dissonances which ought to be prepared may find their preparation in the imperfect time, but chiefly that all the reposes may happen in the perfect time. This sixth rule admits of an infinite number of exceptions; but the composer ought however to be attentive to it, if he would form a music in which the movements are properly marked, and in which the bars may end gracefully.

Wherever these rules are observed, the harmony shall be regular and without fault: this, however, will not hinder the music from being detestable. See Composition.

A word of illustration on the fifth rule may not be useless. Whatever turn may be given to a fundamental bass, if it is properly formed, one of these alternatives must always be found: either perfect chords moving by consonant intervals, without which these chords would have no connexion; or dissonant chords in operations of cadence: in every other case, the dissonance can neither be properly placed nor properly resolved.

From thence it follows, that the fundamental bass cannot move regularly but in one of these three manners: 1st, To rise or descend by a third rule or by a sixth. 2dly, By a fourth or a fifth. 3dly, To rise diatonically by means of the dissonance which forms the connexion, or by a license upon a perfect chord. With respect to a diatonic descent, it is a motion absolutely prohibited to the fundamental bass; or, at most, merely tolerated in cases where two perfect chords are in succession, divided by a close expressed or understood. This rule has no other exception: and it is from not discerning the foundation of certain transitions, that M. Rameau has caused the fundamental bass to descend diatonically under chords of the seventh; an operation which is impracticable in legitimate harmony. See Cadence, Dissonance.

The fundamental bass, which they add for no other reason than to serve as a proof of the harmony, must be restrained in execution, and often in practice it would have a very bad effect; for it is, as M. Rameau very properly observes, intended for the judgment, and not for the ear. It would at least produce a monotony extremely nauseous by frequent returns of the same chord, which they disguise and vary more agreeably by combining it in different manners upon the continued bass, without reckoning upon the different inversions of harmony, which furnish a thousand means of adding new beauties to the music and new energy to the expression. See Chord, Inversion.

But it will be objected, if the fundamental bass is not useful in composing good music, if it must even be retraced in practice, what good purpose, then, can it serve? We answer, that, in the first place, it serves for a rule to scholars, upon which they may learn to form a regular harmony, and to give to all the parts such a diatonic and elementary procedure as is prescribed by them that fundamental bass. It does more, as we have already said: it proves whether a harmony already formed be just and regular; for all harmony which cannot be subjected to the test of a fundamental bass, must according to all rules be bad. Finally, it serves for the investigation of a continued bass under a given air: though in reality, he who cannot directly form a continued bass will scarcely be able to form a fundamental bass, which is better; and much less still will he be able to transform that fundamental bass into a legitimate continued bass. These which follow are, however, the principal rules which M. Rameau prescribes for finding the fundamental bass of a given air.

1. To ascertain with precision the mode in which the composer begins, and those through which he passes. There are also rules for investigating the modes; but so long, so vague, so incomplete, that with respect to this, the ear may be formed long before the rules are acquired; and the dunces who should try to use them would gain no improvement but the habit of proceeding always note by note, without even knowing where he is.

2. To try in succession under each note the principal chords of the mode, beginning by those which are most analogous, and passing even to the most remote, when the composer sees himself under a necessity of doing so.

3. To consider whether the chord chosen can suit the upper part in what precedes and in what follows, by a just fundamental succession; and when this is impracticable, to return the way by came.

4. Not to change the note of the fundamental bass till after having exhausted all the notes which are allowed in succession in the upper part, and which can enter into its chord; or till some syncopated note in the air may be susceptible of two or a greater number of notes in the bass, to prepare the dissonance which may be afterwards resolved according to rule.

5. To study the intertexture of the phrases; the possible succession of cadences, whether full or avoided; and above all, the pauses which for ordinary return at the end of every four, or of every two bars, so that they may always fall upon perfect and regular cadences.

6. In short, to observe all the rules formerly given for the composition of the fundamental bass. These are the principal observations to be made for finding one under any given air; for there are sometimes several different ones which may be investigated. But, whatever may be said to the contrary, if the air has accent and character, there is only one just fundamental bass which can be adapted to it.

After having given a summary explication of the manner in which a fundamental bass should be composed, it should remain to suggest the means of transforming it into a continued bass; and this would be easy, if it were only necessary to regard the diatonic procedure and the agreeable air of this bass. But let
Funeral oratory, called the rostra, the next of the kind laudabant functum pro rostris, that is, made a funeral oration, in the commendation principally of the party deceased, but touching the worthy acts also of those his predecessors whose images were there present. The account given by Dr Kennet is in these words: "In all the funerals of note, especially in the public or indicative, the corpse was first brought with a vast train of followers into the forum; here one of the nearest relations ascended the rostra, and obliged the audience with an oration in praise of the deceased. If none of the kindred undertook the office, it was discharged by some of the most eminent persons in the city for learning and eloquence, as Appian reports of the funeral of Sylla. And Pliny the younger reckons it as the last addition to the happiness of a very great man, that he had the honour to be praised at his funeral by the most eloquent Tacitus, then consul; which is agreeable to Quintilian's account of this matter, Nam et funebres, &c. For the funeral orations (says he) depend very often on some public office, and by order of senate are many times given in charge to the magistrates to be performed by themselves in person. The invention of this custom is generally attributed to Valerius Poplicola, soon after the expulsion of the regal family. Plutarch tells us, that honouring his colleague's obscurity with a funeral oration, it so pleased the Romans, that it became customary for the best men to celebrate the funerals of great persons with speeches in their commendations." Thus Julius Caesar, according to custom, made an oration in the rostra, in praise of his wife Cornelia, and his aunt Julia, when dead; wherein he showed, that his aunt's descent, by her mother's side, was from kings, and by her father's from the gods. Plutarch says, that "he approved of the law of the Romans, which ordered suitable praises to be given to women as well as to men after death."—Though by what he says in another place, it seems that the old Roman law was, that funeral orations should be made only for the elder women; and therefore he says, that Caesar was the first that made one upon his own wife, it not being then usual to take notice of younger women in that way: but by that action he gained much favour from the populace, who afterwards looked upon him, and loved him, as a very mild and good man. The reason why such a law was made in favour of the women, Livy tells us, was this: That when there was such a scarcity of money in the public treasury, that the sum agreed upon to give the Gauls to break up the siege of the city and capital could not be raised, the women collected among themselves and made it up; who hereupon had not only thanks given them, but this additional honour, that after death, they should be solemnly praised as well as the men: which looks as if, before this time, only the men had those funeral orations made for them.

This custom of the Romans very early obtained among the Christians. Some of their funeral sermons or orations are now extant, as that of Eusebius on Constantine; and those of Nazianzen on Basil and Cæsarius; and of Ambrose on Valentinian, Theodosius, and others. Gregory, the brother of Basil, made suavissimus lugus, a funeral oration, for Melitus bishop of Antioch: in which orations, they not only praised the dead, but addressed themselves to them, which seems to have introduced the custom of praying to departed saints. Now these orations were usually made before the bodies of the deceased were committed to the ground; which custom has been more or less continued ever since, to this day.

Thus it appears, that those rites and ceremonies among the heathens, which have been delivered from one people to another, are what have given birth to Funeral Sermons and Orations, among Christians. Though this practice is considerably improved, and cleared of many things which would smell too rank of paganism, and is thrown into a method which, perhaps, may be of some service to Christianity; yet, notwithstanding this new dress, its original may very easily be discerned. The method in which the characters of deceased persons are given in our funeral sermons, is very much the same with that observed in those pagan orations; where first an account is given of the parentage of the deceased, then of his education; after that, we hear of his conduct in riper years; then his many virtues are reckoned up, with his generous, noble, and excellent performances.—Nor let the practice be condemned because of its rise and original; for why may not the customs of heathens, if just and laudable in themselves, and nowise pernicious to Christianity in their consequences, be followed by Christians? Only, since we are come into this practice, there is one thing we should take care to follow them in; and that is not to make those sermons or orations for every one; but for those only whose characters are distinguished, who have been eminently useful in the world, and in the church of Christ. The old heathens honoured those alone with this part of the funeral solemnity, who were men of probity and justice, renowned for their wisdom and knowledge, or famous for warlike exploits: This, as Cicero informs us, being part of the law for burials, &c. De Leg: which directs, that the praises only of honourable persons shall be mentioned in the oration. It would be much more agreeable, therefore, if our funeral discourses were not so common, and if the characters given of the deceased were more just; devoid of that fulsome flattery with which they too often abound.

Fungi (from φυκτής, fungus), the name of the 4th order of the 24th class of vegetables, in the Linnean system; comprehending all those which are of the mushroom kind, and which in Tournefort constitute the 2d, 3d, 4th, 5th, 6th, 7th, and 8th genera of the first section in the class xvii. This order in the Linnean arrangement, contains 10 genera; and it constitutes one of the natural order of plants in the Fragmenta Methodi Naturalis of Linnaeus. See Botany Index.

But as the classification of this order only has been given under the article Botany, we shall here detail some of the speculations of naturalists concerning their nature and mode of production.

The ancients called fungi children of the earth, meaning, no doubt, to indicate the obscurity of their origin. The moderns have likewise been at a loss in what rank to place them; some referring them to the animal, some to the vegetable, and others to the mineral kingdom.

Messrs Wilck and Munchhausen have not scrupled to rank these bodies in the number of animal productions; because,
FUR

chieflly performed with emery. See the article Emery.

FURCA, in antiquity, a piece of timber resembling a fork, used by the Romans as an instrument of punishment.

The punishment of the furca was of three kinds: the first only ignominious, when a master, for small offences, forced a servant to carry a furca on his shoulders about the city. The second was penal, when the party was led about the circus, or other place, with the furca upon his neck, and whipped all the way. The third was capital, when the malefactor having his head fastened on the furca, was whipped to death.

FURCHE', in Heraldry, a cross forked at the ends.

FURETIERE, ANTONY, an ingenious and learned Frenchman, was born at Paris in 1620; and after a liberal education became eminent in the civil and canon law. He was first an advocate in the parliament; and afterwards taking orders, was presented with the abbey of Chaliov, and the priory of Chaines. Many works of literature recommended him to the public; but what he is chiefly known by and valued for is his Universal Dictionary of the French Tongue, in which he explains the terms of art in all sciences. He had not, however, the pleasure of seeing this useful work published before his death; which happened in 1688. He was a member of the French academy; and the disputes and quarrels which he had with certain members of it made a great noise in the world.

FURIA, in Zoology, a genus of insects belonging to the order of vermes zoophyta. There is but one species, viz. the infernalis, which has a linear smooth body ciliated on each side, with reflexed feelers pressed to its body. In Finland, Bothnia, and the northern provinces of Sweden, it was not unfrequently that people were seized with a pungent pain, confined to a point, in the hand or other exposed part of the body, which presently increased to a most excruciating degree, and hath sometimes been suddenly fatal. This disorder was more particularly observed in Finland, especially about boggy and valued for is his Universal

Dictionary of the French Tongue, in which he explains the terms of art in all sciences. He had not, however, the pleasure of seeing this useful work published before his death; which happened in 1688. He was a member of the French academy; and the disputes and quarrels which he had with certain members of it made a great noise in the world.

FURIES, in Pagan antiquity, certain goddesses whose office it was to punish the guilty after death. They were three in number: Allecto, Megera, and Tisiphone; who were described with snakes instead of hair, and eyes like lightning, carrying iron chains and whips in one hand, and in the other flaming torches; the latter to discover, and the former to punish, the guilty; and they were supposed to be constantly hovering over such persons as had been guilty of any enormous crime.

Mythologists suppose, that Tisiphone punished the crimes which sprang from hatred or anger; Megera,
those from envy; and Alecto, those from an insatiable pursuit after riches and pleasure.

FURLING, in naval affairs, signifies the operation of wrapping up and binding any sail close to the yard.

FURLONG, an English long measure containing the one-eighth of a mile, and therefore equal to 660 feet, or 220 yards.

FURLOUGH, in the military language, is a license granted by an officer to a soldier to be absent from his duty for a limited time.

FURNACE,

Furnace is a vessel or building, for the purpose of containing combustible materials, whether of coal or wood, and so constructed that great heat may be produced and concentrated. There is a great variety of furnaces, and they are variously constructed, according to the views of the operator, and the purposes to which they are applied. But in all furnaces there are four things which require to be particularly attended to.

1. To be able to concentrate the heat, and direct it as much as possible to the substances which are to be acted upon.
2. To prevent the dissipation of the heat after it is produced.
3. To obtain the greatest quantity of heat from the smallest quantity of fuel; and,
4. To be able to regulate at pleasure the necessary degree of heat.

To concentrate the heat.

1. To accomplish the first object, namely to concentrate the heat, it is usual to confine the fire in a chamber or cavity properly constructed, furnished with a door or opening, by which the fuel is introduced; a grate for supporting it, and allowing a free passage to the air, as well as for the ashes to fall through into the cavity below, called the ash-pit. In this way the heat produced by the combustion of the fuel is confined by the sides of the furnace, and so concentrated that its force is chiefly spent on the substances inclosed.

2. The dissipation of the heat is prevented by keeping the door of the furnace shut, by constructing the chimney no wider than to allow a passage for the smoke, and placing the substance to be acted upon in such a manner that the fire may have its full effect as it goes up the chimney.

To produce the greatest proportion of heat.

3. The third object, which is not the least important, is to produce the greatest quantity of heat from the smallest quantity of fuel. In an economical point of view, this object is worthy of the greatest attention, though it is often difficult to attain it. In this view much depends upon the proportion between the spaces between the bars of the furnace, and the width and height of the chimney. This is obvious from considering the circumstances which regulate the process of combustion; for this depends on the current of air passing through the combustible matter. When the fuel in the furnace is kindled, a certain degree of heat is produced; but without a current of fresh air passing through the burning matter, the fire is instantly extinguished; and without this stream of fresh air the inflammation cannot go on. But when this takes place, the air within the furnace is rarified, and being no longer a balance for the external air, it is driven up the chimney by a current of denser air, rushing in at the openings. This having passed through the fuel, is also rarified, and passes off, giving place in its turn to a new current, so that in this way there is a constant flux of air up the chimney. From this it must appear, that the greater the rarefaction of the air in the fire-place is, the greater will be the intensity of the heat produced. By constructing a furnace in a particular way, the heat may be so managed that the under part of the chimney may be nearly as strongly heated as the fire-place itself; so that, although a strong current of air passes through the fuel, yet as the heat is uselessly spent on the chimney, there is a great and unnecessary waste of fuel. To prevent this, there is a contrivance by which the throat of the chimney is occasionally contracted, by means of a sliding plate, which, when it is pushed in, closes up the whole vent; but may be drawn out in such a way as to form a larger or smaller opening as may be thought necessary. Till the fuel is thoroughly kindled, and the furnace fully heated, the plate should be quite drawn out, so that the largest column of air which the furnace will admit, may pass through the fuel. The plate is then put in to a certain length, and so regulated that the smoke may be prevented from issuing at the door of the furnace. The current of air increases in proportion to the rarefaction of the fire in the fire-place, and this increases the inflammability of the fuel; and the heat now being reflected from every point of the furnace, steeping the narrow passage by which the smoke passes off, becomes extremely intense. If a large quantity of fuel be introduced at once, it will consume slowly, and require little attention, in comparison with those furnaces where this precaution is not observed. When the intensity of the heat is not very great, the sliding-plate may be of cast-iron; but to resist great degrees of heat, it will be found more convenient to have it made of fire-clay. But it must be observed, that the advantage derived from the sliding-plate is lost to those furnaces which are of a large construction, and where great quantities of metal are to be melted; and there it is commonly found, that the waste of fuel is very great.

4. To attain the fourth object, namely, to be able to method of regulate conveniently the degree of heat, a certain proportion of air only is to be allowed to pass through the fuel. With this view it is necessary to have the command of the furnace below, because the parts above are often filled with small quantities of soot. To manage this in the most effectual manner, the door of the ash-pit is to be perfectly closed, and furnished with a series of round holes which have a certain proportion to each other. In the furnaces constructed according to Dr Black's direction, the areas of these holes are as 1, 2, 4, 8, 16, &c. in geometrical progression. Seven or eight of these in the door of the ash-pit give a sufficient command over the fire. When the utmost intensity of heat is required, all the passages are thrown open, and the height of the chimney is increased, so that the height of the column of rarefied air being augmented, the motion of the current of air through the fuel is proportionately more rapid, and consequently the heat of the furnace becomes more intense. In the construction of a furnace recommended by Maquer, another tube is applied to the ash-pit, having the extremity
most distant from the furnace widest, and gradually tapering as it approaches it. By this contrivance, it was proposed to increase the velocity of the current of air as it passes from a wider into a narrower tube. But it is found that the air will not ultimately move with greater velocity than if the tube were not applied. It may indeed be useful where the furnace is placed in a small apartment, and the tube itself forms a communication with the external air.

After these preliminary observations on the general principles of furnaces, we propose in the following treatise to give a short account of the construction and application of some of the more important furnaces which are employed in the arts and manufactures.

But before we enter into the detail and description of particular furnaces, we shall lay before our readers the description of one which was invented by Messrs Robertons of Glasgow, for the purpose of consuming its own smoke, and saving fuel.

To construct furnaces (says the author of the Philosophical Magazine, from which this account is taken), on such a principle as should enable them to consume their own smoke, has long been a desideratum; and we believe the public in general, but especially those who have been annoyed by the smoke of steam engines, foundries, and similar erections in their neighbourhood, will be glad to learn that a furnace has been contrived which effectually gains this end.

The construction is extremely simple, and will be easily understood by the following description, and the plate to which it refers.

Fig. 1. represents a vertical section, and fig. 2. a front view of a steam-engine boiler, furnished with one of Messrs Robertons furnaces; and the same letters refer in both to the same parts of the construction.

The opening A, through which the fuel is introduced into the furnace, is shaped somewhat like a hopper, and is made of cast iron built into the brickwork H, H. From the mouth it inclines downward to the place where the fire rests on the bottom grate B. The coals in this mouth piece or hopper answer the purpose of a door (A), and those that are lowest are by this means brought into and heated by ignition before those who are forced into the furnace. Below the lower plate of the hopper K, c the furnace is provided with front bars G (a), which not only serve to admit air among the fuel, but offer ready service to force the fuel back, from time to time, from c to d (c), to make room for fresh quantities to fall into the furnace from the hopper or mouth-piece. By this arrangement the fuel is brought into a state of ignition before it reaches the farther side of the bottom-grate, where it is stopped by the rising breast, b, of the brick-work, so that any smoke liberated from the raw coals in the mouth-piece, must pass over these burning coals before it can reach the flue FF. But this, though it would cause a large quantity of the smoke to be burnt, would not completely prevent the escape and ascent of smoke up the chimney; for it is not merely necessary that the smoke should be exposed to a heat sufficient to ignite it before it escapes: unless, at the same time, a quantity of fresh air, able to furnish a sufficiency of oxygen for the combustion of the smoke, can be brought into contact with it, it will still escape in an undecomposed state. The judicious admission of fresh air, in such a manner that it can reach the smoke, without previously passing through the fire, and parting with its oxygen in its passage, and in such quantity as not to cool the bottom of the boiler, but merely to cause the smoke to burn, constitutes the chief merit of this invention; and to us it appears that it will fully answer the proposed end. Below the upper side of the mouth-piece or hopper, and at about the distance of three-fourths of an inch from it, (this space being a little more or less, according to the size of the furnace), is introduced a cast iron plate a n. This plate is above the fuel, and the space between it and the top of the hopper is open for the admission of a thin stream of air, which, rushing down the opening, comes first in contact with that part of the fire which is giving off the greatest part of the smoke, viz., the fuel that has been last introduced, mixes with it before it passes over the fuel in the interior, which is in a high state of combustion, and enables it to inflame so completely, that not a particle of smoke ever escapes undecomposed.

The quantity of air thus admitted to pass over the upper surface of the fire, is regulated by a very simple contrivance. The plate a n rests at each end on a stud, or pin, projecting from the cheeks of the mouth-piece A, or is furnished at each end with a pivot which works in the cheeks; the said pins or pivots being placed about midway between the outside and inside of the mouth-piece or hopper, so that, by elevating or depressing the edge a of the plate, the opening at n is enlarged or diminished. When that degree of opening which produces the best effects are obtained, which is easily known, the plate a n is kept in its place by means of a piece of iron introduced above it, and answering the purpose of a wedge.

Under the grates is the ash-hole I, the upper part of which is furnished with doors SS, which, when shut, prevent the heat from the front bars G from coming out into the apartment, and incommoding the workmen.

Invited by an advertisement, we went to Messrs Bunnell.

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(A) "In the management of this furnace, what is chiefly to be attended to is, that the hopper be kept full of coal, and either wholly or in part small coal, to prevent, as much as possible, air getting in by that passage; it is also necessary at some times to use a shutter of thin plate-iron, to be applied to the mouth of the hopper to exclude the entrance of air by that passage.

(b) "These bars are, in fact, a grated door, kept in their position by a catch L, and which may be opened at pleasure for cleaning the fire out. In small furnaces an opening here is all that is necessary; the bars may be dispensed with.

(c) "Between the back end, d, of the bottom bars, and the breast brickwork b, is represented in the plate, a section of a shutter, which is sometimes opened for the purpose of getting out the refuse of the fuel.
FURNACE.

Bunnell and Silver, Bedford-street, Covent-Garden, to see one of these furnaces at work, and we were not a little gratified in observing that the smallest appearance of smoke could not be perceived issuing from the top of the chimney. The advantages of such an improvement can hardly be better illustrated than by mentioning what had actually happened with this steam engine. The smoke, before the improved furnace was employed, incomed the neighbourhood so much, that it was stopped as an intolerable nuisance. Now it is so far from disturbing any one, that, without being admitted to see the engine, it would be actually impossible to know when it is at work.

These furnaces, we understand, have also been adopted by many intelligent manufacturers at Leeds and at Manchester. At the latter place, if we may credit newspaper reports, several manufacturers have had their works indicted as nuisances for not having adopted the improvement; the magistrates arguing, that, though the welfare of the place required that such inconveniences should be submitted to while no possible cure for them was known, the health and comfort of the inhabitants equally demand, now that the evil can be done away, that smoking furnaces should not be permitted in the place.

We earnestly recommend to owners of steam engines, and also to those who are annoyed by them, to endeavour to bring this improvement into general use. Indeed, we entertain no doubt of its being universally adopted sooner or later; for it yields advantages not only in point of cleanliness, comfort, and health, but also in point of interest; all the smoke usually discharged at the top of the chimney, being in fact, so much good fuel, that only wanted the contact of fresh air to inflame it under the boiler. It is a fact well known, that the flame which is often seen issuing from the chimneys of founders, &c. has no existence except at the top of the chimney: while ascending the fire it is only dense smoke, consisting of the azote of the atmospheric air decomposed in passing through the fire, of hydrogen, coal tar, and carbonaceous matter, of such a high temperature, that it only wants oxygen to make it inflame spontaneously: this it obtains from the atmospheric air into which it ascends, and then presents such appearances as would make a hasty observer adopt the opinion that the flame had ascended, as flame, from the fuel in the furnace; which is by no means the case. A consideration of this simple fact will convince any person that it is not an inconsiderable proportion of the fuel that is thus wasted. Nor is this the only loss sustained; the quantity of heat required not merely to render such a portion of the fuel volatile, but to give to it a temperature able to produce the effect of which we have taken notice, is itself furnished at the expense of an extra and unnecessary quantity of fuel. The whole waste in many cases is, we are persuaded, not less than an eighth of the whole fuel employed.

One of the most important furnaces, particularly for this country, where, although great and essential improvements have been made by industry and ingenuity, the manufacture is yet in its infancy, is that for the smelting of iron.

We shall therefore enter more fully into the detail of the history, construction, and general principles of the operation of blast furnaces; and in tracing their pro-

gressive history, it may be observed, that in this country it has experienced a revolution, of which no analogous instance has occurred in other countries.

In the early and barbarous periods of society, before the introduction of agriculture, the surface of a country is usually covered with extensive forests. From this circumstance wood, as being most accessible, abundant, and of easiest application, is usually employed by mankind for the purposes of fuel. In the progress of population and improvement, other advantages were derived from the general use of wood as fuel; and among these the improvement of the climate, and clearing land for the purposes of agriculture, were none of the least. The application of wood as fuel to different manufactories, had no doubt also an early origin; and in the manufacture of iron, if conducted on a scale of any extent, the demand for fuel of this kind must have been very great. If, then, during the gradual improvement and prosperity of this country, this manufacture, in place of remaining stationary, or declining, from diminished consumption, has increased in capital and extent, without some substitute for wood, the art would have been long before this time entirely lost, because it depended on a stock which must have rapidly declined, and even its very existence was often far from being compatible with the views and interest of landholders. Such were the circumstances in which Great Britain was placed, from the reign of Charles II. to the middle of the 18th century. During this period, being in a prosperous state, the manufacture and commerce of the country increased the demand for iron, while the supply of wood, one of the most necessary materials in its manufacture, was greatly diminished. It is true, indeed, that, previous to this period, pit-coal had been employed as a substitute; but the prejudice of some, and the selfish views of others, and especially the want of sufficient mechanical powers, obstructed the progress of this mode of manufacture. When, however, these difficulties were surmounted, and it was found that the change of fuel in the blast furnace was likely to prove beneficial, this manufacture acquired new vigour, and improvements succeeded each other in rapid succession. In a period of about 30 years, a complete revolution was effected, not only in relinquishing the mode of making iron with charcoal and in employing pit-coal in the blast furnace, but also in the immense increase of the circumference.

At what period the manufacture of iron commenced in Britain, cannot be precisely ascertained. It has been said, however, that the Phoenicians, who brought the tin mines of Cornwall, may have introduced into the country men who were skilled in metallic arts, and were capable of estimating their value, by converting these mineral riches to such purposes as their own necessities, or the wants of the inhabitants, might require. It is probable also, that the invasion of England by the Danes, and their establishment in this country, added something to their former knowledge in the art of mining and manufacturing the ore of iron. In support of this conjecture, the large heaps of scorched found in many parts of England, and having a considerable thickness of soil upon them, have been denominated from time immemorial, "Danes cinders," and indeed so early as the year 1066, large oaks were found in a state of decay, upon the tops of some of those hills of
None of the adventurers, however, succeeded in their attempts till the year 1619, when Dudley made pig-iron in a blast furnace, but produced only three tons in the week. At this time the price of iron had risen, in consequence of many of the iron-works having stopped for want of wood as fuel. To those manufacturers, therefore, who could still be furnished with a supply of wood, the manufacture was highly profitable, so that they opposed any new attempt by which the price of iron was likely to be diminished.

After this period, the progress of the iron manufacture was greatly interrupted from other causes. Amidst the distraction occasioned by the civil wars which raged in England, little improvement was to be expected. It appears, however, that patents were granted during the Commonwealth, for the exclusive privilege of manufacturing iron in the new way; and in one of these, it was believed at the time, that the Protector himself had a share. All these experienced the fate of the former, and no manufacture of any extent was successfully established. In the year 1663, Dudley in his application for his last patent, stated that he could produce at one time seven tons of pig iron in the week with a furnace of an improved construction, 27 feet square, and with bellows which one man, without much fatigue, could work for an hour.

Thus, as the demand for wood for the purposes of fuel in this manufacture increased, and the growth of timber was greatly diminished, the manufacturer was forced by necessity to have recourse to the use of pit-coal; and when various valuable improvements had been made on machinery, and particularly when the beneficial effects of the steam engine had been ascertained, the iron manufacturer saw himself in possession of a command of power in the management of his materials, of which he had formerly no conception. The small furnace supplied with air from bellows constructed of leather, which was moved by means of oxen, horses, or men, went into disuse, when larger furnaces were introduced, with an increase of the column of air, for the purpose of exciting combustion. But at this period, when the manufacture derived new vigour from the introduction of the steam engine, and the general improvement in machinery, it seemed, from the operation of other causes, and particularly from the deficiency of fuel, to decline rapidly. The demand for iron in the manufactured state, and particularly for bar iron, had increased, while the quantity produced gradually diminished. Recourse was now had to foreign markets for a supply, and the importation of Russian and Swedish iron then commenced. Of the 300 blast furnaces spoken of by Dudley, 59 only existed; and estimating their annual produce at about 293 tons to each furnace, the total amount did not much exceed 17,000 tons.

Such was the state of the manufacture of iron in England and Wales, before the introduction of pit-coal; and thus it appears, that in a period of from 150 to 150 years, it had suffered a diminution of more than 50,000 tons annually. It proved of singular benefit to this manufacture, that the steam engine, which had then become a powerful machine, was introduced, for the purpose of raising and compressing the air, and could be employed in those places where materials were abundant, but where there was a deficiency of water for moving the machinery. Besides, experience now taught
the manufacture, that the produce of his furnace could be increased by enlarging the diameter of the steam cylinder, for rendering the vacuum under the piston more perfect; and it was soon found that, by increasing these effects, such a quantity of pig iron could be produced from the coak of pit-coal, as would be attended with a suitable profit. It is scarcely to be wondered at, that this circumstance should have long remained a secret; for a small quantity of air only being necessary to ignite the charcoal furnace, whether it arose from the peculiar inflammability of the fuel, or the small capacity of the furnace, it was always under the eye of the manufacturer, and he would more frequently experience the inconveniences of overblowing than underblowing the furnace. It seems too extremely probable, that pit-coal, being considered in every respect inferior to charcoal, the manufacturer would proceed with great caution in enlarging the column of air, or increasing its density; and thus the advantages to be derived from its use would be in a great measure lost. When, however, experience had taught them a different lesson, the limits to the quantity of air that might be directed to a coak blast furnace, before any injurious effects arose, were not very observable. It was found, indeed, that the density of air diminished the quantity of the produce, and the same law seemed to hold with regard to pit-coal as well as to wood,—that the softer qualities might be overblown, while the strata of a denser and more compact consistence remained undiminished before a heavier blast.

Becomes in general use. Between the years 1750 and 1760 the coak of pit-coal was pretty generally substituted for charcoal, in the blast furnace. The iron manufacture assumed new vigour, and in a period of 30 years it experienced in England and Wales a very remarkable progress. From the general and increasing use of pit-coal, it is probable that many of the charcoal works were sooner relinquished than they would otherwise have been. The history of the celebrated foundery of Carron in Scotland, affords us a curious instance of the progress of the use of pit-coal in this manufacture. These extensive operations commenced, but the year 1750. The blast, as was the practice at the time, was performed by means of large bellows, moved by a water wheel. But as there was a scanty supply of air, and as this was deficient in density, the weekly produce of the furnace rarely exceeded 10 or 12 tons, and often in summer this quantity was considerably diminished. With a view to improve the operation, immense quantities of wood charcoal were prepared, and it was found that the process of smelting succeeded much better with this kind of fuel than with the mineral coal which was dug out in the neighbourhood. But in the improvement of machinery, more effectual means were discovered to procure a blast of sufficient force and density for the ignition of pit-coal, wheels of greater force were constructed; the use of the bellows was relinquished, and in their place large iron cylinders, so contrived as to blow both up and down, were introduced. Thus, a larger column of air, of three or four times the former density, was obtained, and the beneficial effects arising from the improvements were soon perceived; for the same furnace which formerly produced 10 or 12 tons in the week, sometimes yielded 40 tons in the same time; and on an annual average, not less than 15,000 tons of metal.

About the end of the reign of Queen Elizabeth, we are informed by Dudley, that blast furnaces had been constructed on so large a scale, and with such a power of machinery, as to yield a daily produce of more than two tons of charcoal iron; but it is probable that so large a produce could only be obtained in situations where there was a copious supply of water, and where the water wheels and bellows employed were of large size. In the more ordinary modes of conducting this process, furnaces of a much smaller size were employed, and these received the supply of air from hand bellows which were moved by men, and sometimes by cattle. From the superiority of the manufacture of iron guns, mortars, &c. England possessed at this time a considerable export trade; but as pit-coal had not yet been applied to any departments in the manufacture of iron, it seems probable that these articles were cast from the large blast furnaces, because the flame of wood, comparing it with that of pit-coal, possessing but feeble effects, would render the application of the reverberating furnace (if it was then known) of no use in the casting of guns and mortars. The want of pit-coal in every department of the foundry, greatly retarded the perfection to which the art of moulding might have arrived, and even obstructed its improvement. The backward state in which the art of casting and moulding long remained in this country, showed that the want of this material of the smelting fuel in the blast furnace was long severely felt; and owing to this, other nations, who in many other respects enjoyed fewer advantages, made more rapid progress in the improvement of this manufacture. Before this period, it is not improbable that the use of pit-coal might have been suggested to the manufacturer, and that this material, employed as a fuel, might have been considered as an auxiliary, or as a substitute in various departments of the process. The inflammability of this substance, and its tendency to be converted into a cinder, as well as the general decay of wood, would afford sufficient ground for what might be considered by any as a useful speculation. The benefits of this manufacture as it then stood, had been carefully investigated, and fully appreciated by those who were interested in it. The supply of wood only seemed to limit its extent, but for want of a sufficient supply of materials, the establishment of new works became impracticable, those already engaged in the business were anxious to preserve the supply they enjoyed, however limited, rather than encourage any innovation or change in the process, which, by the substitution of pit-coal for charcoal from wood, would probably give to new adventurers and speculators a superiority of the market. Besides, many of the furnaces which were then going, were at a great distance from pit-coal, so that the general use of this substance, and the advantages to be derived from it, would be highly injurious to their interests.

Such was the state of this manufacture when the use of pit-coal in this process was discovered, or when it was proposed to employ it for this purpose. With this view, James I. in the year 1612, granted a patent to Simon Sturtevant, for the exclusive manufacture of iron with pit-coal, for the period of 31 years. In obtaining this privilege,
Furnaces. The patentee obliged himself to publish a full account of his discoveries, and this appeared in the form of a paper under the title of "Metallica." It appears, however, that Sturtwaff had not succeeded in his scheme; for in the following year he gave up his privilege, but it is not known to what causes the failure is to be ascribed.

After Sturtwaff, a John Ravenston, embarked in the same hazardous undertaking; and although he procured a patent without much trouble, he had soon to encounter difficulties in the way of the ultimate success, analogous to those which had prevailed over the perseverance of Sturtwaff, and induced him to relinquish the further prosecution of his scheme. He obtained his patent on conditions similar to those on which his predecessor procured it, in consequence of which he published his "Metallica" in 1615. All his successors were, like him, obliged to resign their patents from the want of adequate success.

Dudley procured his patent in the year 1619, and notwithstanding he affirmed that he manufactured not more than three tons per week, he found it a lucrative undertaking. This discovery he brought to perfection at the works of his father in Worcestershire, but by the influence of those who wished to share in the emoluments arising from the manufacture of iron with pit-coal, his patent was limited to 14 years. He informs us himself, that, during the greater part of this period, he was enabled to sell pig and bar iron much cheaper than any of his competitors; but as his remarkable success drew their envy upon him, his devoted works were at length destroyed by a lawless mob, urged on, it is supposed, to perpetrate so atrocious a deed by his rivals in business. In this unmerited treatment of the sanguine but unfortunate Dudley, the coke pig process unquestionably experienced an irreparable loss. He had so many rivals to contend with, by virtue of the original ground he occupied as a manufacturer, and his attachment to the cause of royalty was so sincere, that his improvements were effectually prevented from arriving at lasting or general utility. Could he have procured a new patent after the restoration, there is little doubt but he would have again entered with avidity on the laborious paths of discovery.

Furnaces. The production of iron received no further improvements for about a century after this period. It was found to be practicable; but how to procure such a quantity as to produce a lucrative return, was not to be derived from the mere knowledge of the particular proportions of the raw materials. Had machinery reached that degree of perfection in the time of the ill-fated Dudley which it has since done, we have good reason to believe that the rapid progress of the pig-iron manufacture would have dated its origin from the era of that enterprising genius.

We shall conclude this historical account of the iron manufacture, with a view of the progressive quantity in furnaces produced at the different furnaces in Great Britain at different periods.

In 1620, the 300 blast furnaces mentioned by Dudley, which existed in England and Wales, produced each at an average 250 Tons.

At a later period, but previous to the use of pit-coal, 59 furnaces produced each at an average 294 Tons.

In 1788, 24 charcoal furnaces, which were then being used in England, produced each at an average 545 Tons.

In 1788, 53 blast furnaces, in which coke from pit-coal was used, yielded each an average 907 Tons.

In 1788, eight furnaces in Scotland produced an average each 875 Tons.

In 1796, there were in England and Wales, 104 furnaces, from each of which was obtained an average 1048 Tons.

But from the above statement we are not enabled to draw an accurate conclusion of the degree of improvement which has been introduced in blowing machinery; for among the furnaces mentioned in 1796, were included a number of charcoal blasts, which yielded only a small produce. But the average produce of iron manufactured at pig-iron furnaces, at no less an amount than 946 Tons.

At melting furnaces 1200 Tons.

At forge pig works 2000 Tons.

To what we have now said, we shall only give a view of the prices of the produce of this manufacture, and different channels of consumption for this immense quantity periods of materials.

Charcoal pig iron sold in 1620 for L.6 0 0
Ditto for melting in 1788 8 0 0
Ditto in 1798 9 10 0
Coal pig iron in the time of Dudley 4 0 0
Ditto in 1788 5 10 0
Ditto in 1798 6 10 0
Melting iron in 1802 8 10 0

The produce of pig iron in England and Wales, and in Scotland, from 168 furnaces, has been calculated at the immense quantity of 172,000 tons. It will be impossible to say with absolute precision what are the channels into which this immense quantity of raw materials passes for consumption; but the following view will enable the reader to account for part of it.

Annual consumption in the erection of new furnaces, forges, &c. 5000 Tons.
Furnace.

The same time the quantity is reduced by a portion of the metal being lost in the scoria (8). To correct these occasional imperfections in the quality of the air, and devise methods to procure air always fit for proper combustion, ought to be an object of much consideration to the manufacturer of cast iron. Whether such a consideration has given rise to the different modes of receiving and discharging the air now in use, I cannot say; I rather think not: a great quantity of air has hitherto been a greater object than a certain and uniform quality; and in a country where there is more temperate and cold weather than hot, it is by far the most important object: to unite both, however, would be an attainment of the greatest utility, and would rank the discoverer amongst the well-deserving of his country. How far the mechanism of our present machinery has been adapted to the exigencies of our atmosphere, will appear upon examining the nature and properties of the air, judged by its effects upon the blast furnace.

The air produced by the blowing and receiving cylinder is less changed, and less subject to change, than that produced and lodged in contact with a vast body of air or water. If the blowing cylinder is fixed in a dry cool spot, the only difference which the air undergoes is an increase of temperature; this is so very considerable, that upon entering the blowing cylinder immediately after stopping the engine, I have found the thermometer rise 15 to 16½ degrees higher than the surrounding air. That this heat is generated in the cylinder is unquestionable; but whether it is occasioned by the friction of the piston and upper parts of the cylinder, or expressed from the air by its severe compression, I have not yet been able to decide. It very probably arises from both causes, although the latter is sufficient to produce a much greater degree of heat. What effect this increase of temperature has upon combustion we are unable to say, as the degree of heat accumulated will at all times bear a reference to the temperature of the surrounding air, and as there is no method likely to be devised where heat would not be generated by the action of the particles of air upon each other. When the bulb of a thermometer is held in the middle of the current of blast, as it issues from the discharging pipe, a temperature is indicated as much lower than the temperature of the surrounding air; as the temperature of the cylinder was higher; and it is most probable that a much higher degree would be obtained, were it not for the previous expression of some heat in the blowing cylinder. Upon the whole, I think, the quality of the air obtained in this way of blowing uniformly most fit for combustion, provided the numerous pauses and irregularities of the current of air were done away.

Air forced into the furnace under water pressure always contains a considerable portion of moisture; the blast of course is colder, as it issues from the discharging pipe. The temperature differs so much from that of the external air as to sink the thermometer from 45° down to 28° and 30°: Such effects are produced by air coming into contact with water, that, although the temperature of the atmosphere is 60, 65, to 70; yet the blast at the orifice seldom rises above 38°: the cold produced in this manner is much increased if the air is surcharged with so much water as to be visible in the state of a fine spray. The leading feature, therefore, of the water vault, as to its effects upon the quality of the air, seems to indicate an almost uniform degree of temperature in the blast: this can only be occasioned by the warm air in summer taking up a greater portion of the water in solution, the escape of which at a small orifice, and under a great degree of compression, produces the very great depression of the thermometer. I have already hinted at the bad effects produced by moist blasts, and shall, in a proper place, more minutely attend to them.

The most inferior quality of air used in the blast from the furnace is that thrown into the air vault, and afterwards air vault expressed from thence by its own elasticity and the successive strokes of the engine. The capacity of such a building is from 60 to 70,000 cubical feet; this, when filled, generates a much superior degree of heat to that sensible in the blowing cylinder. As this heat is produced many feet distant from any mechanical motion, it is most evident that it is extricated from the air, and will readily unite with the moisture which penetrates the building: the quality of the air introduced into the furnace will therefore be in proportion to the quantity of moisture taken up; this will be much more in summer than in winter, as the temperature of the former exceeds that of the latter. The sensation, on entering the air vault in the coldest months, immediately after stopping the engine, is exactly similar to that experienced upon entering a crowded room in the hottest summer day; the walls are covered with damp, and the superior regions of the vaults readily obscure the flame of a candle. The feeling, upon remaining in the air vault when the engine is at work, is less marked than would be expected where so great a compression of air existed; the sense of hearing, owing to the moisture in the conducting medium, is considerably impaired, and respiration is performed with some difficulty; the light of a candle is faint, and not visible at the distance of a few feet.

I have explained the necessity of just proportions existing between the area of the interior of the blast furnace, the quantity of air thrown per minute, and the quality of coal. The various modes of blowing, and their respective effects, deduced from strict observation, were also attended to. We have now, thirdly, to adduce examples where the various changes of the atmosphere, as to heat and pressure, occasion the most sensible difference in the quantity of materials consumed, and in the quality and quantity of metal produced.

It has been already demonstrated, that the air in winter, by containing less moisture, is more proper for combustion, and more calculated to produce carbonised crude iron, than the air existing at any other season. From this superior quality the manufacturer obtains advantages, which induce him to wish for a continuance.

(H) May not the superabundant azote of the summer atmosphere produce part of these effects, by dissolving a portion of the carbure, and forming carbonated azotic gas, as has been proved by M. Lavoisier?
Furnace.

of cool air throughout the whole year. These effects are not, however, uniform; they depend greatly upon a light or heavy atmosphere. The keener and more still the air, the more rapid the combustion. During a severe frost, the descent of the materials is facilitated from one-tenth to one-fifteenth more than in rainy or hazy weather, and at the same time the quality of the iron is rather improved than impaired. When a change from frost to snow or rain takes place, the effects frequently become almost immediately obvious; the colour of the flame at the furnace head is changed; the tuyere of the furnace inflames, and burns with great violence; the lava, as it flows from the notch of the dam stone, becomes lengthened and tenacious; the form of it is changed, and the colour undergoes the most visible alterations; the iron no longer retains its complete saturation of carbon, but flows out sensibly impaired of its fluidity; and when cold, the privation of carbon is most evident by the examination of its fracture.

"When such consequences arise from the transition so frequent in winter from frost to thaws, it will be easily conceived that the change effected during the milder and warmer months must produce proportionally additional effects. The increase of temperature by the subliming up of boiling in solution, a much greater portion of aqueous vapour, will account for the ordinary effects which are annually observable in every work. Where these pernicious consequences approach to extremity, a solution of the phenomenon will likely be obtained by the examination of the blowing apparatus. If air is fitted for combustion in proportion as it is free from watery solutions, we are not to expect similar results from these blast furnaces in summer, which are blown by air from the regulating cylinder, and those blown by air from a water or air vault. I have for years seen this fact verified, and superior quantity and quality of iron during the hot weather, obtained from a furnace excited by means of blast, from the simple regulating cylinder, with a less proportion of fuel, than from furnaces whose air was expressed by means of the water or air vault. Observations thus made, where every day the effects of the different means could be justly estimated and compared, have led me to the following opinion: That the quality of the air, as furnished by nature in our atmosphere, is uniformly more fit for the manufacture of crude iron to profitable account, when discharged simply by means of cylinders and pistons, when brought into contact with moisture either in the water vault or air vault.

"So imperfect has the quality of the summer air been found in this country for combustion, where the water vault was used, that experiments have been made to repair the deficiency of effect by introducing steam into the furnace by means of an aperture above the tuyere. The inducing motive to this act, was a belief, that combustion was diminished in consequence of a diminution of oxygen gas during the summer; that, by introducing water upon a surface of materials ignited to whiteness, decomposition would ensue, a larger quantity of oxygen would then be presented to the fuel, and superior effects, as to combustion, obtained in this manner than hitherto witnessed. The idea was ingenious, and, in its application to the manufacture of cast iron, original; but the whole train of facts, which have been detailed, as to the effects of a superabundant quantity of oxygen, was overlooked. The event proved in the most complete manner, and on a great scale, the pernicious effects of moisture. The furnace gradually became cooled where the steam entered; the heat, set free by the decomposition of the water and the disengagement of the oxygen, increased to an alarming pitch a considerable way up the furnace; the quality of the iron became brittle, and as white in the fracture as silver; the introduction of the steam was still continued, the descending materials were instantly robbed of their heat to facilitate the decomposition of the water, and by and by the furnace closed entirely over, and the experiment ceased.

"This experiment, performed in a furnace 18 feet high, is a complete proof that heat is disengaged from bodies while they pass from the fluid to the solid and rigid state. The first instant of the discharge of steam, a very considerable portion of heat would be withdrawn from the fusing materials and united to the water. This, in its turn, would be ignited to whiteness, and decomposed upon the metals and cokes, in a superior region of the furnace. The process continuing for several hours, the materials at the tuyere were at last so completely reduced of the caloric power of the material torrent of steam, that they lost fluidity, cooled rapidly, and at last became black. Had another aperture for steam and for air been opened above these, now entirely shut up by the consolidated materials, the same effects would have been produced; the immense quantity of caloric, disengaged by the decomposition of the ignited water, would now approach nearer to the top of the furnace, another stratum of fusing materials would again become consolidated, till in the end the whole furnace would be set fast from top to bottom. From the introduction of steam into the blast furnace, either as such, or under a superior degree of expansive force, the following important truths may be learned: That the quantity of oxygen which enters into our atmospheric compound is generally more fit for the manufacture of the superior qualities of crude iron than any mixture which may be furnished by the addition of water; that, although the decomposition of water, by furnishing a superior quantity of oxygen, which, in a given proportion of caloric, increases the effects of combustion immediately in the vicinity of this chemical analysis; yet, as the water had previously abstracted the heat necessary to its decomposition from the inferior strata, a greater quantity by no means exists in the furnace. The water, in fact, only serves as a medium to convey the heat from one particular spot; but, by attempting to fly off with it, meets decomposition, and renders up not only the abstracted heat, but that which was contained in the oxygen of its decomposition.

4th, The compression and velocity of the air discharged into the furnace, considerably affect the result and of the smelting operations. In the consideration of this subject, the various qualities of coals will be found to have an intimate connexion with the area of the discharging pipe and the compression of the blast. It has already been more than once observed, that a soft or mixed quality of coal is more susceptible of combustion than either the split or cold coal; the consequence of this is, that, unless the necessary compression of air is used, decomposition is too early accomplished, and the cokes become oxygenated by combustion in a greater ratio.
I hope you will not think me tedious, when I explain to you another experiment, which appears to me to be of considerable importance to all manufacturers of cast iron.

I had reason to conjecture, from my own observations on the effects of blowing machinery on blast furnaces, as well as from the knowledge I had acquired from my father Dr Roeckebuck, and from my communications with other experienced iron masters, that a great part of the power of such machinery was misapplied in general practice, by throwing air into furnaces with much greater velocity than necessary. The velocity and that, if this velocity was, to a certain degree, diminished, the same power, by properly adjusting the blast, blowing machinery, of whatever nature, would be capable of throwing into the furnace a proportionally greater quantity of air. For, since the quantities of any fluid, issuing through the same aperture, are as the square roots of the pressure; it follows, that it would require four times the pressure, or power, to expel double the quantity of air, through the same aperture, in the same time; but if the area of the aperture was doubled, then the quantity of air expelled by the same power, and in the same time, would be increased in the ratio of the square root of 2 to 1, though its velocity would be diminished exactly in the same proportion. Again: I considered that the quantity and intensity of heat, produced in blast furnaces, and consequently its effects in increasing the produce, might be only in proportion to the quantity of air decomposed in the process of combustion, without regard to its greater velocity; that is to say, whether or not the same quantity of air was forced, in the same time, into the furnace through a small pipe, or through one of larger dimensions; for, in attending to the process of a common air furnace for remelting of iron, where there is a very large quantity of air admitted through the large areas between the bars, it is well known, that a much greater intensity of heat is produced than takes place in a blast furnace; and yet the air does not enter into the fire through the bars with increased density or great velocity. I therefore thought it probable, that increasing the quantity of air thrown into the blast furnace in a considerable degree, although the velocity or density might be much less, would have the effect of increasing its heat, and operations, and produce. And quantity, as, from the principles above stated, with regard to the considered machinery, I saw I could greatly increase the quantity of air thrown into the furnace, by enlarging the diameter of the blow pipe, and regulating the engine accordingly, without being obliged to employ more power, I was anxious to make this experiment.

A system of management, of which I did by no means approve, was adopted by the other partners of the Devon company, soon after the works were begun to be erected; and, in the prosecution of it, they ordered their second furnace to be put in blast, without permitting those measures to be taken that were necessary to provide and maintain a sufficient stock of materials; and also without allowing their blowing machine to be completed, according to the original design, by the addition of its second boiler. As might have been expected, a trial of several months to carry on two furnaces, with only half the power of steam that was necessary, and an inadequate stock of materials, proving unsuccessful.
FURNACE.

with each other, and flow connected into the general cavity or reservoir. By-and-by this becomes filled, and literally forms a beautiful molten mirror, in which sometimes part of the interior furnace is reflected.

"The furnace man, by searching at the bridge with his fire-iron or tongs, judges when the metal is nearly all gone. Of this he is certain by looking up from the peep-hole of the lading door. If the streamlets of the running metal have ceased, then the whole is melted, and ready for running out.

"In the operation of melting, the three following circumstances ought to be particularly attended to: the thinness or homogeneity of the metal; the waste or loss sustained in melting; and the quality of coals employed.

"The first is of the utmost importance, as many articles in the foundry business require the metal in a state of the greatest division; otherwise they will be found imperfect when taken from the sand, and unfit for sale. The furnace man, therefore, is always on the watch to replace the fire as it decays, and keep a large and sharp volume of flame constantly passing over the metal.

"The waste or loss of real metal is also an object of great importance. This always bears a relation to the quality of the iron, the strength and cleanness of the coals, and the judgment and attention of the melter. Strong iron is found always more difficult to fuse; this necessarily exposes it for a long period in contact with the flames. The reverse happens with metal that is more fragile, and easier broken in the pig. The length of the exposure in fusing depends on this; and other circumstances being alike, the loss or waste of metal will also be in the same ratio.

"There are, however, other facts not unworthy of notice. No. 1. pig iron, or richly carburated metal, when run from an air furnace, will be found in point of quality little better than No. 2. or carburated iron. This is owing to a quantity of its carbone being destroyed during the fusion. The loss in melting No. 1. iron, therefore, chiefly consists of carbon; and the deficiency of metal ought never, with a clean bottom, to exceed 1 cwt. in 20.

"Carbureted or No. 2. iron also becomes deprived of a considerable portion of its carburaceous mixture in fusion; and when run from the air furnace is seldom better than No. 3. metal. The loss sustained in melting may be averaged at 74 per cent.

"No. 3. pig iron is, after melting in an air furnace, found whitish or mottled. It is seldom susceptible of the same nice degree of division as the superior qualities, and loses in fusion a much larger proportion of metal, seldom under 10 per cent. and frequently 12 or 15.

"The quantity of coals requisite to melt a given quantity of iron is various, as much depends upon the quality and fusibility of the metal. If the furnace goes one beat a day with No. 1. or 2. iron, the quantity of coals will be from 20 to 25 cwt. for a ton of iron. If two or three heats a day, or as many tons of iron are melted at one kindling, the proportion of coals will be nearly weight for weight of the iron melted when the coals are mixed with a fair proportion of small: with strong large splint coals, one ton of good pig iron may be completely reduced with from 12 to 15 cwt. including the previous heating of the furnace."

In the reduction and fusion of ores, the improvement of the blowing apparatus, or the machinery contrived for the purpose of forcing a current of air into furnaces, where a high degree of temperature was necessary, has always been an important object of consideration to the blowing manufacturer; and indeed, it appears that the history of machinery, and improvement of this kind of machinery have progressively advanced, in some cases have exceeded the improvement of other departments of the manufactures of this country.

In smelting some metallic ores, as, for instance, those of lead and tin, the magnitude and powers of blowing machines have been less attended to, because the requisite temperature for that purpose is far inferior to what is necessary for the reduction of the ores of iron. Lead and tin being naturally fusible, and easily volatilized in a temperature beyond a bright red heat, have hitherto fixed the limits with regard to the size of the furnace, and the quantity of blast. The air furnace is generally employed in the manufacture of copper, excepting in small blast furnaces, in which the precipitated oxide of this metal is received, and they are similar to the furnaces called cupolas, and used at iron foundries.

The lead mill, as it is called, or machine for the reduction of the ores of lead, is of a very simple construction. In the middle of a square building a water wheel is erected, and to the shaft of this wheel, four small wheels of cast iron, about 18 inches in diameter, are attached. Two pairs of bellows placed at equal distances, and on each side of the shaft, are supported on a strong frame of wood. During the revolution of the shaft of the water wheel, the small wheels are also carried round, and alternately depress the end of the lever, which is attached, by means of an iron chain, to an equally balanced beam. When this lever descends, the opposite end of the beam is elevated, and to this end there is attached, by another iron chain, the movable surface of the bellows. The blast produced in this way is soft, and far inferior, either with regard to quantity or density, to the blast necessary for an iron furnace. The length of the bellows is usually about 20 feet, the breadth across the breech about five or six, and they move at the rate of about 30 strokes a minute.

But in the manufacture of iron, and particularly since the use of pit-coal was introduced, it is absolutely necessary to have a more powerful blowing machinery power in this, however, has always been an essential requisite of the manufacture of iron, and has been a constant object in this manufacture; for in proportion to the quantity of air thrown into the furnace, the produce and quantity of metal is increased.

In the earlier periods of this manufacture, when the fuel employed was charcoal from wood, the process was more easily managed. Furnaces which were built of small size, and which were then called bloomers, were considered of sufficient capacity to yield profit, if they produced a bloom or two of iron in the day, each bloom amounting to about 90 or 120 lbs. For smaller operations, hand bellows, and what were called fuel blast, were deemed of sufficient power; but when the refining furnace began to be employed, and the iron manufacture branched out into the making of pig iron, and the refining
Furnace.

The first moving power introduced was that of the water wheel; and this working two or more pairs of leather bellows, was found to produce effects sufficiently powerful for the purpose.

Progressive improvement of machinery constructed in this way, and set in motion by the power of water, continued to be employed for this purpose, till the principles of the steam engine were fully understood, and this powerful machine came into general use. The steam engine, besides many other advantages, could be employed in situations where the want of water prevented furnaces being erected, but otherwise commodious, in being near the necessary materials of ore and fuel. The first substitute for the leather bellows were cylinders composed of wood, closely jointed, and strongly hooped. These in their turn gave place to cylinders of cast iron, smoothly and accurately bored; and this kind of apparatus being discovered and applied in the manufacture of iron, the blowing machine now assumed a more perfect and more manageable form.

But without attempting to describe any of the blowing machines in our own country, the power and effects of which are familiar to those to whom this knowledge is most interesting, we shall give a short description of an apparatus of this kind, which is set in motion by the pressure of a column of water, and is erected near Namur in the Netherlands. The account of this machine is given by Baillie, inspector of the mines, who observes, that its construction is simple, and not very expensive, and that it may be kept up without requiring much repair. This machine, besides, can be employed to blow several furnaces at once. It does not require any great moving power, and the consumption of water is much less than in the blowing apparatus of leather or wood. In consequence of these advantages, the number of furnaces has been greatly increased since this apparatus was first erected, and the extent of the manufacture has been doubled. This apparatus possesses another superiority over the ordinary blowing machines. The latter, to be put in motion, require a water wheel; but the apparatus which is here alluded to, is set in motion merely by the pressure of a column of water.

The following is the description of this blowing machine, as it was first erected at Marcho upon the Meuse. It was invented and constructed by Jannings, proprietor of the forges, and it consists of two cylinders of three feet eight inches diameter, and of thirty inches high, placed vertically near each other. One of these cylinders is represented at fig. 16. A piston of wood covered with leather, (fig. 17.) moves in each cylinder, and forces the air through the tubes o, o, o, which are fitted to the upper part of the cylinders, and are conducted to the different furnaces where combustion is to be excited. The base of these tubes is furnished with valves, to prevent the return of the air. The piston is, besides, furnished with two lids or covers, s, s, (fig. 18 and 19.) which open when it descends, and shut when it rises. The piston is surrounded with a band of leather in the usual way, to make it tight.

The moving power in this apparatus, is a water wheel erected on the horizontal shaft, a. On this shaft are fixed the arms a, a, projecting from its circumference, which alternately elevate the stalk of the piston.

The descent of the piston is regulated by the weight j, which acts as a counterpoise; and the spring of wood, g, which is balanced when the stalks of the piston are at their lowest descent, serves to retard the velocity, and to prevent any sudden or violent stroke.

Two of these cylinders, erected at one of the forges at Marché, furnish air to two furnaces, which employ charcoal from wood, and one with coke from pit-coal. The stroke of the piston is about 18 inches, and 25 strokes in a minute, and with this length of stroke and velocity, the two pistons produce nearly about 400 cubic feet of air. The consumption of water, having a fall of about 10 feet, is about 80 cubic feet.

The similar cylinders, erected at another furnace at the same place, move with the velocity of 19 strokes per minute. The length of each stroke is about 22 inches, so that it produces about 360 cubic feet of air. For this, with a fall of 10 feet, 75 cubic feet of water are necessary.

In the construction of this blowing machine, no peculiar difficulty occurs. It is not necessary that the cylinders should be accurately turned in the inside. All that is required is, to grind or polish their inner surface with sand stone. It was in this way that the cylinders and apparatus, just described, were prepared.

The piston, which is made of wood, has in the middle of it a mortise, w, fig. 17. and 19. to admit the stalk, p, which is kept in its place by four bands or straps of iron, x, fig. 17.

The band of leather, w, is about three lines in thickness, and about five inches broad. It is nailed to the piston, and ought to be raised above the groove or gutter, v.

The grooves y, y, are sunk in the piston, in proportion to the thickness of the leather, and their external diameter should be somewhat smaller than that of the cylinder. The large lids or covers of the piston are of wood, lined with sheep skin; and their hinges, which are made of leather, are fixed with screws to the wood: a bridle of leather limits the extent of the opening.

The small valves, which are fixed at the upper opening of the cylinders, at the end of the tubes for conducting the air, are also of wood, and covered with sheep skin.

The tubes or pipes which conduct the air are made of iron plates, or of tinned iron, and they terminate in pipes of a convenient diameter, and proportioned to the different furnaces. They should also be furnished with keys or cocks, for regulating at pleasure the quantity of the air.

The frame which supports these cylinders is of a very simple construction, as will appear by inspecting fig. 16. It is attached and secured to part of the wall of the building.

All that is necessary to keep this apparatus in order, is with a brush to cover the internal surface of the cylinders with oil once every 20 days.

The following are the dimensions of the principal parts in the old French measure.

<table>
<thead>
<tr>
<th>Description</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>The large valves of the piston</td>
<td>8 inches by 6</td>
</tr>
<tr>
<td>The interval between these valves</td>
<td>14 inches</td>
</tr>
<tr>
<td>Stalk of the piston</td>
<td>6 inches square</td>
</tr>
<tr>
<td>The rollers on the axis</td>
<td>12 inches</td>
</tr>
<tr>
<td>of the wheel</td>
<td>Diameter, 36 inches</td>
</tr>
</tbody>
</table>
FURNACE.

wind as it comes from the bellows is conveyed by a copper pipe, three inches in diameter, adjusted to the upper part of the box. The box itself is supported by two iron bars built into the wall. From the lower part of this box descend, in a vertical direction, three pipes of copper, two inches in diameter, bent at right angles about 45 inches below it, to bring them into a horizontal position, and to convey the wind to the furnace, which is about six feet distant. The extremities of these pipes are fitted into three tuyeres of forged iron, fixed at equal distances around the circumference of the furnace; these three pipes are more or less curved or bent, to convey the wind into the furnace by the three apertures made for that purpose.

About six inches below the box is adjusted, on each of the three tubes, which descend in a vertical direction, a brass cock about three inches of interior diameter: these cocks serve to intercept entirely the communication between the bellows and the furnace; and by opening them all more or less, or each of them separately, any required quantity of wind may be obtained (1).

These cocks are well fixed to the tubes, and kept in their place by two clips of iron suited to the diameters of the tubes, and forming a kind of three collars, which by means of four screws embrace and confine them: these pieces of iron are themselves fastened fast to two crutches of iron, which support the box and are fixed to it by screws. The box is kept on the crutches by two straps, which embrace it at each extremity, and are fixed by female screws, which are fitted to screws on the ends of these straps after they have passed through the horizontal part of the two crutches.

To give the proper strength to this furnace, a solid square was constructed of mason-work, about a foot larger on each side than the exterior diameter of the sides of the furnace, which were from 21 to 22 inches from outside to outside. Bricks were placed on the ground in the middle of this erection for the extent of 18 inches in order to form a bottom, and on this base were placed the sides of the furnace constructed in the manner about to be described.

I caused to be forged two iron hoops six lines in thickness, from 2 to 2½ inches in breadth, and about 22 inches of exterior diameter; these two circles were fastened together by three bars of iron, the distance of their exterior edge being kept at about nine inches, the height of the bricks; these bars are pierced with holes towards the end rivetted on the circles, and placed at equal distances on their circumference. One of the extremities of each of these three bars is left of a sufficient length to pass beyond the lower circle about an inch, in order to make them enter into three holes formed in the brick-work which forms the bottom of the furnace, and by these means to prevent the furnace from becoming deranged.

This kind of iron frame was filled with bricks similar to those employed for the bottom of the furnace; they were rubbed one on the other to smooth them, and the corners were a little rounded; so that, being placed upright with their broad sides applied to the iron hoops, the narrow side stood inwards. By these means all these bricks were adjusted in such a manner as to touch each other by their broadest faces, and to form the sides of the furnace, the thickness of which was equal to the breadth of the bricks, and its depth to their length. Three apertures were reserved for the tuyeres which terminate the three tubes that convey the wind, by cutting from as many bricks a portion equal to the thickness of a brick.

These bricks thus adjusted were taken from the iron frame, and then replaced, putting between them a cement to connect them firmly and to fill up the joints. The dust produced by cutting the bricks was reserved for this purpose; and I desired the workmen to mix with it a small quantity of clay diluted in a good deal of water, in order to make a puddle for dusting over the bricks, and in particular to put between them no more than was necessary for filling the joints and the small space left between their faces in consequence of any inequality left in dressing them.

The furnace thus constructed was then placed on its base, a stratum of the same mortar employed for filling up the joinings of the bricks being first interposed. The extremities of the three iron bars projecting beyond the lower circle were placed in the holes left in the base to receive them. The body of the furnace encircled with iron, both by its weight and the gentle blows given to the iron hoops above the bars which connected them, expelled the excess of the mortar, and caused a part of it to enter and unite with that which filled up the joints of the brick work of the circumference, which rendered it immovable.

The bellows is secured as usual by crutches of iron and supporters fixed in the wall and to the floor: the handle is disposed in such a manner, that the rope which makes it act may be pulled by the same person who manages the fire of the furnace, which in certain cases is necessary.

The tuyeres of forged iron, which receive the ends of the copper tubes, are secured in their proper apertures in the circumference of the furnace by pieces of brick and mortar similar to that employed for filling up the joints; and the ends of the copper pipes introduced into these tuyeres are luted with the same mortar, a little thickened with brick dust.

The apertures of these tuyeres towards the interior of the furnace is only nine lines in diameter; on which account,

(1) "Care must be taken, when the action of the bellows ceases, to shut the cocks, especially when coals are used in the furnace; for the hydrogen disengaged from that mineral substance ascends into the box, and when the bellows are again made to act, may inflame and cause a violent explosion, or even burst the bellows. This accident once took place in the furnace here described: the box burst with a loud noise on the first stroke of the bellows, the gas which filled them having suddenly inflamed; but by good fortune no person was hurt. The same thing happened at the house of C. Garlier, locksmith of Paris; one of his bellows burst with a horrid explosion at the moment when they were put in motion."
FURNACE.

Mr Collier, in a paper communicated to the Manchester Philosophical Society, has delivered some important observations on iron and steel, with a more correct account of the process for the manufacture of the latter than has hitherto been given. To this account he has added the description of a furnace for the conversion of iron into steel. As his observations and reasons are extremely valuable, we shall lay the whole before our readers in his own words.

"After examining (says Mr Collier) the works of different authors who have written on the subject of making iron and steel, I am persuaded that the accounts given by them of the necessary processes and operations are extremely imperfect. Chemists have examined and described the various compound minerals containing iron with great accuracy, but have been less attentive to their reduction. This observation more particularly applies to steel, of the making of which I have not seen any correct account.

"It is singular to observe, how very imperfectly the cementation of iron has been described by men of great eminence in the science of chemistry. Citizen Fourcroy states the length of time necessary for the cementation of iron to be about twelve hours; but it is difficult to discover whether he alludes to cast or to bar steel: for he says, that short bars of iron are to be put into an earthen box with a cement, and closed up. Now steel is made from bars of iron of the usual length and thickness: but cast steel is made according to the process described by Citizen Fourcroy, with this essential difference; the operation is begun upon bar steel and not bar iron.

"Mr Nicholson is equally unfortunate in the account given in his Chemical Dictionary. He says, that the usual time required for the cementation of iron is from six to ten hours, and cautions us against continuing the cementation too long; whereas the operation, from the beginning to the end, requires sixteen days at least. In other parts of the operation he is equally defective, confounding the making of bar with that of cast steel, and not fully describing either. In speaking of the iron known as steel, or rather of what constitutes its superiority, Mr Nicholson is also deficient. He observes, that its most useful and advantageous property is that of becoming extremely hard when plunged into water. He has here forgotten everything respecting the temper and tempering of steel instruments, of which, however, he takes some notice in the same page. "Plunging into water" requires a little explanation: for if very hot steel be immersed in cold water without great caution, it will crack, nay, sometimes break to pieces. It is, however, necessary to be done, in order to prevent the steel from growing soft, and returning to the state of malleable iron; for, were it permitted to cool in the open air, the carbune which it holds in combination would be dissipated (n).

"I shall, at present, confine my remarks to the operation performed on iron in Sheffield and its neighbourhood: from whence various communications have been transmitted to me by resident friends, and where I have myself seen the operations repeatedly performed.

"The iron made in that part of Yorkshire is procured from ores found in the neighbourhood, which are of the argillaceous kind, but intermixed with a large proportion of foreign matter. These, however, are frequently combined with richer ores from Cumberland and other places. The ore is first roasted with cinders for three days in the open air, in order to expel the sulphurous or arsenical parts, and afterwards taken to the furnace: some of which are constructed so that their internal cavity has the form of two four-sided pyramids joined base to base; but those most commonly used are of a conical form, from 40 to 50 feet high. The furnace is charged at the top, with equal parts of the coal-cinder and lime-stone. The lime-stone acts as a vehicle for the flux, at the same time that it supplies a sufficient quantity of earthy matter to be converted into scorias, which are necessary to defend the wrought iron from calcination, when it comes near the lower part of the furnace. The fire is lighted at the bottom; and the heat is excited by means of two pair of large bellows blowing alternately. The quantity of air generally thrown into the furnace is from a thousand to twelve hundred square feet in a minute. The air passes through a pipe, the diameter of which is from two inches and a quarter, to two and three quarters, wide. The compression of air which is necessary is equal to a column of water four feet and a half high. The ore melts as it passes through the fire and is collected at the bottom, where it is maintained in a liquid state. The slag, which falls down with the fused metal, is let off, by means of an opening in the side of the furnace, at the discretion of the workmen.

"When a sufficient quantity of regulus, or imperfectly reduced metal, is accumulated at the bottom of the furnace (which usually happens every eight hours), it is let off into mortels; be reserved for the purposes intended, such as cannon or pig iron.

"Crude iron is distinguished into white, black, and gray. The white is the least reduced, and more brittle than the other two. The black is that with which a large quantity of fuel has been used; and the gray is that which has been reduced with a sufficient quantity of fuel, of which it contains a part in solution.

"The operation of refining crude iron consists in the burning the combustible matter which it holds in solution; at the same time that the remaining iron is more perfectly reduced, and acquires a fibrous texture. For this purpose, the pigs of cast iron are taken to the forge, where they are first put into what is called the refinery: which is an open charcoal fire.

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(n) "It is the opinion of some metallurgists, that a partial abstraction of oxygen takes place, by plunging hot metal into cold water."
FURNACE.

There is also a third method of rendering crude iron malleable, which, I think, promises to be abundantly more advantageous than either of the two former, as it will dispense both with the refinery and chasery: and nothing more will be necessary than a reverberating furnace, and a furnace to give the metal a malleable heat, about the middle of the operation. The large forge hammer will also fall into disrepute, but in its place must be substituted metal rollers of different capacities, which, like the forge hammer, must be worked either by a water wheel, or a steam engine.

It is by the operation of the forge hammer or metal rollers, that the iron is deprived of the remaining portion of impurity, and acquires a fibrous texture.

The iron made by the three foregoing processes is equally valuable, for by any of them the metal is rendered pure; but after those different operations are finished, it is the opinion of many of the most judicious workers in iron, that laying it in a damp place, for some time, improves its quality; and to this alone, some attribute the superiority of foreign iron, more time elapsing between making and using the metal. To the latter part of this opinion I can by no means assent, as it is well known that the Swedish (o) ores contain much less heterogeneous matters than ours, and are generally much richer, as they usually yield about 50 per quintal of pure iron, whereas the average of ours is not more than 40 or 40 (p): add to this, that the Swedish ores are smelted in wood fires, which gives the iron an additional superiority.

Iron instruments are case-hardened by heating them in a cinder or charcoal fire; but if the first be used, a quantity of old leather, or bones, must be burnt in the fire to supply the metal with carboce. The fire must be urged by a pair of bellows to a sufficient degree of heat; and the whole operation is usually completed in an hour.

The process for case-hardening iron, is in fact the same as for converting iron into steel, but not continued so long, as the surface only of the article is to be impregnated with carboce.

Some attempts have been made to give cast iron, by case-hardening, the texture and ductility of steel, but they have not been very successful. Table and penknife blades have been made of it, and, when ground, have had a pretty good appearance; but the edges are not firm, and they soon lose their polish. Common table knives are frequently made of this metal.

The cementation of iron converts it into steel—a substance intermediate between crude and malleable iron.

The furnaces for making steel are conical build-Furnace for ings; about the middle of which are two troughs of making brick or fire stone, which will hold about four tons of steel iron in the bar. At the bottom is a long grate for fire.

A layer of charcoal dust is put upon the bottom of the

(o) "Steel is commonly made of Swedish iron.”
(p) "The iron made from the ore found in the neighbourhood of Sheffield, contains a great deal of phosphate of iron, or siderite, which renders the metal brittle when cold.”
FURNACE.

A sufficient quantity of lead being introduced into the furnace, the lead is luted on with baked clay, and the fire is applied in the usual way. As soon as the lead is completely fused, the basin appears covered with the burnt straw; this is removed by means of an iron instrument, and this operation is repeated several times. When the lead begins to grow red, the action of the bellows commences, at first softly, and the blast is so directed that it may strike the centre of the cupel. To effect this more completely, a small round plate of iron is attached to the extremity and upper part of the pipe by means of a hinge, so that at each blast it is half raised, and the current of air is directed to the surface of the fused metal.

After the whole of the scum that rises has been removed, and the lead is covered with a stratum of litharge, a small gutter is made by means of a hook for the purpose, in the sand of the cupel. This is gradually and cautiously hollowed, till it is on a level with the surface of the bath, and then the litharge driven by the blast towards the anterior part of the furnace, will flow this way, and spread itself on the floor in the usual way. When the operator perceives that the litharge has been removed, he stops up the gutter with moistened ashes, till another quantity of litharge appears on the surface. He then re-opens the gutter, which is now made deeper in proportion to the diminution of the fused metal, but at the same time taking care that no part of the lead escapes, especially towards the end of the process, because then a considerable portion of silver would be carried off.

In this way the process is conducted till the separation of the silver begins to take place, observing at the same time to increase the heat as the quantity of fused metal diminishes, because then the silver is collected together; and since it is much more difficult to keep it in fusion than the small portion of lead which remains combined with it, the separation would be very imperfect, without the application of a sufficient temperature. Instead of having only one-twentieth of lead, which is the usual proportion in the common process, the quantity would be much greater, and this would render the operation, the refining of the silver, much more difficult.

Du Hamel observes, that a cupel of sand, well made, will answer for the repetition of the process several times, without renewing it at the end of each operation, as is the case with those of ashes. The only precaution to be observed is, to remove the kind of varnish of oxyde of lead which remains on the sides of the gutter by which the litharge flowed out, that the new sand with which it is to be filled up may combine easily with the old.

The length of time which the reverberatory furnace may be employed in smelting the ores of lead, and even in reducing litharge, is a proof that the oxyde of lead acts only on the surface of the cupel, and penetrates a very small thickness. After the process has been several times repeated, this crust is removed, and it is fused for the purpose of obtaining the lead. This process will be as easy as the reduction of the metal contained in the ashes of the ordinary cupels, and in much smaller quantity.
FURNACE.

9. A square ledge, made of thick iron plate, is fixed at the top of the upper edge of the lower door, for supporting the grate and the lute, and, that it may be easily introduced into the cavity of the furnace, it should be of two pieces.

10. Iron bars are then to be fixed in the inside of the furnace, for supporting the fuel. These must be equal in length with the diameter of the furnace, about $\frac{1}{2}$ inch thick, and $\frac{1}{2}$ inch distant from each other. They are supported at their extremities by a square iron ledge.

11. To prevent the dissipation of the heat, and the destruction of the iron, by being repeatedly made red hot, the inside of the furnace must be lined with lute, about a finger’s breadth, or rather more, in thickness.

For luting furnaces, Dr Black recommended a simple mixture of sand and clay. The proportions for resisting the violence of fire are four parts of sand to one of clay; but when designed for the lining of furnaces, he uses six or seven of sand to one of clay, the more effectively to prevent the contraction of the latter; for it is known from experiments, that clay, when exposed to a strong heat, contracts the more in proportion to its purity. The sand settles into loose bulk when wet, and does not contract by heat, which it also resists as well as the clay itself.

Besides this outside luting next the fire, Dr Black uses another to be laid on next the iron of the furnace; and this consists of clay mixed with a large proportion of charcoal dust. It is more fit for containing the heat, and is put next to the iron, to the thickness of an inch and a half. That it may be dry when first put in, he takes three parts by weight of the charcoal dust, and one of the common clay, which must be mixed together when in dry powder, otherwise it is very difficult to mix them perfectly. As much water is added as will form the matter into balls; and these are beaten very firm and compact by means of a hammer upon the inside of the furnace. The other lute is then spread over it to the thickness of about half an inch, and this is also beaten solid by hammering; after which it is allowed to dry slowly, that all cracks and fissures may be avoided; and after the body of the furnace is thus lined, the vent is screwed on and lined in the same manner. It must then be allowed to dry for a long time; after which a fire may be kindled, and the furnace gradually heated for a day or two. The fire is then to be raised to the greatest intensity; and thus the luting acquires a hardness equal to that of free-stone, and is afterwards as lasting as any part of the furnace.

To perform an operation in this furnace, two iron bars an inch thick, and of sufficient length to project a little beyond the holes of the furnace, are passed through four lower holes, which are placed before and behind, directly opposite to each other. These bars support the muffle, which is introduced through the upper opening of the furnace, and placed upon the bars, in such a way that the open side of it may be near the inner border of the upper door. The fuel is introduced through the top of the furnace, and the best fuel is charcoal made of hard wood. It should be reduced to small pieces, that they may readily fall between the muffle and the sides of the furnace. The muffle is to be covered with fuel, to the height of several inches. The pieces of charcoal should not be too small, because they may fall immediately through the interstices of the grate, or be too rapidly consumed, and thus increasing the quantity of ashes, obstruct the current of air.

As the management of the fire is of great importance, observe the success of operations in the furnace, the following directions may be attended to. To increase the heat to the utmost, the door of the ash-hole may be left open; the sliders of the upper door drawn towards each other, so as to touch in the middle, and the cover and funnel adapted to its tube, placed on the top of the furnace. The heat is still further increased by putting red burning coals into the open upper door. By shutting the upper door with the slider, which has a narrow oblong hole in it, the heat is diminished, and it is still farther diminished by shutting the door with the other slider, having the semicircular hole. The heat is also diminished by removing the funnel at the top of the cover; and the heat is less by partially or totally shutting the door of the ash-hole, because then the current of air necessary to excite combustion is obstructed.

The heat of the furnace is also increased in proportion to the diminished size of the muffle. The heat is stronger too, according as the muffles are more and larger segments cut out of it, as the sides of it are thinner, and as the number of vessels placed in the hinder part of it is increased; and the contrary. It may be here observed, that when many of the conditions necessary to produce strong heat are wanting, the operator, with all his sagacity, will scarcely be able to excite combustion in such a degree in common assay furnaces as to succeed well in his operations; and even when he employs belows, and introduces coals by the upper door. The grate, therefore, ought to be placed nearly three inches below the muffle, that the air rushing through the ash-hole, may not cool its bottom, and that the smaller coals, almost already consumed, and the ashes, may more easily fall through the interstices of the grate; larger coals, fit for keeping up the requisite degree of heat, must be used. The funnel is added, that the blowing of the fire being increased by means of it as much as possible, may be brought to the degree that is wanted; for the fire may be at any time diminished, but without the assistance of proper apparatus, it cannot always be increased at pleasure.

Explanation of Fig. 32, 33, and 34.

Fig. 32. a, a, b, b, body of the assay furnace.
bb, c c, top of the same.
d, opening at the top of the furnace.
e, door leading to the ash hole.
f, upper door.
Gg, h h, i i, the iron plates rivetted on the furnace, which form the grooves in which the doors slide.
h h, i i, the sliding doors.
m, the hole in the doors ; s, the semicircular hole.
ô ô, the holes for receiving the bars which support the muffle.
but most saws are too thick, and when a little used, the teeth get rounded off, which makes them work intolerably slow. I have found by far the best tool to be an old table knife, or rather two of them, worn thin by use, and hacked and jagged as deeply as possible, by striking the edges strongly against each other. These work well and expeditiously, and when they become dull are again roughened by the same simple means. The holes may be drilled with a common gimlet of the largest size, and a little steadiness of hand will easily enable the operator to give them the oblique direction with sufficient accuracy; for much is not required. To make a smooth surface to the parts intended to adapt to each other, first wear them down a little with the soft fire-brick, and then grind them with water on a flat free-stone (a sink-stone for example), and lastly make them entirely fit by rubbing one surface on the other.

"No luting of any kind is ever required; so that the whole may be set up and taken down immediately. Nor is it necessary to bind the pots with metal hoops; for they are thick enough to endure considerable blows without breaking; and yet they will bear, without cracking, to be heated as suddenly and intensely as possible. In short, the black-lead crucible seems to be the best material that could possibly be devised for these purposes.

"The heat which this little furnace will afford is so intense, and so much more than would at first sight be expected from so trifling an apparatus, that it was only the accidental fusion of a thick piece of cast iron in it that led us to suspect its power. The utmost heat which we have procured in this furnace has been 167° of a Wedgwood pyrometer piece, which was withdrawn from a very small Hessian crucible when actually sinking down in a state of porcellaneous fusion. A steady heat of 155° to 155° may be usually depended on, if the fire be properly managed and the bellows worked with vigour. This is sufficient for most operations in chemistry; and the economy in time and fuel is extreme, since a furnace of the given dimensions will very well raise to the above point of heat in from five to ten minutes a Hessian crucible of such a diameter, that the average thickness of burning fuel around its bottom is not more than one inch and a half. A smaller crucible will take a higher heat, but at the risk of its softening and falling in by the weight of the incumbent fuel.

"Coal, or common cinders taken from the fire just when the coal ceases to blaze, and broken into very small pieces, with the dust sifted away, form the best fuel for the highest heat. A light spongy kind of coal, formed of a mixture of coal and charcoal, called Davy's patent coal, also answers extremely well. Charcoal alone has not weight enough, when broken so small as it must be to lie close in this little fire-place, to withstand the force of the blast when very violent. A bit of lighted paper, a handful of the very small charcoal, called in London small coal, and 10 or 12 strokes of the bellows, will kindle the fire in almost as many seconds.

"Various little alterations and arrangements, which will readily occur to the practical chemist, will fit this little apparatus for distillation with an earthen retort, heating a gun-barrel passed through the fire, bending glass tubes, &c."

FURNACE.

FURNITURE, a term in dialling, which denotes certain additional points and lines drawn on a dial, by way of ornament, such as the signs of the zodiac, length of days, parallels of declination, azimuths, points of the compass, meridians of chief cities, Babylonian, Jewish, or Italian hours, &c.

FUR, or Fur, in Commerce, signifies the skin of several wild beasts, dressed in slime with the hair on; and used as a part of dress, by princes, magistrates, and others. The kind most in use are those of the ermine, sable, castor, hare, rabbit, &c. See MUSKETTA.

It was not till the later ages that the furs of beasts became an article of luxury. The more refined nations of ancient times never made use of them; those alone whom the former stigmatized as barbarians were clothed in the skins of animals. Strabo describes the Indians covered with the skins of lions, panthers, and bears; and Seneca, the Scythians clothed with the skins of foxes and the lesser quadrupeds. Virgil exhibits a picture of the savage Hyperboreans, similar to that which our late circumnavigators can witness to in the clothing of the wild Americans, unseen before by any polished people.

Gen. effrenas videmus Rhipheo tantius Evo; Et specularia velutina corpora setis.

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Matters, however, were prevented from coming to extremities, by a compliance on the part of Spain, after many delays and much artifice of negotiation, with the requisitions of Britain; in consequence of which, among other advantages unnecessary to be here recited, the whole trade from California to China is completely laid open; and the British allowed the full exercise of navigation and commerce in those parts of the world which were the subject of discussion.

In some accounts of the voyages above mentioned, the fur trade in those parts has been greatly magnified. In that published by Captain Portlock, however, this officer observes, that the gains hitherto have certainly not been enviable great; although the merchants have no doubt found the trade lucrative.

History of the Fur Trade from Canada to the North-west.—The following account of this trade is extracted from Mr. McKenzie’s Narrative of his Voyages and Travels from Montreal, through the North-west Continent of America, and to the Pacific ocean.

“...The fur trade, he says, from the earliest settlement of Canada, was considered of the first importance to that colony. The country was then so populous, that, in the vicinity of the establishments, the animals whose skins were preciously in a commercial view, soon became very scarce, if not altogether extinct. They were, it is true, hunted at former periods, but merely for food and clothing. The Indians, therefore, to procure the necessary supply, were encouraged to penetrate into the country, and were generally accompanied by some of the Canadians, who found means to induce the remotest tribes of natives to bring the skins which were most in demand, to their settlements, in the way of trade.

“It is not necessary for me to examine the cause, but experience proves that it requires much less time for a civilized people to deivate into the manners and customs of savage life, than for savages to rise into a state of civilization. Such was the event with those who thus accompanied the natives on their hunting and trading excursions; for they became so attached to the Indian mode of life, that they lost all relish for their former habits and native homes. Hence they derived the title of Courcours des Bois, became a kind of pedlars, and were extremely useful to the merchants engaged in the fur trade; who gave them the necessary credit to proceed on their commercial undertakings. Three or four of these people would join their stock, put their property into a birch-bark canoe, which they worked themselves, and either accompanied the natives in their excursions, or went at once to the country where they knew they were to hunt. At length, these voyages extended to 12 or 15 months, when they returned with rich cargoes of furs, and followed by great numbers of the natives. During the short time requisite to settle their accounts with the merchants, and procure fresh credit, they generally contrived to squander away all their gains, when they returned to their favourite mode of life: their views being answered, and their labour sufficiently rewarded, by indulging themselves in extravagance and dissipation during the short space of one month in 12 or 15.

“The indifference about amassing property, and the pleasure of living free from all restraint, soon brought on a licentiousness of manners which could not long escape the vigilant observation of the missionaries, who
Paraguay were converted into a scene of abundant cultivation, and its savage inhabitants introduced to all the advantages of a civilized life.

The Canadian missionaries should have been contented to improve the morals of their own countrymen, so that by bettering their character and conduct, they would have given a striking example of the effect of religion in promoting the comforts of life to the surrounding savages; and might by degrees have extended its benign influence to the remotest region of that country, which was the object, and intended to be the scene, of their evangelical labours. But by bearing the light of the gospel at once to the distance of 2500 miles from the civilized part of the colonies, it was soon obscured by the cloud of ignorance that darkened the human mind in those distant regions.

The whole of their long route I have often travelled, and the recollection of such a people as the missionaries having been there, was confined to a few superannuated Canadians, who had not left that country since the cession to the English, in 1763, and who particularly mentioned the death of some, and the distressing situation of them all. But if these religious men did not attain the objects of their persevering piety, they were, during their mission, of great service to the commanders who engaged in those distant expeditions, and spread the fur trade as far west as the bank of the Saskatchewan river, in 53° north latitude, and longitude 102° west.

At an early period of their intercourse with the savages, a custom was introduced of a very excellent tendency, but is now unfortunately discontinued, of not selling any spirituous liquor to the natives. This admirable regulation was for some time observed, with all the respect due to the religion by which it was sanctioned, and whose severest censures followed the violation of it. A painful penance could alone restore the offender to the suspended rites of the sacrament. The casuistry of trade, however, discovered a way to gratify the Indians with their favourite cordial, without incurring the ecclesiastical penalties, by giving, instead of selling it to them.

But notwithstanding all the restrictions with which commerce was oppressed under the French government, the fur trade was extended to the immense distance which has been already stated; and surrounded many most discouraging difficulties, which will be hereafter noticed; while, at the same time, no exertions were made from Hudson's Bay to obtain even a share of the trade of a country which, according to the charter of that company, belonged to it, and, from its proximity, is so much more accessible to the mercantile adventurer.

Of these trading commanders, I understood, that two attempted to penetrate to the Pacific ocean, but the utmost extent of their journey I could never learn; which may be attributed, indeed, to a failure of the undertaking.

For some time after the conquest of Canada, this trade was suspended, which must have been very advantageous to the Hudson's Bay company, as all the inhabitants to the westward of Lake Superior were obliged to go to them for such articles as their habitual use had rendered necessary. Some of the Canadians who had lived long with them, and were become attached
Fur

[310] Fur

attached to a savage life, accompanied them thither annually, till mercantile adventurers again appeared from their own country, after an interval of some years, in consequence of an ignorance of the country in the conquerors, and their want of commercial confidence in the conquerors. There were, indeed, other discouragements, such as the immense length of the journey necessary to reach the limits beyond which this commerce must begin; the risk of property; the expenses attending such a long transport; and an ignorance of the language of those who, from their experience, must be necessarily employed as the intermediate agents between them and the natives. But, notwithstanding these difficulties, the trade, by degrees, began to spread over different parts to which it had been carried by the French, though at a great risk of the lives, as well as the property, of their new possessors, for the natives had been taught by their former allies to entertain hostile dispositions towards the English, from their having been in alliance with them against their enemies the Iroquois. There were not wanting a sufficient number of discontented, disappointed people to keep alive such a notion; so that for a long time they were considered and treated as objects of hostility. To prove this disposition of the Indians, we have only to refer to the conduct of Pontiac, at Detroit, and the surprise and taking of Michilimackinac, about this period.

"Hence it arose, that it was so late as the year 1766, before which the trade I mean to consider commenced from Michilimackinac. The first who attempted it were satisfied to go the length of the river Camenisiquia, about 30 miles to the eastward of the Grande Portage, where the French had a principal establishment, and was the line of their communication with the interior country. It was once destroyed by fire. Here they went, and returned successful in the following spring to Michilimackinac. Their success induced them to renew their journey, and invited others to follow their example. Some of them remained at Camenisiquia, while others proceeded to and beyond the Grande Portage, which since that time has become the principal entrepot of that trade, and is situated in a bay, in latitude 48° north, and longitude 90° west. After passing the usual season there, they went back to Michilimackinac as before, and encouraged by the trade, returned in increased numbers. One of these, Thomas Curry, with a spirit of enterprise superior to that of his contemporaries, determined to penetrate to the furthest limits of the French discoveries in that country; or at least till the frost should stop him. For this purpose he procured guides and interpreters, who were acquainted with the country, and with four canoes arrived at Fort Bourbon, which was one of their posts, at the west end of the Cedar lake, on the waters of the Saskatchewan. His risk and toil were well recompensed, for he came back the following spring with his canoes filled with fine furs, with which he proceeded to Canada, and was received with great joy at the Indian country.

"From this period people began to spread over every part of the country, particularly where the French had established settlements."

After continuing the detail of the history of the trade, for which we must refer to the work itself, Mr. MacKenzie proceeds to inform us of the concern which he himself had in it, when in the year 1785, he was assumed as a partner, on condition of going into the Indian country to take his station in the business. After some struggles, from jealousy and rivalry, with another company who had been some time in the trade, a union between the two companies was formed. This happened in 1787, and the following is Mr. MacKenzie's account of its success, and of the extent and mode of conducting this trade.

"This commercial establishment," he proceeds, "was now founded on a more solid basis than any hitherto known in the country; and it not only continued in full force, vigour, and prosperity, in spite of all interference from Canada, but maintained at least an equal share of advantage with the Hudson's Bay Company, notwithstanding the superiority of their local situation. The following account of this self-erected concern will manifest the cause of its success.

"It assumed the title of the North-West Company, and was no more than an association of commercial men, agreeing among themselves to carry on the fur trade unconnected with any other business, though many of the parties engaged had extensive concerns altogether foreign to it. It may be said to have been supported entirely upon credit; for whether the capital belonged to the proprietor, or was borrowed, it equally bore interest, for which the association was annually accountable. It consisted of twenty shares, unequally divided among the persons concerned. Of these, a certain proportion was held by the people who managed the business in Canada, and were styled agents for the Company. Their duty was to import the necessary goods from England, store them at their own expense at Montreal, get them made up into the articles suited to the trade, pack and forward them, and supply the cash that might be wanting for the outlays; for which they received, independent of the profit on their shares, a commission on the amount of the accounts, which they were obliged to make out annually, and keep the adventure of each year distinct. Two of them went annually to the Grande Portage, to manage and transact the business there, and on the communication at Detroit, Michilimackinac, St. Mary's, and Montreal, where they received stores, packed up, and shipped the company's furs for England, on which they had also a small commission. The remaining shares were held by the proprietors, who were obliged to winter and manage the business of the concern with the Indians, and their respective clerks, &c. They were not supposed to be under any obligation to furnish capital, or even credit. If they obtained any capital by the trade, it was to remain in the hands of the agents; for which they were allowed interest. Some of them, from their long services and influence, held double shares, and were allowed to retire from the business at any period of the existing concern, with one of those shares, naming any young man in the company's service to succeed him in the other. Seniority and merit were, however, considered as affording a claim to the succession, which, nevertheless, could not be disposed of without the concurrence of the majority of the concern; who, at the same time relieved the succeeding person from any responsibility respecting the share that he transferred, and accounted for it according to the annual value or rate of the property; so that the seller could have no advantage but that of getting the..."
the share of stock which he retained realised, and receiving for the transferred share what was fairly determined to be the worth of it. The former was also discharged from all duty, and became a dormant partner. Thus, all the young men who were not provided for at the beginning of the contract, succeeded in succession to the character and advantages of partners. They entered into the company's service for five or seven years, under such expectations, and their reasonable prospects were seldom disappointed: there were indeed, instances when they succeeded to shares, before their apprenticeship was expired, and it frequently happened that they were provided for while they were in a state of articled clerkship. Shares were transferable only to the concern at large, as no person could be admitted as a partner who had not served his time to the trade. The dormant partner indeed might dispose of his interest to any one he chose, but if the transaction were not acknowledged by his associates, the purchaser could only be considered as his agent or attorney. Every share had a vote, and two thirds formed a majority. This regular and equitable mode of providing for the clerks of the company, excited a spirit of emulation in the discharge of their various duties, and, in fact, made every agent a principal, who perceived his own prosperity to be immediately connected with that of his employers. Indeed, without such a spirit, such a trade could not have become so extended and advantageous, as it has been and now is.

"In 1798, the gross amount of the adventure for the year did not exceed £40,000; but by the exertion, enterprise, and industry of the proprietors, it was brought in eleven years to triple that amount and upwards; yielding proportionate profits, and surpassing, in short, anything known in America.

"Such, therefore, being the prosperous state of the company, it, very naturally, tempted others to interfere with the concern in a manner by no means beneficial to the company, and commonly ruinous to the undertakers.

"In 1798 the concern underwent a new form, the shares were increased to forty-six, new partners being admitted, and others retiring. This period was the termination of the company, which was not renewed by all the parties concerned in it, the majority continuing to act upon the old stock, and under the old firm; the others beginning a new one; and it now remains to be decided, whether two parties, under the same regulations and by the same exertions, though unequal in number, can continue to carry on the business to a successful issue. The contrary opinion has been held, which, if verified, will make it the interest of the parties again to coalesce: for neither is deficient in capital to support their obstinacy in a losing trade, as it is not to be supposed that either will yield on any other terms than perpetual participation.

"It will not be superfluous in this place, to explain the general mode of carrying on the fur trade.

"The agents are obliged to order the necessary goods from England in the month of October, eighteen months before they can leave Montreal; that is, they are not shipped from London until the spring following, when they arrive in Canada in the summer. In the course of the following winter they are made up into such articles as are required for the savages; they are then packed into parcels of ninety pounds weight each, but cannot be sent from Montreal until the May following; so that they do not get to market until the ensuing winter, when they are exchanged for furs, which come to Montreal the next fall, and from thence are shipped, chiefly to London, where they are not sold or paid for before the succeeding spring, or even as late as June; which is forty-two months after the goods were ordered in Canada; thirty-six after they had been shipped from England; and twenty-four after they had been forwarded from Montreal; so that the merchant, allowing that he has twelve months' credit, does not receive a return to pay for those goods, and the necessary expenses attending them, which is about equal to the value of the goods themselves, till two years after they are considered as cash, which makes this a very heavy business.

"There is even a small proportion of it that requires twelve months longer to bring round the payment, owing to the immense distance it is carried, and from the shortness of the seasons, which prevent the furs, even after they are collected, from coming out of the country for that period (A).

"The articles necessary for this trade, are coarse woollen cloths of different kinds; milled blankets of different sizes; arms and ammunition; twist and carrot tobacco; Manchester goods; linens, and coarse sheetings; thread, lines, and twine; common hardware; cutlery and ironmongery of several descriptions; kettles of brass and copper, and sheet-iron; silk and cotton handkerchiefs; hats, shoes, and hose; calicoes and printed cottons, &c. &c. &c. Spirituous liquors and provisions are purchased in Canada. These, and the expense of transport to and from the Indian country, including wages to clerks, interpreters, guides, and canoe-men, with the expense of making up the goods for the

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(A) "This will be better illustrated by the following statement:

<table>
<thead>
<tr>
<th>Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>We will suppose the goods for 1798;</td>
<td></td>
</tr>
<tr>
<td>The orders for the goods are sent to this country</td>
<td>23rd Oct. 1796.</td>
</tr>
<tr>
<td>They are shipped from London</td>
<td>March 1797.</td>
</tr>
<tr>
<td>They arrive in Montreal</td>
<td>June 1797.</td>
</tr>
<tr>
<td>They are made up in the course of that summer and winter</td>
<td>May 1798.</td>
</tr>
<tr>
<td>They are sent from Montreal</td>
<td>Sept. 1799.</td>
</tr>
<tr>
<td>They arrive in the Indian country, and are exchanged for furs the following winter</td>
<td>1798-9.</td>
</tr>
<tr>
<td>Which furs come to Montreal</td>
<td></td>
</tr>
<tr>
<td>And are shipped for London, where they are sold in March and April, and paid for in May or June</td>
<td>1800.</td>
</tr>
</tbody>
</table>
the market, form about half the annual amount against
the adventure.

"This expenditure in Canada ultimately tends to the
encouragement of British manufacture, for those who
are employed in the different branches of this business,
are enabled by their gains to purchase such British ar-
ticles as they must otherwise forgo.

"The produce of the year of which I am now speak-
ing, consisted of the following furs and peltries:

10,000 Beaver skins, 600 Lynx skins,
2100 Bear skins, 600 Wolverine skins,
1,500 Fox skins, 1,500 Fisher skins,
4,000 Kitt fox skins, 1,000 Raccoon skins,
4600 Otter skins, 3,800 Wolf skins,
17,000 Musquash skins, 700 Elk skins,
12,000 Marten skins, 750 Deer skins,
1,100 Mink skins, 1,200 Deer skins dressed,
500 Buffalo robes, and a quantity of castoreum.

"Of these were diverted from the British market,
being sent through the United States to China, 13,364
skins, fine beaver, weighing 19,283 pounds; 1250 fine
otters, and 1,724 kit foxes. They would have found
their way to the China market at any rate, but this de-
viation from the British channel arose from the follo-
wing circumstance:

"An adventure of this kind was undertaken by a re-
spectable house in London, half concerned with the
North-West Company in the year 1792. The furs
were of the best kind, and suitable to the market; and
the adventurers continued this connexion for five suc-
cessive years, to the annual amount of 40,000.
At the winding up of the concern of 1792, 1793, 1794,
1795, in the year 1797, (the adventure of 1796 not
being included, as the furs were not sent to China,
but disposed of in London), the North-West Company
experienced a loss of upwards of 40,000. (their half,
which was principally owing to the difficulty of getting
home the produce procured in return for the furs from
China, in the East India Company's ships, together
with the duty payable, and the various restrictions of
that company. Whereas, from America there are no
impediments; they get immediately to market, and the
produce of them is brought back, and perhaps sold in
the course of twelve months. From such advantages
the furs of Canada will not doubt find their way to Chi-
na by America, which would not be the case if British
subjects had the same privileges that are allowed to
foreigners, as London would then be found the best
and safest market.

"But to return to our principal subject.—We shall
now proceed to consider the number of men employed
in the concern: viz. 50 clerks, 71 interpreters and
clerks, 1,120 canoe men, and 35 guides. Of these, five
clerks, 18 guides, and 350 canoe men, were employed
for the summer season in going from Montreal to the
Grande Portage, in canoes, part of whom proceeded
from thence to Rainy Lake, as will be hereafter ex-
plained, and are called pork-eaters, or goers and com-
ers. These were hired in Canada or Montreal, and were
absent from the 1st of May till the latter end of Sep-
tember. For this trip the guides had from 800 to 1000
livres, and a suitable equipment; the foreman and
steersman from 400 to 600 livres; the middle men from
250 to 350 livres, with an equipment of one blanket,
one shirt, and one pair of trousers; and were maintai-
ned during that period at the expense of their employ-
ers. Independent of their wages, they were allowed to
traffic, and many of them earned to the amount of their
wages. About one-third of these went to winter, and
had more than double the above wages, and equipment.
All the others were hired by the year, and some times
for three years; and of the clerks many were appren-
tices, who were generally engaged for five or seven
years, for which they had only 100l. provision and
 Clothing. Such of them who could not be provided for
as partners, at the expiration of this time, were allowed
from 100l. to 300l. per annum, with all necessaries, till
provision was made for them. Those who acted in the
twofold capacity of clerk and interpreter, or were so
denominated, had no other expectation than the pay-
ment of wages to the amount from 1000 to 4000 livres
per annum, with clothing and provisions. The guides,
who are a very useful set of men, acted also in the ad-
ditional capacity of interpreters, and had a stated
quantity of goods, considered as sufficient for their
wants, their wages being from 1000 to 3000 livres.
The canoe men are of two descriptions, foremen and
steersmen, and midlemen. The two first were allow-
ed annually 1200, and the latter 400, livres each. The
first class had what is called an equipment, consisting of
two blankets, two shirts, two pair of trousers, two
handkerchiefs, 14 pounds of tobacco, and some trilling
articles. The latter had 10 pounds of tobacco, and all
the other articles: those are called north men, or win-
turers; and to the last class of people were attached
upwards of 700 Indian women and children, victualled
at the expense of the company.

"The first class of people are hired in Montreal five
months before they set out, and receive their equip-
ments, and one-third of their wages in advance; and
an adequate idea of the labour they undergo may be
formed from the following account of the country
through which they pass, and their manner of proceed-

"The necessary number of canoes being purchased,
at about 300 livres each, the goods formed into pack-
ages, and the lakes and rivers free of ice, which they
usually are in the beginning of May, they are then dis-
patched from La Chine, eight miles above Montreal,
with eight or ten men in each canoe, and their bag-
gage; and 65 packages of goods, 600 weight of bis-
cuit, 200 weight of pork, three bushels of peas, for
the men's provision; two oil cloths to cover the goods,
a sail, 8c. an axe, a towing-line, a kettle, and a
sponge to bail out the water, with a quantity of gum,
bark, and watape, to repair the vessel. An European
on seeing one of these slender vessels thus laden, be-
ached up, and sunk with her gunwale within six inches
of the water, would think his fate inevitable in such a
boat, when he reflected on the nature of her voyage;
but the Canadians are so expert that few accidents
happen."
but formerly wore caps like the grenadiers, though somewhat shorter. There are three regiments in the British service: the royal regiment of Scotch fusiliers raised in 1678; the royal regiment of English fusiliers raised in 1683; and the royal regiment of Welsh fusiliers raised in 1688.

FUSION, the state of a body rendered fluid by fire. See FLUIDITY, and CHEMISTRY INDEX.

FUST, or Faust, John, was a goldsmith of Mentz, and one of the three artists to whom the valuable invention of printing has been usually ascribed. The names of the other two were Gutenburg and Schöffer. It seems impossible, however, to determine with certainty, whether Fust had any part whatever in the business than that of supplying Gutenberg with money, who had been making some attempts with carved blocks at Strasburgh, before he visited Mentz. To Schöffer, the son-in-law of Fust, we are indebted for the invention of punches and matrices, by means of which this noble art was afterwards carried to perfection. That work which may be regarded as the origin of the true typographic art, was the "Durandi Ratione Divinorum Officiorum," published in 1450, by Fust and Schöffer, which was soon followed by a copy of the Bible, both executed in a very masterly manner.

We are informed that Fust went to Paris in 1462, in order to dispose of a part of the second edition of his Bible, which he was enabled to sell considerably lower than bibles in manuscript, yet some reckon themselves overcharged by him, and some pretend that he was even accused of magic, but for the belief of this there appears to be no rational foundation. It seems certain that Fust was never in Paris after the year 1466; but that he was in that metropolis there is no doubt, as a note at the end of a copy of Cicero's Offices, intimating that the first possessor received it from John Fust at Paris, in 1466. It is extremely probable that he died that year of the plague, to which 40,000 of the inhabitants fell a sacrifice in the months of August and September. This opinion is farther corroborated by this circumstance, that the name of Schöffer alone was prefixed to the books which were published at Mentz after that period.

This man has been frequently confounded with John Faust, better known by the name of Dr Faustus, a pretender to the art of magic, who was first a theologian, then a student of medicine, and last of all sold himself to the devil for 24 years, at the expiration of which period it seems the devil came to carry off his purchase, and dashed out the doctor's brains against the wall about midnight. This wretched romance has no doubt been invented by the monks, to blacken the reputation of the great Fust, whose art deprived them of the emoluments arising from the copying of manuscripts. See (History of) PRINTING.

FUST, in Architecture, the shaft of a column, or the part comprehended between the base and the capital, called also the naked.

FUSTIAN, in Commerce, a kind of cotton stuff, which seems as it were whaled on one side.

Right fustians should be altogether made of cotton-yarn, both wool and warp; but a great many are made, the warp of which is flax, or even hemp.

There are fustians made of several kinds, wide, narrow, fine, coarse; with shag or nap, and without it.
viences.—However, some have supposed, that these are Persians converted to Christianity, who, being afterwards led to themselves, mingled their ancient superstitions with the truths and practices of Christianity, and so formed for themselves a religion apart: and they allege, that throughout the whole of their system of doctrine and practice, we may discern the marks and traces of Christianity, though grievously defaced; the annunciation, the magi, the massacre of the infants, our Saviour's miracles, his persecutions, ascension, &c.

GABRIEL, the name of one of the principal angels in heaven. It signifies the strength of God. There are a few events, in which this exalted being was concerned, recorded in Scripture. He was sent to the prophet Daniel, to explain to him the vision of the ram and goat, and the mystery of the seventy weeks, which had been revealed to him. He was sent to Zecharias, to declare to him the future birth of John the Baptist. Six months after, he was sent to Nazareth to the Virgin Mary, to warn her of the birth of Jesus Christ.

The Orientalists add several particulars to what the Scriptures inform us concerning the angel Gabriel. The Mahometans call him the faithful spirit; and the Persians, by way of metaphor, the peacock of heaven. We read, in the second chapter of the Koran, that whosoever is an enemy to Gabriel shall be confounded. It was Gabriel, they believe, who brought to Mahomet their false prophet the revelations which he published; and it was he who conducted him to heaven mounted upon the animal Burak.

GABRIL, St., an island lying in the great river La Plata, South America, which was discovered by the celebrated navigator Sebastian Cabot, in the year 1526.

GABRIELITES, in ecclesiastical history, a sect of Anabaptists that appeared in Pomerania in 1530. They derive their name from Gabriel Scherling; who, after having been for some time tolerated in that country, was obliged to remove, and died in Poland.

GAD, a Jewish prophet, the seer or domestic prophet of King David, and his adviser in all matters of importance. When the displeasure of the Almighty was roused against David and the children of Israel for numbering the people, Gad received a commission to wait upon the king, and make him an offer of three evils as a punishment for his offence. These were famine, war, or pestilence, the last of which was chosen by David, the ravages of which were terrible beyond description, and produced genuine repentance in the hearts of survivors. To perpetuate the memory of this event, Gad ordered an altar to be erected in the threshing floor of Ornan the Jebusite, around which place, it is said, the temple was afterwards built. We learn from the Old Testament that Gad was an author, who wrote a history of his own times, of which much use appears to have been made by the compilers of the books of Samuel and Chronicles. Gad was also the name of one of the twelve patriarchs, or sons of Jacob.

GAD, in Ancient Geography, a district of the Transjordan Palestine, situated between Gilead and the kingdom of Bashan to the north, and the kingdom of the Amorites, to the south; having the Jordan to the west, and bounded by various people on the east; so called from a tribe of that name.

GAD, among miners, a small punch of iron, with a long wooden handle, used to break up the ore.

One of the miners holds this in his hand, directing the point to a proper place, while the other drives it into the vein, by striking it with a sledge hammer.

GAD-BEE, or Gad-Fig. See Zoétrus, Entomology Index.

GADARÁ, in Ancient Geography, a town of the Perea, or Transjordan, in the Decapolis, a very strong place. Restored by Pompey after its demolition by the Jews (Josephus). After Herod's death, it was joined to the province of Syria by Augustus.

GADARENORÚM AGER, in Ancient Geography, the country of the Gadarenes, called by Matthew the country of the Gergesenes, because it was a district that lay between Gadara and Gergesa, otherwise called Gerasa, both which lay within the Decapolis on the other side Jordan.

GADES, or GADIRA, in Ancient Geography, a small island in the Atlantic, on the Spanish coast, 25 miles from the Columns of Hercules. It was sometimes called Tartessus and Erithia according to Pliny. Geryon, whom Hercules killed, fixed his residence there. Hercules, surnamed Gaditanus, had there a celebrated temple, in which all his labours were engraved with excellent workmanship. The inhabitants are called Gaditan.

GADUS, a genus of fishes belonging to the order of jugulares. This genus includes the cod, the whiting, the torsk, &c. See Ichthyology Index.

GAELIC LANGUAGE. See Highlands.

GÆTULIA, in Ancient Geography, a country of Africa, lying to the south of Mauritania, called Gætulica Propría, and Vetus. Gætuli, the people, were distinguished by different epithets; as Nógrí, Autolócoes, Dorna and Baníères (Pliny). The Gætuli were among the first inhabitants of Africa: a rough, unpolished people, living on venison and the spontaneous productions of the earth; a roving, wandering people, who took up with the first place in which might surprise them, (Sallust).

GAFF, a sort of boom or pole, frequently used in small ships, to extend the upper edge of the mizen; and always employed for the same purpose on those sails whose foremost edges are joined to the mast by hoops or lacings, and which are usually extended by a boom below. Such are the main sails of all sloops, brigs, and schooners.

GAFFAREL, James, a French divine, and very learned writer, born about 1601. He acquired great skill in the oriental and several other languages; and was particularly versant in the cabalistic and occult sciences, which he learned, exposed, and refuted. Cardinal Richelieu made choice of him for his library keeper, and sent him into Italy to collect the best manuscripts and books. He published a book entitled Curiosités Innovantes, i.e. Unheard-of Curiosities. It is said the cardinal designed to employ him in his grand project for the reunion of religions. He died in 1687, aged 80. He had been labouring for many years, and had almost finished a history of the subterranean world; containing an account of the caves, grottoes, vaults, catacombs,
bore that every inch in length should be a cubic inch of air, and the every contents of the globe and tube together 500 cubic inches; then when the air is compressed within an hundredth part of the whole, it is evident the treacle will not approach nearer than five inches of the top of the tube, which will agree to the depth of 3300 feet of water as above. Twice this depth will compress the air into half that space nearly, viz. 25 inches, which correspond to 660c, which is a mile and a quarter. Again, half that space, or 2½ inch, will show double the former depth, viz. 13200 feet, or 2½ miles; which is probably very nearly the greatest depth of the sea.

**Bucket Sea Gage**, an instrument contrived by Dr Hales to find the different degrees of coolness and saltiness of the sea, at different depths: it consists of a common household pail or bucket, with two heads; these heads have each a round hole in the middle, about four inches in diameter, covered with square valves opening upward; and that they may both open and shut together, there is a small iron rod fixed to the upper part of the lower valve, and the other end to the lower side of the upper valve. So that as the bucket descends with its sinking weight into the sea, both the valves may open by the force of the water, which by that means has a free passage through the bucket. But when the bucket is drawn up, then both the valves shut by the force of the water at the upper part of the bucket; so that the bucket is drawn up full of the lowest sea water to which it has descended. When the bucket is drawn up, the mercurial thermometer fixed in it is examined; but great care must be taken to observe the degree at which the mercury stands, before the lower part of the thermometer is taken out of the water in the bucket, lest it be affected by the different temperature of the air. In order to keep the bucket in a right position, there are four cords fixed to it, reaching about three feet below it; to which the sinking weight is fixed. The result of several trials with this gage was, that when it was let down to different depths, from 360 feet to 5346 feet, in lat. 25° 13′ N. and long. 25° 12′ W. it was discovered by the thermometer, that the cold increased gradually in proportion to the depths, till it descended to 3900 feet, viz. near ¾ths of a mile, whence the mercury in the thermometer came up at 53°; and though it was afterwards sunk to 5346 feet, i.e. a mile and 66 feet, it came up no lower: the warmth of the water upon the surface, and that of the air, was all that time 84°. When the water in the bucket was become of the same temperature with that on the surface of the sea, equal quantities of both were weighed and tried by the hydrometer; that from below was found to be the heaviest, and correspondingly the clearest.

Dr Hales was probably led to the construction of this sea gage from an instrument invented by Dr Hook, and designed for the same purpose. This consists of an square wooden bucket C, (fig. 3.) whose bottoms are so contrived, that as the weight of A sinks the iron B, to which the bucket C is fastened by two handles D, D, on the end of which are the moveable bottoms or valves EE, and thereby draws down the bucket, the resistance of the water keeps up the bucket in the posture C, whereby the water, whilst the bucket was descending, hath a free passage through it; whereas, as soon as the bucket is pulled upwards by the line F, the resistance of the water to that motion beats the bucket downwards, and keeps it in the posture G, whereby the included water is kept from getting out, and the ambient water kept from getting in. Phil Trans. N° ix. p. 149, and N° xxiv. p. 447. or Abr. vol. ii. p. 260.

Aque-mercurial Gage, is the name of an apparatus contrived by Dr Hales, and applied in various forms to the branches of trees, in order to determine the force with which they imbibe moisture. Let c r, (fig. 4.) be a cylindrical glass, e. g. of an inch diameter within, and eight inches long. Into this glass is introduced the branch of a young thriving apple tree δ, about three feet long, with lateral branches; the diameter of the transverse cut i being ¼ths of an inch. Having fitted the joint r to the tube at r, by folding a piece of sheep’s skin round the stem, it is cemented with a mixture of bees wax and turpentine melted together, in such proportion as to make a very still clammy paste when cold, and over the cement folds of wet bladders are bound firmly with pack thread. To the lower end e of the large tube, a smaller tube s r is cemented, being about ¼ of an inch diameter, and 18 inches long, and in substance full ¾ of an inch thick. These tubes are cemented together at e with common hard brick dust or powdered chalk cement, and the joint is farther secured with the cement of bees wax and turpentine, over which a wet bladder is bound. The apparatus being thus prepared, the branch is turned downwards, and the glass tube upwards, and then both tubes are filled with water; with the finger applied to the open end of the small tube, it is inverted and immersed in the glass cistern s, full of mercury and water. In this situation the lower end of the branch was immersed six inches in water, viz. from r to i; the water was imbibed by the branch at its transverse cut i; and during its ascent into the sap vessels of the branch, the mercury rose in the tube as from the cistern s, so that in half an hour it was risen 53 inches high, as far as s. The height of the mercury indicated, in some measure, the force with which the sap was imbibed, though not the whole force; because while the water was imbibed by the branch, its transverse cut was covered with innumerable little hemispheres of air, and many air bubbles issued out of the sap vessels, which partly filled the tube c r, as the water was drawn out of it; and therefore the height of the mercury could only be proportional to the excess of the quantity of water drawn off above the quantity of the air which issued out of the wood. If the quantity of air issuing from the wood had been equal to the quantity of water imbibed, it is plain that the mercury could not rise at all; because there would be no room for it in the tube; but if nine parts in twelve of the water be imbibed by the branch, free pr such parts of air issue into the tube in the same time the mercury must rise near six inches, and so proportionably in other cases. Dr Hales observed, that the mercury rose highest, in most cases, when the sun was clear and warm, and that it subsided three or four inches towards evening, but rose again the next day as it grew warm, though seldom so high as at first.
respectively \( d, c, \) as before. Then it is evident, that the column \( AD \) is to the column \( GF \) as \( a^2 \) to \( d^2 \). But these columns are equal; therefore \( d^2 = ac \); and consequently \( x = \frac{a^2}{d^2} \). It is also evident that the column \( AD \) is equal to the difference of the columns \( AB, DB \); but the difference of these columns is as \( b^2 - c^2 \). Therefore \( d^2 = b^2 - c^2 \). Whence we get \( x = \frac{b^2}{d^2} + c \).

The use of the small tube of communication \( ab \) (fig. 2) is to check the undulation of the water, so that the height of it may be read off from the scale with ease and certainty. But it is particularly desired to prevent the water from being thrown up to a much greater or less altitude than the true height of the column which the wind is able at that time to sustain, from its receiving a sudden impulse whilst it is vibrating either in its ascent or descent. As in some cases the water in the instrument might be liable to freeze, and thus break the tubes, Dr Lind recommends a saturated solution of sea salt to be used instead of it, which does not freeze till Fahrenheit’s thermometer falls to \( 0 \).

**GAHNIA**, a genus of plants belonging to the hexandria class. See Botany Index.

**GAIETA**, an ancient, handsome, and strong town of Italy, in the kingdom of Naples, and in the Terra di Lavoro, with a fort, citadel, harbour, and bishop’s see. It was taken by the Austrians in 1707, and by the Spaniards in 1734. It is seated at the foot of a mountain near the sea, in E. Long. 13° 37′. N. Lat. 41° 30′.

**GAIN**, the profit or lucre a person reaps from his trade, employment, or industry. Some derive the word from the German gewin; whereof the Italians had made guadagno; the French and English gain.

There are legal and reputable gains, as well as sordid and infamous ones. What is gained by gaming is of the latter description. Such gains are not acknowledged by law, so that the payment is not legally binding on the loser.

**GAIN**, in architecture, is the workman’s term for the bevelling shoulder of a joint or other timber. It is used also for the lapping of the ends of the joint, &c. upon a trimmer or gider; and then the thickness of the shoulder is cut into the trimmer; also bevelling upwards, that it may just receive the gain; and so the joint and trimmer lie even and level with the surface.

This way of working is used in floors and hearths.

To **GAIN THE WIND**, in sea language, is to arrive on the weather side or to windward of some other vessel in sight, when both are plying to windward, or sailing as near the wind as possible.

**GAINAGE, GAINAGIUM**, in our ancient writers, signifies the draught oxen, horses, wain, plough, and furniture, for carrying on the work of tillage by the baster sort of sorkemen and villains.

**Gainsage,** the same with what is otherwise called **wagonage**. Bracton, lib. i. cap. 9. speaking of lords and servants, says, *Ut si eis darienstur, quod solvunt non possit eis esse wagonium suum.* And again, lib. iii. tract. 2. cap. x. *Falesium non amerciitustur, nisi salvo wagoniio suo.* For anciently, as it appears both by Magna Charta, and other books, the villain, when pressed had his gainage or wagonage free, to the end his plough might not stand still; and the law, for the same reason, does still allow a like privilege to the husbandman; that is, his draught horses are not in many cases distrainable.

**Gainage** is also used for the land itself, or the profit raised by cultivating it.

**GAINSBROUGH**, a town of Lincolnshire in England, 148 miles from London, seated on the east bank of the Trent, which brings tolerably sized vessels with the tide up to the town, about 40 miles from the Humber. It is a large well-built town, with a pretty good trade, is noted for its ale, and has the title of an earldom. W. Long. 1. 45°. N. Lat. 53° 26′. The north marsh in its neighbourhood is noted for horse races. The Danes who invaded the kingdom brought their ships up to this place; and it was here that Sweno the Dane was murdered by one of the English, while revelling with his companions. In the year 1043 a battle was fought here between the royalists and the parliament forces under Cromwell. The number of inhabitants in 1811 amounted to 5172, of whom nearly 600 were employed in trade and manufactures.

**GALACTOPHAGI,** and **GALACTOTOX,** in antiquity, persons who lived wholly on milk, without corn or the use of any other food. The words are compounded of *galactus, galactus,* milk; *galactus,* to eat; and *morsus,* I drink.

Certain nations in Scythia Asiactica, as the Getae, Nomades, &c. are famous, in ancient history, in quality of galactophagi, or milk-eaters. Homer makes their elegie, Illiad, lib. iii.

Ptolemy, in his geography, places the Galactophagi between the Riphian mountains on one side, and the Hyrcanian sea on the other.

**GALANGALS,** in the *Materia Medica.* See KEMPFFERIA.

**GALANTHUS,** the Snow-Drop, a genus of plants belonging to the hexandria class, and in the natural method ranking under the ninth order, Spathaceae. See Botany Index.

**GALASHIELS,** a small town in Selkirkshire in Scotland, situated on the stream called Galashiels Water, at the place where it joins the Tweed. Galashiels and its neighbourhood have been long famous for the manufacture of coarse woollen cloth, known by the name of Galashields grey. The improved state of the agriculture of this vicinity is much commended. Galashiels is 30 miles S. E. from Edinburgh, and had 986 inhabitants in 1811.

**GALATA,** a great suburb belonging to Constantinople, opposite to the seraglio, on the other side of the harbour. It is here the Greeks, Armenians, Franks, Christians, and Jews inhabit, and are allowed the exercise of their respective worships.

**GALATÆA,** or **GALATHÆA,** in fabulous history, a sea nymph, daughter of Nereus and Doris. She was passionately loved by the Cyclops Polyphemus, whom she treated with coldness and disdain; while Acis, a shepherd of Sicily, enjoyed her unbounded affections. The happiness of these two lovers was disturbed by the jealousy of the Cyclops, who crushed his rival to pieces with a piece of a broken rock while he reposed on the bosom of Galatea. The nymph was inconsolable for the loss of Acis; and as she could not restore him to life, she changed him into a fountain.

**GALATIA,** the ancient name of a province of Asia Minor, now called **Amastris.** It was bounded on the
was fulfilled, he became pastor over a congregation of private conventicles in Holborn. He died in 1678; and is principally known by an elaborate work, intituled, the Court of the Gentiles, calculated to show that the Pagan philosophers derived their most sublime sentiments from the Scriptures.

Gale, Dr Thomas, a learned divine, born at Scranton in Yorkshire, in the year 1626, was educated at Cambridge, and at length became professor of the Greek language in that university. He was afterwards chosen head master of St Paul's school, London; and was employed by the city in writing those elegant inscriptions on the monument erected in memory of the conflagration in 1666. In 1676 he was collated to a prebend in the cathedral of St Paul's; and was likewise elected a fellow of the Royal Society to which he presented a Roman urn with its ashes. About the year 1697, he gave to the new library of Trinity college, in Cambridge, a great number of Arabian manuscripts; and in the same year he was admitted dean of York. He died in that city in 1702; and was interred in the cathedral, where a monument, with a Latin inscription, was erected to his memory. He was a learned divine, a great historian, one of the best Greek scholars of his age, and maintained a correspondence with the most learned men abroad as well as at home. He published 1. Historiae Posticae Antiqui Scriptores, octavo. 2. Opuscula Mythologica, Ethica, et Physica, in Greek and Latin, octavo. 3. Herodoti Historia, folio. 4. Historiae Anglo-Cæliæ Scriptores quinque, in folio. 5. Historiae Britannicae, Saxonicae, Anglo-Danicae, Scriptores quindecim, in folio. 6. Rheteres Selecti, &c.

Galea, an antiquity, a light casque, head piece, or morion, coming down to the shoulders, and commonly of brass; though Camillus, according to Plutarch, ordered those of his army to be of iron, as being the stronger metal. The lower part of it was called buccula, and on the top was a crest. The velites wore a light galea, made of the skin of some wild beast to make it more terrible.

Galeasse, a large low-built vessel, in which both sails and oars are used, and the largest of all the vessels that make use of the latter. It may carry twenty guns, and has a great variety of lodging a great number of marines. It has three masts, which are never to be lowered or taken down. It has also thirty-two benches of rowers; and to each bench six or seven slaves, who sit under cover. This vessel is at present used only by the Venetians.

Galega, a genus of plants belonging to the dia
delphia class; and in the natural method ranking under the 32d order, Papilionaceae. See BOTANY.

Galenus, prince of the Greek physicians after Hippocrates, was born at Pergamus in the Lesser Asia, about the year 132. His father was possessed of a considerable fortune; was well versed in polite literature, philosophy, astronomy, and geometry; and was also well skilled in architecture. He himself instructed his son in the first rudiments of learning, and afterwards procured him the greatest masters of the age in philosophy and eloquence. Galen having finished his studies under their care, chose physis for his profession, and chiefly studied the works of Hippocrates. Having at length exhausted all the sources of literature that were to be found at home, he resolved to travel, in order to converse with the most able physicians in all parts, intending at the same time to take every opportunity of inspecting on the spot the plants and drugs of the countries through which he passed. With this view he went to Alexandria, and paid some years in that metropolis of Egypt; passed thence he travelled through Cilicia; then through Palestine; visited the isles of Crete and Cyprus; and made two voyages to Lemnos, in order to examine the Lemnian earth, which was then esteemed an admirable medicine. With the same view he went into the Lower Syria, in order to obtain a thorough insight into the nature of the opobalsamum, or balm of Gilead; and having completed his design, returned home by the way of Alexandria.

Galen had been four years at Pergamus, where his practice was attended with extraordinary applause, when some sedition commotions induced him to go to Rome, where he resolved to settle: but the proofs he gave of his superior skill, added to the respect shown him by several persons of very high rank, created him so many enemies among his brethren of the faculty, that he was obliged to quit the city, after having resided there four or five years. But he had not long returned to Pergamus, when he was recalled by the emperors Aurelius and Vereus. After their death, he retired to his native country; where he died about the year 200. He wrote in Greek; and is said to have composed two hundred volumes, which were unhappily burnt in the temple of Peace. The best editions of those that remain, are, that printed at Basil in 1538, in five volumes, and that of Venice in 1625, in seven volumes. Galen was of a weak and delicate constitution, as he himself asserts; but he nevertheless, by his temperance and skill in physic, arrived at a great age; for it was his maxim, always to rise from table with some degree of appetite. He is justly considered as the greatest physician of antiquity, next to Hippocrates; and he performed such surprising cures, that he was accused of magic.

Galen, a military township in the state of New York, situated on the creek of Cauadasque, about 12 miles north-west of Cayuga lake, and 13 south by east of Great Sudus.

Galenus, a name given by mineralogists to a species of lead ore. See Lead-Mine, and Mineralogy Index. It was also the original name given by Andre-machus to the theriac, from its effect in bringing on a pleasing calm over the blood and spirits on taking it.

Galenus, a genus of plants belonging to the oe
tandria class; and in the natural method ranking under the 13th order, Succulentae. See BOTANY Index.

Galenic, or Galenical, in Medicine, is that manner of considering and treating diseases, founded on the principle of Galen, or introduced by Galen. This author, collecting and digesting what the physicians before him had done, and explaining every thing according to the strictest doctrine of the Peripatetics, set physic on a new footing; he introduced the doctrine of the four elements; the cardinal qualities and their degrees; and the four humours or temperaments.

Galenic is more frequently used as contradi
guished from chemical.

The distinction of galenical and chemical was occa
sioned
it were under a heap of leaves, which preserves it from the injuries of the weather. This apartment, however, though so commodious a retreat in the winter, is a perfect prison in the spring. The fly, roused from its lethargy by the first heats, breaks its way through, and ranges where it pleases. A very small aperture is sufficient, since at this time the fly is but a diminutive creature. Besides, the ringlets whereof its body is composed dilate and become p lust in the passage.

Oak gall, put in a very small quantity, into a solution of vitriol in water, though but a very weak one, give it a purple or violet colour; which, as it grows stronger, becomes black; and on this property depends the art of making our writing ink, as also the arts of dyeing and dressing leather, and other manufactures. See Ink, Chemistry Index.

The best galls come from Aleppo: these are not quite round and smooth like the other sorts, but have several tubercles on the surface. Galls have a very austere styptic taste, without any smell; they are very strong astringents, and as such have been sometimes made use of both internally and externally, but are not much taken notice of by the present practice. Some recommend an ointment of powdered galls and bogs lard as very effectual in certain painful states of hemorrhoids; and it is alleged, that the internal use of galls has cured intermitents after the Peruvian bark has failed. A mixture of galls with a bitter and aromatic has been proposed as a substitute for the bark.

GALT, St., a considerable town in Swisserland, and in the Upper Thurgow, with a rich and celebrated abbey, whose abbot is a prince of the empire. This place has for some time been a republic, in alliance with the cantons. It is not very large; but well built, neat, and populous. It contains about 10,000 inhabitants, who, are chiefly employed in the linen manufacture; and make annually, it is said, 40,000 pieces of linen, of 200 ells each; which renders it one of the richest towns in Swisserland. The inhabitants are Protestants; for which reason there are often great contests between them and the abbey about religious affairs. It is seated in a narrow barren valley, between two mountains, and up ten or two small streams. E. Long. 2. 59. N. Lat. 47. 39.

GALL-FLY. See CYNIPS, ENTOMOLOGY Index.

GALLA, an Abyssinian nation, originally dwelling, as Mr. Bruce supposes, under the line, and exercising the profession of shepherds, which they still continue to do. For a number of years, our author tells us, they have been constantly migrating northwards, though the cause of this migration is not known. At first they had no horses; the reason of which was, that the country they came from did not allow these animals to breed; but as they proceeded northward and conquered some of the Abyssinian provinces, they soon furnished themselves with such numbers, that they are now almost entirely cavalry, making little account of infantry in their armies. On advancing to the frontiers of Abyssinia, the multitude divided, and part directed their course toward the Indian ocean; after which, having made a settlement in the eastern part of the continent, they turned southward into the countries of Bali and Dawaw, which they entirely conquered, and settled there in the year 1537. Another division having taken a westerly course, spread themselves in a semicircle along the banks of the Nile; surrounding the country of Gojam, and passing eastward behind the country of the Agow, extended their possessions as far as the territories of the Gongas and Gafats. Since that time the Nile has been the boundary of their possessions; though they have very frequently plundered, and sometimes conquered, the Abyssinian provinces on the other side of the river, but have never made any permanent settlement in these parts. A third division has settled to the southward of the low country of Shoa, which the governor of that province has permitted, in order to form a barrier between him and the territories of the emperor, on whom he scarcely acknowledges any dependence.

The Gallas are of a brown complexion, and have long black hair; but some of them who live in the valleys are entirely black. At first their common food was milk and butter; but since their intercourse with the Abyssinians, they have learned to plough and sow their land, and to make bread. They seem to have predilection for the number seven, and each of the three divisions already mentioned is subdivided into seven tribes. In behaviour they are extremely barbarous; and live in continual war with the Abyssinians, whom they murder without mercy as often as they fall into their hands. They cut off the privities of the men, and hang them up in their houses by way of trophies; and are so cruel as to rip up women with child, in hopes of thus destroying a male. Yet notwithstanding their excessive cruelty abroad, they live under the strictest discipline at home; and every broil or quarrel is instantly punished according to the nature of the offence. Each of the three divisions of the Gallas mentioned has a king of its own; and they also have a kind of nobility, from among whom the sovereign can only be chosen: however, the commonalty are not excluded from rising to the rank of nobles if they distinguish themselves very much in battle. None of the nobility can be elected till upwards of 40 years of age, unless he has with his own hand killed a number of enemies which added to his own age makes up 40. There is a council of each of the seven tribes, which meets separately in its own district, to settle how many are to be left behind for the governing and cultivating of the territory, and other matters of importance. These nations have all a great veneration for a tree which grows plentifully in their country, called swanzy, and which these superstitious people are even said to adore as a god. Their assemblies for the choice of a king are all held under one of these trees; and when the sovereign is chosen, they put a bludgeon of this wood in his hand by way of sceptre, and a garland of the flowers upon his head.

The Gallas are reported to be very good soldiers, especially in cases of surprise; but, like most other barbarians, have no constancy nor perseverance after the first attack. They will, however, perform extraordinary marches, swimming rivers holding by the horse's tail, and thus being enabled to do very great mischief by reason of the rapidity of their movements. They are excellent light horse for a regular army in a hostile country; but are very indifferently armed, on account of the scarcity of iron among them. Their principal arms are lances made of wood sharpened at the end and hardened in the fire; and their shields are composed only of one single fold of bull's hide; so that they are extremely apt to warp by heat, or become too soft.
GALLERY, in Architecture, a covered place in a house, much longer than broad, and usually in the wings of a building, its use being chiefly to walk in.

GALLERY, in Fortification, a covered walk across the ditch of a town, made of strong beams covered over with planks, and loaded with earth; sometimes it is covered with raw hides, to defend it from the artificial fires of the besieged.

GALLERY of a Mine, is a narrow passage or branch of a mine carried on under ground to a work designed to be blown up. See MINE.

GALLERY, in a ship, that beautiful frame, which is made in the form of a balcony, at the stern of a ship without board; into which there is a passage out of the admiral's or captain's cabin, and is for the ornament of the ship.

GALLEY, a kind of low flat-built vessel, furnished with one deck, and navigated with sails and oars, particularly in the Mediterranean. By the Greek authors under the eastern empire, this kind of vessel was called γαλάτης and γαλάτιον; and by the Latin authors of the same time, galea; whence, according to some, the modern denomination. Some say it was called galeos, on account of a casque or helmet which is carried on its prow, as Ovid attests, de Tristibus. The French call it galère; by reason, they say, that the top of the mast is usually cut in the form of a hat, which the Italians call galera. Others derive both galea, and galère, from a fish by the Greeks called γαλατώρ and γαλατευς, and by us the sword-fish, which this vessel resembles. Lastly, Others derive the galera, galea, galères, galäëse, &c. from the Syræ and Chaldea gæst, and gális, a man expos'd on the water in a vessel of wood.

The largest sort of these vessels is employed only by the Venetians. They are commonly 162 feet long, above, and 133 feet by the keel; 32 feet wide, with 25 feet length of stern post. They are furnished with three masts, and 32 banks of oars; every bank containing two oars, and every oar being managed by six or seven slaves, who are usually chained thereto. In the fore part they have three little batteries of cannon, of which the lowest is of two 36 pounders, the second of two 24 pounders, and the uppermost of two 2 pounders; three 18 pounders are also placed on each quarter. The complement of men for one of these galleys is 1000 or 1200. They are esteemed extremely convenient for bombarding or making a descent upon an enemy's coast, as drawing but little water; and having by their oars frequently the advantage of a ship of war, in light winds or calms, by cannonading the latter near the surface of the water; by scouring her whole length with their shot, and at the same time keeping on her quarter or bow, so as to be out of the direction of her cannon.

The galleys next in size to these, which are also called half galleys, are from 120 to 130 feet long, 18 feet broad, and nine or ten feet deep. They have two masts, which may be struck at pleasure; and are furnished with two large lateen sails, and five pieces of cannon. They have commonly 25 banks of oars, as described above. A size still less than these are called quarter galleys, carrying from 12 to 16 banks of oars. There are very few galleys now besides those in the Mediterranean, which are found by experience to be of little utility except in fine weather; a circumstance which renders their service extremely precarious. They generally keep close under the shore, but sometimes venture out to sea to perform a summer cruise.

GALLER, in Zoology. See Iulus, Entomology Index.

GALLI, in antiquity, a name given to the priests of Cybele, from the river Gallus in Phrygia; but of the etymology of the name we have no certain account. All that we learn with certainty about them is, that they were eunuchs and Phrygians, and that in their solemn processions they danced, bawled, drummed, cut and slashed themselves, played upon timbrels, pipes, cymbals, &c. and driving about an ass loaded with the sacred rites and trumpery of their goddess. When a young man was to be initiated, he was to throw off his clothes, run crying aloud into the midst of their troop, and there draw a sword and castrate himself; after this he was to run into the street with the parts cut off, in his hand, throw them into some house, and in the same house put on a woman's dress.

These priests had the names also of Curetes, Corybantes, and Dacyples. The chief priest was called Archagallus. This order of priesthood is found both amongst the Greeks and Romans. See an account of them in Lucret. lib. ii. and Juv. Sat. vi.

GALLI, the Gauls. See Gallia and Gaules.

GALLI, five small desolate islands on the coast of the Principato Citra of Naples. They are supposed to be the Syrenusse, or islands once inhabited by the Sirens, which Ulysses passed with so much caution and hazard. Great revolutions, however, have been occasioned in their shape, size, and number, by the effects of subterranean fire; and some learned persons go so far as to assert, that these rocks have risen from the bottom of the sea since Homer sang his rhapsodies; consequently, that those monsters dwelt on some other spot, probably Sicily or Capri. The tradition of Sirens residing hereabouts is very ancient and universally admitted; but what they really were, divested of their fabulous and poetical disguise, it is not easy to discover. See SIREN.

The Sirens were only three in number; and therefore if those and the Galli be the same, two more must have since risen, or the three have been split into five by a subterraneous convolution. On the largest is a watch-tower, and the next has a deserted hermitage. The principal island is only a narrow semicircular ridge covered with a shallow coat of soil; two other little islands and some jagged rocks just peeping above the waves, correspond with this one so as to trace the outline of a volcanic crater. The composition of them all is at top a calcareous rock, extremely shaken, tumbled, and confused, mixed with masses of breccia, disposed in a most irregular manner; below these is lava, and the deeper the eye follows it the stronger are the marks of fire; below the surface of the water, and in some places above it, the layers are complete blocks of basaltite. Hence it is presumed by some that central fires have heaved up to light the torrefied substances that originally lay near their focus, with all the intermediate strata that covered them from the sea. The layers incline downwards from east to west; the air seems to have forced its way into part of the mass while in fusion, and by checking its workings caused many large cavities.
GALLIA, a large country of Europe, called Galatia by the Greeks. The inhabitants were called Galli, Celts, Celiberti, and Celtsuchete. Ancient Gaul was divided into four different parts by the Romans, called Gallia Belgica, Narbonensis, Aquitania, and Celtica. Gallia Belgica was the largest province, bounded by Germany, Gallia Narbonensis, and the German ocean; and containing the modern country of Alsace, Lorraine, Picardy, with part of the Low Countries, and of Champagne, and of the Isle of France. Gallia Narbonensis, which contained the provinces now called Languedoc, Provence, Dauphiné, Savoy, was bounded by the Alps and Pyrenean mountains, by Aquitania, Belgium, and the Mediterranean. Aquitania Gallia, now called the provinces of Poitou, Saintonge, Guienne, Berry, Limosin, Gascony, Auvergne, &c. was situated between the Garonna, the Pyrenean mountains, and the ocean. Gallia Celtica, or Lugdunensis, was bounded by Belgium, Gallia Narbonensis, the Alps, and the ocean. It contained the country at present known by the names of Lyonnet, Bouraine, Forez, Comté, Sancerre, Switzerland, and part of Normandy. Besides these grand divisions, there is often mention made of Gallia Cisalpina or Citerior, Transalpina or Ulterior, which refers to that part of Italy which was conquered by some of the Gauls who crossed the Alps. By Gallia Cisalpina, the Romans understood that part of Gaul which lies in Italy, and by Transalpina, that which lies beyond the Alps, in regard only to the inhabitants of Rome. Gallia Cispadana, and Transpadana, is applied to a part of Italy conquered by some of the Gauls; and then it means the country on this side of the Po, or beyond the Po, with respect to Rome. By Gallia Togata, the Romans understood Cisalpine Gaul, where the Roman gowns, toga, were usually worn. Gallia Narbonensis was called Bracca, on account of the peculiar covering of the inhabitants for their thighs. The epithet of Comata is applied to Gallia Celtica, because the people suffered their hair to grow to an uncommon length. The inhabitants were great warriors, and their valor overcame the Roman armies, took the city of Rome, and invaded Greece in different ages. They spread themselves over the greatest part of the world. They were very superstitious in their religious ceremonies, and revered the sacerdotal order as if they had been gods. They long maintained a bloody war against the Romans, and Caesar resided ten years in their country before he could totally subdue them. See GALL.

GALLIARD, or Gagliarda, a sort of dance anciently in great request; consisting of very different motions and actions, sometimes proceeding terra à terra or smoothly along; sometimes capering; sometimes along the room, and sometimes across. The word is French, gailiarde, or rather Italian; and literally signifies, gay, merry, sprightly.” This dance was also called Romancese, because brought from Rome.

Thoinet Arbeau, in his Orchesography, describes it as consisting of five steps, and five positions of the feet, which the dancers performed before each other, and wherein he gives us the score or tablature, which is of six minims, and two triple times.

GALLIARDS, in the Italian music, the name of a tune that belongs to a dance called a Galliard. The air of it is lively and in triple time.

GALIC ACID. See Chemistry Index.

GALLICAN, anything belonging to France; thus the term Gallican church denotes the church of France, or the assembly of the clergy of that kingdom.

GALLICISM, a mode of speech peculiar to the French language, and contrary to the rules of grammar in other languages. With us it is used to denote such phrases or modes of speech in English as are formed after the French idiom.

GALLINACEUS LAPIS, a glossy mineral substance supposed by some to be produced by the operation of volcanic fires; and is thought to be the lapis obsidians, of the ancients. See Obsidian, Mineralogy Index.

GALLINÆ, an order of birds. See Ornithology Index.

GALLINACEOUS, an appellation given to the birds of the order of the gallinae.

GALLING, or EXCORIATION, in Medicine. See Excoration.

Galling of a Horse’s Back, a disorder occasioned by heat, and the chafing or pinching of the saddle.

In order to prevent it, some take a hind’s skin well garnished with hair, and fit it neatly under the pannel of the saddle, so that the hairy side may be next the horse.

When a horse’s back is galled upon a journey, take out a little of the stuffing of the pannel over the swelling, and sew a piece of soft white leather on the inside of the pannel: anoint the part with salt butter, and every evening wipe it clean, rubbing it till it grow soft, anointing it with salt butter, or, for want of that with grease: wash the swelling, or hurt, every evening with cold water and soap; and stew it with salt, which should be left on till the horse be saddled in the morning.

GALLINULE. See Fulica, Ornithology Index.

GALLIPOLI, a sea-port town of Italy, in the kingdom of Naples, and in the Terra-di-Oranto, with a bishop’s see. It stands on a rocky island, joined to the continent by a bridge. From the remotest antiquity this was a station so favourable to commerce, that every maritime power wished to secure it; and it is a reproach to government, that nothing has been done to improve its natural advantages: at present, Mr Swinburne informs us, it has neither harbour nor shelter for shipping. Charles II. demolished Gallipoli for its adherence to Frederick of Arragon. The Venetians treated it with great cruelty in the 15th century: and in 1481 it was pillaged by the Turks. To preserve it from future calamities, Charles V. repaired and strengthened its fortifications; and, since that period, it has enjoyed the benefits of peace and trade, which have rendered it the most opulent and genteel town upon the coast, though its inhabitants do not exceed 5000 in number. Consumptions and spitting of blood are rather frequent here, occasioned by the great subility of the air, which is ventilated from every quarter. The buildings are tolerable, and some
even to the minutest rite, as he never lost the pious impressions which were made upon his mind at an early period of life. To this cause we may probably trace back his determination never to take what was called the civic oath of allegiance to the Cisalpine republic, for which he was barbarously deprived of all his offices and dignities. Devoured by melancholy, and nearly reduced to a state of indigence, he took up his residence in the house of his brother James, a man of respectability, where he fell into a state of extenuation and debility. At this time even republican governors appear to have been ashamed of their brutal conduct towards such an extraordinary man; in consequence of which a decree was passed for restoring him to his chair in the university, together with its emoluments; but this fit of generosity was too long in seizing them. He departed this life on the 5th of November, 1798, in the 61st year of his age, amidst the tears of his friends, and the regret of the public, in whose death the learned world has been deprived of one of its brightest ornaments.

GALVANISM.

If two pieces of metal, the one of zinc, and the other of silver, or the one of zinc and the other of copper, or, what answers the purpose equally well, a penny piece and a half crown piece, be so placed that the one shall touch the upper surface of the tongue, and the other shall touch its under surface, while the edges project over the point; as often as the edges of the metals in this situation are brought into contact, a peculiar sensation is produced in the tongue; there is something like a slight shock of electricity, and there is perceived at the same time an austere, astringent, or metallic taste.

If a bit of tinfoil be placed on one of the eyes, and a bit of copper held between the teeth or touching the tongue, and a communication be formed by means of a wire between the piece of metal on the eye and that on the tongue, a flash of light is seen, and this is produced as often as the communication is completed. But in the above experiments, if metals of the same kind be employed, no perceptible effect whatever is produced.

If a pile composed of 50 or 60 pairs of plates of zinc and silver, or zinc and copper, be arranged in a regular series, with pieces of cloth moistened in a solution of common salt placed between each pair; and if one hand, previously moistened with water, touch the lower pair, and the other hand, also moistened, touch the upper pair of plates, the moment the communication between the bottom and top of the pile is completed, a smart shock is felt; and if 50 or 60 pairs of plates of copper and zinc be arranged in a trough as will be afterwards described, and the spaces between the pairs be filled with water, to which about \( \frac{1}{4} \)th of pretty strong nitric acid has been added, a similar shock is perceived, when the hands wetted with water touch the plates at the extremities of the trough. If a communication by means of wires and two pieces of well-prepared charcoal be made between the extremities of the trough, a very brilliant combustion is excited every time the two pieces of charcoal are brought into contact. By placing tinfoil, gold leaf, white or yellow Dutch metal or brass leaf, on a wire connected with one end of the trough, and touching the metallic leaves with a plate of copper or zinc connected with a wire from the other end of the trough, a rapid and brilliant deflagration is exhibited every time that the communication is effected.

The phenomena which are thus produced have received the name of Galvanism, from the name of Galvani, who first observed and published an account of some of them, and the power by which these effects are produced has been denominated the galvanic power or fluid. From its effects on animals being similar to those of the electrical fluid, it was at first called animal electricity; but then the knowledge of galvanism was limited to its effects on animals, and it was supposed to depend on something peculiar to animal life.

In the following treatise we propose to give a view of the progress and present state of galvanism; and for this purpose we shall arrange the whole under two great divisions. Under the first, we shall consider the phenomena of galvanism, or detail the facts which have been ascertained with regard to this power. The second part will be occupied in the history, progress, and theories, which have been held with regard to the nature of galvanism.

PART I. OF THE PHENOMENA OF GALVANISM.

IN treating of the phenomena of galvanism, its progressive history suggests an arrangement sufficiently convenient for taking a view of the effects of the galvanic fluid. Those effects, which are to be regarded as strictly chemical, were altogether unknown, till after its application to animals, and a great mass of facts relative to its effects on animal life had been accumulated. We may therefore first consider the effects produced on animals by the operation of the galvanic fluid, and in the next place those effects which are strictly chemical. But before we proceed to this, it is necessary that the nature and construction of the apparatus, by which these effects were produced, should be understood. These topics, therefore, shall be the subjects of the three following chapters. In the first we shall treat of the construction of the apparatus by which the phenomena of galvanism are produced; the second will be employed in considering the effects of the galvanic fluid on animals; and the third will comprehend a view of its chemical effects.
GALVANISM. Part I.

Chap. I. Of the Construction of the Apparatus for exhibiting the Phenomena of Galvanism.

On the first discovery of galvanism, the apparatus for exhibiting its effects was extremely simple. It consisted merely of two pieces of different metals, such as has been described above, by which a peculiar sensation is produced on the tongue. This, it has been stated, is effected by means of a piece of zinc and a piece of copper, one placed on the upper surface, and the other on the under surface of the tongue, while the projecting edges are brought into contact. In the same way, and with such an apparatus, a great variety of experiments, especially in cold-blooded animals, were exhibited, when the knowledge of this remarkable power was first announced and investigated.

For the purpose of exhibiting some of the simpler effects of galvanism, we shall describe the following apparatus, which is of very easy construction. AB, fig. 1, is zinc wire, sharp at the point A, and fixed in the wooden stand C. If the frog prepared in the way which we shall immediately describe, be fixed on the point of the wire at A, and a gold or a silver wire (a silver tea spoon will answer the purpose) be brought into contact with the side of the wire as at the point D; and while in contact with the wire at D, it is brought into contact with the feet of the frog at E or F, the effect of the galvanic power will be immediately perceived. The limbs of the animal will be strongly convulsed, and will exhibit as much motion by the contraction of the muscles as if it were alive, and in full vigour. But if a zinc wire, similar to AB, were substituted for the gold or silver wire, no such effect would be produced.

Frogs, as they are most easily found, and as they are, perhaps, more convenient in other respects, have been oftener the subject of galvanic experiments than any other animal. To prepare them for these experiments, various methods have been followed. Some physiologists propose to remove only the integuments, and lay bare the muscles, while others open the cavities of the thorax and abdomen, remove the viscera which are contained in these cavities, and bring into view the nerves and muscles which are there distributed. Some again, after the above previous preparation, separate all the parts between the origin of the nerve and its insertion in the muscle, so that the latter may be attached by means of the nerves only, to the trunk of the body; while others, after a similar preparation, cut off the animal's head, that the effects produced by galvanism may not be confounded with the voluntary movements of the living animal. By another mode of preparation, each of the parts is separated from the body by dissection, after laying bare the muscles and nerves.

But in general a frog is understood to be prepared when it is divided with a pair of scissors into two portions, through the middle of the body and spine. The viscera are then removed, as well as the integuments of the inferior extremities. As the sciatic nerves of this animal rise very high upon the spine, they are distinctly seen after this treatment. When it is intended, as in some experiments, to arm the nerves, as it is called, a pair of sharp-pointed scissors is introduced beneath them, and the spine is cut through, but without dividing the nerves. A portion of the inferior part of the spine is afterwards to be separated, that room may be left for covering the nerves with a bit of tin-foil. This is what is usually understood by arming or coating the nerves. In some experiments it will be found more convenient to separate the lower extremities from the trunk, and to employ the cranial nerve.

Phenomena similar to the above may be produced by placing a frog A prepared in the way described above, on a plate of zinc B, fig. 2, and on a plate of silver or copper C. If the communication between the plates A and B be completed by means of the conductor D, the muscles of the frog are immediately thrown into strong convulsions, and these motions are renewed as often as the contact is made by the conducting wire and the two metals.

The apparatus we have now described affords an example of the simplest galvanic combination, or what vanie conbination is usually denominated a single galvanic combination. Here it may be observed, that this combination must consist of three different conductors. The conductors of electricity have been arranged into two principal classes: to the first belong the metallic substances and charcoal, which have been otherwise called dry and perfect conductors; the second class consists of the imperfect conductors, which are water and other oxidizing fluids, and the substances which contain these fluids. But although the conductors of electricity, for the sake of convenience, are thus arranged, they differ from each other in their conducting power, and this difference is greatest among the substances comprehended under the second class. Now, if the three conductors of the galvanic fluid be all of the first class, or all of the second, the effect is scarcely perceptible. An active, simple galvanic combination, then, must consist of three different bodies, one conductor must belong to one class, and two different conductors must be taken from the other class. In fig. 3, and 4, are exhibited examples of active simple galvanic combinations. In fig. 3, the and 4 letters AB mark the bodies belonging to the first class or perfect conductors; and a marks the body belonging to the second class, or imperfect conductors, and in fig. 4, A marks one body belonging to the first class, and a and b two bodies belonging to the second class, or the imperfect conductors. Of the three bodies forming a galvanic combination, if two of them belong to the first class, and one to the second, this combination is said to be of the first order; but if one of the three bodies only belong to the first class, and two to the second, the combination is said to be of the second order. Fig. 3, is a galvanic combination of the first order, and fig. 4, is one of the second. This may be further illustrated by examining fig. 5, 6, 7, which consist of two bodies only, and therefore are not active 8, 9 combinations; and also by examining fig. 8 and 9, which consist of three bodies, but two of them are of the same kind, and therefore act as a single body. In the last five figures, the capital letters denote the bodies belonging to the first class, and the small letters those belonging to the second.

In the single active galvanic circle, the two bodies of one class must be in contact with each other in one or more points, while, at the same time, they are connected together at other points.
points with the body belonging to the other class. Thus, if a prepared frog is convulsed by the contact of the same piece of metal in two different places, the fluids of those parts, which must be somewhat different from each other, are the two conductors of the second class, and the metal constitutes the third body for the conductor of the first class. But if two metals be employed, the fluids of the prepared animal differing little from each other, are to be considered as one body of the second class.

Here it may be necessary to anticipate a little, by observing, that in a simple galvanic circle, the conductor or conductors of one class must have some chemical action upon the other conductor or conductors, otherwise no galvanic action would be produced, or at least a very feeble one, from the combination of three bodies. This galvanic action, too, seems to be in proportion to the degree of chemical action, from which some have supposed, that this chemical agency is the primary cause of the phenomena.

It is found that the most active galvanic combinations, or galvanic circles belonging to the first order, are those in which two solids possessing different degrees of oxidability, are combined with a fluid which is capable of oxidizing at least one of the solids. Gold, silver, and water, do not form an active galvanic combination, because water is incapable of oxidizing either of these metals; but if a small quantity of nitric acid, or any other fluid which may be decomposed by the silver, be mixed with water, an active galvanic circle may thus be formed.

If zinc, silver, and water, or zinc, copper, and water, be combined together, an active galvanic circle is formed, and the water will be found to oxidize the zinc, if it hold any portion of atmospheric air in solution, and still more so, if it contain oxygen. But the combination of the same substances forms a much more powerful galvanic circle, if a little nitric acid be added to the water, because then the fluid has a strong action on the zinc, and oxidizes it.

Galvanic combinations belonging to the second order are found to be most powerful, when two conductors of the second class have different chemical actions on the conductors of the first class, while at the same time they have an action upon each other. As an example of this, copper, silver, or lead, combined with a solution of an alkaline sulphuret, and diluted nitric acid, constitute a very active galvanic circle.

The following is a list of galvanic circles of the first order, composed of two conductors of the first class, and of the second:

1. Zinc with gold, or charcoal, or silver, or copper, or tin, or iron, or mercury; and water containing a small quantity of any of the mineral acids.
2. Iron, with gold, or charcoal, or silver, or copper, or tin, and a weak solution of any of the mineral acids, as above.
3. Tin, with gold, or silver, or charcoal, and a weak solution of any of the mineral acids, as above.
4. Lead, with gold, or silver, and a weak acid solution, as above.
5. Any of the above metallic combinations, and common water, viz. water containing atmospheric air, or especially water containing oxygen air.
6. Copper, with gold, or silver, and a solution of nitrate of silver and mercury; or the nitric acid; or the aconit acid.
7. Silver, with gold, and the nitric acid.

The following is a list of galvanic circles of the second order, consisting of one conductor of the first class, and of the second of the second order.

1. Charcoal, or water, or with a solution of any hydrogogenated alkaline sulphuret, capable of acting on the first three metals, and a solution of nitric acid, or oxygenated muriatic acid, &c.
2. Copper, or lead, or tin, or iron, or zinc, capable of acting upon all the metals.

But the effects of the galvanic fluid are extremely feeble, when they are limited to the operation of even the most powerful simple combinations. In the progress of the knowledge of galvanism it was soon found, that these effects might be combined and increased to almost any degree. This is done by connecting together a number of active simple combinations, which, it is to be observed, must be so disposed that they may not counteract each other. A number of simple combinations thus connected together have received the name of batteries; and these batteries are said to belong to the first and second order, according as the simple combinations of which they are formed, are composed of substances of the first or second order of conducting powers. Thus, for example, if a plate of zinc be laid upon a plate of copper, and a piece of moistened card or leather be laid upon the zinc, and a similar arrangement of three other pieces be laid upon the first, and any number of combinations of the same kind be continued, taking care that they are always arranged in the same order, the whole will form a battery of the first order. But if a plate of copper be connected with a piece of cloth moistened with water, and the latter with another piece of cloth, moistened with a solution of sulphuret of potash, and this be connected with another piece of copper, repeating the same series to any convenient number, a battery of the second order will be formed of the whole.

Batteries of the second order have been arranged by Mr Davy into the three following classes. 1. The most feeble battery is composed, when single metallic plates are so arranged that two of their surfaces or opposite extremities are in contact with different fluids, the one of which is capable, and the other is incapable, of oxidizing the metal, a regular series of such combinations are formed. 2. When single combinations or elements of the series are each composed of a single plate of a metallic substance, capable of acting upon sulphuret hydrogen, or upon sulphurets dissolved in water, accompanied with portions of a solution of sulphuret of potash on one side, and water on the other. 3. The third class is the most powerful, being formed when metallic substances oxidizable in acids, and capable of acting on solutions of sulphurets, are connected as plates with oxidizing fluids, and solutions of sulphuret of potash, and so arranged that the opposite sides of every plate may undergo different chemical changes, the mode of alteration being regular.

The first attempt to increase the effects of the galvanic fluid, by combining a series of simple circles, was made by Volta; to this he gave the name couronne de}
GALVANISM.

Part I.

The following is the construction and mode of applying this apparatus.

Take any number of cups or glass tumblers A, B, C, D, E, fig. 10. Fill them about three-fourths full with any of the saline solutions, which will be afterwards described, as that of common salt or sal ammoniac in water. To one extremity of a bent brass wire solder a plate of zinc of about two inches in diameter, and to the other extremity of the same wire, solder in the same manner a plate of copper of the same diameter. These connecting wires are represented in the figure by the letters Z and C viz. zinc and copper. In arranging the plates in the vessels, it ought to be observed, that a plate of zinc and a plate of copper belonging to different vessels, must be in the same vessel, and never two plates of the same kind. Thus in the first vessel A, there is a plate of copper; in the second B, connected by the same wire, there is a plate of zinc; in the same vessel B, there is also a plate of copper, which is connected by means of another wire to a plate of zinc in the third vessel C. The same order and arrangement are to be observed to whatever number of plates and vessels the series may extend.

Suppose now that the apparatus has been arranged in the way described above, and the vessels have been filled with a solution of common salt in water; if the number of vessels be not less than ten or twelve, a slight shock will be felt by immersing one hand in the vessel, at one extremity of the series, and the other hand in the vessel at the other extremity; as for instance, by putting the fingers of one hand in the vessel A, fig. 10, and suddenly plunging the fingers of the other hand in the vessel E. The shock will perhaps be more sensibly felt by previously wetting the palms of both hands, and taking a silver or pewter spoon in each hand, immerse the handle of the one into the vessel A, and the handle of the other into the vessel E.

The strength of this apparatus depends on the number of series of plates and vessels employed. But it is obvious that this series, from the nature of the apparatus, could not be greatly extended, so as to afford any great increase of power. This occurred very early to the ingenious discoverer, as an insurmountable objection to the use of this apparatus. The views of this philosopher in investigating the nature of galvanism, seem at this time to have been chiefly directed to the discovery of instruments or apparatus, by means of which he might be enabled to augment its power. In the prosecution of his inquiries, therefore, he contrived another apparatus, which was afterwards known by the name of the galvanic pile, and sometimes, but more rarely, by that of the voltaic pile or pile of Volta, from the name of the discoverer. This apparatus is constructed in the following manner.

A pile of moderate strength may be constructed of 60 pairs of plates of zinc and copper, each plate being about two inches in diameter; it may be constructed also with similar plates of zinc and silver, or of almost any two other dissimilar metals. Such piles have been very conveniently constructed, with half crown pieces and plates of zinc of the same size, or more conveniently with penny pieces and plates of zinc of the same diameter. But of whatever different metals this kind of apparatus is to be constructed, the same order of arrangement is to be observed throughout the whole series.

Suppose the metals to be employed in the construction of the pile are zinc and copper, (and these from views of economy have been most frequently employed), an equal number of pieces of cloth, pasteboard, or leather, of the same diameter with the metallic plates, is to be prepared. The use of these pieces of cloth is to retain the moisture, by means of which the communication between the plates is formed, and the galvanism of the combinations are completed; and with proportion to the length of time during which the pieces of cloth or other substances retain the fluid which they have absorbed, the operation of the pile continues. The pile is formed by placing a pair of plates, one of zinc, and one of copper, upon a stand, the one immediately above the other. Upon this pair of plates is then placed a piece of cloth which has been soaked in some saline solution, as that of common salt, or sal ammoniac. Upon this piece of cloth is placed another pair of plates, arranged in the same order as the first pair. It makes no difference which of the metals is placed first in the series, only it is necessary to take care that the same order be observed throughout the whole pile. If the series, for instance, begins with copper, it runs in the following order: copper, zinc, cloth; copper, zinc, cloth, &c. to whatever number of pairs of plates and pieces of cloth the series may extend.

But if the number of series amount to 60 pairs, it will be necessary to have rods to confine the pairs of plates, and to retain them in a perpendicular column; for without this the weight at top would be so considerable that the least inclination to one side (and this could not well be avoided) would derange the whole apparatus. The rods which have been employed for this purpose have been sometimes made of glass, and sometimes of wood. When wood is used, it should be pretty dry, or baked, by which means its conducting power is either greatly diminished or entirely destroyed.

The pile being constructed in this manner, its effects may be observed, by applying the fingers of one hand moistened with water to the lowest pair of plates, and then touching with the fingers of the other hand, moistened in the same manner, the upper pair of plates, thus completing the communication between the extremities of the pile. Every time that this communication is made, a sensation is experienced, similar to a slight shock of electricity. The intensity of this shock is in proportion to the number of the pairs of plates, the nature of the fluid employed, and the care with which the pile has been erected, or the time that it has continued in action. With a pile of 60 pairs of plates, the shock will be perceptible through the fingers, or the whole of the hand, and in some persons, when it is in full activity, it will extend as high as the elbows.

In making experiments with this kind of apparatus, it will be found that 50 or 60 pairs of plates will be a sufficient number to be erected in one pile; but to increase the power of the galvanic fluid, a number of piles may be connected together. This may be done in two ways; either by combining the separate action of the different piles employed; as, for instance, if three piles are constructed, let the pairs of plates be arranged in
Galvanism.

The third column C is arranged in the same manner as the column A, viz. copper, zinc, pastebread; copper, zinc, pastebread, &c. Thus, then, the three columns are so arranged, that the different series succeed each other from the bottom of column A to the top, from the top of column B to the bottom, and from the bottom of column C to the top, as if the whole had been disposed in one column A. A communication is then formed between the top of the column A and the top of column B, by a metallic conductor D, and between the bottom of column B, and the bottom of column C, by means of the metallic conductor E. If then the fingers of one hand moistened are brought into contact with the wire F, which communicates with the bottom of column A, and the fingers of the other hand also moistened are brought into contact with the wire G, a smart shock will be felt, from the combined action of the three columns or piles.

The inconveniences of the pile, as we have already hinted, were soon felt by those who were eager in the investigation of galvanism, and who wished their experiments to continue with undiminished energy, that they might be enabled to ascertain with precision the new and curious facts which presented themselves. These inconveniences, it is very probable, suggested the improvements in galvanic apparatus which we are now to describe.

By the invention of the trough, for which we are indebted to the ingenuity of Mr. Cruikshank of Woolwich, the progress of galvanism became rapid and brilliant; for by this means philosophers were enabled not only to give a longer duration to their experiments, but to command a degree of energy in the galvanic fluid, which, before the discovery of this apparatus, was not even suspected. This apparatus, we believe, is now almost universally employed for galvanic experiments. We shall therefore give a more detailed account of the method of constructing and using it.

Troughs with plates of various sizes have been constructed, from 2 to 6, 8, and even 14 inches square; but, as an example, we shall suppose the following trough to be constructed with plates of about four inches square. A wooden trough AB, fig. 13, is to be made of baked mahogany; the length may be about 30 inches, and, as we shall suppose the number of pairs of plates to be 50, an equal number of grooves is to be cut on the sides and bottom of the inside of the trough. These grooves are to be cut at equal distances from each other, and the width of each groove is to be such, as to correspond nearly to the thickness of each pair of plates, so that the latter may slip easily into the grooves.

The plates are like those which have been already described in the construction of the pile made of zinc and copper. No difficulty has ever occurred in procuring plates of copper for this purpose; because all that is necessary is to cut them out of sheets of copper of the requisite thickness to any size that is wanted. But the case has been very different with regard to plates of zinc, especially where large plates were required. Attempts have been made to cast them in moulds of sand, such as are used for casting different utensils of other metals; but these attempts, it would appear, have been generally unsuccessful. The method

which it is said has succeeded best in forming plates of any considerable size is the following. The zinc of which the plates are to be composed is to be melted in a narrow-mouthed vessel, so that a small surface of fused metal may be exposed. The reason of this is, that the metal when it reaches a certain temperature is very rapidly oxidized in consequence of the strong affinity between this metal and oxygen. The metal in this state is converted into a fine flocculent substance, known by the name of flowers of zinc. This change, therefore, as it is attended with a loss of the metal, is to be as much as possible avoided. A mould of stone of the dimensions of the proposed plates (in this case four inches), and about one-eighth of an inch in thickness, is to be prepared; but one formed of brass is found to answer the purpose still better. When the metal is in perfect fusion, the plates should be cast as quickly as possible, because, as the metal cools rapidly, cavities and imperfections would appear on the surface from its flowing unequally.

The plates of zinc being prepared, plates of copper which need not exceed one-tenth of the thickness of the zinc plates are to be cut out of a sheet of copper to the requisite dimensions, viz. corresponding to the size of the zinc plates. The copper plates must be reduced by hammering to a smooth and plane surface that they may apply exactly to the surface of the zinc plates, and be in contact in as many points as possible.

The plates being thus prepared are to be soldered together; but it must be observed that it is not to be the plates through the whole extent of the plate. It is found quite sufficient to solder them about one-fourth of an inch from the edges. The solder employed for this purpose is soft solder; and great precaution must be observed that the union at the edges be so close as to prevent any of the liquid with which the cells in the trough are to be filled from entering between the plates; for otherwise the power of its action would be greatly interrupted or perhaps entirely destroyed.

The operation of soldering was performed with considerable difficulty by many workmen; at least, it was found that in many cases the plates were either not in contact when the dimensions were large, or the joints were not perfectly secure. We are not certain in what way this operation is generally performed, but we know that this difficulty has been obviated by the following contrivance. The inside angles on the edges of the plates, that is, on the sides of the plates which are to be united together, are filed away, so that, when the plates are brought into close contact, a triangular groove all round the edge of the pair of plates remains. This groove is filled with solder, and the operation is conducted in the usual way. Plates soldered according to this contrivance have been found to answer the purpose extremely well. But this inconvenience is now rendered less embarrassing since the discovery of rendering zinc malleable and flexible was made, for plates of zinc of this description are of a much more equal thickness, are thinner and smoother, so that the copper can be brought into a closer contact. The plates which have been prepared of malleable zinc have the copper folded over the edge of the zinc plates, and in this way they are secured without difficulty, by soldering.

In whatever way the pairs of plates are to be secured, so that they may remain in close contact, they are afterwards
the plates must be opposed to the surface of a different plate; as, for instance, the zinc surface of one of the plates must be constantly opposite to the copper surface of the next plate in the series. The different troughs thus uniformly arranged, are to be connected together by means of metallic conductors. A slip of copper, for instance, about half the width of the trough, is inserted by its opposite extremities in the cells of the ends of two of the troughs.

When the plates are of a very large size, their weight, with that of the quantity of fluid required to fill the cells, renders the trough very unmanageable. It is then necessary to fix it in a frame of sufficient strength, to support its weight by means of axles of brass or iron, fixed to the outside of the box. By this contrivance the fluid can be easily poured out into a proper vessel placed under the trough.

We shall afterwards speak more particularly of the effects of plates of different extent of surface: here, however, it may be necessary to observe, that in combining together two or more troughs or batteries, to have the full effect of such a number of plates as may be employed, in proportion to the extent of their surfaces, the surface of the plates in each trough should be the same; otherwise, if troughs of different extent of surfaces be employed, the action of that trough which has the largest surface is diminished, and reduced to that of the action of the trough whose plates have the smallest extent of surface. This circumstance is necessary to be attended to, for, if it be overlooked in the construction or combination of different batteries, the effects will be so feeble as to produce disappointment without the cause being known.

In making experiments with the trough, the communication is to be formed between the two extremities, or the circle is to be completed in the same way as has been already directed in the management of the pile. For this purpose there is a projecting piece of wood fixed to the upper edge of each of the ends of the trough; this is perforated so as to admit a piece of wire which passes through to the fluid in the two last cells at the extremity of the trough. If then the wires are placed in this situation, and the moistened fingers of one hand touch the wire at one extremity, while the moistened fingers of the other hand are brought into contact with the wire at the other extremity of the trough, a shock will be felt; and in this way the circle is completed.

The other parts of the apparatus which are necessary to conduct experiments with a trough of this description, are so simple as scarcely to require any particular description. All that is wanted for deflagrating metals is to have a bent wire fixed at one extremity of the trough, and to have a polished plate of copper or zinc communicating with the other extremity of the trough by means of a flexible wire. The metal to be deflagrated is placed upon the bent wire, and the metallic plate is brought into contact with it.

The apparatus for the decomposition of water is the following. A glass tube, $G$, $H$, fig. xi., about three inches long, and $\frac{1}{2}$ inch in diameter, is furnished with a light cork at the upper end $G$, through which cork the wire is communicating with the upper part of the pile, passes. It may be also furnished with a cork at the other extremity $H$, but this must have grooves cut on its sides, to allow the water to escape from the tube. The wire $K$ communicating with the bottom of the pile, passes through this cork; or without the cork at this extremity, if the tube is retained in its perpendicular position by any other contrivance, the wire $K$ may be passed within the tube. When this operation is commenced, the tube is to be filled with waves, the cork at the upper extremity $G$ being made air-tight; and then it is to be inverted, and the extremity $H$ to be placed in a small cup or basin of water; after which the wire $K$ being introduced, the circle is completed between the wires through the medium of the water in the tube, the decomposition of which will go on as long as the communication and the action of the pile are continued. This process will be observed by bubbles of air escaping from one of the wires, and rising to the top of the tube; or if the wires are of gold or of platinum, bubbles of air will be seen passing from the extremity of both wires, and this air collecting at the top of the tube, forces out a quantity of water equal to the space which it occupies. The same experiment may be made by means of a still simpler apparatus. If the wires communicating with the extremities of the pile are introduced into a small glass phial filled with water, and inverted in a basin of water, the same process of decomposition will go on.

But an apparatus which is rather more complicated, but at the same time sufficiently convenient, is usually employed for this purpose. A small brass cup, $E$, fig. 15, is supported by the wire $F$, which is fixed in the hole of the projecting piece of wood $D$, at one end of the trough; from the centre of the cup there arises a pair of brass pincers, which hold a piece of wire of gold or platinum $G$. Over the pincers is placed a glass tube $H$, which has at the upper extremity, $I$, a brass cap, to the inside of which is fixed another piece of wire of gold or platinum. The two wires should be at a little distance from each other, as they appear in the figure. The tube is then filled with water, and is inverted over the pincers in the brass cup, which is also filled with water; and thus, by means of the water in the tube, a communication is formed between the two wires. A wire proceeding from the other extremity of the trough $C$, is connected with the top of the tube $I$, and, as soon as this communication is formed, the process of the decomposition of the waters in the tube commences; for the galvanic circle, or the communication between the extremities of the trough or battery is completed. The gases, as they are disengaged from the wires in the tube, rise to the top, and the water which occupied the space now filled with air, is forced out into the cup. This process goes on as long as the communication continues, or till the surface of the water is lower than the extremity of the upper wire, when the communication is interrupted, and then the operation ceases.

With these observations we conclude what was intended to be said concerning the construction of galvanic apparatus. We shall notice what may be farther necessary to be explained, in the course of the detail which is to be given of the experiments in galvanism, or of the influence of the galvanic fluid on animals, as well as its chemical effects. We, therefore, now proceed, in the following chapter, to the consideration of some of these phenomena.
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Part I.

Effects of

Animals.

It has been already observed, that the first effects of galvanism were exhibited on animals; and indeed it was supposed that these effects could only be exhibited by means of animals; and hence, from the coincidence which was observed with the properties of electricity already known, it was denominated animal electricity.

The first experiments which were made in investigating the nature and properties of the galvanic fluid, were chiefly performed on cold-blooded animals. It was indeed from observing its effects on them, as we shall find afterwards in tracing its history, that the discovery was first made. This discovery was made on the frog, and since that time the frog has been oftener the subject of galvanic experiments than any other animal. From being found in great numbers, from being conveniently got, as well as from the irritability of the muscular fibre, as it is denominated by physiologists, continuing for a long time, it has perhaps become the devoted victim of those investigations.

We have already mentioned a simple experiment with a prepared frog, in which it forms the communication between two dissimilar metals. When the frog, as in fig. 1. is prepared, that is, skinned, and the lower extremities separated from the spine, and suspended on the zinc wire AB, if the extremities of the frog be touched with a different metallic substance, such as gold or silver, while this metallic substance is in contact with the zinc wire at the point D, the limbs of the frog are thrown into convulsions, and this takes place as often as the communication is formed.

Soon after the discovery of Galvani, and after the result of his experiments and opinions on the subject of this discovery was announced to the world, the attention of philosophers became much occupied in repeating and extending these experiments. Among others, Volta, an Italian physiologist, instituted a series of experiments, an account of which was communicated to the French philosophers, who soon after repeated them. As these experiments afford us not only a pretty full view of the effects of the galvanic fluid on animals, but also the state of galvanism at the time, we shall here detail them.

Experiment 1.—When two metallic coatings or slips of metal, the one of lead, and the other of silver, were placed on a frog, fastened to a table, the coating of lead being placed on the belly of the animal, and that of silver on the pelvis, and a communication being formed by means of a slip or wire of copper, strong convulsive motions were produced in the animal.

Experiment 2.—The coating or slip of lead which was employed in the preceding experiment, was removed, and the abdomen was left bare. The copper wire was then applied to the abdomen the same way as before, while its other extremity was in contact with the coating of silver on the pelvis; convulsive motions were still produced, but they were less sensible than in the former experiment, and sometimes did not succeed at all.

Experiment 3.—When two coatings of the same metal were employed, as, for instance, silver or gold, the effects produced by means of copper forming the communication, were found to be much fuller; and when the effects of the coatings were of similar metals, such as copper, lead, Galvanism or tin, and the metal forming the communication was on animals, no effect whatever was produced.

Experiment 4.—By placing the coating on the abdomen in a horizontal direction, so that the points of contact became less numerous, the effects were found to be proportionally diminished; but when the coating was brought into full contact with the surface of the abdomen, it was observed that they became equally powerful as before.

Experiment 5.—A frog was skinned and cut transversely through the middle; the nerves of the thighs were laid bare, joined together, and placed on a slip of gold, while the thighs themselves were in contact with a piece of silver. When the metallic conductor of copper was applied, slight contractions were produced. It was found also that contractions took place when both the coatings were of silver; but when coatings of tin, copper, or lead, were substituted for the silver coating which surrounded the nerves, powerful contractions took place. The gradation observed in the action of the metals, is the following. Lead produced the strongest contractions, next the tin, and lastly the copper; but in proportion as the vitality of the animal diminished, the metals were found also to lose their power of producing motion. The metals which retained this property longest were lead, tin, and zinc.

Experiment 6.—When plumbers lead was employed on each side as a coating, and when the metal forming the communication was the same, no effect was produced; but when lead of different qualities, as, for instance, lead of the assayer and plumbers lead, was used, and the metal forming the communication being either the one or the other, very singular effects took place.

While it was found that these two kinds of lead, by changing the different metals, were no longer susceptible of producing any effect in one of the coatings, silver, gold, bismuth, antimony, or zinc, substituted for the lead, produced very powerful contractions; and what seemed still more singular, when the pieces of lead in the first part of this experiment were re-applied, slight convulsions took place.

Experiment 7.—After a short interruption of the experiments on the same animal, it appeared that it became susceptible of very strong convulsive motions, when the same experiments were repeated.

Experiment 8.—When the galvanic power seemed to be nearly exhausted in the frog, it was found that the different metals, when they produced, by their contact, new convulsions, did not, when this effect could be no longer produced, leave to the animal the power of exhibiting anew any contractions with coatings of the different kinds of lead, as in experiment 6.

Experiment 9.—The following is the gradation of the diminution of effect, till it entirely ceased, when the plumbers lead always formed one of the coatings. With the assayers lead forming the other coating, the action became feeble, and it at last ceased. The next in order was tin, the next antimony, and so on in the order in which they are named as follows: zinc, copper, gold, silver. Iron, it was observed, lost its power of producing any effect before the antimony; but whether it was deprived of this property before lead and tin, was not ascertained.

Experiment 10.
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Part I.

Exper. 10.—Zinc, on losing the property of exciting convulsions in a frog, on which experiments had been made for an hour, was not found susceptible of any farther action, when the communication was formed by means of lead; but it was observed as a very singular circumstance, that contractions were still produced by this metal the moment that the person engaged in the experiment removed the conductor, and interrupted the circuit. This experiment was frequently repeated.

Exper. 11.—The upper part of a frog which was skinned, and divided transversely, had the crural nerves, as in the former experiments, armed with a piece of lead, and placed in a glass filled with water, while the lower part was placed in another glass, also filled with water. Strong contractions were produced when the communication was formed by means of different persons holding each other by the hand, while two of them touched the water in the glasses. One of them held in his hand a piece of metal, which was brought into contact with the coating of lead.

Exper. 12.—When any one individual of the persons who thus formed the chain of communication between the two glasses withdrew himself, so that the communication was interrupted, no effect was perceptible.

Exper. 13.—When the frog was arranged in the same way as in experiment 11, having its parts placed in two glasses, no motion was excited when a communication was established with two fingers; nor was any motion produced, when a person with one hand armed with a piece of metal, touched the body of the frog, while he brought a finger of the other hand in contact with the metallic coating of the crural nerves. But by placing one finger on the inferior part of the frog, be touched with a piece of metal the coatings of the nerves, powerful contractions were produced.

Exper. 14.—When the animal was touched with a metallic substance in an insulated state, no perceptible effect was observed; but when the metals ceased to be insulated, very considerable motions were invariably produced.

Exper. 15.—The fore leg of a rabbit was separated from the body; the brachial nerves were laid bare and armed with a bit of sheet lead. The communication between the lead on the nerve and one of the contiguous muscles was made with a piece of silver, and strong convulsive contractions took place in the limb; but when this experiment was varied, by substituting for the metallic conductors, plumbers and assayers lead, no farther motion was produced. When one of the coatings employed was lead, and the other iron, no perceptible motion was observed. But when lead as one of the coatings, was employed with silver, gold, copper, zinc, or antimony, as the other coating, the motions and contractions of the limb were renewed. The motions were very slight, which were produced by means of a coating of bismuth, along with a coating of lead.

Exper. 16.—This experiment was instituted to ascertain the state of the electricity in the animal which was the subject of it. With this view, the animal was placed in a vessel containing one or two of Coulomb's electrometers, and it was then successively electrified, both positively and negatively; and in both of these cases the balls of the electrometer were so much influenced by the animal, as to shew, not only that its electricity was in a state of perfect rest, both before and during the time of the experiment, but also to exhibit in the system of the body on which the experiment was made, in a very distinct and striking manner, phenomena quite analogous to those of the Leyden phial.

Exper. 17.—The left crural nerve of a living frog was tied with a ligature so strongly, that the animal was deprived of the power of motion in that part of the limb below the point where the ligature was fixed; but when the nerve was armed with a metallic coating, in the way described in the former experiments, and a communication was formed between the part of the nerve above the ligature and the muscle, the motion and contraction of the limb were excited.

Exper. 18.—The ligature was afterwards placed on the left crural nerve, and brought in contact with the muscle. It was also fixed in such a way on the right crural nerve, so that part of it projected: the left part of the animal was then quite paralytic, and without motion, and the convulsive contractions which were produced when the communication was formed, were entirely limited to the right side; but when the same left crural nerve was more completely laid bare, and separated from the muscular substance which surrounded it, its conducting power was restored, and the communication being established, the convulsive motions became very strong. When, however, the ligature was again brought into contact with the muscle, the limb was again deprived of its power of motion.

Exper. 19.—One of the crural nerves of a frog being laid bare, was armed with a piece of sheet lead; and a communication having been formed between this nerve and the other crural nerve, which was unarmed, very strong convulsive motions were produced.

Exper. 20.—When one of the crural nerves was armed with two pieces of lead at different places in its course, and a communication formed between the two parts by a metallic conductor, violent agitations followed. It was observed, too, that the same effects took place, when the whole of the nerve was laid bare, and completely separated from the surrounding muscle.

Exper. 21.—A similar experiment was made on a hot-blooded living animal. The animal selected for this purpose was a guinea pig; but when the communication was established in the usual way, no effect followed, from which any thing precise or satisfactory could be deduced.

With a view to discover during what length of time frogs, which were made the subjects of these experiments, could resist their effects, and retain the power of having motion excited in them, Valli made use of a number of experiments. At 10 o'clock at night he prepared two frogs, which on the following morning at seven o'clock he found had become extremely feeble, but not entirely deprived of the power of motion. Slight convulsions were excited in both by means of the galvanic apparatus; but an hour having elapsed, they ceased to afford any farther symptoms of vitality. No effort that could be made succeeded in producing motion. In other cases he prepared frogs, which by the following morning were found to be quite dry, and then no symptoms of motion could be exhibited. He separated several of the muscles from the body of a frog, and after having torn them, he found it impossible to...
to excite the irritability by any mechanical stimulus whatever; but, after previous preparation, and by means of a metallic conductor, motion was produced.

The same naturalist made a variety of experiments, to ascertain the effects of galvanism on animals which were destroyed with opium, and other narcotic substances; but the results of his experiments on animals to which opium had been exhibited internally, as well as applied externally, were found to be very different from each other. Four frogs were destroyed by means of powdered tobacco, were rendered completely insensible to any mechanical stimulus, and seemed to be in a state of total stupefaction; but by the application of the galvanic apparatus, symptoms of vitality appeared, and slight motions were produced. A number of lizards being poisoned with tobacco, exhibited, at the time of their death, convulsive motions; but they still continued to afford symptoms of vitality and motion on the application of galvanism.

Animals were destroyed in a variety of ways, with a view of ascertaining what were the effects of galvanism, after the principle of life seemed to be extinguished. A small bird, which was for some time immersed in hydrogen gas, or inflammable air, showed no symptoms of vitality or motion; but, on the application of galvanism, convulsive contractions of its limbs were produced. Two kittens were killed in azotic gas, and the fore legs were separated and prepared in the usual way. The same effects were produced as in the experiment with the bird.

Some animals were destroyed with the extract of hemlock; but it did not appear that the effects on the application of the galvanic apparatus were all diminished by means of this poison. In frogs which were exposed to the exhalation of corrupted animal matters, perceptible motions were observed by means of galvanism; but these were very feeble.

Mosquitoes deprived several frogs of life, by placing them in the vacuum of an air pump; and when these were subjected to experiment with the galvanic apparatus, slight motions were produced; but it was observed that these, although they followed each other in rapid succession, were excited with some difficulty. Here it was found that the blood was extravasated in the cellular membrane of the muscles, by which the flesh was tinged with a deep red colour. To this circumstance was ascribed the feeble effects produced in the above experiment, as it was supposed that the blood carried off part of the galvanic fluid, and thus prevented its action on the muscular fibres, through the medium of the nerves. This opinion was supported by another experiment, which was made on prepared frogs, in which there was no extravasation of blood; and in this case the galvanic effects did not seem to be in any degree diminished.

Before proceeding farther with an account of the experiments of the particular effects of galvanism on animals, we shall here relate two of a more general nature, the one with regard to the effects produced by the peculiar application of the metallic conductor, and the other with respect to the velocity of the galvanic fluid being increased, without increasing its intensity.

A difference, which appeared to be a very singular fact, was observed in the mode of applying the metallic conductor, to excite motion in animals by means of galvanism. It was found, that the motions produced effects on the animal by this means were generally more powerful; galvanism was found, when the conductor was applied, first to the muscles, and then to the coating, than if the reverse had taken place; that is, by applying first to the coating, and afterwards to the muscles; and indeed when the galvanic power began to be nearly exhausted, no motion whatever could be excited when the application was made, first to the coating and then to the muscles, while at the same time, by the contrary mode of application, motion could be easily produced.

The other fact alluded to is, that the velocity of the velocity of galvanic fluid may be increased without increasing the degree of its intensity. This was proved by M. Vallis, in the following experiment. By means of a chain, without which was in contact with the nerves of a prepared frog, increase of the chain was increased, and the frog exhibited convulsive contractions, but afterwards remained for some time without motion. When the conductor was removed to a very small distance, motion was again excited in the animal; soon after, however, this ceased. But when an insulated conductor was brought to the muscles of the frog, the motions were immediately renewed; and when they again ceased, a communication being formed between the operator himself and the conductor, the contractions were again excited. The conclusion which he deduced from the above experiment was, that the galvanic influence is constantly the same, however various the modes of its application. The same result, however, he observes, would not be obtained, if the experiment were made on an animal in which the principle of life was in full vigour.

From a number of experiments which were made by the same physiologist, it appeared that certain intervals were necessary, in order to obtain the same intensity of action in animals subjected to the influence of the galvanic fluid. Frogs, mice, rats, and tortoises, were the subjects of these experiments; they were destroyed by means of different poisons, or by respiring some of the noxious gases. In applying the galvanic apparatus to these animals, an interval of several minutes was required, when the motions excited became feeble, or had nearly ceased; and then, after this interval had elapsed, the same effects, and almost equally powerful as before, were produced.

With regard to the conducting power of the blood-vessels, two questions were proposed to Vallis, by Vic. D'Azuy. 1. Whether the blood-vessels are to be considered as conductors of the galvanic fluid. And, 2. Whether, by coating the blood-vessels instead of the nerves, any motion through their medium could be excited? In the solution of these questions Vallis observed, that the blood-vessels are undoubtedly to be considered as conductors of the galvanic fluid; but in whatever way this is affected, it seems to be through the nerves alone, in consequence of the way in which they are disposed, that muscular motion can be excited. The arteries and veins, he farther observes, are to be considered as less powerful conductors than the nerves; for no motion is obtained, if the vessels, without having any communication with the nerves, be distributed directly to the muscles. The tendons also, when the same communication is established, are also conductors as well as the bones, if they have not been deprived of the.
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11. Vallis did not succeed in exciting muscular contraction of the heart by means of galvanism; nor did he succeed in similar experiments made on the stomach, intestines, or bladder, although he armed or applied metallic coatings to the nerves of all these organs.

12. To produce contractions in the wing of a fowl, the nerves of which were coated and previously steeped in oil, very powerful shocks of artificial electricity were found requisite, but the effects of the galvanic fluid did not, by this process, seem to be at all diminished: it retained its whole energy.

Fontanesi’s experiments and investigations on this subject, found, that he could accelerate the motions of the heart, when these motions were going on; and when the motions had ceased, could bring it to produce contractions. By placing the heart between two pieces of metal, zinc and antimony, so that it shall be in contact with both, and then forming a communication by means of a metallic conductor between the two metals, its motions are excited, even after it is separated from the body and cut in pieces. According to the experiment of Marsiglio, part of the heart of a fowl, placed on a piece of charcoal, and another portion put on a plate of pasteboard, covered with tinfoil, gave repeated contractions, and was strongly convulsed.

M. Delamethier made a variety of experiments, at a very early period, on this subject. The following are some of the general results of these experiments.

1. He found that the effects of galvanism in a prepared frog were feeble.

2. That it possesses the greatest intensity at the time when the animal has been just deprived of life; from this he infers, that the intensity of the effect must be greater in the living animal, from which he thinks it follows, that it is only by means of good conductors that the galvaneic fluid can be conveyed from the nerves to the muscles of a frog; and it is by means of the metals, which may vary in the degree of their conducting power, that this communication is established.

3. Plumbago and charcoal were found to be inferior in their conducting power to metallic substances; but by their means the galvaneic fluid could be conveyed from the nerves to the muscles of a frog.

4. He did not find from his experiments that this effect could be produced by forming the communications by means of animal substances; for when a person touched at the same time the nerves and muscles of a frog which had been laid bare, the same effect did not follow.

By Volta, whose name has been already mentioned as the inventor and improver of the apparatus by means of which the galvaneic power could be greatly increased, was the same time, one of the most zealous and the most indefatigable inquirers into its nature and properties. The views which this philosopher entertained with regard to the nature of this fluid, were different from those of Galvani. They are distinguished for their originality, exhibit a train of careful investigation, and have served as an excellent foundation on which the superstructure of galvanism was quickly raised. We shall therefore give a pretty full detail of the experiments and reasonings of this philosopher; and from the importance of his views, which we have stated above, it will not be less acceptable to the reader, if this detail be given, as we propose to do, in his own words. In this, indeed, something of what belongs to the second part of this treatise, will be unavoidably anticipated; but this sacrifice of strict method to perspicuity, will, we are persuaded, be readily admitted as a sufficient apology for this deviation.

To understand clearly the peculiar views which Volta has embraced in the observations which we have now related to, it will be necessary to anticipate a little farther, by stating, that, according to Galvani, the fluid which bears his name is a peculiar kind of electricity, which resides in the organs of the animal, and is essentially inseparable connected with them. But, according to the theory of Volta, the whole phenomena of the galvaneic fluid depend entirely on artificial electricity, which is excited into action, or put in motion, when conductors of a different nature are brought into contact; and these, he thinks, are to be considered as the primary exciters. The motion of this fluid is induced in three different ways, that is, by means of three conductors at least, which are of a different nature, being so arranged as to form the communication or circle. In the first way, two metals or conductors of the first class, of a dissimilar nature, are employed. These are brought directly into contact by one of their extremities; but the communication between the other extremities is established by means of moist conductors, or conductors belonging to the second class. This fluid, put in motion another way, by a single metallic conductor of the first class, placed between two moist conductors of a dissimilar nature, between the latter of which a communication is established. In the third way of exciting the action of this fluid, or putting it in motion, a communication is formed among three conductors; each of which is of a different nature. To illustrate the variety of action observed in these conducting substances, the following account of the experiments of this naturalist, with his views and reasonings, was communicated by him in letters to Gess.
GALVANISM.

Part I.

Effects of Galvanism on Animals.

I explain the phenomenon in this manner according to my principles, and indeed it cannot be explained in any other, as everything tends to confirm my assertion, and to prove it in various ways. The contact of different conductors, particularly the metallic, including pyrites and other minerals as well as charcoal, which I call dry conductors, or of the first class, with moist conductors, or conductors of the second class, agitates or disturbs the electric fluid, or gives it a certain impulse. Do not ask in what manner; it is enough that it is a principle, and a general principle. This impulse, whether produced by attraction or any other force, is different or unlike, both in regard to the different metals and to the different moist conductors, so that the direction, or at least the power with which the electric fluid is impelled or excited, is different when the conductor A is applied to the conductor B, and to another, C. In a perfect circle of conductors, where either one of the second class is placed between two different from each other of the first class, or, contrariwise, one of the first class is placed between two of the second class, a current from each other of the two classes is occasioned by the predominating force either to the right or to the left; a circulation of this fluid, which ceases only when the circle is broken, and which is renewed when the circle is again rendered complete. This method of connecting the different conductors will be more readily comprehended by turning to the figures, where the capital letters denote the different conductors or exciters (moteurs) of the first class, and the small letters those of the second class. Fig. 3. and 4. express the two cases above mentioned.

I consider it as almost superfluous to observe, that when the circle consists merely of two kinds of conductors, however different or however numerous the pieces may be of which each consists, two equal powers are opposed to each other; that is, the electric fluid is impelled with equal force in two different directions, and consequently no stream can be formed from right to left, or, contrariwise, capable of exciting convulsive movements.

There are other cases, however, and other modes of combination, where the powers are equally in equilibrium, and where no current of the electric fluid can take place; or, at least, none of such a force as to make an impression on the tenderest nerves, or to excite any convulsive movement in the best prepared frog that may be placed in the circle, notwithstanding the intervention of two or more different kinds of metals. This is the case when each of these metals is placed between two moist conductors, or of the second class, and which are very nearly of the same kind; or when, in a circle of three pieces, two of them of the same metal, and one of a different metal, are so connected, that the latter is immediately between the other two.

When one of the ends of a piece of metal, which is a conductor of the first class, is immediately applied to another of the same class, but, instead of immediately touching with the other end, the other piece touches an intermediate conductor of the second class, either great or small, either a drop of water, a piece of raw or boiled flesh, or of sponge not moist, paste of meal, jelly, soap, cheese, or the white of an egg boiled to hardness; in this new combination, where a conductor of the second class is between two of the first class, the powers are no longer opposed to each other; and this is sufficient to determine an electric stream. When, therefore, a piece of a conductor of the second class, as a piece of meat, is placed as the conductor of the second class, it will always be violently agitated as often as this circle is made complete.

It may be readily perceived that the two last experiments coincide with those announced by M. Humboldt, where a drop of water, a small bit of fresh meat, or a very thin stratum of any fluid, performs the whole wonder. When another drop of water, or any other aqueous conductor, is applied between the other end of the first conductor and the other corresponding piece, each piece of metal is insulated, as I shall express it, between two aqueous conductors; but then the powers from right to left, and from left to right, are again completely opposed to each other; consequently the electric stream is impeded, and the frog remains without any movement. It is, therefore, absolutely necessary that two different metals or conductors of the first class, should be in immediate contact with each other, on the one side, while with their opposite ends they touch conductors of the second class.

We might consider this mutual contact of two different metals as the immediate cause which puts the electric fluid in motion; instead of ascribing that power to the contact of the two metals with the moist conductors. Thus, for example, in fig. 3, instead of admitting two different actions, at least, in regard to the magnitude of the power, one where B comes in contact with a, and another where A comes in contact with a also, by which an electric current arises in the direction from A to B, we might suppose only one action at the point where B comes in contact with A, which impels the fluid in that direction. In both suppositions the result, as may easily be seen, is the same. But though I have reasons for adopting the first as true rather than the second, yet the latter represents the proposition with more simplicity, and it may be convenient to adhere to it in the explanation, as it affords a reader view of it. We may then say, that in the cases above stated, no effect will be produced, because there is no mutual contact of different metals; the effect also will be null, when a conductor of the first class, on two opposite sides, is in contact with two others of the same class; for the actions therefore are in equilibrium; and, lastly, that an electric current will be occasioned by the action which arises from the contact of conductors of the first class, and which is counteracted by no other contact of the like kind.

Having seen the result of employing three pieces of metal, or conductors of the first class, viz. two of one kind and one of a different, when combined sometimes in one way and sometimes in another, with conductors of the second class, we shall now try what will be the result, according to my principles, with four pieces of metal, two of which are of one kind, for example, zinc, when connected with moist conductors of different kinds.

I shall first observe, that when they are connected in a circle, the powers which endeavour to put the electric fluid in a streaming movement, will be opposed to each other, and in perfect equilibrium, and that consequently no movement can take place in the frog, here supposed to be the moist conductor a, or a part of it, however irritable and well prepared it may be.
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between the two pieces A, Z (fig. 16.), that is, between two different metals, a drop of water, or a small bit of moistened sponge, or a thin stratum of any fluid, soup, or any other viscid matter, will be quite sufficient, as has been already observed. This surprising experiment I generally make in such a manner, that, instead of the piece of the metal, I employ a cup or spoon filled with water, and then cause the person who holds the perfectly dry and pure stick of tin, to touch with the stick sometimes the perfectly dry sides of the spoon or cup, and sometimes the water contained in them. It is wonderful to see, that, as by the latter method, the violent agitation of the frog never ceases, the first method, which corresponds with fig. 14., does not produce the least irritation; unless by accident there be a small drop of water, or a thin stratum of moisture, at the place of contact, by which the case represented fig. 16. would be restored. This may serve to shew with what care and attention the experiment must be made, in order to guard against error or deception, which might so easily arise; and every where exhibit anomalies.

When I introduce water or any other moist body, great or small, not merely between one pair of metallic pieces, A, Z, as fig. 16., but between two pairs, as represented fig. 20., each piece of metal is between like fig. 20. moist conductors, and by these means all the actions are again rendered contrary, or brought into equilibrium; or, according to the other mode of viewing the matter, there is no longer any action, for want of the mutual contact of two different metals, which, as we have seen, is certainly necessary to excite an electric current: and it is always found that the frog experiences no agitation.

I shall not enlarge farther on these combinations, which may be varied ad infinitum with a greater number of metallic pieces, and by which one may be enabled to foretell the phenomena which, according to my principles, will always be found to take place. It will be sufficient, for the present, to draw this conclusion, that in a circle consisting merely of two conductors, however different they may be, their mutual contact can produce no electric stream sufficient to excite sensibility, or muscular movement; and that, on the contrary, this effect infallibly follows as often as the chain is formed of three conductors, one of one class, and two different from each other of another class, which come into mutual contact with each other, and that this effect will be stronger, the greater the difference is between the latter; that in other cases, where there are more than three different conductors, the effect either is not produced, or will be produced in different degrees, according as the forces called forth by the different combinations, which will be expanded at each heterogeneous contact, and which are often in opposition, and endeavour to impel the electric fluid in opposite directions, are perfectly in equilibrium with each other (which must be a very rare case), or when the sum of those which exert themselves in one direction is more or less exceeded by the sum of those which act in another direction.

I shall here, however, leave the two complex combinations, and return to the simple cases, those with three different conductors, represented by fig. 3., which are more demonstrative; or, in other words, those with two...
two different metals or conductors of the first class, which are in contact with each other, and are applied on the other side to moist conductors, or conductors of the second class. This method has been commonly employed since Galvani's discovery, and is in exact proportion with the diversity of metals, on which I consider the whole phenomena to depend.

The other method of combination, which is expressed by fig. 4, or that of a metal placed between two different moist conductors, for example, between water on the one side, and an aqueous, saponaceous, or saline fluid on the other, I discovered in the autumn of 1794, and though since that period I have repeated the much varied experiments of different persons, both foreigners and others, among which was that of Humboldt, and though I wrote to several correspondents respecting it, that light has not yet been thrown on this new phenomenon which it seems to deserve.

The singular circumstance before mentioned, in regard to the acid taste when the tongue is brought into contact with an alkaline liquid, belongs, as you may perceive, to this second method of exciting the electric fluid, and putting it in circulation (if the tin vessel be touched on the outside by the hand moistened with water, and on the inside by the alkaline liquor), and shows that this current is no less strong and active than that excited by the first method, viz. by employing two sufficiently well-chosen metals, such as lead and copper, iron and silver, zinc and tin. I must here observe, that though with tin alone, placed between water and an alkaline liquor, you obtain nearly the effect which is produced by two of the most different metals, as silver and zinc, combined with any conductor whatever of the second class; you can obtain the same, and even in a higher degree, with iron alone or silver alone, when the iron is introduced between water on the one side and nitrous acid on the other, or when the silver is applied between water and a solution of sulphur or pot-ash.

If you take a frog, the head of which has been cut off, and which has been deprived of all life by thrusting a needle into the spinal marrow, and immersing it, without skinnin, it, taking out the bowels, or any other preparation, into two glasses of water, the lump into one, and the leg into the other as usual, it will be strongly agitated and violently convulsed, when you connect the water in both glasses by a bow formed of two very different metals, such as silver and tin or lead, or, what is better, silver and zinc; but this will by no means be the case when the two metals are less different in regard to their powers, such as gold and silver, silver and copper, copper and iron, tin and lead. But what is more, the effect will be fully produced on this so little prepared frog, when you immerse in one of the two glasses the end of a bow merely of tin or zinc, and into the other glass the other end of this bow, which has been rubbed over with a little alkali. You may perform the experiment still better with an iron bow, one end of which has been covered with a drop or thin coating of nitrous acid; and beyond all expectation, when you take a silver bow having a little sulphur of potash adhering to the end of it.

Fig. 21. represents the form of this experiment, where $g$ is the frog; $a, a$, the two glasses with water; $d$, the bow formed of one single metal, and $m$ the drop.

or a thin stratum of a mucous, saline, &c. fluid, with which the bow has been rubbed over, and which on this side is between the metal and the water.

The very considerable difference in regard to the quantity of effect in the before-mentioned experiments already shews, that if the electric stream excited by contact is strongest towards a certain metal, when that metal is placed between a certain fluid on the one side, and another fluid on the other, there are other fluids which produce a greater effect with another kind of metal; so that it will be necessary to discover by experiment the particular arrangement of conductors suited to each metal, in which the fluids or conductors of the second class must be disposed according to their activity. I have paid great attention to this circumstance, and have formed several tables, which I shall publish as soon as I have brought them to perfection.

I shall here, however, only observe, that in order to class, in some manner, the innumerable different moist conductors of this kind, I distinguish them into aqueous, spirituous, mucous, and gelatinous, saccarine, saponaceous, saline, acid, alkaline, and sulphurous (livers of sulphur) liquids; that I make subdivisions in the acids down to the best known simple mineral acids, (as I find in this respect great difference between the nitrous and the muriatic acids), corresponding to the principal vegetable acids and the acids of gall, and do the same in regard to the saline fluids, according as they are solutions of neutral salts, earthy salts, and particularly metallic salts.

When it can be determined in what order all these kinds of fluids follow each other, in regard to the power in question, for the metal $A$, and another for the metal $B$, &c. we shall then be in a condition to determine what place must be assigned to a great number of other heterogeneous fluids, whether mineral, vegetable, or animal, which belong to several of the above classes. In general, the order for the greater part of the metals hitherto observed is as follows: 1st, pure water; 2d, water mixed with clay or chalk (which shows a pretty different effect when the before-mentioned experiment is made with two glasses, a bow of tin or zinc, and a properly prepared frog, which has a sufficient degree of vitality); 3d, a solution of sugar; 4th, alcohol; 5th, milk; 6th, mucilaginous fluids; 7th, animal gelatious fluids; 8th, wine; 9th, vinegar, and other vegetable juices and acids; 10th, saliva; 11th, mucus of the nose; 12th, blood; 13th, brains; 14th, solution of salt; 15th, soap-suds; 16th, chalk-water; 17th, concentrated mineral acids; 18th, strong alkaline leys; 19th, alkaline fluids; 20th, livers of sulphur. With some metals there is, however, a considerable deviation from this order, in regard to livers of sulphur, alkaline fluids, and the nitrous and saline acids.

As to the metals, which in their position between these different fluids are either more or less proper for the electric effect in question, I have found in general, that tin exceeds all others, and that silver is the worst, except when one of the fluids by which the silver is placed is water, or any other aqueous conductor, and the other liver of sulphur: in this case silver far exceeds zinc, and even tin. Iron also produces a much greater effect than any other metal, when it is in contact, on the one side, with mere water or an aqueous conductor,
Tained liquid liver of sulphur; and in that case the acid taste would be pretty strong.

The electric fluid is excited also with the greatest strength and activity, when the metal is tin, between water and a saline fluid; but it will be excited with still greater energy to produce an acid sensation on the tongue when the tin is between water and an inimical mucilaginous fluid; or when the experiment is made with a tin basin filled with a solution of gum, liquid glue, white of an egg, &c. The other metals, in like circumstances, produce some effect, but much weaker: silver produces the weakest, except with liver of sulphur, as I have already observed.

A like experiment, which I made three years ago, and exhibited to various persons, not with two different fluids and one metal, as in that above described, but contrariwise, with two metals of a different kind and a fluid, is already known. I took a basin of tin (one of zinc is better), placed it on a silver stand, and filled it with water. When any of the persons in company applied the tip of his tongue to the water, he found it perfectly tasteless as long as he did not touch the silver stand; but as soon as he laid hold of the stand, and grasped it in his hands well moistened, he experienced on the tongue a very perceptible and pretty strong acid taste. This experiment will succeed, though the effect is proportionally weaker, with a chain of several persons who hold each other's hands, after they have been moistened with water, while the first applies the tip of his tongue to the water in the basin, and the last lays hold of his hands of the silver stand.

If these experiments, in regard to the taste excited on the tongue by the action of two different metals, are striking, the others, in regard to the taste excited, modified and changed by one metal between two different fluids, are no less so, and they are also newer. They are still interesting on this account, that they discover to us the cause of that taste often perceived in water and other liquids, which is more or less considerable or various when drunk from vessels of metal, and particularly of tin. When the outer extremity of the vessel is applied to the under lip, rendered moist by the saliva, and the tongue is extended so as to be in contact with the water, beer, wine, &c. in the vessel, or when the tongue is bent as is done in drinking, is there not then a complete circle, and is not the metal between two more or less different liquids, that is, between the saliva of the under lip and the liquor in the cup or vessel? A stronger or weaker electric stream must thereby be occasioned, according as the fluids are different—a stream which will not fail in its way to affect the sensible organs of the tongue in the said circle.

Besides the two methods already considered, of producing an electric current, that is, by means of one or more moist conductors, or conductors of the second class, placed between two different metals or conductors of the first class; or contrariwise by means of a conductor of the first class placed between two of the second class, also different; there is still a third method of exciting the electric fluid, though in a degree so much weaker, that it is scarcely capable of causing convulsions in a perfectly prepared frog, in which there is still a strong degree of vitality. This new method consists in forming the circle of three different conductors, all of the second class, without the intervention of one of the first or a metal one. Some think they find in this method a strong objection against my principle.

Fig. 22. represents this third method compared with the other two. In the experiments of Professor Vallis, respecting which so much noise has been made without any reason, t represents the leg of the frog, and particularly the hard tendinous part of the musculus gastrocnemius; m the rump, or the muscles of the back, or the ischiatic nerves, to which the said tendinous parts are applied; and \( a \) the blood, or the viscous serous or saline fluid, applied to the point of contact.

I have fully described this new method, where no metal is used, in my third and fourth letter to Professor Vassali, written in the autumn and winter of the year 1795. I have there shewn, that these new facts, far from altering my ideas and principles, serve rather to establish them; and that they render more general the principle that the conductors, by heterogeneous contact, that is, of two different from each other, become ex- citers of electricity, and confirm the beautiful law arising from it, that to produce an electric current, the circle must necessarily be formed of three different conductors. You now see in what the whole secret, the whole magic consists; and that it depends not merely on metals, as might have been believed, but on all the different conductors. As long as we adhere to these principles, it will be easy to explain all the before-mentioned experiments without being reduced to the necessity of having recourse to any imaginary principle, or any peculiar and active electricity of the organs. By their assistance you will be enabled to invent new experiments, and to foretell the result of them, as I have several times done, and still do daily. If you, however, abandon these principles, you will find nothing but uncertainty and contradiction, and the whole will be an inexplicable problem.

Some new facts, he observes in a farther communication, lately discovered, seem to show that the immediate cause which excites the electric fluid, and puts it in motion, whether it be an attractive or a repulsive power, is to be ascribed much rather to the mutual contact of two different metals, than to their contact with moist conductors. But, though it cannot be denied, that in the latter case there exists an action, it is proved that it exerts itself in a far more considerable degree when the two metals mutually touch each other. There arises by the mutual contact, for example, of silver and tin, an action or power by which the former communicates the electric fluid, and the latter receives it; or the silver suffers it to escape, and the tin attracts it. This produces, when the circle is rendered complete by moist conductors, a stream, or continual circulation of the fluid. When the circle is complete, there is an accumulation in the tin at the expense of the silver; which indeed is very small, and far under the point necessary to enable it to announce itself by the most delicate electrometer. I have however been able, by the assistance of my condenser, constructed on a new plan, and still better by Nicholson's doubler, to render it very perceptible: I shall here communicate the result obtained by my experiments, which I made some time ago with great satisfaction.

**Experiment I.** The three plates of the doubler are of brass. I took two strong wires, one of silver and the
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hot-blooded animals, but succeeded in producing muscular contractions in part of a frog, after an hour had elapsed from the time that the natural motions had ceased. He made a similar experiment on the heart of a cat which had been drowned in warm water, and he found that in this case the motion of the heart could be excited by means of galvanism; but when the animal was drowned in cold water, no effect could be produced.

It was another object of his investigations, to ascertain the effects of galvanism on the organs of the senses. The disagreeable taste which remains on the tongue, when two dissimilar metals, the one placed on the upper surface, and the other touching the under surface, are brought into contact, has been already taken notice of, and the method of applying the metals particularly described. The strongest impression, it was observed, was produced, when gold and zinc were employed. He introduced a metallic substance of a different kind into each ear, and having formed a communication between them, he experienced a shock in the head when these two metals were brought into contact. A bit of tinfoil was placed on the point of the tongue; the rounded end of a silver pencil case was applied to the internal angle of the eye; and when the other extremity of the pencil case and the tinfoil on the tongue were brought into contact, he perceived a flash of pale light, as well as the metallic taste in the tongue which is produced in a preceding experiment. The flash seemed most vivid when gold and zinc were employed. A similar effect is produced by introducing one of the metals between the upper lip and the gum, and the other between the under lip and the gum, and retaining them in this position to bring the edges in contact; or, by inserting one of the metals into the nose, and placing the other on the tongue, to form the communication between them.

Similar experiments were made by the late Professor Bebiscus of Edinburgh. He particularly observed that the effects of the galvanic fluid were more sensibly felt when one of the conducting metals was placed on a wound, or on the nerve of a carious tooth. From the peculiar impression on the tongue on the application of gold or silver trinkets, he could ascertain whether any solder was employed about them.

In another experiment the same philosopher seemed to think that he had proved that the effect was produced even before the metallic conductors were brought into direct contact. A piece of zinc was introduced between the gums and cheek on one side of the head, and a piece of silver was placed in the same way on the other side of the head. A rod of zinc was then applied to the zinc piece, and a rod of silver to the silver piece on the different sides of the head; the extremities of these rods which projected from the mouth were then cautiously brought into contact; and, as soon as this was completed, a strong sensation was produced in the gums. But before the direct contact was made between the extremities of the rods, he perceived a flash of light which was repeated when the rods were again separated to a small distance from each other. It is scarcely necessary to add, that when the arrangement of the rods was reversed, the effects ceased; that is, when the zinc rod was substituted for the silver rod, and the silver one for that of zinc.

To the account of the experiments on animals now given, which were chiefly made on cold-blooded animals, we shall now add those of Aldini, the nephew of Aldini's Galvani, which were made on the body of a man executed in London for murder. This man, who was executed on the 17th January 1832, was 26 years of age, of a male constitution. The body was exposed for an hour to a temperature two degrees below the freezing point Fahrenheit, at the end of which it was conveyed to a house not far distant, where the apparatus for the experiments had been arranged. The following is the account of these experiments in the author's own words.

Experiment 1.—One arm being applied to the mouth, and another to the ear, wetted with a solution of muriate of soda (common salt), galvanism was communicated by means of three tongues combined together, each of which contained 40 plates of zinc, and as many of copper. On the first application of the area the jaw began to quiver, the adjoining muscles were horribly contorted, and the left eye actually opened.

"Exper. 2.—On applying the arc to both ears, a motion of the head was manifested, and a convulsive action of all the muscles of the face; the lips and eyelids were also evidently affected, but the action seemed much increased by making one extremity of the arc to communicate with the nostrils, the other continuing in one ear.

"Exper. 3.—The conductors being applied to the ear and to the rectum, excited in the muscles contractions much stronger than in the preceding experiments. The action even of those muscles furthest distant from the points of contact with the arc was so much increased as almost to give an appearance of reanimation.

"Exper. 4.—In this state, wishing to try the power of ordinary stimulants, I applied volatile alkali to the nostrils and to the mouth, but without the least sensible action; on applying galvanism great action was constantly produced. I then administered the galvanic stimulus and volatile alkali together; the convulsions appeared to be much increased by this combination, and extended from the muscles of the head, face, and neck, as far as the deltoid, the effect in this case surpassed our most sanguine expectations, and vitality might, perhaps, have been restored, if many circumstances had not rendered it impossible.

"Exper. 5.—I next extended the arc from one ear to the biceps flexor cubiti, the fibres of which had been laid bare by dissection. This produced violent convulsions of all the muscles of the arm, and especially in the biceps and the coraco brachialis, even without the intervention of salt-water.

"Exper. 6.—An incision having been made in the wrist, among the small filaments of the nerves and cellular membrane, on bringing the arc into contact with this part, a very strong action of the muscles of the forearm and hand was at once perceived. In this, as in the last experiment, the animal moisture was sufficient to conduct the galvanic stimulus without the intervention of salt-water.

"Exper. 7.—The short muscles of the thumb were dissected.
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Dissected, and submitted to the action of the galvanic apparatus, which induced a forcible effort to clench the hand.

**Exper. 8.**—The effects of galvanism in this experiment were compared with those of other stimulants. For this purpose, the point of the scalpel was applied to the fibres, and even introduced into the substance of the biceps flexor cubiti, without producing the slightest motion. The same result was obtained from the use of caustic volatile alkali and concentrated sulphuric acid. The latter even corroded the muscle, without inducing it to action.

**Exper. 9.**—Having opened the thorax and the pericardium, exposing the heart in situ, I endeavoured to excite action in the ventricles, but without success. The arc was first applied upon the surface, then in the substance of the fibres, to the carnea columnae, to the septum ventriculorum, and lastly, in the course of the nerves by the coronary arteries, even with salt water interposed, but without the slightest visible action being induced.

**Exper. 10.**—In this experiment the arc was conveyed to the right auricle, and produced a considerable contraction, without the intervention of salt water, but especially in that part called the appendix auricularis; in the left auricle scarcely any action was exhibited.

**Exper. 11.**—Conductors being applied from the spinal marrow to the fibres of the biceps flexor cubiti, the gluteus maximus, and the gastrocnemius, separately, no considerable action in the muscles of the arm and leg was produced.

**Exper. 12.**—The sciatic nerve being exposed between the great trochanter of the femur and the tuberosity of the ischium, and the arc being established from the spinal marrow to the nerve divested of its theca, we observed, to our astonishment, that no contraction whatever ensued in the muscles, although salt water was used at both extremities of the arc. But the conductor being made to communicate with the fibres of the muscles and the cellular membrane, as strong a motion as before was manifested.

**Exper. 13.**—By making the arc to communicate with the sciatic nerve and the gastrocnemius muscle, a very feeble action was produced in the latter.

**Exper. 14.**—Conductors being applied from the sciatic to the peroneal nerve, scarcely any motion was excited in the muscles.

**Exper. 15.**—The sciatic nerve being divided about the middle of the thigh, on applying the conductors from the biceps flexor cruris to the gastrocnemius, there ensued a powerful contraction of both. I must here observe that the muscles continued excitable for seven hours and a half after the execution. The troughs were frequently renewed, yet towards the close they were very much exhausted. No doubt, with a stronger apparatus we might have observed muscular action much longer; for, after the experiments had been continued for three or four hours, the power of a single trough was not sufficient to excite the action of the muscles: the assistance of a more powerful apparatus was required. This shows that such a long series of experiments could not have been performed by the simple application of metallic coatings. I am of opinion that, in general, these coatings, invented in the first instance by Galvani, are passive. They serve merely to conduct the fluid pre-existent in the animal system, whereas, with the galvanic batteries of Volta, the muscles are excited to action by the influence of the apparatus itself.

From the above experiments there is reason to conclude,

1. That galvanism, considered by itself, exerts a considerable power over the nervous and muscular systems, and operates universally on the whole of the animal economy.

2. That the power of galvanism, as a stimulant, is stronger than any mechanical action whatever.

3. That the effects of galvanism on the human frame differ from those produced by electricity communicated with common electrical machines.

4. That galvanism, whether administered by means of troughs or piles, differs in its effects from those produced by the simple metallic coatings employed by Galvani.

5. That when the surfaces of the nerves and muscles are armed with metallic coatings, the influence of the galvanic batteries is conveyed to a greater number of points, and acts with considerably more force in producing contractions of the muscular fibre.

6. That the action of galvanism on the heart is different from that on other muscles. For, when the heart is no longer susceptible of the galvanic influence, the other muscles remain still excitable for a certain time. It is also remarkable that the action produced by galvanism on the auricles is different from that produced on the ventricles of the heart, as is demonstrated in experiment the tenth.

7. That galvanism affords very powerful means of resuscitation in cases of suspendedanimation under common circumstances. The remedies already adopted in asphyxia, drowning, &c. when combined with the influence of galvanism, will produce much greater effect than either of them separately.

Excepting the experiments of Aldini which we have just detailed, the greater number of those of which an account has been given, it has been already observed, were made on cold-blooded animals, and besides, the apparatus usually employed, was a single galvanic combination. After the construction of the pile was known, and still more so after batteries in the form of troughs were invented and employed, very different effects were exhibited on the animal body, both in the dead and living state.

With batteries composed of 200, 300, or 400 pairs of plates arranged in troughs, very powerful shocks will be felt when the circle is completed between the extremities of the battery by means of the two hands of any person, so that the fluid shall pass through the body. This experiment may be performed by touching with one hand wetted, a wire connected with one extremity of the battery, and with the other hand also moistened a wire proceeding from the other end of the battery. Every time that the contact is made a shock is felt. The effect will be more powerful if round balls of brass having brass rods attached to them after being well wetted, be placed in the palms of the hands also well wetted, and a communication be established between the ends of the battery. The same effect is produced when the circle is completed by means of a number of persons joining hands together; but it must be observed, that each person must take care to have the
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The hands well moistened, otherwise the intensity of the shock will be greatly diminished, or its effect entirely obscured. No experiments have been made, so far as we recollect, to ascertain with any degree of precision, how far the intensity of the shock is diminished by increasing the number of persons composing the circle of communication, or whether, indeed, when the experiment is made with the requisite degree of caution and attention, it suffers any diminution.

It has been observed by some, (and so far as we can judge from our own feelings in numerous experiments made with a pile composed of 60 pairs of plates, or with a trough of 50 pairs, and sometimes with two and four troughs of 50 pairs each combined, the observation which we have made coincides with that of others), that the shock from the galvanic battery possessed some peculiarity, by which the sensation it excited was much more disagreeable than a shock of artificial electricity which seemed to be of no greater intensity. But it must be allowed, that in the comparison of experiments of such delicacy, the result of which depends on the feelings, great ambiguity must prevail; and therefore, when the comparison is unavoidably so inaccurate, it can afford no precise conclusion.

The sensation is extremely unpleasant when the shock of galvanism, even when it is very slight, passes through the fingers, if they have been scratched or wounded.

A slight shock directed through the head between the temples, produces the sensation of a flash of light before the eyes, and an irresistible contraction of the muscles of the upper eyelids, so that the person who is the subject of the experiment involuntarily winks every time that the circle is completed. This experiment, which should be repeated with caution, is performed in the following manner: Place a bit of tin-foil which will adhere by wetting with water to the part to which it is applied, on each temple. Then having formed the communication between one end of the trough and one temple by means of a metallic conductor, flat like a small button, in that part which touches the tin-foil; this is retained in contact with the tin-foil by an assistant; and by means of another assistant, another similar conductor is applied to the tin-foil on the other temple. Things being thus arranged, the wire connected with the latter, is by the operator brought in contact with the other extremity of the battery, or with that part of it to which the extent or intensity of the shock is to be limited. Every time that this contact is repeated, the sensation of the flash of light, and the other effects, are produced. It has been hinted above, that this experiment should be performed with caution. Not more than from 12 to 20 pairs of plates should be employed, at least on those on whom the effects of a small number have not been previously tried; and perhaps with that number, at least in the experiments of this kind which we have seen made, there are not many persons who would choose to have them repeated on themselves. But these effects, it may be added, will be more or less powerful in proportion to the period that the battery has continued in action with the same fluid.

A battery composed of 200 pairs of plates will produce strong contractions in the limbs of a fowl or rabbit, which has been recently killed. These effects may be conveniently exhibited by introducing one of the conducting wires, by means of a hook, into the mouth, or fixing it about the back part of the head of the animal, and fixing a similar hook from another wire connected with the other end of the battery near the rump, so that the current of galvanic fluid shall pass through the body. When the communication between the extremities of the battery is formed, the convulsive motions of the limbs of the animal take place, and are repeated as often as the circle is completed. Similar effects are produced on a dog or sheep; but to induce strong convulsions in the larger animals, a more powerful apparatus must be employed. It will be necessary to put in action a battery consisting of at least 300 or 400 pairs of plates arranged in troughs.

With a battery of such extent and power, the convulsive motions produced on the limbs of horses that were subjected to its action, were so strong that they could scarcely be resisted by the strength of two persons.

The head of an ox, soon after it was separated from the body, and while it was yet warm, was acted on by six batteries, amounting to about 300 pairs of plates. Strong convulsive motions were produced; the eyes opened, and the pupils were greatly dilated; the ears were also put in motion; and the tongue, drawn out and fixed to the table with an iron skewer which entered the wood above half an inch, was retracted with such force as to detach itself from the skewer which was thrown to some height into the air.

It has been said that the motions thus induced on the limbs of animals by means of galvanism, resemble the convulsive motions of epilepsy. Perhaps the motions of animals during the struggles of death may be considered as nearly similar. Whether this be so or not, we have observed that the convulsive contractions of animals subjected to galvanism, greatly resemble the peculiar motions of each animal in the struggles of death. This observation, however, only extends to what has happened to fowls, rabbits, and sheep; but so far as it goes, it has been allowed by those to whom we have remarked the circumstance to be pretty correct.

With these observations we conclude this long detail of the effects of galvanism on animals. This seemed to be necessary in order to give the reader a distinct view of what may be considered as the dawn of this department of science; for as we have already hinted, the experiments and investigations of naturalists were at first limited to its effects on animals; and from their labours an immense body of facts were accumulated before its chemical effects were much known or distinctly ascertained. We now therefore proceed to the consideration of the chemical effects of galvanism. These shall be the subject of the next chapter.

CHAP. III. Of the Chemical Effects of Galvanism.

In the account we propose to lay before our readers, of these effects of the galvanic fluid which are to be considered as more strictly chemical, we shall first state more generally some of the experiments by means of which these effects are illustrated, and describe the method of performing them, and then enter into a more particular detail of the experiments of different philosophers.
Part L

GALVANISM.

Chemical Effects.

But if the wires terminating in the tube be of brass or iron, or any metal which is easily oxidized, only one of the gases is collected in the tube; the other (the oxygen) combines with the metal, forming an oxide, which collects on the point of the wire.

By a very simple contrivance these gases may be collected separately. With this view two tubes in which the conducting wires terminate, are employed. These tubes being filled with water, must be inverted in the same basin of water, the latter of which forms the communication between the extremities of the battery.

Other fluids, as oil, alcohol, ether, and ammonia in solution, may be also decomposed by a similar process. For the decomposition of oil, alcohol, and ether, the pieces of charcoal may be immersed in vessels containing these liquids; and, when they are brought into contact, the decomposition is effected, with the formation and evolution of carbonic acid gas, which is seen rising in bubbles to the surface.

Exper. 4.—By means of galvanism, and with a battery of moderate power, metals may be precipitated from their solutions in acids. The apparatus to be employed for this purpose is similar to that for the decomposition of water, and the tube is filled with a solution of the metallic salt. The communication being then established, the metal is precipitated, and appears in an arborescent form on the point of the wire. In this way the acetate of lead, or sugar of lead, the nitrate of silver, and many other metallic salts, may be revived.

Many other curious and amusing experiments might have been related, but what we have now given will enable the reader to have a distinct notion of the chemical effects of galvanism. Many other of the chemical effects of the galvanic fluid are so closely connected with the peculiar views and theories of those who have discovered and observed them, that we shall not enter into any detail of them till we come to consider that part of the subject. In the mean time we shall occupy the remaining part of the present chapter with an account of some of the experiments on the chemical effects of galvanism which were observed by philosophers in the earlier part of its progress.

Mr Cruickshank, the inventor of the galvanic trough, very early directed his attention to this inquiry, and prosecuted it with great ardour and success. In one of his early communications on this subject we have a comprehensive view of some of the chemical phenomena of galvanism. We shall, therefore, give it in his own words.

I shall not, says he, give any particular account of the apparatus employed, being a pile, and not differing materially from that in use. I shall only just observe, that it was composed of pieces of zinc and silver, of about 1.6 inches square, and that the number of each employed in the following experiments varied from 40 to 100, according to the power required.

I found that a solution of the muriate of ammonia answered better for moistening the interposed papers than common water.

When the machine was in full action, sparks which were perfectly visible in the day time, could be taken at pleasure, by making a communication in the usual way between the extremities of the pile, and a small report or snap could be heard; the shock given at that time was very strong, and a gold-leaf electrometer, placed in the circle of communication, was very sensibly affected: these circumstances, some of which, I believe, have been already ascertained by Messrs. Nicholson and Carlisle, shew the strong resemblance of this influence to electricity. These gentlemen have likewise discovered that galvanism decomposes water with much greater facility than electricity, but with phenomena somewhat different.

Exper. 5.—A quantity of common water was introduced into a glass tube, being confined at each end by corks, but perfectly at one by a cement of rosin and beeswax; pieces of silver wire were passed through the corks, and brought within an inch of each other in the fluid, their other extremities being at the same time connected with those of the machine or pile, one with the lower zinc plate, and the other with the upper silver plate. In future, to avoid circumlocution, I shall call the wire attached to the silver plate, the silver wire, and the other the zinc wire. The tube was then placed upright in a cup containing water, with the unconnected end downwards. As soon as the communication was made between the extremities of the pile by the wires, a quantity of small air bubbles began to ascend from the end of the wire connected with the silver, as observed by Messrs. Nicholson and Carlisle; but a white cloud at the same time made its appearance at the one proceeding from the zinc, or the zinc wire. This cloud gradually increased, and assumed a darker colour, and at last it became purple, or even black. A very few air bubbles were likewise collected upon and ascended from this wire, but when the machine was in full force, a considerable stream could be observed.

The gas was collected, and found to be a mixture of hydrogen and oxygen, in the proportion of three parts of the former to one of the latter. No great dependence, however, was placed upon this in point of accuracy. The zinc wire was found to be much corroded, and looked as if a considerable portion of it had been dissolved. As the cloud which was formed around this wire became purple on exposure to the light, I suspected it might be luna cornes, or muriate of silver precipitating from the silver, which had been somehow dissolved, and afterwards precipitated in this state, by the muriatic salts in the common water. This led to the following experiments:

Exper. 2.—The glass tube was now filled with distilled water, to which a little tincture of litmus was added; when the communication was made by the wires as in the former experiment, a quantity of gas arose from both wires, but in the greatest quantity from that connected with the silver. In a few minutes a fine red line, extending some way upwards, was perceived at the extremity of the zinc wire; this increased, and in a short time the whole fluid below the point of this wire became red; the fluid, however, above the silver wire, looked of a deeper blue than before, the slight tinge of purple being destroyed.

Exper. 3.—I next filled the tube with distilled water, tinged with the tincture of Brazil wood; it was no sooner placed in the circle of communication, than the fluid surrounding the silver wire, particularly towards its extremity, became purple, and this tinge increased so fast, that the whole fluid surrounding this wire, and occupying the upper part of the tube, soon assumed as deep a colour, as could be produced by ammonia.

The portion of the fluid in contact with the zinc wire...
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History. the changes in the state of the electricity in the atmosphere; but after a repetition of the experiments he found that he was mistaken. He discovered, however, at last, after many ingenious experiments, that he could at pleasure produce the convulsions, by touching two different parts of the animal, each with a piece of metal, and then bringing these pieces of metal into contact. The experiment may be made in the following manner. Let the cranial nerve of a frog be laid bare about an inch in extent; let a piece of zinc be placed in contact with the nerve, and let a piece of silver be placed on the muscles with which the nerve communicates. Then bring the zinc and silver into contact, and the whole limb will be instantly thrown into convulsions.

After Galvani had published his experiments, the convulsions thus excited were ascribed to the action of some unknown fluid, to which the name Galvanism was given, or Animal Electricity. According to Galvani, a fluid is secreted in the brain, the same with the nervous fluid; but being analogons to common electricity, might with more propriety be termed animal electricity. The conductors of this fluid are the nerves. It is carried off by them as it is secreted, and deposited on the interior surface of the muscular fibres, which being non-conductors of the fluid, do not permit it to pass through them. The state of the muscular fibres exactly resembled that of a charged Leyden jar. Their inner surface is electrified positively, and the outer surface is electrified negatively. The communication between the exterior and interior surfaces of the muscular fibres is formed by the nerves. They convey the redundant electricity from the internal to the external surface, and, like the effect of the electrical stimulus, every discharge is attended with a muscular contraction.

On the other hand Volta, another philosopher who carried his researches far into this subject, and of whose experiments and views we have given a long detail, adopted a different opinion. He thought that the convulsions occasioned by the galvanic apparatus were entirely independent of the action of the nervous fluid, and were to be ascribed to common electricity excited by the metallic conductors which are employed. These different opinions were supported with much ingenuity in a controversy which commenced between Galvani and Volta. The writers on galvanism divided themselves into two parties. While one party maintained with Volta, that the phenomena were owing to the action of common electricity on the muscular fibres, another party thought that they were entirely dependent upon something peculiar to animal matter. By many this seemed to have been considered as the nervous fluid, which was supposed to be the same with, or analogous to, common electricity.

It had been long asserted, that porter, and some other liquors, drunk out of a pewter pot, had a different taste from what it has when drunk out of glass or earthen ware. Pure mercury, it has been observed, retains its metallic splendour for a long time; but when amalgamated with any other metal, it is soon tarnished or oxidized. The Etruscan inscriptions on pure lead are in good preservation to this day; whereas some medals of lead and tin, of no great antiquity, are much corroded, and works of metal, whose parts are soldered together by the interposition of other metals, soon tarnish about the places where the different metals are joined. When the copper sheathing of ships is fastened on by means of iron nails, the nails, but particularly the copper, are readily corroded about the place of contact. A piece of zinc placed in water for a considerable time scarcely undergoes any change; but if a piece of silver happen to touch the zinc whilst it is in the water, it is soon corroded or oxidized.

In the course of a very few years after the publication of Galvani's discovery, a great number of writers appeared, and presented to the world a great body of facts which they had ascertained by experiments and observations. The following are among the most important: 1. When a piece of metal is placed on the muscle of an animal just dead, and still moist, and another piece of a different metal is placed on the nerve which leads to the muscle, or on another part of the muscle, and if the two pieces of metal be brought into contact, a contraction or convolution of the muscle takes place. 2. A single piece of metal, or two pieces of the same metal, have no effect in exciting contraction of the muscle. It is necessary to have two perfect conductors of electricity in contact, before any convolution can be produced. 3. The muscle must be moist. The effect is not prevented by a ligature on a nerve; but the susceptibility of a muscle to be thrown into convulsions is diminished, and at last destroyed, by the application of opium, which destroys irritability. The same change takes place if the muscle be allowed to remain for some time after death. 4. The different muscles of the body are differently affected by the galvanic influence. They are not equally susceptible of the same degree of convulsive effect. 5. If a plate of zinc be placed on the upper surface of the tongue, and a plate of silver or copper be applied to its under surface; and if the two pieces of metal thus placed be brought into contact, a strong metallic taste is immediately perceived. An acid taste is perceived, when the tongue is dip into an alkaline solution contained in a tin or zinc cup held in the moist hand. 6. If a piece of metal, as a silver spoon, be placed on the ball of the eye, and another piece of a different metal, as a piece of zinc, be placed on the tongue, and if the two pieces of metal be brought into contact, a flash of fire is instantly perceived; and it is perceived, both when the metals are brought into contact, and when they are separated. 7. Another fact, which was ascertained by Aldini, who performed a great many experiments in galvanism during his visit to this country, is, that convulsions may be excited merely by forming a proper chain of muscles and nerves. This is proved by the following experiment. He took a prepared frog, and held it suspended in one hand by the foot. The sciatic nerves were brought into contact with the tongue of an ox, the head of which had been recently separated from the body. He then introduced the other hand moistened with a solution of common salt in water into the ear of the animal, thus completing the circle. Every time that the communication was formed, the muscles of the frog were thrown into convulsions.

Most of the facts which we have now related, were ascertained by the different philosophers, whose researches were directed to the subject of galvanism between the years 1791 and 1794. Hitherto the connection between galvanism and animal bodies was considered by most
most writers, so close and intimate, that they supposed the one could not exist independent of the other. Some facts, however, which were established by Fabroni and others, seemed to favour the opinion of those who considered galvanism as the action of a peculiar fluid on the animal fibre. This fluid is developed by the mutual action of the metals employed as exciting causes, and it exists in other bodies as well as in those which are endowed with life. We have already mentioned that two pieces of different metals put into water produced changes on the water, which neither of them separately could effect. This was observed by Fabroni, from which he concluded that a chemical change was effected by the metals on each other. To this change he supposed part at least of the phenomena of galvanism was owing.

Thus explained the necessity of two different metals and of moisture in the production of these phenomena. Those metals, he also observed, which occasioned the most rapid changes on each other in water, were most powerful in exciting galvanic convulsions.

Metals and charcoal, it was ascertained by Volta, being good conductors of electricity, attract and repel that fluid with different forces. When two different metals in their natural state of electricity are brought into contact, electric matter passes from the one to the other; the one becomes electrified positively, and the other negatively. From this he concluded, that the electricity which occasioned the galvanic phenomena did not reside in the animal fibres, but in the metals employed as exciters, and that the convulsions were produced by the electric matter passing through these fibres.

The seeming inconsistency which appeared in the opinions of Volta and Fabroni was removed by succeeding discoveries, which demonstrated that both electricity and chemistry were concerned in the galvanic phenomena. Galvanism was no longer considered as something connected with living matter, which was totally inexplicable, but as something developed by the mutual action of inorganic substances on each other, the effect or energy of which might be estimated and measured by its action on the muscular fibres. The discovery of the galvanic pile by Volta put it in the power of philosophers to increase the power or energy of the galvanic influence at pleasure. This pile, and the method of constructing it, have been already described.

A description has also been given of a different apparatus, the invention of Mr Cruickshank of Woolwich, which has been employed in place of Volta's pile. This is called the galvanic trough, and it consists of a number of square plates of different metals in the other, which are soldered together in pairs, and fixed by means of cement in a box of baked wood, at a small distance from each other.

A striking analogy was at once observed between this apparatus and charged electrics. A great deal of discussion took place on the subject; much investigation followed; and philosophers held different opinions concerning the phenomena of galvanism, whether it was to be considered as the same with common electricity, or as something specifically different.

It was at last ascertained by Nicholson and Carlisle, that the zinc end of the pile was in the state of positive electricity, and the silver or copper end in the negative state. The zinc end of the pile, then, according to the commonly received theory of electricity, gives out the electric fluid, which enters at the silver or copper end. And if the circle be completed by means of metallic wires or charcoal, when the pile is sufficiently powerful, sparks similar to what take place by the discharge of common electricity may be perceived. Electric batteries have been charged by means of the pile; metallic wires, tin-foil, gold leaf, are burnt; and mixtures of hydrogen and oxygen gas are exploded in the same way as happens when electric discharges are made to pass through them. From the whole of the phenomena, there seems now to be little doubt of the identity of the two fluids.

Chemistry, however, has a very considerable share in the phenomena of galvanism. The action of the pile is most powerful in oxygen gas: it ceases entirely in the vacuum of an air-pump, or in astatic gas. The electrical machine also, it has been ascertained, cannot be excited in any gas unless it contain oxygen; and it seems probable, that the effect of the amalgam, which is employed in exciting the electrical machine, bears a proportion to the facility or rapidity of its oxidation. But we shall discuss this point more fully in the second chapter.

When the action of the pile has continued for some time, it gradually becomes weaker, till at last its energy is entirely lost. This power can only be renewed by cleaning the plates, the surfaces of which have been very much changed. It was observed that the time in which the action of the pile ceased, was in proportion to the energy which it originally possessed. When it was strongest, the duration of its action was shortest. It was observed also, that one of each pair of plates was covered with a coat of oxide; and when this process of oxidation was finished, and the surface of the plate was entirely covered, the action ceased. Of the two metals employed in the construction of the pile, that which is most easily oxidated, always undergoes this process. When zinc and silver, or zinc and copper, are used, the zinc is always oxidated; and unless this oxidation take place, there is no action of the pile. Its action or energy is proportional to the oxidation of the metal; and thus it appears that this oxidation is essentially necessary to the action of the pile. For, unless the liquid which is employed to moisten the pieces of card or cloth between the pairs of plates, or that which fills the cells in the trough, be capable of oxidating the zinc, no action follows. There is no action at all with silver and zinc, and perfectly pure water. In vacuo the action of the pile soon ceases, even with common water; for the oxygen which is held in solution by the water soon combines with the zinc, and then the process stops. The action is increased by oxygen gas, because the oxidation of the zinc is facilitated. Its action is also increased, and goes on even in vacuo, when nitric acid, which supplies oxygen for the process of oxidation, is substituted for the water. Thus, by estimating the proportion between the oxidation of the metals and the action of the pile, it may be determined what metals are proper for forming piles, and with what liquids they may be employed. In the choice of the different metals, it must be observed, that one of them must always be more easily oxidated than the other. Two perfect conductors which are unequally oxidable, with an imperfect
perfect conductor which is capable of oxidizing the most oxidizable of the perfect conductors, constitute the elements of the galvanic battery.

But some of the most important phenomena of galvanism are exhibited in its chemical effects. Most of these were first observed by the chemical philosophers of this country. We have already detailed many of the experiments by which these effects are illustrated; and we shall here only, for the sake of giving a connected view of this subject, merely recapitulate some of them.

When water forms part of the circle between the extremities of the battery, and the conducting wires are brought within a small distance of each other, being immersed in a glass of water, the water is decomposed, and it will be recollected that the phenomena are different according to the nature of the wires employed. When the wires are of gold or platinum, they undergo no change; oxygen gas is evolved in small bubbles from the positive wire, and hydrogen gas from the negative wire; and if the gases be collected separately by the apparatus formerly described, they are found to be in the proportions of the component parts of water. If one of the wires be immersed in one glass, and another into a separate glass, by completing the circle with a finger plunged into each glass, the process goes on, and the hydrogen gas is extricated in the one vessel, while the oxygen is given out from the wire in the other. This fact was first discovered by Mr Davy. When spring water is used, or water having azotic gas in solution, an acid is formed at the extremity of the positive wire, and an alkali at the extremity of the negative wire. The acid was found to be nitric, and the alkali ammonia. If the wires be plunged in different glasses, and the connection be formed by means of an animal body, the positive wire produces in the water tinged with an infusion of litmus, a red colour, while the negative wire also reddens an infusion of brazil wood.

If other wires besides those of gold or platinum be used, it is found that the positive wire undergoes oxidation, but little or no gas is separated from it; while the negative wire, as in the former case, gives out hydrogen gas. When the wires are immersed in metallic solutions, as acetate of lead, nitrate of silver, &c. the silver or lead is revived, and deposited on the negative wire; and if solutions which contain sulphuric, nitric, or oxymuriatic acids, are used for the immersion of the conducting wires, the acids are decomposed, oxygen gas is evolved from the positive wire, and sulphur or hydrogen gas makes its appearance at the negative wire. The decomposition of ammonia has already been mentioned. This was discovered by Mr Henry. The hydrogen is given out by the negative wire, while the azotic gas is evolved by the positive wire. When plumbago or charcoal are employed as conductors in place of metals, it is found that carbonic acid is evolved from the positive end, and hydrogen gas from the negative.

It may be necessary here to describe a galvanic battery, constructed by Mr Davy, on principles somewhat different from that of Volta. In the Voltiac pile there are two perfect conductors, and one imperfect conductor; but this consists of two imperfect, and one perfect conductor: the two imperfect conductors are nitrous acid and liquid sulphuret of potash. A trough is divided into cells with slips of horn and plates of zinc, arranged alternately; nitrous acid is poured into the first cell, and sulphuret of potash into the second; the two liquids being separated by the slip of horn, a communication is formed between them by means of a moist piece of cloth laid over the horn, and in the same way the rest of the cells are filled. In this case the liquids are the imperfect conductors, and the zinc is the perfect one; and the action of the battery continues till the oxidation of one of the surfaces of the zinc takes place, the other surfaces remaining unchanged.

Having finished the short view which we proposed to give of the history and progress of galvanism, we should next proceed to detail some of the later experiments and discoveries which have been made on this subject. What we here chiefly allude to, is the discovery of the formation of muriatic acid and soda by means of the galvanic fluid. But this is proposed to be the subject of a separate chapter. We shall therefore proceed in the next chapter to consider the hypothesis by means of which the phenomena of galvanism have been explained, and to point out the analogy between electricity and galvanism.

Chap. II. Of the Theory of Galvanism, and the Analogy between the Galvanic Fluid and Electricity.

We have already observed that the philosophers who were occupied in researches on galvanism, early divided themselves into two parties. According to one party, with Volta at their head, the phenomena of galvanism were ascribed to the action of common electricity on the muscular fibres; while another party maintained the opinion that they depended entirely on something peculiar to animal matter. This was the opinion of Galvani himself, the original discoverer, and it was supported by his nephew Aldini, with certain modifications. The greater number of philosophers have now adopted the opinion of Volta, as being more consistent with the phenomena. We shall therefore now give a more particular account of the hypothesis which has been more generally followed in explaining these phenomena on the principles of electricity.

According to the received principles of electricity, there is a subtile fluid which exists in all bodies; but the existence of this fluid can only be recognised when the proportion which a body contains is greater or less than the quantity which is natural to it. When the quantity is greater than usual, the body is said to be electrified positively or plus; and when the quantity is less than usual, the body is said to be electrified negatively or minus. The electric fluid penetrates certain bodies, and passes through them with facility, and these bodies are called conductors of electricity; but there are other bodies which it cannot pass through without difficulty, these bodies are called non-conductors or electrics. Of conductors there are two kinds; one of which is denominated perfect, because the electric fluid passes through them with ease; the other is called imperfect conductors, because the fluid passes through them with difficulty. The perfect conductors are solid bodies which are susceptible of oxidation; and when they enter into combination with oxygen, they lose their properties as perfect conductors. The metal and charcoal are
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effect.

In the same way the chemical changes which are effected by means of galvanism may be explained. Let it be supposed, that a gold wire, connected with the upper plate of the battery, terminates in a glass of water, and another gold wire, from the lower plate of the battery, terminates in the same water. The circle is then completed by the gold wire, which is a perfect conductor. The current of electricity passes through the wire which is connected with the uppermost plate to the base of the battery, and it would pass uninterruptedly, if there were no interval between the wires. This interval is supplied with water, and, when the electric fluid reaches the extremity of the wire, it must pass through the water, but it can only pass through an imperfect conductor when it is in combination with hydrogen. It therefore combines with the hydrogen of the water, which is accordingly decomposed at the point of the wire. The oxygen is disengaged, and the hydrogen in combination with the electricity passes through the water till it reach the point of the other wire; and the affinity between this wire and the electric fluid being greater than the affinity of the latter for water, the electric fluid enters the wire, and passes on to the other end of the battery; but the hydrogen is previously separated from the extremity of this second wire, in the form of gas, because the fluid cannot enter the wire in combination with hydrogen.

If the wires are immersed in ammonia, the hydrogen is derived from that substance of which it forms one of the component parts; the azotic gas, the base of which is another constituent, is evolved at the extremity of the first wire, and hydrogen gas at the extremity of the second. But, if the wires are plunged in the water which contains common air, and consequently a certain portion of azote, as oxygen gas combines with azote in its nascent state, or at the moment of its evolution, the compound resulting from this combination is nitric acid. Hydrogen gas also, in its nascent state, will combine with azote, and ammonia is the result of this combination. Hence it is, that in some experiments nitric acid is found at the point of the positive wire, and ammonia at the point of the negative wire, when common water is employed.

When liquids holding in solution a metallic salt, the base of which is an oxide of the metal, are employed; as hydrogen gas possesses the property of reducing or reviving metals, if in its nascent state it comes in contact with their oxides, the metallic salts are in this case decomposed, and the metal is revived. It is found deposited on the negative wire. When copper or iron wires are employed to complete the circle, instead of wires of gold or platinum, as oxygen has the property of combining with these metals, at the moment of its disengagement, it is deposited on the positive wire, and in this case none is separated from it; but if the circle be completed by means of charcoal or plumbago, and the interval between these conducting substances be water, carbonic acid gas is separated from the positive conductor, because the oxygen in its nascent state is susceptible of combination with carbone; and the hydrogen in the same state combining with carbone, carbureted hydrogen is given out by the negative conductor.

Such is the hypothetical explanation which has been given of the action of galvanism, and the phenomena which it exhibits. A fuller view of the analogy between galvanism and electricity has been given by Dr. Wollaston.

"Notwithstanding, he observes, the power of Mr. Volta's electric pile is now known to be proportional to the disposition of one of the metals to be oxidized by the fluid interposed, a doubt has been entertained by many persons, whether this power arises from the chemical action of the fluid on the metal, or, on the contrary, whether the oxidation itself may not be occasioned by electricity, set in motion by the contact of metals that have different conducting powers.

"That the oxidation of the metal is the primary cause of the electric phenomena observed, is, I think, evolved to be inferred from the following experiments, which exhibit the galvanic process reduced to its most simple state.

"Exper. 1.—If a piece of zinc and a piece of silver have each one extremity immersed in the same vessel, containing sulphuric or nitric acid diluted with a large quantity of water, the zinc is dissolved, and yields hydrogen gas, by decomposition of the water; the silver, not being acted upon, has no power of decomposing water; but, whenever the zinc and silver are made to touch, or any metallic communication is made between them, hydrogen gas is also formed at the surface of the silver.

"Any other metal besides zinc, which by assistance of the acid employed is capable of decomposing water, will succeed equally, if the other wire consists of a metal on which the acid has no effect.

"Exper. 2.—If zinc, iron, or copper, is employed with gold in diluted nitric acid, nitrona gas is formed, in the same manner, and under the same circumstances, as the hydrogen gas in the former experiment.

"Exper. 3.—Experiments analogous to the former, and equally simple, may also be made with many metallic solutions. If, for instance, the solution contains copper, it will be precipitated by a piece of iron, and appear on its surface. Upon silver merely immersed in the same solution, no such effect is produced; but as soon as the two metals are brought into contact, the silver receives a coating of copper.

"In the explanation of these experiments, it is necessary to advert to a point established by means of the electric pile.

"We know that when water is placed in a circuit of conductors of electricity, between the two extremities of a pile, if the power is sufficient to oxidize one of the wires of communication, the wire connected with the opposite extremity affords the hydrogen gas.

"Since the extrication of hydrogen, in this instance, is seen to depend on electricity, it is probable, that in other instances, electricity may be also requisite for its conversion into gas. It would appear, therefore, that in the solution of a metal, electricity is evolved during the
Part II. Galvanism.

The action of the acid upon it; and that the formation of hydrogen gas, even in that case, depends on a transition of electricity between the fluid and the metal.

"We see, moreover, in the first experiment, that the zinc, without contact of any other metal, has the power of decomposing water; and we can have no reason to suppose that the contact of the silver produces any new power, but that it serves merely as a conductor of electricity, and thereby occasions the formation of hydrogen gas.

"In the third experiment also, the iron by itself has the power of precipitating copper, by means, I presume, of electricity evolved during its solution; and here likewise the silver, by conducting that electricity, acquires the power of precipitating the copper in its metallic state.

"The explanation here given receives additional confirmation from comparative experiments, which I have made with common electricity; for it will be seen that the same transfer of chemical power, and the same apparent reversion of the usual order of chemical affinities in the precipitation of copper by silver, may be effected by a common electrical machine.

"The machine with which the following experiments were conducted, consists of a cylinder seven inches in diameter, with a conductor on each side, 16 inches long, and three and a half inches diameter, each furnished with a sliding electrometer, to regulate the strength of the spark received from them.

"Exper. 4.—Having a wire of fine silver \( \frac{1}{10} \) of an inch in diameter, I coated the middle of it for two or three inches, with sealing wax, and by cutting through in the middle of the wax, exposed a section of the wire. The two coated extremities of the wire, thus divided, were immersed in a solution of sulphate of copper, placed in an electric circle between the two conductors; and sparks, taken at \( \frac{1}{10} \) of an inch distance, were passed by means of them through the solution. After 100 turns of the machine, the wire which communicated with (what is called) the negative conductor, had a precipitate formed on its surface, which, upon being burned, was evidently copper; but the opposite wire had no such coating.

"Upon reversing the direction of the current of electricity, the order of the phenomena was of course reversed; the copper being shortly re-dissolved by assistance of the oxidizing power of positive electricity, and a similar precipitate formed on the opposite wire.

"Exper. 5.—A similar experiment made with gold wires \( \frac{1}{10} \) of an inch diameter, in a solution of corrosive sublimate, had the same success.

"The chemical agency, therefore, of common electricity, is thus proved to be the same with the power excited by chemical means; but, since a difference has been observed in the comparative facility with which the pile of Volta decomposes water, and produces other effects of oxidation and de-oxidation of bodies exposed to its action, I have been at some pains to remove this difficulty, and can at least produce a very close imitation of the galvanic phenomena, by common electricity.

"It has been thought necessary to employ powerful machines, and large Leyden jars, for the decomposition of water; but when I considered that the decomposition must depend on duly proportioning the strength of the charge of electricity to the quantity of water, and that the quantity exposed to its action at the surface of communication depends on the extent of that surface, I hoped that, by reducing the surface of communication, the decomposition of water might be effected by smaller machines, and with less powerful excitation, than have hitherto been used for that purpose; and, in this hope, I have not been disappointed.

"Exper. 6.—Having procured a small wire of fine gold, and given it as fine a point as I could, I inserted it into a capillary glass tube; and after heating the tube, so as to make it adhere to the point and cover it in every part, I gradually ground it down, till, with a pocket lens, I could discern that the point of the gold was exposed.

"The success of this method exceeding my expectations, I coated several wires in the same manner, and found, that when sparks from the conductors before-mentioned were made to pass through water, by means of a point so guarded, a spark passing to the distance of one-eighth of an inch would decompose water, when the point exposed did not exceed \( \frac{1}{100} \) of an inch in diameter. With another point, which I estimated at \( \frac{1}{100} \), a succession of sparks \( \frac{1}{100} \) of an inch in length, afforded a current of small bubbles of air.

"I have since found, that the same apparatus will decompose water, with a wire \( \frac{1}{100} \) of an inch diameter, coated in the manner before described, if the spark from the prime conductor passes to the distance of \( \frac{1}{100} \) of an inch of air.

"Exper. 7.—In order to try how far the strength of the electric spark might be reduced by proportional diminution of the extremity of the wire, I passed a solution of gold in \( \text{aqua regia} \) through a capillary tube, and, by heating the tube, expelled the acid. There remained a thin film of gold, lining the inner surface of the tube, which, by melting the tube, was converted into a very fine thread of gold, through the substance of the glass.

"When the extremity of this thread was made the medium of communication through water, I found that the mere current of electricity would occasion a stream of very small bubbles to rise from the extremity of the gold, although the wire, by which it communicated with the positive or negative conductor, was placed in absolute contact with them. Hence it appears, that decomposition of water may take place by common electricity, as well as by the electric pile, although no discernible sparks are produced.

"The appearance of two currents of air may also be imitated, by occasionsing the electricity to pass by fine points of communication on both sides of the water; but, in fact, the resemblance is not complete; for, in every way in which I have tried it, I observed that each wire gave both oxygen and hydrogen gas, instead of their being formed separately, as by the electric pile.

"I am inclined to attribute the difference in this respect to the greater intensity with which it is necessary to employ common electricity; for, that positive and negative electricity, so excited, have each the same chemical power as they are observed to have in the electric pile, may be ascertained by other means.

"In the precipitation of copper by silver, an instance of de-oxidation (or phlogistication) by negative electricity has been mentioned; the oxidizing power of po-
Galvanism.

The following experiments made by Mr Cuthbertson, with galvanic batteries, are supposed to him to afford a distinguishing property between the galvanic and electric fluids. 1. Charcoal was degalvanized and ignited for above an inch in length. 2. Iron wire $\frac{1}{2}$ inch diameter was melted into a ball of $\frac{1}{2}$ inch diameter. 3. Platinum wire $\frac{1}{2}$ inch diameter, was melted into a ball $\frac{1}{2}$ inch diameter. 4. Brass wire $\frac{1}{2}$ inch diameter, three-fourths of an inch in length was ignited. 5. Brass wire $\frac{1}{2}$ inch diameter was red hot at the end. 6. Iron wire $\frac{1}{2}$ inch diameter was red hot for .6 inches in length. 7. Iron wire 1.2 inches degalvanized, and melted into a ball. 8. Iron wire six inches in length was degalvanized. 9. Iron wire eight inches in length was ignited.

The first seven experiments above were made with two troughs, each containing 30 pairs of plates, six inches square, but in the last two experiments, one of these troughs only was used. The conclusion drawn from the four last experiments is, that double quantities of galvanic fluid only burn double lengths of wire, and not the square, as electrical discharges do.

To discover what quantity of coated glass would be required to take a charge sufficient to ignite the same 355 lengths of wire, the two last experiments were compared with common electrical discharges. Two jars, each containing about 170 square inches of coating, were set to the conductor of a 24 inch single plate electrical machine, with the author's universal electrometer, loaded with 31 grains. Eight inches of the same kind of wire were laid in the circuit, and with 57 revolutions of the plate the electrometer discharged the jars, and the wire was ignited as perfectly as in experiment 9th. Afterwards six inches of the wire being laid in the circuit, a discharge was produced with the same number of revolutions of the machine, and the wire was degalvanized, and fused into balls, in the same manner as in the 8th experiment. Hence he concluded, that 340 square inches of coated glass, properly constructed, are sufficient to bear a charge equal to a galvanic battery of 1080 square inches of surface. On comparing the above experiments with some others made some time before, the author finds it necessary to modify the conclusion which he had deduced from them. With a pile of 15 pairs of plates, of 10 inches diameter, eight of which were laid upon each other in the usual manner, and cloths moistened with diluted mariaic acid interposed, he burnt half an inch of wire of $\frac{1}{2}$ inch diameter; and when the other eight pairs were added, he burnt four inches of the same wire. This was repeated with the eight in pairs with the same result, with respect to the burning of metals, but it gave strong and loud sparks from metal to metal, which might be heard at the distance of 300 yards. This result, he observes, had not been attained from troughs, to be heard at any distance. In the last experiment the cloths were moistened with a strong solution of muriate of ammonia. Comparing this effect of the pile and the trough, Mr Cuthbertson thinks there is some defect in the arrangement or construction of the latter.

In many experiments which Volta made on piles composed of a single metal, and a single wet stratum,
GALVANISM.

Some of the most curious phenomena which have yet been exhibited in galvanism, relate to the formation of muriatic acid by means of this power. In the account which has been given of Mr Cruickshank's experiments, it will be recollected that he made the discovery of the formation of an acid and alkali, during the action of the galvanic battery. This acid, he concluded, was the nitric, and the alkali, ammonium. The theory of the production of these substances in the galvanic pile has been already mentioned, and it corresponds with the explanation of the principles which have been adopted for explaining the phenomena of galvanism; later researches, however, have been conducted with more accurate observation, or have opened a wider field of discovery. The truth of this remark will be fully confirmed, if it be at last finally ascertained, that common salt, the component parts of which are muriatic acid and soda, is produced by the action of galvanism.

The first hint of this discovery was given by Mr Peel of Cambridge, in a letter dated April 1805, addressed to the editor of the Philosophical Magazine, from which the following account is given in his own words: "I took (says he), about a pint of distilled water, and decomposed one half of it by means of galvanism; the other half I evaporated, and I found to remain at the bottom of the glass a small quantity of salt, which upon examination I found to be muriate of soda, or common salt.—What induced me to try the experiment was this: I knew that when water was decomposed by means of galvanism, the water near one of the wires had alkaline, while that near the other had acid properties. This being the case, I inferred, that if an alkali and an acid were really produced, I should, by decomposing a large quantity of water, obtain a small quantity of some kind of neutral salt: as was actually the case on trying the experiment. The salt could not have been contained in the water before I made the experiment, because I used every precaution to have it free from impurities. I even took the trouble to repeat the experiment, though a tedious one, and I again obtained the same result." He adds, that a similar experiment being repeated by a friend of his, afforded a similar result.

It having been suggested to Mr Peel, that it might be worth while to vary the experiment, by employing water formed of its elements, he gives the following account of the result of this process, in another letter, dated June 1805.

"Having proceeded, he observes, to the formation of water from its elements, with which to repeat my former experiment, I found when the oxygen and hydrogen gases were quite pure, and exactly in due proportion, that no residue of air was left, and that the water formed was not in the slightest degree acidulous. When the process was not conducted with great accuracy, or any precaution to have it accurate was omitted, I then found the water acidulous, and the acid that caused this acidity to be the nitric acid.

"The acidulous water thus obtained I neutralized with lime, from which I distilled the water, and this water I decomposed by the galvanic process, as in the experiment detailed in my former letter.

"I did not imagine the using water so obtained could make the least difference on the result of the experiment; but as a wish was expressed to have the trial made, I again undertook that interesting but very tedious labour.

"When I came to examine the residuum, to my great astonishment I found that not muriate of soda, but muriate of potash, was produced. I must own I feel myself entirely at a loss how to account for this, nor shall I attempt it; all I can say is, that this, as well as my former experiment, was conducted with the greatest care and accuracy that I could bestow.

"About the same time a discovery of a similar nature was made by Professor Pacchioni of Pisa. This discovery, which relates to the composition of muriatic acid, was first announced in this country in the number of the Edinburgh Medical and Surgical Journal, published the 1st July 1805. The following is an account of his experiments, and the conclusions which he deduces from them in his own words. "The simplicity of the apparatus, (he says), and of the means adopted to attain my views, the care with which I endeavoured to avoid every source of error, have, I hope, sufficiently secured me against those illusions which frequently deceive young men ardent in the pursuit of science, and even those practised in the art of extorting from nature her secrets. Want of time prevents me from relating the series of experiments by which I arrived at the discovery I have mentioned; but you may see it by perusing the manuscript of my memoir, which will be immediately published, to submit my researches and their results to the judgment of the learned. For the present, I shall select from the experiments and facts therein described those which are decisive, and which establish, in an evident manner, the following truths:—

I. Muriatic acid is an oxide of hydrogen, and consequently composed of hydrogen and oxygen.

II. In the oxygenated muriatic acid, and therefore, a fortiori, in muriatic acid, there is a much less proportion of oxygen than in water.

III. Hydrogen is susceptible of very many and different degrees of oxidation, contrary to what is universally believed by pneumatic chemists, who assert that hydrogen is susceptible only of one invariable degree of oxidation, that in which it forms water.

Having at first examined the phenomena of the decomposition of water by the galvanic pile, and having, by accurate experiments, ascertained the true theory,
GALVANISM.

Part II.

Formation of Galvanic Acid nor soda was formed in this experiment.

Some other experiments made with the same view have also failed; but according to De Buch, certain precautions seem to be necessary in conducting this experiment, which, if overlooked, cannot be expected, he thinks, to be followed with success. For the particulars of these, see Phil. Mag. xxiv. 244. For an account of the analogy between the peculiarities of structure of the torpedo, by which it is enabled to give electric shocks, and the galvanic battery, see TORPEDO; and for a full detail of the chemical effects of Galvanism, see ZINC. See also the article GALVANISM in the Supplement.

The following facts, which seem to extend the analogy of galvanism with electricity on the one hand, and with magnetism on the other, were omitted in the preceding treatise.

Ritter, one of the most indefatigable philosophers, in prosecuting experiments and inquiries on this subject, has succeeded in charging a piece of money with the galvanic fluid, and with some of the phenomena of galvanism can be exhibited. To effect this, he places a lousi d'or between two pieces of pasteboard, thoroughly wetted, and keeps it for six or eight minutes in the chain of circulation connected with the pile. In this way the lousi becomes charged, without being immediately in contact with the conducting wires. If this lousi be afterwards applied to the crural nerves of a frog, recently prepared, the usual contractions will be produced. It is found that the charge is retained, in proportion to the time that the piece has remained in

The circuit of the pile. Some have retained it for five minutes. Ritter has also discovered, that the piece of Murastic gold thus galvanised, exerts at once the action of two metals; the half next the negative pole, while in the circle, became positive, and the half towards the positive pole became negative. He also tried the effect of golden needles charged with galvanism, and balanced on a pivot, and he perceived, to his surprise, that these needles had a certain dip and variation—that the angle of variation was uniformly the same, differing, however, from that of the magnetic needle, and that the positive pole always dips.

Nicholas prove, should be fully ascertained, there is an obvious analogy, not only between electricity and galvanism, but also between the latter and magnetism.

A galvanic pile has been constructed by Dr Baronio of Milan, entirely of vegetable matters. For this purpose he cuts discs of horse radish and beet root, of two inches in diameter. He then prepared equal discs of walnut tree wood; the latter discs were raised at their edges, to contain a little solution of acetic acid or tannate of potash in vinegar, in which they had been previously boiled to free the wood from resin. Sixty pairs of discs were employed in the following order; viz. horse radish, beet-root, discs of wood, in each of which the solution was put. The spinal marrow of a prepared frog was connected with the pile, by means of a leaf of cochinellaria: the muscles of the frog were connected with the top of the pile by means of a double band of gray paper wetted with vinegar, and as often as this circuit was completed, contractions were excited in the animal.

GALWAY. Galway.

GALWAY, or GALLOWAY, a county of Ireland, which is 76 miles in length, and 40 in breadth, bounded by the counties of Clare, Tipperary, King's County, Roscommon, and the sea. The river Shannon washes the frontiers of the county, and forms several miles in length. This county contained 142,000 inhabitants in 1792. It sends two members to the imperial parliament. See GALWAY, Supplement.

GALWAY, a town of Ireland, in the county of the same name, and province of Connaught, of which it is the capital. It is seated on the bay of Galway on the western ocean, 96 miles west of Dublin, and in W. Long. 8° 58', N. Lat. 53° 15'. It is surrounded with strong walls; the houses are well built, and the number of inhabitants is about 15,000. It has a good trade into foreign parts, on account of its harbour, which is defended by a fort. It is governed by a mayor, sheriffs, and recorder. It has but one parish church, which is a large and beautiful Gothic structure, an exchange, barracks for 10 companies of foot, a charter school, and an hospital. This was one of the strongest towns in the kingdom; it held out some time against General Ginkel, who invested and took it after the battle of Aughrim. Its fortifications were then repaired. The walls are flanked by bastions, but are mostly gone to decay. The salmon and herring fisheries are carried on here with great spirit, and employ 700 boats; the quantity of kelp manufactured and exported is considerable; and the growth of the linen manufacture, though of late introduction, is become very important. In 1326, Sir William de Burgh founded a monastery here for Franciscan friars, on St Stephen's island, situated without the north gate of the town. In 1381, there being two popes at Rome, and the people of Ireland being doubtful to which they should pay obedience, Pope Urban, to fix them entirely to his interest, empowered the guardian of this monastery to excommunicate every person in the province of Connaught who should adhere to his rival Clement VII, who he assured them was antipope.—Near the west gate of the town, without the walls, was the monastery of St Mary of the Hill: on the nuns forsaking it, the secular clergy entered into and kept possession of it for a considerable time; but on the petition of the inhabitants of the town to Pope Innocent VIII. it was granted to the Dominican friars, by a bull dated the 4th December 1488. There are no remains of this foundation except the cemetery; the whole building having been demolished by the townsmen in the year 1652, in order to prevent Cromwell from turning it into a fortification against themselves; there was also an Augustinian friary, on a hill near this town, founded by Stephen Lynch, and Margaret his wife, in the year 1508, at the earnest solicitation of Richard Nangle, a friar of the same order, who afterwards became bishop of Tuam.

GAMA,
at liberty to take or kill any beasts of chase, but such as have an ancient chase or park; unless they be also beasts of prey.

As to all inferior species of game, called beasts and fowls of warren; the liberty of taking or killing them is another franchise or royalty, derived likewise from the crown, and called free warren; and which signifies preservation or custody: as the exclusive liberty of taking and killing fish in a public stream or river is called a free fishery; of which, however, no new franchise can at present be granted by the express provision of magna charta, c. 16. The principal intention of granting these franchises or liberties was in order to protect the game, by giving him a sole and exclusive power of killing it himself, provided he prevented other persons. And no man but he who has a chase or free warren, by grant from the crown, or prescription, which supposes one, can justify hunting or sport upon another man's soil; nor indeed, in thorough strictness of common law, either hunting or sporting at all.

However novel this doctrine may seem, it is a regular consequence from what has been before delivered, that the sole right of taking and destroying game belongs exclusively to the king. This appears, as well from the historical deduction here made, as because he may grant to his subjects an exclusive right of taking them; which he could not do, unless such a right was first inherent in himself. And hence it will follow, that no person whatever, but he who has such derivative right from the crown, is by common law entitled to take or kill any beast of chase, or other game whatsoever. It is true, that by the acquiescence of the crown, the frequent grants of free warren in ancient times, and the introduction of new penalties of late by certain statutes for preserving the game, this exclusive prerogative of the king is little known or considered; every man that is exempted from these modern penalties looking upon himself as at liberty to do what he pleases with the game; whereas the contrary is strictly true, that no man, however well qualified he may vulgarly be esteemed, has a right to encroach on the royal prerogative by the killing of game, unless he can shew a particular grant of free warren; or a prescription which presumes a grant; or some authority under an act of parliament. As for the latter, there are but two instances wherein an express permission to kill game was ever given by statute: the one by 1 Jac. I, c. 37. altered by Jac. I, c. 12. and virtually repealed by 22 and 23 Car. II, c. 25. gave authority, so long as they remained in force, to the owners of free warren, to lords of manors, and to all freeholders having 40l. per annum in lands of inheritance, or 80l. for life or lives, or 400l. personal estate (and their servants), to take partridges and pheasants, upon their own, or their master's free warren, inheritance, or freehold; the other by 5 Ann. c. 14. which empowered lords and ladies of manors to appoint gamekeepers, to kill game for the use of such lord or lady; which with some alteration still subsists, and plainly supposes such power not to have been in them before. The truth of the matter is, that these game laws do indeed qualify nobody, except in the instance of a gamekeeper, to kill game; but only to save the trouble and formal process of an action by the person injured, who perhaps too might remit the offence, these statutes inflict additional penalties, to be recovered either in a regular or summary way, by any of the king's subjects, from certain persons of inferior rank who may be found offending in this particular. But it does not follow that persons excused from these additional penalties are therefore authorized to kill game. The circumstance of having 100l. per annum, and the rest, are not properly qualifications, but exemptions. And these persons so exempted from the penalties of the game statutes, are not only liable to actions of trespass by the owners of the land; but also if they kill game within the limits of any royal franchise, they are liable to the actions of such who may have the right of chase or free warren therein.

Upon the whole it appears, that the king, by his prerogative, and such persons as have, under his authority, the royal franchise of chase, park, or free warren, are the only persons who may acquire; see those any property, however fugitive and transitory, in these articles. animals ferus naturae, while living; which is said to be vested in them proper privilegium. And it must also be observed, that such persons as may thus lawfully hunt, fish, or fowl, ratione privilegiis, have only a qualified property in these animals; it not being absolute or permanent, but lasting only so long as the creatures remain within the limits of such respective franchise or liberty, and ceasing the instant they voluntarily pass out of it. It is held indeed, that if a man starts any game within his own grounds, and follows it into another's and kills it there, the property remains in himself. And this is grounded on reason and natural justice; for the property consists in the possession; which possession commences by finding the right in his own liberty, and is continued by the immediate pursuit. And so, if a stranger starts game in one man's chase or free warren, and hunts it into another liberty, the property continues in the owner of the chase or warren; this property arising from privilege, and not being changed by the act of a mere stranger. Or if a man starts game on another's private grounds, and kills it there, the property belongs to him in whose ground it was killed, because it was also started there; this property arising ratione soli. Whereas if, after being started there, it is killed in the grounds of a third person, the property belongs not to the owner of the first ground, because the property is local; nor yet to the owner of the second, because it was not started in his soil; but it vests in the person who started and killed it; though guilty of a trespass against both the owners. See the article Game Laws.

It will probably be considered by sportsmen who have not an opportunity of seeing the book, as a curious piece of information, to have the following, which we extract from Daniel's Rural Sports, concerning the quantity of game killed in different countries.

"The lists of the game, says he, that has been killed upon particular manors in England by parties, and even by single gentlemen, exhibit such a wanton registry of slaughter, as no sportsman can read without regret; but to prove that British are rather more meritorious than French shooters, the account of the former game establishment at Chantilly is first presented to the reader, in the words of the very ingenious person who recorded it."

The
The game establishment at Chantilly was the most extraordinary establishment of the kind in Europe.

The following list of the quantity of different kinds of game killed at Chantilly, in a period of 32 years, beginning with the year 1748, and ending with the year 1779, was copied from the household registers there, and what seems unaccountable, never was printed before, not even in France! The copy was taken in 1788, and the statement, as an object in natural history, is no small curiosity, and as such it is philosophically interesting.

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<td>818</td>
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</table>

Connected with this establishment, there was a park of 21 miles, and a forest of 48 miles in extent, and while the family were at the place, they had 300 horses, as many servants, and from 60 to 80 couples of dogs.

The Germans too, says Mr. Daniel, have a happy knack at a massacre. In 1788 a party of 10 persons at the chateau of Prince Adam Daversberg, in Bohemia, were out five hours on the 9th and 10th of September, allowed that the first day 6169 shots were fired, and 276 hares, 259 pheasants, 361 partridges, beside quails, rabbits, &c. were bagged, or rather waggoned. On the second day 5904 shots were discharged, and 181 hares, 634 pheasants, and 736 partridges were killed, besides some that were picked up in the evening. The number of shots in the two days were 11,972, the game carried home were

| Hares         | 1099 |
| Pheasants    | 938  |
| Partridges   | 1201 |

besides small game. It is added that the birds were all shot on the wing.

In Germany, during the month of October 1797, Prince Lichtenstein, and eleven other gentlemen, killed in one day, when they were out fourteen hours, 35,000 pieces of game; it was of all sorts, but chiefly hares and partridges. The king of Naples and Sir W. Hamilton killed 800 head of game in the neighbourhood of Ga...
A and B play at single quits, and A is the best gamer, so that he can give B 2 in 3: What is the ratio of their chances at a single throw? Suppose the chances as 3 to 1, and raise 2 to 1 to its cube, which will be $3^3 = 27 + 27 + 27 + 1$. Now since A could give B 2 out of 3, A might undertake to win three throws running; and consequently the chances in this case will be as $3^3 = 27 + 27 + 27 + 1$; hence $2^3 = 27 + 27 + 27 + 1$; or $2^{3^3} = 27 + 27 + 27 + 1$. And therefore $\sqrt{2} = \frac{1}{2}$, and consequently, $\sqrt{2} = \frac{1}{2}$.

The chances, therefore, are $\frac{1}{2}$, $\frac{1}{2}$, and 1, respectively.

Again, suppose I have two wagers depending, in the first of which I have 3 to 2 the best of the lay, and in the second 7 to 4; What is the probability I win both wagers?

1. The probability of winning the first is $\frac{3}{5}$, that is, the number of chances I have to win, divided by the number of all the chances: the probability of winning the second is $\frac{4}{7}$; therefore, multiplying these two fractions together, the product will be $\frac{3}{5} \times \frac{4}{7}$, which is the probability of winning both wagers. Now, this fraction being subtracted from 1, the remainder is $\frac{1}{5}$, which is the probability I do not win both wagers: therefore the odds against me are 34 to 21.

2. If I would know what the probability is of winning the first, and losing the second, I argue thus: The probability of winning the first is $\frac{3}{5}$, the probability of losing the second is $\frac{2}{5}$; therefore multiplying $\frac{3}{5}$ by $\frac{2}{5}$, the product $\frac{6}{5}$ will be the probability of my winning the first and losing the second; which being subtracted from 1, there will remain $\frac{1}{5}$, which is the probability I do not win the first, and at the same time lose the second.

3. If I would know what the probability is of winning the second, and at the same time losing the first, I say thus: The probability of winning the second is $\frac{4}{7}$; the probability of losing the first is $\frac{3}{5}$; therefore, multiplying these two fractions together, the product $\frac{4}{7} \times \frac{3}{5}$ is the probability I win the second, and also lose the first.

4. If I would know what the probability is of losing both wagers, I say, the probability of losing the first is $\frac{2}{5}$, and the probability of losing the second is $\frac{3}{5}$; therefore, multiplying $\frac{2}{5}$ by $\frac{3}{5}$, the product $\frac{6}{5}$ is the probability of losing both; which, being subtracted from 1, there remains $\frac{1}{5}$: therefore, the odds of losing both wagers is 34 to 21.

This way of reasoning is applicable to the happening or failing of any events that may fall under consideration. Thus if I would know what the probability is of missing an ace four times together with a die, this I consider as the failing of four different events. Now the probability of missing the first is $\frac{1}{6}$, the second is also $\frac{1}{6}$, the third $\frac{1}{6}$, and the fourth $\frac{1}{6}$; therefore the probability of missing it four times together is $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{6}$. But if the flinging of an ace was undertaken in three times, the probability of missing it three times would be $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{6}$. But if the flinging of an ace was undertaken in three times, the probability of missing it three times would be $\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6} = \frac{1}{6}$.

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The probability of taking the ace out of the first heap is $\frac{1}{12}$; the probability of taking the ace out of the second heap is $\frac{1}{12}$; therefore the probability of taking out both aces is $\frac{1}{12} \times \frac{1}{12} = \frac{1}{12}$; which being subtracted from 1, there will remain $\frac{1}{12}$. Therefore, the odds against me are 12 to 1.

In cases where the events depend on one another, the manner of arguing is somewhat altered. Thus, suppose that out of one single heap of thirteen cards of one colour I should undertake to take out first the ace; and, secondly, the two: though the probability of taking out the ace be $\frac{1}{13}$, and the probability of taking out the two be likewise $\frac{1}{13}$: yet, the ace being supposed as taken out already, there will remain only twelve cards in the heap, which will make the probability of taking out the two to be $\frac{1}{12}$; therefore the probability of taking out the ace, and then the two, will be $\frac{1}{12} \times \frac{1}{12}$.

In this last question the two events have a dependence on each other; which consists in this, that one of the events
recommending their books, distinguished the type by Garanond
his name; and in particular the small Roman was by
the name of Garanond’s small Roman. By
the special command of King Francis I. he founded
three sizes of Greek types for the use of Robert Ste-
phens, who with them printed all his beautiful editions
of the New Testament, and other Greek authors. He
died at Paris in 1561.

GARASSE, FRANCIS, a remarkable Jesuitical writ-
er, the first author of that irreconcilable enmity that
still subsists between the Jesuits and Jansenists, in the
church of Rome, was born at Angouleme in 1585,
and entered the Jesuits college in 1600. As he had
a quick imagination, a strong voice, and a peculiar
turn to wit, he became a popular preacher in the chief
cities of France; but not content with this honour,
he distinguished himself still more by his writings,
which were bold, licentious, and produced much con-
troversy. The most considerable in its consequences
was entitled La somme theologique ou tres capitales
de la religion cretienne; which was first defended by
the abbot of St. Cyran, who observing in it a prodigious
number of falsifications of the Scriptures and of the
fathers, besides many heretical and impious opinions,
conceived the honour of the church required him to
undertake a refutation. Accordingly was published a
full answer to it; while Garasse’s book was also under
examination of the doctors of the Sorbonne, by whom
it was afterwards condemned. Garasse replied to St
Cyran; but the two parties of Jesuits and Jansenists, of
whom these were respectively the champions, grew to
an implacable animosity against each other, that is not
eveng now likely to subside. The Jesuits were forced
to remove their brother to a distance from Paris; where,
probably weary of his inactive obscurity, when the
plague raged at Poictiers in 1632, he begged leave of
his superior to attend the sick, in which charitable of-
face he caught the disorder, and died.

GARBE, in heraldry, a sheaf of any kind of grain,
born in several coats of arms, and said to represent
summer, as a bunch of grapes does autumn.

GARBIL, a word used to signify the action of
separating the dross and dust from spice, drugs, &c.
Garbling is the cleansing and purifying the good from
the bad; and may come from the Italian garbo; i.e.
finery or neatness: and hence, probably, we say, when
we see a man in a neat habit, that he is in handsome
garb.

GARCILASO DE LA VEGA, an eminent Spanish
poet, was born at Toledo, in 1503. He was the
younger son of a man of rank, who had been employed
in negotiating business of importance. Garcilasso
was distinguished for his wit and bravery, and in a particu-
lar manner for his poetical talents. He was chiefly in-
strumental in giving popularity to an innovation of his
friend Bocan, who introduced measures borrowed from
the Italians. His works consist chiefly of pastorals,
which have a tedious prolixity. He is chiefly noted
for tenderness, which is remarkably conspicuous in
some of his sonnets. He is free of bombast than the
generality of his countrymen, owing to his familiar
acquaintance with the ancients; and it is said that his
learning and taste were superior to his genius. He fol-
lowed the profession of arms, and attended Charles V.
in a number of his expeditions. He lost his life at the
attack of a fortress in Provence, when only 33 years of
age. Garcilaso is also the name of an author, a native
of Cusco in Peru, who composed a history of Florida
in Spanish, and another of Peru and its Inca.
GARCINIA, a genus of plants belonging to the
dodecandria class, and in the natural method ranking
under the 18th order, Bicornes. See BOTANY Index.
GARGON, or GARSON, a French term, literally
signifying a boy, but also applied to divers inferior of-
cers, amongst us called groom, garçons.
GARD, a department in the south of France. The
north part which lies among the Cevennes is rugged
and barren; but the south part is fertile and populous.
It contains mines of copper, lead, iron, and pit coal.
The whole number of inhabitants in 1815 was 322,000,
of whom about one half were Protestants. Nîmes is
the chief town.
GARDANT, or GUARDANT, in Heraldry, denotes
any beast full faced, and looking right forward.
GARDEN, FRANCIS, better known to the public
by the title of Lord Gardenstone, was born at Edin-
burgh, June 23d 1686. His father was
Alexander Garden of Troop, an opulent landholder
in Aberdeenshire; his mother was Jane, daughter of
Sir Francis Grant of Cullen, S. C. I.
After passing through the usual course of liberal edu-
cation at the school and the university, he betook him-
self to the study of law for his profession; and in the
year 1744 he was admitted a member of the Faculty of
Advocates, and called to the Scottish bar.
In his practice as an advocate he soon began to be
distinguished, by a strong native rectitude of under-
standing; by that vivacity of apprehension and imagi-
nation which is commonly denominated genius; by
manly candour in argument, often more persuasive than
subtlety and sophistical artifice; by powers which, with
diligence, might easily attain to the highest eminence
of the profession. But the same strength, openness,
and ardour of mind, which distinguished him so advan-
tageously among the pleaders at the bar, tended to
give him a fondness for the gay enjoyments of conviv-
ial intercourse, which was unfavourable to his progress
in juridical erudition. Shining in the social and conviv-
cial circle, he became less solicitously ambitious than
he might otherwise have been, of the character of an
eloquent advocate, or of a profound and learned law-
ner. The vivacity of his genius wasaverse from au-
stere and plodding study, while it was captivated by
the fascinations of polite learning, and of the fine arts.
Nor did he always escape those excesses in the pursuit
of pleasure into which the temptations of opening life
are apt, occasionally, to seduce the most liberal and in-
genious youth. But his cheerful conviviality, his wit,
humour, taste, good nature, and benevolence of heart,
rendered him the delight of all his acquaintance. He
became his majesty's solicitor July 30, 1764.
At length the worth of his character, and his abili-
ties as a lawyer, recommended him to the office of a
judge in the courts of session and justiciary, the
supreme judicatures, civil and criminal, for Scot-
land. His place in the court of session he continued
to occupy till his death; but had, some years before,
resigned the office of a commissioner of justiciary, and
in recompense got a pension of 200l. per annum.

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Clear discernment, strong good sense, conscientious ho-
nesty, and amiable benevolence, remarkably distinguish-
ed all his opinions and conduct as a judge.
In the year 1762 he purchased the estate of John-
ton, in the county of Kincardine. Within a few
years after he began to attempt a plan of the most
liberal improvement of the value of this estate, by an
extension of the village of Laurencekirk, adjoining. He
offered leases of small farms, and of ground for building
upon, which were to last for the term of one hundred
years; and of which the conditions were extremely in-
viting to the labourers and tradesmen of the surround-
ing country. These offers were eagerly listened to.
More desirous to make the attempt beneficial to the
country than to derive profit from it to himself, he was
induced, within a few years, to reduce his ground-
rents to one-half of the original rate.—Weavers, join-
ers, shoemakers, and other artisans in a considerable
number, resorted to settle in the rising village. His
lordship's earnestness for the success of his project,
and to promote the prosperity of the good people
whom he had received under his protection, led him to
engage in several undertakings; by the failure of which
he incurred considerable losses. Projects of a prin-
cipal field, and of manufactures of linen and of stockings,
attempted with sanguine hopes in the new village, and
chiefly at his lordship's risk and expense, miscarried
in such a manner as might well have finally disgusted a man
of less steady and ardent philanthropy with every such
engagement. But the village still continued to advance.
It grew up under his lordship's eye, and was the fa-
vourite object of his care. In the year 1779, he pro-
cured it to be erected into a burgh of barony; having
a magistracy, an annual fair, and a weekly market. He
provided in it a good inn for the reception of travel-
ers; and with an uncommon attention to the enter-
tainment of the guests who might resort to it, furnished
this inn with a library of books for their amusement.
He invited an artist for drawing, from the continent,
to settle at Laurencekirk. He had the pleasure of see-
ing a considerable linen-manufacture at length fixed
in it. A bleachfield was also established as a natural
counterpart to the linen manufacture. Before his lord-
ship's death, he saw the plan of improving the condition
of the labourers, by the formation of a new village at
Laurencekirk, crowned with success beyond his
most sanguine hopes. He has acknowledged, with an
amiable frankness, in a memoir concerning this village,
"That he had tried, in some measure, a variety of the
pleasures which mankind pursue; but never relished
any so much as the pleasure arising from the progress
of his village."

In the year 1785, upon the death of his elder bro-
th, Alexander Garden of Troop, M. P. for Aberdeens-
ship, Lord Gardenstone succeeded to the possession of
the family estates, which were very considerable.
Until this time his lordship's income had never been
more than adequate to the liberal expence into which
his rank, and the generosity of his nature, unavoidably
led him. But the addition of a fortune of about
three thousand pounds a-year to his former revenue
gave him the power of performing many acts of bene-
dience with which he could not before gratify his
good heart. It was happy, likewise, that his succe-
sion to this ample income, at a period when the vigour
It requires no great exertion of mind or body; and its
satisfactions are of that kind which please without vio-
lenient agitation. Its beneficial influence on health is an
additional reason for an attention to it at an age when
infirmities abound.

In almost every description of the seats of the
blessed, ideas of a garden seem to have predominated.
The word Paradise itself is synonymous with garden.
The fields of Elysium, that sweet region of poesy, are
adorned with all that imagination can conceive to be
delightful. Some of the most pleasing passages of Mil-
ton, are those in which he represents the happy pair
engaged in cultivating their blissful abode. Poets have
always been delighted with the beauties of a garden.
Lucan is represented by Juvenal as reposing in his
garden. Virgil's Georgics prove him to have been
captivated with rural scenes; though, to the surprise of
his readers, he has not assigned a book to the subject of
a garden. Our Shakespeare made it his study; but, with
all his taste and fondness for it, he was not led in it.
The captivating scenes which he created at the
Leasowes, afforded him, it is said, little pleasure in
the absence of spectators. The truth is, he made the
embellishment of his grounds, which should have been
the amusement of his life, the business of it; and
involved himself in such troubles, by the expenses it
occasioned, as necessarily excluded tranquil enjoy-
ment.

It is the lot of few, in comparison, to possess territo-
ries like his, extensive, and sufficiently well adapted
to constitute an ornamented farm. Still fewer are ca-
able of supporting the expense of preserving it in
good condition. But let not the rich suppose they
have appropriated the pleasures of a garden. The
possessor of an acre, or a smaller portion, may receive
a real pleasure, from observing the progress of vegeta-
tion, even in a plantation of culinary plants. A very
limited tract, properly attended to, will furnish ample
employment for the individual. Nor let it be thought
a mean care; for the same hand that raised the cedars,
formed the hyssop on the wall. Even the orchard,
cultivated solely for advantage, exhibits beauties une-
qualed in the shrubbery; nor can the greenhouse pro-
duce an appearance to exceed the blossom of the apple
and the almond.

Hanging Gardens, in antiquity, gardens raised on
arches by Nebuchadnezzar king of Babylon, in or-
der to gratify his wife Amytis, daughter of Astyages
king of Media. Quintus Curtius makes them equal in
height to the walls of the city, viz. 50 feet. They
contained a square of 400 feet on every side, and were
carried up into the air in several terraces laid above
one another, and the ascent from terrace to terrace was
by stairs 10 feet wide. The arches sustaining the
whole pyle were raised above one another, and it was
strengthened by a wall, surrounding it on every side,
of 22 feet in thickness. The floors of each of the ter-

aces were laid in the following manner: on the top
of the arches were first laid large flat stones 16 feet
long and 4 broad, and over them was a layer of reeds
mixed with a great quantity of bitumen, over which
were two rows of bricks closely cemented together by
plaster, and over all were laid thick sheets of lead;
and lastly, upon the lead was laid the mould of the
garden. The mould or earth was of such a depth as
to admit the largest trees to take root and grow; and
it was covered with various kinds of trees, plants, and
flowers. In the upper terrace there was an aqueduct
or engine, whereby water was drawn up out of the river
for watering the whole garden.

Floating Gardens. We are informed by the abbe
Clavigero in his History of Mexico, that when the
Mexicans were brought under subjection to the Col-
busan and Tepanecan nations, and confined to the
miserable little islands in the lake of Mexico, they
ceased for some years to cultivate the land, because
they had none, until necessity and industry together
taught them to form moveable fields and gardens, which
floated on the waters of the lake. The method which
they pursued to make these, and which they still prac-
tice, is extremely simple. They plant and twist willows
and roots of marsh plants or other materials together,
which are light, but capable of supporting the earth
of the garden firmly united. Upon this foundation they
lay the light bushes which float on the lake; and over
all, the mud and dirt which they draw up from the bot-
tom of the same lake. Their regular figure is quadran-
gular; their length and breadth various: but generally
they are about eight perches long, and not more than
three in breadth, and have less than a foot of elevation
above the surface of the water. These were the first fields
which the Mexicans owned after the foundation of
Mexico; there they first cultivated the maize, great pep-
er, and other plants necessary for their support. In
progress of time, as those fields grew numerous from
the industry of the people, there were among them
gardens of flowers and odoriferous plants, which were
employed in the worship of their gods, and served for
the recreation of the nobles. At present they culti-
vate flowers and every sort of garden herbs upon them.
Every day of the year, at sunrise, innumerables vessels
loaded with various kinds of flowers and herbs, which
are cultivated in those gardens, are seen arriving by
the canals, at the great market place of that capital.

All plants thrive there surprisingly; the mud of
the lake is an extremely fertile soil, and requires no water
from the clouds. In the largest gardens there is com-
monly a little tree, and even a little hut to shelter the
cultivator and defend him from rain or the sun. When
the owner of a garden, or the Chinampa as he is usu-
ally called, wishes to change his situation, to remove
from a disagreeable neighbour, or to come nearer to
his own family, he gets into his little vessel, and by his
own strength alone, if the garden is small, or with the
assistance of others if it is large, he tows it after
him, and conducts it wherever he pleases with the
little tree and hut upon it. That part of the lake
where those floating gardens are, is a place of infinite
recreation, where the senses receive the highest possible
gratification.
GARDENING;

THE art of planning and cultivating gardens. In its utmost extent, whatever contributes to render the scenes of nature delightful, is among the subjects of gardening; and animate as well as inanimate objects are circumstances of beauty or character. The whole range of nature is open to the gardener, from the parterre to the forest; and whatever is agreeable to the senses or the imagination, he may appropriate to the spot he is to improve: it is a part of his business to collect into one place the delights which are generally dispersed through different species of country.

History of Gardening.

GARDENING, Mr Walpole observes, was probably one of the first arts that succeeded to that of building houses, and naturally attended property and individual possession. Culinary, and afterwards medicinal herbs, were the objects of every head of a family: it became convenient to have them within reach, without seeking them at random in woods, in meadows, and on mountains, as often as they were wanted. When the earth ceased to furnish spontaneously all those primitive luxuries, and culture became requisite, separate enclosures for rearing herbs grew expedient. Fruits were in the same predicament; and those most in use, or that demand attention, must have entered into and extended the domestic enclosure. The good man Noah, we are told, planted a vineyard, drank of the wine, and was drunken; and every body knows the consequences. Thus we acquired kitchen gardens, orchards, and vineyards. No doubt the prototype of all these sorts was the garden of Eden; but as that Paradise was a good deal larger than any we read of afterwards, being enclosed by the rivers Pison, Gihon, Hiddekel, and Euphrates; as every tree that was pleasant to the sight and good for food grew in it; and as two other trees were likewise found there, of which not a slip or sucker remains; it does not belong to the present discussion. After the fall no man living was suffered to enter into the garden; and the poverty and necessities of our first ancestors hardly allowed them time to make improvements in their estates in imitation of it, supposing any plan had been preserved. A cottage and a slip of ground for a cabbage and a gooseberry bush, such as we see by the side of a common, were in all probability the earliest seats and gardens: as well and bucket succeeded to the Pison and Euphrates. As settlements increased, the orchard and the vineyard followed; and the earliest princes of tribes possessed just the necessities of a modern farmer.

Matters, we may well believe, remained long in this situation; and we have reason to think that for many centuries the term garden implied no more than a kitchen garden or orchard.

The garden of Alcinoes, in the Odyssey, is the most renowned in the heroic times. Is there an admirer of Homer who can read his description without rapture? or who does not form to his imagination a scene of delights more picturesque than the landscapes of Timian or Juan Fernandez? "Yet (continues our author) what was that boasted Paradise with which the gods ordain'd"

To grace Alcinoes and his happy land?

Why, divested of harmonious Greek and bewitching poetry, it was a small orchard and vineyard, with some beds of herbs and two fountains that watered them, enclosed within a quickset hedge. The whole compass of this pompous garden enclosed—four acres:

Four acres was th' allotted space of ground, Fenc'd with a green enclosure all around.

The trees were apples, figs, pomegranates, pears, olives, and vines.

Tall thriving trees confesst'd the fruitful mold; The red'ning apple ripens into gold. Here the blue fig with luscious juice o'erflows, With deeper red the full pomegranate glows; The branch here bends beneath the weighty pear, And verdant olives flourish round the year.

** • • • • • • •

Beds of all various herbs, for ever green, In beauteous order terminate the scene.

Alcinoes's garden was planted by the poet, enriched by him with the fairy gift of eternal summer, and no doubt an effort of imagination surpassing any thing he had ever seen. As he has bestowed on the same happy prince a palace with brazen walls and columns of silver, he certainly intended that the garden should be proportionally magnificent. We are sure, therefore, that, as late as Homer's age, an enclosure of four acres, comprehending orchard, vineyard, and kitchen garden, was a stretch of luxury the world at that time had never beheld."

Previous to this, however, we have in the sacred writings hints of a garden still more luxuriously furnished. We allude to the Song of Solomon, part of the scene of which is undoubtedly laid in a garden. § Chap. iv. Flowers and fruits are particularly spoken of as the ornaments and the produce of it; and besides these, aromatic vegetables formed a considerable part of the gratification it afforded. The camphor and the cinnamon tree, with all trees of frankincense, and all the chief spices, flourished there §. Solomon tells us in an- § Cant. iv. other place §, That he made him great works;—gar- § 1 Esal. ii. dens and orchards, and planted in them trees of every kind. Indeed we must suppose his gardens to have been both amply and curiously furnished, seeing the kinds, nature, and properties of the vegetable tribes, seem to have been a favourite study with the royal philosopher, and to have been deemed a subject worthy of his pen: for we are told, that he wrote of plants, from the great cedar of Lebanon down to the hyssop of the wall §. § Kings iv. §. § Fountains and streams of water appear also to have had a share in the composition, and probably for ornament as well as use.

The hanging gardens of Babylon, mentioned in a proceeding:
GARDENING.

preceding article, were a still greater prodigy. But as they are supposed to have been formed on terraces and the walls of the palace, whether soil was conveyed on purpose, Mr Walpole concludes, that they were what sumptuous gardens have been in all ages till the present, unnatural, enriched by art, possibly with fountains, statues, balustrades, and summer houses, and were any thing but verdant and rural.

Others, however, have allowed them greater praise. They seem, in many respects, to have been laid out with good taste. Their elevation not only produced a variety and extent of view, but was also useful in moderating the heat. Such a situation would likewise suit a greater variety of trees and plants than a plain surface, and would contain a larger as well as a more diversified extent.

The suit of the situation to the nature of the tree seems, from the account given by Josephus, to have been one view in the erecting the building in such a manner. And the success seems to have been answerable, as the trees are said to have flourished extremely well, and to have grown as tall as in their native situations. On the whole, then, however different these may appear from modern gardens, they seem to have been formed with judgment and taste, and well adapted to the situation and circumstances.

It seems probable, from several circumstances, that the eastern gardens were adjoining to the house or palace to which they belonged. Thus, King Asaerus goes immediately from the banquet of wine to walk in the garden of the palace. The garden of Cyrus, at Sardis, mentioned by Xenophon, was probably contiguous to the palace: as was that of Attalus, mentioned by Justin. The hanging gardens at Babylon, were not so much adjacent to the palace, as a part of the palace itself, since several of the royal apartments were beneath them.

It is not clear what the taste for gardening was among the Greeks. The Academus, we know, was a wooded shady place; and the trees appear to have been of the olive species. It was situated beyond the limits of the walls, and adjacent to the tombs of the heroes; and though we are nowhere informed of the particular manner in which this grove was disposed or laid out, it may be gathered from Pausanias, in his Attica, that it was an elegant ornamented place. At the entrance was an altar dedicated to Love, which was said to be the first erected to that deity. Within the Academus, were the altars of Prometheus, of the Muses, of Mercury, of Minerva, and Hercules; and at a small distance was the tomb of Plato. So that in all probability, it was highly adapted by art, as well as nature, to the philosophic reflection and contemplation.

We are told by Plutarch, that before the time of Cimon, the Academus was a rude and uncultivated spot: but that it was planted by that general, and had water conveyed to it; whether this water was brought merely for use to refresh the trees, or for ornament, does not appear. It was divided into gymnasia, or places of exercise, and philosophic walks shaded with trees. These are said to have flourished very well, until destroyed by Sylla (when he besieged Athens), as well as those in the Lyceum.

Near the academy were the gardens of the philosophers, of Plato and of Epicurus; which, however, were probably but small. The scene of Plato's Dialogue concerning Beauty is elegantly described as being on the banks of the river Ilissus, and under the shade of the plantain; but no artificial arrangement of objects is mentioned, nor any thing which will lead us to imagine the prospect to be anything but merely natural.

Among the Romans, a taste of gardens, or otherwise than as a matter of utility, seems not to have prevailed till a very late period; at least the writers on husbandry, Cato, Varro, Columella, and Palladius, make not the least mention of a garden as an object of pleasure, but solely with respect to its productions of herbs and fruits. The Lucullan gardens are the first we find mentioned of remarkable magnificence; though probably from the extravagance to which these were arrived, they were not the first. Plutarch speaks of them as incredibly expensive, and equal to the magnificence of kings. They contained artificial elevations of ground to a surprising height, of buildings projected into the sea, and vast pieces of water made upon land. In short, his extravagance and expense were so great, that he acquired the name of the appellation of the Roman Xerxes. It is not improbable, from the above account, and from the consideration of Lucullus having spent much time in Asia, in a situation wherein he had an opportunity of observing the most splendid constructions of this kind, that those gardens might be laid out in the Asiatic style. The vast masses of buildings said to have been erected, might have borne some resemblance, in the arrangement and style, to the Babylonian gardens; and the epithet of the Roman Xerxes might be applicable to the taste, as well as to the size and expense of his works.

The Tuscan villa of Cicero, though often mentioned, is not anywhere described in his works, so as to give an adequate idea of the style in which his gardens or grounds were disposed.

There is but little to be traced in Virgil relative to this subject. Pines, it seems probable, were a favourite ornament in gardens; and flowers, roses especially, were much esteemed, perfumes indeed having been always highly valued in warm climates. Virgil places Anchises in Elysium, in a grove of bays: and is careful to remark, that they were of the sweetest kind. The Roman rose was chiefly valued for its excellence of color; and the same multiplication appears to be the cause why they were placed by Tibullus as ornaments to the Elysian fields. There appears also to have prevailed among the Romans a piece of luxury relative to gardens, which is equally prevalent at present among us, namely the forcing of flowers at seasons of the year not suited to their natural blooming: and roses were then, as at present, the principal flowers upon which these experiments were tried, as appears from Martial and others.

When Roman authors (Mr Walpole remarks), vi. ep. 23. Eleg. vii. vi. and others, whose climate instilled a wish for cool retreats, speak of their enjoyments in that kind, they sigh for grovess, caves, and the refreshing hollows of mountains, near rigorous and shady fountains; or boast of their particules, walks of planes, canals, baths, and breezes from the sea. Their gardens are never mentioned as affording shade and shelter from the rage of the dog star. Pliny has left us descriptions of two of his villas. As he used his Lausentine villa for his winter retreat, it is not surprising
of a garden formerly, that in Du Cerceau’s architecture, who lived in the time of Charles IX. and Henry III. there is scarce a ground plot without one of each.

In Kip’s Views of the Seats of our Nobility and Gentry, we see the same tiresome and returning uniformity. Every house is approached by two or three gardens, consisting perhaps of a gravel walk and two grass plats or borders of flowers. Each rises above the other by two or three steps, and as many walls and terraces, and so many iron gates, that we recollect those ancient romances in which every entrance was guarded by nymphs or dragons. Yet though these and such preposterous inconveniences prevailed from age to age, good sense in this country had perceived the want of something at once more grand and more natural. These reflections, and the bounds set to the waste made by royalty, gave origin to Parks. They were contracted forests, and extended gardens. Heintzner says, that according to Bons of Warwick, the first park was that at Woodstock. If so, it might be the foundation of a legend that Henry II. secured his mistress in a labyrinth: it was no doubt more difficult to find her in a park than in a palace, where the intricacy of the woods and various lodges buried in covert might conceal her actual habitation.

It is more extraordinary that, having so long ago stumbled on the principle of modern gardening, we should have persisted in retaining its reverse, symmetrical and unnatural gardens. That parks were rare in other countries, Heintzner, who travelled over great part of Europe, leads us to suppose, by observing that they were common in England. In France they retain the name, but nothing is more different both in compass and disposition. Their parks are usually square or oblong enclosures, regularly planted with walks of chestnuts or limes, and generally every large town has one for its public recreation.

One man, one great man, we had (continues Mr. Walpole), on whom nor education nor custom could impose their prejudices; who, on evil days though fallen, and with darkness and solitude compassed round, judged that the mistaken and fantastic ornaments he had seen in gardens, were unworthy of the Almighty hand that planted the delights of Paradise. He seems with the prophetic eye of taste to have conceived, to have foreshone modern gardening; as Lord Bacon announced the discoveries since made by experimental philosophy. The description of Eden is a warmer and more just picture of the present style than Claude Lorraine could have painted from Hagley or Stourhead. The first lines we shall quote exhibit Stourhead on a more magnificent scale:

Thro’ Eden went a river large,
Nor chang’d his course, but thro’ the shaggy hill,
Pass’d underneath ingulph’d: for God had thrown
That mountain as his garden mound, high rain’d
Upon the rapid current——

Hagley seems pictured in what follows:

Which thro’ veins
Of porous earth with kindly thirst updrawn,
Rose a fresh fountain, and with many a rill
Watered the garden——

What colouring, what freedom of pencil, what landscape in these lines!

—from that sapphire fount the crisped brooks,
Rolling on orient pearl and sands of gold,
With many errors under pendant shades,
Ran nectar, visiting each plant, and fed
Flow’rs worthy of Paradise, which not nice art
In beds and curious knots, but nature boon,
Pour’d forth profuse on hill, and dale, and plain,
Both where the morning sun first warmly smote
The open field, and where the unpiec’d shade
Imbrownd the noontide bow’r——Thus was this place
A happy rural seat of various view.

Read this transporting description, paint to your mind the scenes that follow, contrast them with the savage but respectable terror with which the poet guards the bounds of his paradise, fenced

——with the champaign head
Of a steep wilderness, whose airy sides
With thicket overgrown, grotesque and wild,
Access denied; and over head up grew
Insuperable height of loftiest shade,
Cedar and pine, and fir, and branching palm,
A sylvan scene, and, as the ranks ascend,
Shade above shade, a woody theatre,
Of statelyst view——

and then recollect, that the author of this sublime vision had never seen a glimpse of anything like what he has imagined; that his favourite ancients had dropped not a hint of such divine scenery; and that the conceits in Italian gardens, and Theobalds and Nonsuch, were the brightest originals that his memory could furnish. His intellectual eye saw a nobler plan, so little did he suffer by the loss of sight. It sufficed him to have seen the materials with which he could work. The vigour of a boundless imagination told him how a plan might be disposed, that would embellish nature, and restore art to its proper office, the just improvement or imitation of it.

“Now let us return to an admired writer, posterior to Milton, and see how cold, how insipid, how tasteless, is his account of what he pronounced a perfect garden. We speak not of his style, which it was not necessary for him to animate with the colouring and glow of poetry. It is his want of ideas, of imagination, of taste, that deserve censure, when he dictated on a subject which is capable of all the graces that a knowledge of beautiful nature can bestow. Sir William Temple was an excellent man; Milton, a genius of the first order.

“We cannot wonder that Sir William declares in favour of parterres, fountains, and statues, as necessary to break the sameness of large grass plots, which he thinks have an ill effect upon the eye, when he acknowledges that he discovers fancy in the gardens of Alcimus. Milton studied the ancients with equal enthusiasm, but no bigotry; and had judgment to distinguish between the want of invention and the beauties of poetry. Compare his paradise with Homer’s garden, both ascribed to a celestial design. For Sir William, it is just to observe, that his ideas centered in a fruit garden. He had the honour of giving to his country many delicate fruits,
History.

Gardening.

The best figure of a garden (says he) is either a square or an oblong, and either upon a flat or a descent: they have all their beauties, but the best I esteem an oblong upon a descent. The beauty, the air, the view, make amends for the expense, which is very great in finishing and supporting the terrace walks, in levelling the parterres, and in the stone stairs that are necessary from one to the other. The perfectest figure of a garden I ever saw, either at home or abroad, was that of Moor Park in Hertfordshire, when I knew it about 30 years ago. It was made by the countess of Bedford, esteemed among the greatest wits of her time, and celebrated by Dr. Donne; and with very great care, excellent contrivance, and much cost; but greater sums may be thrown away without effect or honour, if there want sense in proportion to money, or if nature be not followed; which I take to be the great role in this, and perhaps in every thing, for the conduct not only of our lives but our governments. [We shall see how natural that admired garden was]. Because I take the garden I have named to have been in all kinds the most beautiful and perfect, at least in the figure and disposition, that I ever have seen, I will describe it for a model to those that meet with such a situation, and are above the regards of common expense. It lies on the side of a hill, upon which the house stands, but not very steep. The length of the house, where the best rooms and of most use or pleasure are, lies upon the breadth of the garden; the great parlour opens into the middle of a terrace gravel walk that lies even with it, and which may be, as I remember, about 300 paces long, and broad in proportion; the border set with standards laurels and at large distances, which have the beauty of orange trees out of flower and fruit. From this walk are three descents by many stone steps, in the middle and at each end, into a very large parterre. This is divided into quarters by gravel walks, and adorned with two fountains and eight statues in the several quarters. At the end of the terrace walk are two summer houses, and the sides of the parterre are ranged with two large cloisters open to the garden, upon arches of stone, and ending with two other summer houses even with the cloisters, which are paved with stone, and designed for walks of shade, there being none other in the whole parterre. Over these two cloisters are two terraces covered with lead and fenced with balusters; and the passage into these airy walks is out of the two summer houses at the end of the first terrace walk. The cloister facing the south is covered with vines, and would have been proper for an orange house, and the other for myrtles or other more common greens, and had, I doubt not, been cast for that purpose, if this piece of gardening had been then in as much vogue as it is now. From the middle of this parterre is a descent by many steps flying on each side of a grotto, that lies between them, covered with lead and flat, into the lower garden, which is all fruit trees ranged about the several quarters of a wilderness, which is very shady; the walks here are all green, the grotto embellished with figures of shell rock-work, fountains, and water works. If the hill had not ended with the lower garden, and the wall were not bounded by a common way that goes through the park, they might have added a third quarter of all greens; but this want is supplied by a garden on the other side the house, which is all of that sort, very wild, shady, and adorned with rough rock-work and fountains. This was Moor Park when I was acquainted with it, and the sweetest place, I think, that I have seen in my life, either before or since, at home or abroad. 

It is unnecessary to add any remarks on this description. Any man might design and build as sweet a garden, who had been born in and never stirred out of Holborn. It was not, however, peculiar to Sir William Temple to think in that manner. How many Frenchmen are there who have seen our gardens, and still prefer natural flights of steps and shady cloisters covered with lead! Le Nau tre, the architect of the groves and grottoes at Versailles, came hither on a mission to improve our taste. He planted St James's and Greenwich Parks—no great monuments of his invention: in every thing has in all countries, in every thing that is true and noble in the conduct not only of our lives but our governments. [We shall see how natural that admired garden was].

'To do farther justice to Sir William Temple, we must not omit what he adds. 'What I have said of the best forms of gardens is meant only of such as are in some sort regular; for there may be other forms wholly irregular, that may, for ought I know, have more beauty than any of the others: but they must owe it to some extraordinary dispositions of nature in the seat, or some great race of fancy or judgment in the contrivance, which may reduce many disagreeing parts into some figure, which shall yet, upon the whole, be very agreeable. Something of this I have seen in some places, but heard more of it from others who have lived much among the Chinese, a people whose way of thinking seems to lie as wide of ours in Europe as their country does. Their greatest reach of imagination is employed in contriving figures, where the beauty shall be great and strike the eye, but without any order or disposition of parts, that shall be commonly or easily observed. And though we have hardly any notion of this kind of beauty, yet they have a particular word to express it: and when they find it hit their eye at first sight, they say the Shurawadji is fine or is admirable, or any such expression of esteem: but I should hardly advise any of these attempts in the figure of gardens among us; they are adventures of too hard achievement for any common hands; and though there may be more honour if they succeed well, yet there is more dishonour if they fail, and it is twenty to one they will, whereas in regular figures it is hard to make any great and remarkable faults.'

Fortunately Kent and a few others were not quite so timid, or we might still be going up and down stairs in the open air. It is true, we have heard much lately, as Sir William Temple did, of irregularity and imitations of nature in the gardens or grounds of the Chinese. The former is certainly true: they are as whimsically irregular, as European gardens are formally uniform and unvaried—but with regard to nature, it seems as much avoided, as in the squares and oblongs and straight lines of our ancestors. An artificial perpendicular rock starting out of a flat plain, and connected with nothing, often pierced through in various places with oval hollows, has no more pretension to be deemed natural than a lineal terrace or a parterre. The late Mr Joseph Spence, who had both taste and zeal

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where discontinued by different levels, its course appeared to be concealed by thickets properly interspersed, and glittered again at a distance, where it might be supposed naturally to arrive. Its borders were smoothed, but preserved their waving irregularity. A few trees scattered here and there on its edges sprinkled the same bank that accompanied its meanders; and when it disappeared among the hills, shades descending from the heights leaned towards its progress, and framed the distant point of light under which it was lost, as it turned aside to either hand of the blue horizon.

Thus, dealing in none but the colours of nature, and catching its most favourable features, men saw a new creation opening before their eyes. The living landscape was chastened or polished, not transformed. Freedom was given to the forms of trees: they extended their branches unrestricted; and where any eminent oak, or master beech, had escaped maiming and survived the forest, bush and bramble was removed, and all its honours were restored to distinguish and shade the plain. Where the united plumage of an ancient wood extended, wide its undulating canopy, and stood venerable in its darkness, Kent thinned the foremost ranks, and left but so many detached and scattered trees, as softened the approach of gloom, and blended a chequered light with the thus lengthened shadows of the remaining columns.

"Succeeding artists have added new master strokes to these touches; perhaps improved or brought to perfection some that have been named. The introduction of foreign trees and plants, which we owe principally to Archibald duke of Argyle, contributed essentially to the richness of colouring so peculiar to our modern landscape. The mixture of various greens, the contrast of forms between our forest trees and the northern and West Indian firs and pines, are improvements more recent than Kent, or but little known to him. The weeping willow, and every florid shrub, each tree of delicate or bold leaf, are new tints in the composition of our gardens.

"But just as the encomiums which have been bestowed on Kent's discoveries, he was neither without assistance or faults. Mr Pope undoubtedly contributed to form his taste. The design of the prince of Wales' garden at Carlton house was evidently borrowed from the poet's at Twickenham. There was a little of affected modesty in the latter, when he said, of all his works he was most proud of his garden. And yet it was a singular effort of art and taste to impress so much variety and scenery on a spot of five acres. The passing through the gloom from the grotto to the opening day, the retiring and again assembling shades, the dusky groves, the larger lawn, and the solemnity of the termination at the cypress trees that lead up to his mother's tomb, are managed with exquisite judgment; and though Lord Peterborough assisted him

To form his quincunx and to rank his vines,
those were not the most pleasing ingredients of his little perspective.

"Having routed professed art (for the modern gardener exercises his talents to conceal his art), Kent, like other reformers, knew not how to stop at the just limits. He had followed Nature, and imitated her so happily, that he began to think all her works were equally proper for imitation. In Kensington garden he planted dead trees to give a greater air of truth to the scene—but he was soon laughed out of this excess. His ruling principle was, that nature abhors a straight line. His mimics (for every genius has his speces), seemed to think that she could love nothing but what was crooked. Yet so many men of taste of all ranks devoted themselves to the new improvements, that it is surprising how much beauty has been struck out, with how few absurdities. Still in some lights the reformation seems to have been pushed too far. Though an avenue crossing a park or separating a lawn, and intercepting views from the seat to which it leads, are capital faults; yet a great avenue cut through woods, perhaps before entering a park, has a noble air, and,

Like footmen running before coaches
To tell the inn what lord approaches,
announces the habitation of some man of distinction. In other places the total banishment of all particular neatness immediately about a house, which is frequently left gazing by itself in the middle of a park, is a defect. Sheltered and even close walks, in so very uncertain a climate as ours, are comforts ill exchanged for the few picturesque days that we enjoy; and whenever a family can purloin a warm and even something of an old-fashioned garden from the landscape designed for them by the undertaker in fashion, without interfering with the picture, they will find satisfactions in those days that do not invite strangers to come and see their improvements."

PART I. PRINCIPLES OF GARDENING.

GARDENING, in the perfection to which it has been lately brought in Britain, is entitled to a place of considerable rank among the liberal arts. It is (says Mr Wheatley) as superior to landscape painting as a reality to a representation: it is an exaction of fancy; a subject for taste; and being released now from the restraints of regularity, and enlarged beyond the purposes of domestic convenience, the most beautiful, the most simple, the most noble scenes of nature, are all within its province. For it is no longer confined to the spots from which it takes its name; but as already observed, regulates also the disposition and embellishment of a park, a farm, a forest, &c.: and the business of a gardener is to select and apply whatever is great, elegant, or characteristic in any of them; to discover, and to show all the advantages of the place upon which he is employed; to supply its defects, to correct its faults, and to improve its beauties.
SECT. I. Materials of Gardening.

These may be divided into two general classes; Natural and Artificial.

§ 1. Of the Natural Materials.

These, according to Mr Wheatley's enumeration, are—Ground, Wood, Water, and Rocks.

I. GROUND. By this is meant that portion of the surface which is included within the place to be improved; whether that surface be swamp, lawn, roughet, or broken ground; and whether it be a hill, a valley, a plain, or a composition of swells, dops, and levels.

The following passage has been quoted from Mr *Page 62. Gilpin's observations on the Wye*, as affording a sublime idea of what ground ought to be. "Nothing (says he) gives so just an idea of the beautiful swellings of ground as those of water, where it has sufficient room to undulate and expand. In ground which is composed of very refractory materials, you are presented often with harsh lines, angular insertions, and disagreeable abruptnesses. In water, whether in gentle or in agitated motion, all is easy, all is softened into itself; and the hills and valleys play into each other in a variety of the most beautiful forms. In agitated water, abruptnesses indeed are there, but yet they are such abruptnesses as in some part or other unite properly with the surface around them; and are on the whole peculiarly harmonious. Now, if the ocean in any of these swellings and agitations could be arrested and fixed, it would produce that pleasing variety which we admire in ground. Hence it is common to fetch our images from water, and apply them to land: we talk of an undulating line, a playing lawn, and a billowy surface; and give a much stronger and more adequate idea by such imagery, than plain language could possibly present."

The exertions of art, however, are here inadequate; and the artist ought not to attempt to create a mountain, a valley, or a plain: he should but rarely meddle even with the smaller inequalities of grounds. Roughets and broken ground may generally be reduced to lawn, or hid with wood; and a swamp may be drained or covered with water; whilst lawn may be variegated at pleasure by wood; and sometimes by water.

II. WOOD, as a general term, comprehends all trees and shrubs in whatever disposition; but it is specifically applied in a more limited sense, and in that sense we shall now use it.

Every plantation must be either a wood, a grove, or clump. A wood is composed both of trees and underwood, covering a considerable space. A grove consists of trees without underwood. A clump differs from either only in extent: it may be either close or open; when close, it is sometimes called a thicket; when open, a group of trees; but both are equally clumps, whatever may be the shape or situation.

x. One of the noblest objects in nature (Mr Wheatley observes) is the surface of a large thick wood, commanded from an eminence, or seen from below hanging on the side of a hill. The latter is generally the more interesting object. Its aspiring situation gives it an air of greatness; its termination is commonly the horizon; and, indeed, if it is deprived of that splendid boundary, if the brow appears above it (unless some very peculiar effect characterizes that brow), it loses much of its magnificence: it is inferior to a wood which covers a less hill from the top to the bottom; for a whole space filled is seldom little. But a wood commanded from an eminence is generally no more than a part of the scene below; and its boundary is often inadequate to its greatness. To continue it, therefore, till it winds out of sight, or loses itself in the horizon, is generally desirable; but then the varieties of its surface grow confused as it retires; while those of a hanging wood are all distinct, the furthest parts are held up to the eye, and none are at a distance though the whole be extensive.

The varieties of a surface are essential to the beauty of it: a continued smooth shaven level of foliage is neither agreeable nor natural; the different growths of trees commonly break it in reality, and their shadows still more in appearance. These shades are so many tints, which, undulating about the surface, are its greatest embellishment; and such tints may be produced with more effect, and more certainty, by a judicious mixture of greens; at the same time an additional variety may be introduced, by grouping and contrasting trees very different in shape from each other; and whether variety in the greens or in the forms be the design, the execution is often easy, and seldom to a certain degree impossible. In raising a young wood, it may be perfect. In old woods, there are many spots which may be either thinned or thickened: and there the characteristic distinctions should determine what to plant, or which to leave; at the least will often point out those which, as blemishes, ought to be taken away; and the removal of two or three trees will sometimes accomplish the design.

The number of beautiful forms and agreeable masses, which may decorate the surface, is so great, that the place will not admit of one, another is always ready; and no delicacy of finishing is required, no minute exactness is worth regarding: great effects will not be disconcerted by small obstructions and little disappointments.

The contrasts, however, of masses and of groups must not be too strong, where greatness is the character of the wood; for unity is essential to greatness; and if direct opposites be placed close together, the wood is no longer one object; it is only a confused collection of several separate plantations. But if the progress be gradual from the one to the other, the spaces and tints widely different may assemble on the same surface, each should occupy a considerable space: a single tree, or a small cluster of trees, in the midst of an extensive wood, is in size but a speck, and in colour but a spot: the groups and the masses must be large to produce any sensible variety.

When, in a romantic situation, very broken ground is overspread with wood, it may be proper on the surface of the wood to mark the inequalities of the ground. Rudeness, not greatness, is the prevailing idea; and a choice directly the reverse of that which is productive of unity will produce it. Strong contrasts, even opposi-
of the grove, passes by little circumstances at the entrance; even varieties in the form of the line do not always engage the attention; they are not so apparent as in a continued thicket, and are scarcely seen if they are not considerable.

But the surface and the outline are not the only circumstances to be attended to. Though a grove be beautiful as an object, it is besides delightful as a spot to walk or to sit in; and the choice and the disposition of the trees for effects within, are therefore a principal consideration. Mere irregularity alone will not please: strict order is there more agreeable than absolute confusion; and some meaning better than none. A regular plantation has a degree of beauty; but it gives no satisfaction, because we know that the same number of trees might be more beautifully arranged. A disposition, however, in which the lines only are broken, without varying the distances, is equally improper. The trees should gather into groups, or stand in various irregular lines, and describe various figures: the intervals between them should be contrasted both in shape and in dimensions: a large space should in some places be quite open; in others the trees should be so close together, as hardly to leave a passage between them; and in others as far apart as the connexion will allow. In the forms and the varieties of these groups, these lines, and these openings, principally consists the interior beauty of a grove.

The force of them is most strongly illustrated at Claremont †, where the walk to the cottage, though destitute of many natural advantages, and eminent for none; though it commands no prospect; though the water below it is a trifling pond; though it has nothing, in short, but inequality of ground to recommend it; is yet the finest part of the garden: for a grove is there planted in a gently curved direction, all along the side of a hill, and on the edge of a wood, which rises above it. Large recesses break it into several clumps, which hang down the declivity: some of them approaching, but none reaching quite to the bottom. These recesses are so remote from the openings in the middle of the grove; they penetrate almost to the covert: but the clumps being all equally suspended from the wood; and a line of open plantation, though sometimes narrow, running constantly along the top; a continuation of grove is preserved, and the connexion between the parts is never broken. Even a group, which near one of the extremities stands out quite detached, is still in style so similar to the rest as not to lose all relation. Each of these clumps is composed of several others still more intimately united; each is full of groups, sometimes of no more than two trees, sometimes of four or five, and now and then in larger clusters; an irregular waving line, issuing from some little crowd, loses itself in the next; or a few scattered trees drop in a more distant succession from the one to the other. The intervals, winding here like a glade, and widening there into broader openings, differ in extent, in figure, and direction; but all the groups, the lines, and the intervals, are collected together into large general clumps, each of which is at the same time both compact and free, identical and various. The whole is a place wherein to tarry with secure delight, or saunter with perpetual amusement.

The grove at Esher place was planted by the same masterly hand; but the necessity of accommodating the young plantation to some large trees which grew there before, has confined its variety. The groups are few and small: there was not room for larger or for more; there were no opportunities to form continued narrow glades between opposite lines; the vacant spaces are therefore chiefly irregular openings, spreading every way, and great differences of distance between the trees are the principal variety; but the grove winds along the bank of a large river, on the side and at the foot of a very sudden ascent, the upper part of which is covered with wood. In one place, it presses close to the covert; retires from it in another; and stretches in a third across a bold recess, which rises up high into the thicket. The trees sometimes overspread the flat below; sometimes leave an open space to the river; at other times crown the brow of a large knoll, climb up a steep, or hang on a gentle declivity. These varieties in the situation more than compensate for the want of variety in the disposition of the trees; and the many happy circumstances which concur,

† New Esher in Surrey.

In Esher's peaceful grove,

Where Kent and nature vie for Pelham's love,

render this little spot more agreeable than any at Claremont. But though it was right to preserve the trees already standing, and not to sacrifice great present beauties to still greater in futurity; yet this attention has been a restraint; and the grove at Claremont, considered merely as a plantation, is in delicacy of taste, and fertility of invention, superior to that at Esher.

It is, however, possible to secure both a present and a future effect, by fixing first on a disposition which will be beautiful when the trees are large, and then intermingling another which is agreeable while they are small. These occasional trees are hereafter to be taken away; and must be removed in time, before they become prejudicial to the others.

The consequence of variety in the disposition, is variety in the light and shade of the grove; which may be improved by the choice of the trees. Some are impermeable to the sun; others let in here and there a ray between the large masses of their foliage; and others, thin both of boughs and of leaves, only chequer the ground. Every degree of light and shade, from a glare to obscurity, may be managed, partly by the number, and partly by the texture, of the trees. Differences only in the manner of their growths have also corresponding effects: there is a closeness under those whose branches descend low, and spread wide; a space and liberty where the arch above is high; and frequent transitions from the one to the other are very pleasing. These still are not all the varieties of which the interior of a grove is capable; trees, indeed, whose branches nearly reach the ground, being each a sort of thicket, are inconsistent with an open plantation; but though some of the characteristic distinctions are thereby excluded, other varieties more minute succeed in their place; for the freedom of passage throughout brings every tree in its turn near to the eye, and subjects even differences in foliage to observation. These, slight as they may seem, are disagreeable when they occur; it is true, they are not regretted when wanting; but a defect of ornament is not necessarily a blemish.

3. It has been already observed, that *clumps differ from Clumps only*
Part I.  

GARDENING.

§ 2. Of Factitious Accompaniments.

These consist of Fences, Walks, Roads, Bridges, Practical Treatise on Planting and Gardening.

I. The FENCE, where the place is large, becomes necessary; yet the eye dislikes constraint. Our ideas of liberty carry us beyond our own species: the imagination feels a dislike in seeing even the brute creation in a state of confinement. The birds waltzing themselves from wood to grove are objects of delight; and the hare appears to enjoy a degree of happiness unknown to the barred flock. Besides, a tall fence frequently hides from the sight objects the most pleasing; not only the flocks and herds themselves, but the surface they graze upon. These considerations have brought the unseen fence into general use. This species of barrier must be allowed to incur a degree of deception, which can scarcely be warranted upon any other occasion. In this instance, however, it is a species of fraud which we observe in nature's practice: how often have we seen two distinct herds feeding to appearance in the same extended meadow; until coming abruptly upon a deep sunk rivulet, or an unfordable river, we discover the deception. Besides the sunk fence, another sort of unseen barrier may be made, though by no means equal to that, especially if near the eye. This is constructed of paling painted of the invisible green. If the colour of the bank ground were permanent, and that of the paint made exactly to correspond with it, the deception would at a distance be complete; but back grounds in general changing with the season, this kind of fence is the less eligible.

Clumps and patches of woodiness scattered promiscuously on either side of an unseen winding fence, assist very much in doing away the idea of constraint. For by this means

The wand'ring flocks that browse between the shades,  
Seem oft to pass their bounds: the dubious eye  
Decides not if they crop the mead or lawn.

MASON.

II. The WALK, in extensive grounds, is as necessary as the fence. The beauties of the place are disclosed that they may be seen; and it is the office of the walk,
GARDENING.

Part I.

III. The ROAD may be a thing of necessity, as an approach to the mansion; or a matter of amusement only, as a drive or a ride, from which the grounds and the surrounding country may be seen to advantage. It should be the study of the artist to make the same road answer, as far as may be, the twofold purpose.

The road and the walk are subject to the same rule of nature and use. The direction ought to be natural and easy, and adapted to the purpose intended. A road of necessity ought to be straighter than one of mere convenience: in this, recreation is the predominant idea; in that, utility. But even in this the direct line may be dispensed with. The natural roads upon heaths and open downs, and the grassy glades and green roads across forests and extensive wastes, are proper subjects to be studied.

IV. The BRIDGE should never be seen where it is not wanted: a useless bridge is a deception; deceptions are frauds; and fraud is always hateful, unless when practised to avert some greater evil. A bridge without water is an absurdity; and half a stone stuck up as an eye-trap is a paltry trick, which, though it may strike the stranger, cannot fail of disgusting when the fraud is found out.

In low situations, and wherever water abounds, bridges become useful, and are therefore pleasing objects; they are looked for; and ought to appear not as objects of ornament only, but likewise as matters of utility. The walk or the road therefore ought to be directed in such a manner as to cross the water at the point in which the bridge will appear to the greatest advantage.

In the construction of bridges also, regard must be had to ornament and utility. A bridge is an artificial production, and as such it ought to appear. It ranks among the noblest of human inventions: the ship and the fortress alone excel it. Simplicity and firmness are the leading principles in its construction. Mr Wheatley's observation is just when he says, "The single wooden arch, now much in fashion, seems to me generally misapplied. Elevated without occasion so much above, it is totally detached from the river; it is often seen straddling in the air, without a glimpse of water to account for it; and the ostentation of it as an ornamental object, diverts all that train of ideas which its use as a communication might suggest."

But we beg leave to differ from this ingenious writer when he tells us, "that it is spoiled if adorned; it is disfigured if only painted of any other than a dusky colour." In a rustic scene, where nature wears her own coarse garb, "the vulgar foot bridge of planks only guarded on one hand by a common rail, and supported by a few ordinary piles," may be in character; but amidst a display of ornamented nature, a coarseness of that kind would appear mean and paltry; and would be an affectation of simplicity rather than the lovely attribute itself. In cultivated scenes, the bridge ought to receive the ornaments which the laws of architectural taste allow; and the more polished the situation, the higher should be the style and finishings.

V. SEATS have a twofold use; they are useful as places of rest and conversation, and as guides to the points of view in which the beauties of the surrounding scene are disclosed. Every point of view should be marked with a seat; and, speaking generally, no seat ought to appear but in some favourable point of view. This rule may not be irrevocable, but it ought seldom to be deviated from.

In the ruder scenes of neglected nature, the simple trunk, rough from the woodman's hands, and the butts or stools of rooted trees, without any other marks of tools upon them than those of the saw which severed them from their stems, are seats in character; and in romantic or recluse situations, the cave or the grotto is admissible. But wherever human design has been executed upon the natural objects of the place, the seat and every other artificial accomplishment ought to be in unison; and whether the bench or the alcove be chosen, it ought to be formed and finished in such a manner as to unite with the wood, the lawn, and the walk, which lie around it.

The colour of seats should likewise be suited to situations: where uncultivated nature prevails, the natural brown of the wood itself ought not to be altered; but where the rural art presides, white or stone colour has a much better effect.

VI. BUILDINGS probably were first introduced into gardens merely for convenience, to afford refuge from a sudden shower, and shelter against the wind; or, at the most, to be seats for a party; or for retirement. They have since been converted into objects, and now the original use is too often forgotten in the greater purposes to which they are applied: they are considered as objects only; the inside is totally neglected, and a pompous edifice frequently wants a room barely comfortable. Sometimes the pride of making a lavish display to a visitor without any regard to the owner's enjoyments, and sometimes too scrupulous an attention to the style of the structure, occasion poverty and dulness within, which deprives these buildings of part of their utility. But in a garden they ought to be considered both as beautiful objects and as agreeable
GARDENING.

Greeable retreats: if a character becomes them, it is that of the scene they belong to; not that of their primitive application. A Grecian temple or Gothic church may adorn spots where it would be affectation to preserve that solemnity within which is proper for places of devotion: they are not to be exact models, subjects only of curiosity or study: they are also seats: and such seats will be little frequented by the proprietor; his mind must generally be indisposed to so much simplicity, and so much gloom, in the midst of gaiety, richness, and variety.

But though the interior of buildings should not be disregarded, it is by their exterior that they become objects; and sometimes by the one, sometimes by the other, and sometimes by both, they are entitled to be considered as characters.

As objects, they are designed either to distinguish, to break, or to adorn, the scenes to which they are applied.

The differences between one wood, one lawn, one piece of water, and another, are not always very apparent: the several parts of a garden would, therefore, often seem similar, if they were not distinguished by buildings; but these are so observable, so obvious at a glance, so easily retained in the memory, they mark the spots where they are placed with so much strength, they attract the relation of all around with so much power, that parts thus distinguished can never be confounded together. Yet it by no means follows, that therefore every scene must have its edifice: the want of one is sometimes a variety; and other circumstances are often sufficiently characteristic: it is only when these too nearly agree, that we must have recourse to buildings for differences: we can introduce, exhibit, or contrast them as we please; the most striking object is thereby made a mark of distinction; and the force of this first impression prevents our observing the points of resemblance.

The uniformity of a view may be broken by similar means, and on the same principle: when a wide heath, a dreary moor, or a continual plain, is in prospect, objects which catch the eye supplant the want of variety: none are so effectual for this purpose as buildings. Plantations or water can have no very sensible effect, unless they are large and numerous, and almost change the character of the scene: but a single building diverts the attention at once from the sameness of the extent; which it breaks, but does not divide; and diversifies, without altering its nature. The design, however, must not be apparent. The merit of a cottage applied to this purpose, consists in its being free from the suspicion: and a few trees near it will both enlarge the object, and account for its position. Ruins are a hackneyed device immediately detected, unless their style be singular, or their dimensions extraordinary. The semblance of an ancient British monument might be adapted to the same end, with little trouble, and great success. The materials might be brick, or even timber plastered over; if stone could not easily be procured: whatever they were, they would not be discernible; it is an object to be seen at a distance, rude, and large, and in character agreeable to a wild open view. But no building ought to be introduced, which may not in reality belong to such a situation: no Grecian temp-

les, no Turkish mosques, no Egyptian obelisks or pyramids; none imported from foreign countries, and unusual here. The apparent artifice would destroy an effect, which is so nice as to be weakened, if objects proper to produce it are displayed with too much ostentation; if they seem to be contrivances, not accidents; and the advantage of their position appear to be more laboured than natural.

But in a garden, where objects are intended only to adorn, every species of architecture may be admitted, from the Grecian down to the Chinese; and the choice is so free, that the mischief most to be apprehended is an abuse of this latitude in the multiplicity of buildings. Few scenes can bear more than two or three; in some, a single one has a greater effect than any number: and a careless glimpse, here and there, of such as belong immediately to different parts, frequently enlivens the landscape with more spirit than those which are industriously shown. If the effect of a partial sight, or a distant view, were more attended to, many scenes might be filled, without being crowded; a greater number of buildings would be tolerated, when they seemed to be casual, not forced; and the animation, and the richness of the objects, might be had without pretence or display.

Too fond an ostentation of buildings, even of these which are principal, is a common error; and when all is done, they are not always shown to the greatest advantage. Though their symmetry and their beauties ought in general to be distinctly and fully seen, yet an oblique is sometimes better than a direct view: and they are often less agreeable objects when entire, than when a part is covered, or their extent is interrupted; when they are bosomed in wood, as well as backed by it; or appear between the stems of trees which rise before or above them; thus thrown into perspective, thus grouped and accompanied, they may be as important as if they were quite exposed, and are frequently more picturesque and beautiful.

But a still greater advantage arises from this management, in connecting them with the scene: they are considerable, and different from all around them; inclined therefore to separate from the rest; and yet they are sometimes still more detached by the pains taken to exhibit them: that very importance which is the cause of the distinction ought to be a reason for guarding against the independence to which it is naturally prone, and by which an object, which ought to be a part of the whole, is reduced to a mere individual. An elevated is generally a noble situation. When it is a point or pinnacle, the structure may be a continuation of the ascent; and on many occasions, some parts of the building may descend lower than others, and multiply the appearances of connexion: but an edifice in the midst of an extended ridge, commonly seems naked alone, and imposed upon the brow, not joined to it. If wood, to accompany it, will not grow there, it had better be brought a little way down the declivity; and then all behind, above, and about it, are so many points of contact, by which it is incorporated into landscape.

Accompaniments are important to a building; but they lose much of their effect when they do not appear to be casual. A little mount just large enough for it; a small piece of water below, of no other use than
GARDENING.

II. PICTURESQUE BEAUTY. Though the aids of art are as essential to gardening, as education is to manners; yet art may do too much; she ought to be considered as the handmaid, not as the mistress, of nature; and whether she be employed in carving a tree into the figure of an animal, or in shaping a view into the form of a picture, she is equally culpable. The nature of the place is sacred. Should this tend to landscape, from some principal point of view, assist nature and perfect it; provided this can be done without injuring the views from other points. But do not disguise the natural features of the place:—do not sacrifice its native beauties, to the arbitrary laws of landscape painting.

Great Nature scorns controul; she will not bear
One beauty foreign to the spot or soil
She gives thee to adorn: "Tis thine alone
To mend, not change, her features. MASON.

Nature scarcely knows the thing mankind call a landscape. The landscape painter seldom, if ever, finds it perfected to his hands; some addition or alteration is almost always wanted. Every man who has made his observations upon natural scenery, knows that the misletoe of the oak occurs almost as often as a perfect natural landscape; and to attempt to make up artificial landscape upon every occasion is unnatural and absurd.

If, indeed, the eye were fixed in one point, the trees could be raised to their full height at command, and the sun be made to stand still, the rural artist might work by the rules of light and shade, and compose his landscape by the painter's law. But, whilst the sun continues to pour forth its light impartially, and the trees to rise with slow progression, it would be ridiculous to attempt it. Let him rather seek out, imitate, and associate, such striking passages in nature as are immediately applicable to the place to be improved, with regard to rules of landscape, merely human;—and let him,

Sect. II. Principles of Selection and Arrangement in the Subjects of Gardening.

I. Of ART. In the lower classes of rural improvements, art should be seen as little as may be; and in the more negligent scenes of nature, every thing ought to appear as if it had been done by the general laws of nature, or had grown out of a series of fortuitous circumstances. But in the higher departments, art cannot be hid; and the appearance of design ought not to be excluded. A human production cannot be made perfectly natural; and held out as such it becomes an imposition. Our art lies in endeavouring to adapt the productions of nature to human taste and perceptions; and if much art be used, do not attempt to hide it. Art seldom fails to please when executed in a masterly manner:—nay, it is frequently the design and execution, more than the production itself, that strikes us. It is the artifice, not the design, which ought to be avoided. It is the labour and not the art which ought to be concealed. The rural artist ought, therefore, upper every occasion, to endeavour to avoid labour; or, Picturesque if indispensably necessary, to conceal it. No trace of Beauty, should be left to lead back the mind to the expensive soil. A mound raised, a mountain levelled, or a useless temple built, convey to the mind feelings equally disgusting.

III. OF CHARACTER. Character is very reconcileable with beauty; and, even when independent of it, has attracted so much regard, as to occasion several frivolous attempts to produce it: statues, inscriptions, and even paintings, history and mythology, and Ossuaries— a variety of devices, have been introduced for this purpose. The heathen deities and heroes have therefore find their several places assigned to them in the Of embles woods and lawns of a garden; natural cascades have been disposed with river gods, and columns erected only to receive quotations; the compartments of a sum
GARDENING.

Part II.

pass obliquely upon the house and its accompaniments; so that their position with respect to each other, as well as the perspective appearance of the house itself, may vary at every step: and having shown the front and the principal wing, or other accompaniment, to advantage, the approach should wind to the back front, which, as has been already observed, ought to lie open to the park or pastured grounds.

The improvements and the rooms from which they are to be seen should be in unison. Thus, the view from the drawing-room should be highly embellished, to correspond with the beauty and elegance within: every thing here should be feminine, elegant, beautiful, such as attunes the mind to politeness and lively conversation. The breakfasting room should have more masculine objects in view: wood, water, and an extended country for the eye to roam over; such as allure us imperceptibly to the ride or the chase. The eating and banqueting rooms need no exterior allurements.

There is a harmony in taste as in music: variety, and even wildness upon some occasions, may be admitted; but discord cannot be allowed. If, therefore, a place be so circumstanced as to consist of properties totally irreconcilable, the parts ought, if possible, to be separated in such a manner, that, like the air and the recitative, the adagio and the allegro, in music, they may set off each other's charms by the contrast.—These observations, in the elegant performance whence they are extracted, the author illustrates by the following description of Persefield, the seat of Mr. Morris, near Chepstow in Monmouthshire; a place upon which nature has been peculiarly lavish of her favours, and which has been spoken of by Mr. Wheatley, Mr. Gilpin, and other writers, in the most flattering terms.

Persefield is situated upon the banks of the river Wye, which divides Gloucestershire and Monmouthshire, and which was formerly the boundary between England and Wales. The general tendency of the river is from north to south; but about Persefield it describes by its winding course the letter S, somewhat compressed, so as to reduce it in length and increase its width. The grounds of Persefield are lifted high above the bed of the river, shelving, and form the brink of a lofty and steep precipice, towards the southwest.

"The lower limb of the letter is filled with Persewood, which makes a part of Persefield; but it is at present an impenetrable thicket of coppice-wood. This dips to the south-east down to the water's edge; and seen from the top of the opposite rock, has a good effect.

"The upper limb receives the farms of Llancoat, rich and highly cultivated, broken into inclosures, and scattered with groups and single trees; two well-looking farm-houses in the centre, and a neat white chapel on one side: altogether a lovely little paradisalious spot. The lowness of its situation stamps it with an air of meekness and humility; and the natural barriers which surround it add that of peacefulness and security. The picturesque farms do not form a low flat bottom, subject to be overflowed by the river; but take the form of a gorget, rising fullest in the middle, and falling on every side gently to the brink of the Wye; except

Principal Residence.

Principal Residence.

Practical Treatise on
Plumbing and Gardening, p. 615.
made use of in disclosing the natural grandeur of the surrounding objects, which ought to appear as if they presented themselves to his view, or at most as if nothing was wanted but his own penetration and judgment to find them out. The walk should therefore be conducted in such a manner, that the breaks might be quite natural; yet the points of view obvious, or requiring nothing but a block or stone to mark them. A stranger at least wants no seat here; he is too eager in the early part of his walk, to think of lounging upon a bench.

"From the cold-bath he would ascend the steep, near the top of which a commodious bench or benches might be placed: the fatigue of ascending the hill would require a resting place; and there are few points which afford a more pleasing view than this; it is grand, without being too broad and glaring.

"From these branches he would enter the forest part. Here the idea of Nature in her primitive state would be strengthened: the roughnesses and deer to the right, and the rocks in all their native wildness to the left. Even Llanocot might be shut out from the view by the natural shrubbery of the cliff. The Lover's Leap, however (a tremendous sheer), might remain; but no benches, nor other work of nature, should here be seen. A natural path, deviating near the brink of the precipice, would bring the viewer down to the lower corner of the park; where benches should be placed in a happy point, so as to give a full view of the rocks and native wildness, and at the same time hide the farm houses, fields, and other acquired beauties of Llanocot.

"Having satiated himself with this savage scene, he would be led, by a still rustic path, through the labyrinth—when the shrubbery, the lawn, with all its appendages, the graceful Wye, and the broad silver Severn, would break upon the eye with every advantage of ornamental nature: the transition could not fail to strike.

"From this soft scene he would be shown to the top of Windcliff, where in one vast view he would unite the sublime and beautiful of Persefield."

Only one particular remains now to be noticed. A place which is the residence of a family all the year is very defective, if some portion of it be not set apart for the enjoyment of a fine day, for air, and exercise, in winter. To such a spot shelter is absolutely essential; and evergreens being the thickest covert, are therefore the best; their verdure also is then agreeable to the eye; and they may be arranged so as to produce beautiful mixture of greens, with more certainty than deciduous trees, and with almost equal variety: they may be collected into a wood; and through that wood gravel-walks may be led along openings of a considerable breadth, free from large trees which would intercept the rays of the sun, and winding in such a manner as to avoid any draft of wind, from whatever quarter it may blow. But when a retreat at all times is thus secured, other spots may be adapted only to occasional purposes; and be sheltered towards the north or the east on one hand, while they are open to the sun on the other. The few hours of cheerfulness and warmth which its beams afford are so valuable as to justify the sacrifice even of the principles of beauty to the enjoyment of them; and therefore no objections
PART III. PRACTICAL GARDENING.

WE now proceed to treat of horticulture or practical gardening. And although it may not appear to be the most perfect arrangement; yet as it is probably the most convenient and useful in the directions to be given for the practical management of the garden, we shall consider the work to be done for each month of the year in the kitchen garden, the flower garden and the nursery, under so many separate sections.

JANUARY.

SECT. I. Kitchen Garden.

In the beginning, or at any time in the course of this month, when the weather is open, sow some short-top'd radishes on a border exposed to the south, and protected by a wall or other fence; and about the middle or latter end of the month, you may sow some more of the same sort, and also some salmon radishes to succeed the short-top'd. The seed should be sown pretty thick at this season, because vegetation being slow at this period, they will be longer exposed to the depredation of birds, and if the weather prove severe, many of them will be cut off after they have appeared above ground. Sow the seed evenly over the surface, and rake it in with a large-wide-toothed rake, or if sown in beds, cover it with earth to the depth of half an inch from the alleys. A covering of straw about two inches thick would greatly promote their growth, and protect them from frost and birds. After the plants have come above ground, the covering of straw should be drawn off with a light rake in the early part of the day, and replaced in the evening.

Garden mats are frequently used to cover radishes, a number of small pins being previously stuck into the ground to support them an inch or two from the surface, and prevent them from pressing down the young plants. The covering ought to be continued for a longer or shorter time, according to the severity of the weather; but when the plants have pushed out their rough leaves it may safely be discontinued. Radishes sown under common hot-bed frames, without the assistance of warm dung, will succeed very well, and come on much earlier than those sown in the open air: due attention, however, must be paid to give them air whenever the weather is mild, by raising the glasses, or removing them altogether during warm days. If wanted very early, recourse must be had to a slight hot-bed.

At any time in this month, when the weather is mild Carrots. and dry, let a spot of ground in a warm situation be prepared for sowing a few early carrots, by digging the ground a full spade deep, and breaking the earth well; and when the seed is sown, let it be raked in. When carrots are wanted very early, they may be reared in a slight hot-bed.

About the beginning, or any time in the month, Spinach. when the weather is mild, you may sow some spinach; but if the weather will permit, some ought to be sown, both in the beginning and towards the end of the month. The smooth-seeded or round-leaved spinach should chiefly be sown now. It is preferred, on account of its leaves being thicker, larger, and more succulent than the prickly-seeded; though some of the latter ought also to be sown, because it is harder, and better able to sustain the severity of the weather. They may be sown either broadcast and raked in, or in shallow drills about an inch deep, and nine or ten inches asunder. It is a frequent practice to sow spinach in drills between the rows of early beans and cabbages.

You may sow some seed of cress, mustard, radish, Small rape, &c. and likewise some lap lettuce in a warm situation exposed to the sun. They form an agreeable salad when cut young. The ground on which they are to be sown ought to be sloped to the south, and covered with a common hot-bed frame, which should be sunk in the ground, so far as to allow the glasses to approach to within six or eight inches of the sown surface.

But small salad will succeed best in a slight hot-bed of warm dung formed to the depth of 18 or 20 inches; air must be admitted freely, whenever the weather will permit, by raising or removing the glasses.

About the middle, or towards the latter end of the month, sow parsley seed in any dry situation, in shallow drills nine inches asunder, and cover it in with earth to the depth of a quarter of an inch, or in single rows along the borders of the kitchen garden. There are two sorts, the plain-leaved and curled-leaved; the latter is preferred as garnishing on account of its large bushy leaves,
leaves, but both are equally good as pot herbs. This seed lies very long in the ground before it vegetates.

Sow some early peas in a warm situation, to succeed those sown in November and December. The principal early peas are the Charlton hotspur, golden hotspur, Reading hotspur, Masters hotspur, &c. the two first of which are reckoned the earliest. Sow them in rows two feet and a half apart; but when they are to be supported by sticks they ought to be three feet asunder. Some marrowfat peas should likewise be sown at this season for a first crop of late peas: the dwarf marrowfat is the most proper, but any other late pea will succeed very well, such as the Spanish moroito, tall marrowfat, Prussian prolific, sugar pea, dwarf sugar, egg pea, pearl pea, &c. These should be sown in rows three feet asunder, but when it is intended that they should be supported by sticks, the rows should be three feet and a half apart.

Any time in the course of the month, if the weather be mild, a main crop of beans may be sown. The Sandwich bean, toker, Windsor, broad Spanish, broad long-pod, &c. are the kinds most commonly used. After the ground has been well dug, put in the beans to the depth of about two inches, with a dibble, in rows three feet apart, and at the distance of four or five inches from each other in the rows: or they may be sown in drills to the same depth and distance. If no early beans were sown in November or December, they ought to be sown the earliest opportunity this month; the early Mazagan and Lisbon beans are the best. They ought to be planted in a warm border; if at the foot of a south wall, they will come on earlier. These may be planted closer than the larger beans, two feet, or two feet and a half, between the rows, being sufficient. When peas or beans are wanted very early, they may be sown in hot-beds or stoves, and when somewhat advanced, they may either be planted out into other hot-beds, into peach and vine-houses, or into any warm situation in the open air.

In the beginning, and again towards the end of the month, you may sow some lettuce. The kinds commonly used are the green and white cos, brown Dutch, Cilicia, and common cabbage lettuce. Prepare a piece of ground in a warm situation; sow the seeds moderately thick, and rake them in as evenly as possible. They may also be sown under hand glasses or in common hot-bed frames, to be occasionally covered with glasses or mats: but in either case, air must be freely admitted, whenever the weather will permit. When seeded for very early, they may be sown in a slight hot-bed, and planted out in the open air in March or April.

Take care of lettuce plants which have stood the winter.—If you have lettuce plants in frames or under hoops, covered with mats, give them plenty of air when the weather is moderate. Remove all decayed leaves, and destroy snails which frequently infest them; and when the frost is severe, take care to protect them well with mats.

The cauliflower plants raised last autumn, which have stood during the winter in frames, should be looked over in open weather. If any decayed leaves appear, pick them off; stir up the earth between the plants, and remove all weeds. In mild weather, give them plenty of air during the day, by pushing down, or removing the glasses altogether: but cover them during the night, unless when the weather is particularly mild; when it is frosty, or rains much, they ought to be covered during the day. But if the frost is very severe, the frames should be protected at night with a covering of mats, and even during the day, should the frost be intense, without amusing; and some straw, dried leaves, or something of that nature, should likewise be laid all round the outside of the frame, to prevent the frost from penetrating its sides.

Cauliflowers under bell and hand glasses require the same attention: during mild weather, the covers should either be taken off altogether, or raised (or tilted) on the south side, so as to admit the air freely during the day, and shut again at night, unless the weather should be very mild, in which case they may remain a little tilted on one side; but should intense frost prevail, they should be kept shut, and covered with straw or something of that nature. The free admission of the air will prevent the plants from becoming weak, and make them less apt to run up to flower before they have acquired sufficient size. In mild winters, slugs very frequently injure cauliflower plants; they ought, therefore, to be carefully looked for and destroyed.

About the end of the month, if the weather is mild, plant out a few early cabbages, on a spot of ground well dug and manured with rotten dung, at the distance of a foot and a half from each other, or even closer, as they are to be cut early, and before they acquire a great size. The early York, Battersea, and sugar-loaf, are the kinds which should be planted at this season.

Transplant some full grown cabbages and savoys, for transplant seed, about the beginning of the month; though the cabbages, &c. for seed, early part of winter is the most proper time for doing so. See November.

In open dry weather, earth up such celery as has advanced much above ground; let the earth be well bro-celery, and laid up almost to the tops of the plants, but care must be taken not to bruise them. This will afford them protection against frost, which might prove very injurious to them at this season.

Where celery is wanted daily, a quantity of straw or something of that nature, should be laid over the rows on the approach of frost, which will prevent the frost from penetrating the ground, and, on the removal of the covering, the celery may be dug up: or when severe weather threatens to set in, a quantity of celery may be taken up, placed in some situation sheltered from the weather, and covered as far as the blanched part extends with sand.

In open dry weather prepare some full grown endive for blanching. When the plants are perfectly dry, dive them; tie up their leaves close together, and they will be completely blanched in about a fortnight. As endive is very apt to rot in wet weather at this season, when blanched in the open air, a quantity of it ought to be transplanted into a ridge of dry earth, in some situation where it may be sheltered from rain.

In open dry weather, the earth should be drawn up about such peas and beans as may have advanced an inch or two above ground, which will both strengthen them and protect them against frost.
GARDENING.

Part III.

January.
Kitchen Garden.

given after the transplanting has been finished. The pots ought to be plunged close to one another in the earth of the bed, and all the spaces between them ought to be carefully filled with earth, to prevent the rank steam of the dung from rising up, which would certainly kill the plants. The bed ought to be carefully examined every day, to see that the roots of the plants do not receive too much heat. If any thing like that appear, draw up the pots a little, taking care to replunge them to the rim after the danger is over. When the plants are fairly rooted, if the earth appears dry, give them a little water in the warmest time of the day; let the watering be occasionally repeated very moderately, according as the earth in the pots becomes dry. All the water given to the plants at this season ought to stand for a few hours within the bed, that it may acquire the same temperature with the earth in which the plants grow, as very cold water would chill the plants too much.

In order to preserve a proper heat in the bed as long as possible, the sides of it ought to be covered with straw or dry leaves, which will defend the bed from cold piercing winds, heavy rains, and snow. Should the bed be unprotected when any of these prevail, the heat would be diminished, and the plants receive a check. If a lively heat be kept up, you may admit air to the plants every day, by raising the glasses in proportion to the heat of the bed and temperature of the external air. If the air be very cold, it will be necessary to fix a piece of mat or some such thing to the edge of the saish, which may hang down over the opening, and prevent the cold air from rushing too freely into the bed. About a fortnight after the bed has been formed, it ought to be examined carefully, to discover whether the heat of the bed still continues strong enough; if not, the dry leaves and straw ought to be removed from the front and back of the bed if any had been placed there, and a quantity of fresh horse dung should be supplied. The lining thus applied should not exceed 15 or 18 inches in thickness, and should be raised a few inches higher than the bed. When the thick lining is applied, it is apt to throw in too great a heat, and injure the plants. A quantity of earth should be laid on the top of the dung thus applied to the depth of two inches, to keep down the rank steam. The lining will soon increase the heat of the bed, and maintain it for ten days or a fortnight longer. At the expiration of that time, when the heat begins to fail, the two sides of the bed should receive a lining of the same thickness, which will again augment the heat of the bed, and preserve it in good condition for upwards of a fortnight longer. By lining first the one side and then the other at the interval of about a week or ten days, the heat of the bed may be made to last longer than when both linings are applied at the same time. Either method may be followed, according to the degree of external cold which may prevail, or according to the degree of warmth required to be maintained in the bed. After performing the lining, if very cold, wet, or snowy weather prevail, it may be proper to lay a quantity of long dry litter all round the general lining, which will protect the whole of the bed, and keep it in a proper temperature. By the proper management of this seed-bed, and by the due application of linings, the growth of young plants may be promoted till they are fit to be planted out into other hot-beds, where they are to remain and produce fruit. Where there is plenty of hot dung and every other convenience, a second bed may be prepared, into which the young plants may be transferred and nursed till they become perfectly fit for final transplantation. Due attention must be paid to have this second nursery-bed in proper condition for the reception of the pots containing the young plants. It is to be formed, earthed over, and taken care of, according to the directions given for the management of the seed-bed. When the plants have got their two first rough leaves, two or three inches broad, and have pushed out their two first running buds, they are in a proper state for planting out into larger hot-beds. For the further management of cucumbers and melons, see February.

It is proper that none but such seeds, both of cucumbers and melons, as have been kept for some time, should be sown; those which have been kept for two or three years are to be preferred, because the plants which proceed from them are thought to be, not only more fruitful, but to produce their fruit sooner. Plants which are produced from recent seeds commonly push vigorously, and their shoots grow to a great length before they show a single fruit. The best sorts of cucumbers for producing an early crop, are the early short prickly and long green prickly; the former of these is the earlier, the other produces the best crop and the largest fruit. There are several sorts of melons sown for an early crop, viz. the romana, cantaloupe, polignac, &c. The romana is a very good bearer, and produces early, and is a very well-flavoured, though small fruit. The cantaloupe is a very well-flavoured melon, acquires a good size, and ripens early. The polignac is also a very good melon. It is better, however, to sow two or three kinds, if they are easily to be had, for the sake of gaining greater variety.

Hot-beds may be formed any time this month for forcing asparagus: they are to be formed in the same way as hot-beds for cucumbers and melons; the dung, however, need not be raised to the same height, from two and a half to three feet will be sufficient. After a bed has been formed, it should be covered with earth to the depth of six or seven inches, and the asparagus plants immediately put in; but the frame and glasses are not to be put on till after the violent heat of the bed shall have subsided, and the rank steam escaped. A sufficient quantity of asparagus plants, proper for forcing, must be provided; viz. such as have been raised from seed and planted out in the open ground for two or three years, as directed elsewhere; six hundred will be sufficient for a frame of three lights, and so on in proportion, for a larger or smaller frame. The strongest and most vigorous plants ought to be chosen, and should be planted very close together, that the quantity produced may repay the trouble and expense of forcing. Having marked the size of the frame on the surface of the bed, raise a ridge of earth a few inches high, against which place the first row of plants, and draw a little earth over the roots of each; next to them another row may be planted as close as possible, and so on till the whole space is covered, some moist earth should be applied all round the outside of the space, occupied by the plants, and raised an inch or two above their tops. Then the whole should be covered with a quantity
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Where mint, tansy, and terragon, are required very early, a slight hot-bed may be prepared and covered with earth to the depth of five or six inches, in which the roots of mint, tansy, and terragon, may be planted and covered with a frame and glasses.

About the beginning of this month, some peas and Early pea beans may be sown in a hot-bed, either for transplanting into a warm border in the open air, or into other hot-beds where they are to remain, and produce a crop; the early framing peas is best for this purpose.

A hot-bed may be formed, in which some early Early potatoe potatoes may be planted, either to be planted out later, or to remain to produce a crop.

Sow some early kidney beans in a hot-bed, or in pots, to be placed in a hot-house. Fill moderate sized pots (2½") with rich light earth, and sow three or four beans in each pot. When the plants have come up, give them a moderate quantity of water; they will produce a crop in March and April.

SECT. II. Fruit Garden.

If any apple or pear trees remain unpruned on walls, or espaliers, that work may be performed any time this pear tree month, even though the weather should be frosty; some people indeed think it improper to prune trees during frost, lest the trees should receive injury by having their outer surfaces exposed to the action of the frost; but their apprehensions are chimerical.

Apples and pear trees produce their flower buds on short branches, (or spurs as they are termed), which proceed from the sides of the branches of one or more years standing, and which every year increase in number, while the branches from which they proceed continue vigorous: if these branches, which throw out spurs, be shortened or cut at their extremities, they commonly push out a number of smaller branches, which acquire considerable length, but form no flower buds; it is therefore proper in pruning these trees, to take care never to shorten a leading branch where there is room on the wall or espalier to allow it to be extended, unless when a supply of new wood is wanted to fill up a vacancy. In young trees which have not yet formed a sufficient head, select the most vigorous and best placed shoots, and train them to the wall or espalier, at the distance of from four to six inches from one another; any branches that intervene between them are to be removed close to their origin, and all those branches which do not apply well to the wall or espaliers may likewise be removed. When the branches are too thin, and a supply of wood is wanted, one or more of the last year's shoots may be cut down to within a few inches of its origin; four or five buds are commonly left. These branches, so shortened, commonly push out three or four shoots the ensuing season. The young branches that have been laid in at full length, will in two or three years produce a good many spurs or short branches along their sides, from which a crop of fruit may be expected. In old trees, that have been already trained, all the vigorous bearing branches are to be retained, unless where they may happen to be too crowded, then the branch intended to be removed should be cut out close to its insertion. When any of the old bearing branches seem to be worn out, or decayed, they should be pruned out near
left from ten to fifteen inches long, or thereby. In trees of moderate growth the branches ought to be left proportionally longer, the smaller ones from half a foot to ten inches, the more vigorous from one foot to a foot and a half. In very vigorous trees, the branches ought to be shortened but little, and some of them not at all, the smaller shoots may be shortened to the length of a foot or fifteen inches; the more vigorous should have only about a third or fourth part of their length cut off; and the most vigorous should not be shortened at all, for the more they are shortened, the more they are disposed to push vigorously and run to wood, and on that account produce few fruit. As the flower buds are sometimes situated near the extremity, at other times near the bottom of the branch, this circumstance in a certain degree must regulate the shortening the branch, as care must be taken to leave a sufficient quantity of flower buds, where fruit is the object. Care must likewise be taken to have a bud which is expected to produce a branch, at the eye which is next the cut extremity; it is of no moment whether it be alone or in company with one or two flower buds, but it is absolutely necessary to have one to produce a leading branch, without which the fruit will not thrive. When three or four last year’s shoots are found on a branch of the preceding year, the one at the upper and lower extremities is frequently preserved; in that case the intermediate ones ought to be cut away close to the branch: but should any of the intermediate ones be selected as the most proper to be retained, the branch of the preceding year should be cut off close by the uppermost of the shoots which has been fixed on, and all these shoots which are to be removed should be cut away close to the branch from which they proceed. After each tree has been gone over, it ought to be carefully nailed to the wall or fixed to the espalier.

Vines if cut when in a growing state are apt to bleed very copiously. This bleeding is detrimental to them, and is stopt with great difficulty. If vines are pruned at a short time before the rise of the sap, they are likewise liable to bleed at the recently cut extremities; it would therefore be improper any time this month to prune vines which grow in the hot-house or in a vineyard which is to be early forced; but such as grow on open walls or in vineyards may be safely cut any time this month. Though it would certainly be advisable to prune as soon after the fall of the leaf as may be, as in that case the cut extremities would have sufficient time to heal, and all danger of bleeding would be removed.

Fig trees may be pruned any time this month, though perhaps it would be as well to defer it till next or following month. For the method, see FEBRUARY.

Gooseberries and currants may still be pruned. See NOVEMBER.

Gooseberries and currants may be planted if the severity of the frost does not render the ground too hard; indeed they may be planted any time from the fall of the leaf in autumn till the pushing out of their buds in spring. It is usual to plant them in rows along the border plots to divide the plots in the kitchen garden; in which case they ought to be planted two or three yards apart, and the distance between the rows must depend on the size of the plots they are to separate (10, 15 or 18 yards). They ought to be trained up with a single
old plantations of raspberries are commonly made use of for this purpose. Any of the last years shoots that are well rooted and tolerably vigorous will answer perfectly well. Those which have two or three buds, formed on the roots, from which young shoots are to proceed the following summer, are generally to be preferred to those which have fewer though equally vigorous. They ought to be taken up carefully with all their roots, and after the stem has been shortened a little (about one-third) they may be planted at the distances already mentioned. Plantations formed now will yield some fruit the ensuing summer, and a plentiful crop the following season. The kinds of raspberries commonly used are the white, double bearing, (which bears two crops, one in summer the other in autumn), the smooth stalk, the Antwerp (very large).

If the weather be mild, all kinds of fruit trees may be planted any time this month; but if it should be deemed more advisable to defer planting till next month, the ground may be prepared for their reception any time during open weather. The borders on which fruit trees are to be planted, which are to be trained against walls or espaliers, should be trenched or dug to a depth of two feet, or more, from the edge of the walk, for planting and preparing ground for fruit trees, see October.

The roots of the more tender sorts of fruit trees, viz. peaches, nectarines, apricots, and indeed all sorts of stoned fruit, which may have been planted any time in the course of the winter, will require to be protected during frost by a covering of straw, or litter mixed with dung, or something of that nature, applied to a considerable distance round the stem, so as to cover the ground completely, and prevent the frost from penetrating.

Protect fig-trees during frosty weather with a covering of mats, or something of that nature, because their shoots being succulent, particularly towards their extremities, are apt to be destroyed by the frost. This is of the more consequence as the fruit is produced from the young shoots only, and chiefly from their extremities, the parts most liable to suffer.

Where there are vineyards, peach, cherry-houses, &c. force fruit the month when it is intended to force early, and fires ought to be applied about the middle or towards the end of it. See Forcing, February.

Towards the beginning, middle, or end of the month, straw-beds may be made for forcing strawberries, which, if properly managed, will produce ripe fruit in March or April. The straw-beds are to be formed according to the directions given under the article Melon, and Cucumber. See Kitchen Garden, January. The dung should be raised at least to the height of three feet, and the frame and glasses put on as soon as the bed is made, which will both protect it from rain or snow, and draw up the steam sooner. As soon as the violent heat is over, the surface of the bed should be covered to the depth of four or five inches with dry earth, or with a quantity of decayed manure barks taken from an old tan-bed. The pots containing the plants should be plunged up to the rims into the earth or tan with which the bed is filled, and the beds covered. They should be placed as close together as possible, and care taken to fill up all the interstices with earth or tan. When all the pots are plunged, put on the glasses and keep them close till
the steam rise in the bed, when it will be necessary to
raise them a little behind, to allow the steam to pass off.
The alpine and scarlet strawberry are commonly made
use of for this purpose.

The plants should be two years old, and if not frozen
in the past autumn, they will succeed the better; but
if a quantity of plants were not put into pots last au-
turn for this purpose, that work may be done any
time this month during open weather. For the
method, see September. Or the plants may be taken up
now with balls of earth, and placed in the beds without
being put into pots. When the plants begin to push,
let them have plenty of air during favourable weather,
for should they be kept too close they will become
weakly, and either produce no flowers at all, or their
flowers will drop off without yielding fruit. They
should likewise be frequently watered and protected
during the night in severe weather with a covering of
mats. When the heat of the bed begins to decay, it
should be renewed by proper linings of fresh dung, ap-
plied as directed for melon-beds. As to the size of hot-
beds nothing need be said, as that must be regulated by
the number of plants intended to be forced. Hot-beds
formed of tansers bark, particularly where there are pits
constructed on purpose, will answer better than those of
horse-dung, because they afford a more equable heat.
Where there are pine-houses, or hot-houses of any kind,
plenty of strawberries may be obtained early, without
much trouble, by placing pots filled with the plants in
them anywhere near the glass.

Sect. III. The Flower Garden or Pleasure Ground.

Double flowers, as sweetwilliams, wallflowers, stocks,
rose campion, and auriculas, carnations, &c. kept in pots,
grown in a greenhouse, ought to be protected in severe weather, either by common
garden frames, or by coverings of mats supported
on hoops. Due attention must be paid to give them air
whenever the weather is mild. Where there are no
conveniences of the above description, the pots may be
plunged up to their rims in well-sheltered borders close
to a south wall. The pots containing hardy plants
should likewise be plunged in the earth in some dry
situation up to the rims, to protect the roots from
frost.

During severe frosty weather the beds in which the
finer sorts of hyacinths, tulips, ranunculuses, anemones,
&c. have been planted, should be protected by a cover-
ing of mats or straw; but if the plants have begun to
make their appearance above ground, the beds should
be arched over with low hoops and covered with mats,
which ought to be fixed down to prevent their being
blown off by the wind; and they should be removed
occasionally during mild weather.

If any hyacinth, tulip, narcissus, crown imperial,
crocus, or snowdrop roots remain unplanted, they ought
to be put into the ground. For the method of
planting them, see October.

About the latter end of the month, if the weather is
mild, sow a few sweet peas in any warm sheltered situa-
tion for flowering early, also some seeds of candytuft,
larkspur, adonis, dwarf sunflower, persicaria, venus
navel-wort, venus looking-glass, lobel's-catchfly, and
pansy violet.

Pots of pinks, carnations, roses, Persian or common
liach, hyacinth, polyanthus, narcissus, Italian narcissus,
dwarf tulip, jonquil, lily of the valley, &c. may be
placed in the hot-house, where they will flower early.
As soon as they come into bloom they should be removed
into a green-house, or the apartments of a dwelling-
house, where they will continue longer in flower than
they would do in the former, where the great heat
would accelerate their decay. All those should have
been put into pots the preceding autumn, or at least
some time previous to their being introduced into the
hot-house. The roses in particular require to be well
rooted in the pots before they are forced.

Shrubs may now be pruned, which should be done
with a knife and not with garden shears. All mean-
to irregular shoots which extend far beyond the rest of
shrubs, the branches should be cut off. A few branches should
also be cut out wherever they are too much crowded to-
gether, likewise all dead and decayed ones. After the
pruning has been finished, the ground in the shrubbery
ought to be dug over, and all suckers removed. Where
the shrubs are too much crowded together, some of them
ought to be taken out; and where any of them have
died, or if they stand too distant, some young ones may
now be planted to fill up the vacancies.

Grass walks and lawns should be kept neat by fre-
quent polishing and rolling. Polishing may be performed in
open dry weather, with a long taper ash pole about
twelve or fifteen feet long, which breaks and scatters
the worm casts. After this, in moderately dry weather,
roll with a wooden roller, to which all the loose worm
casts will adhere. Walks or lawns may also be made
this month during open weather. Good turf may be
obtained from commons or downs where sheep feed,
or from fields which have been lain under pasture.
Each turf should be marked out a yard long and a foot
in breadth, and cut to the thickness of an inch with a
turfing iron. As the cutting proceeds, they should be
rolled up compactly with the grass side in. If they are
not closely rolled up they will be apt to break in
carrying. They must be laid on the walk or lawn close
to one another after the surface has been rendered level
and compact by proper treading, that it may not settle
unequally. When they have been put on they must be
beaten down with a wooden rammer, and afterwards rolled
with a large iron or wooden roller.

Gravel walks should be cleared of weeds and all de-
Of gravel cayed leaves, and kept clean; and in dry weather they walk.
ne should be occasionally rolled. New walks may likewise
be formed now. For the method, see March.

Edgings of boxwood, thift, &c. may be planted any Edgings
time this month in open weather. See October.

Hedges of hawthorn, barberry, privet, hawthorn, yew, birch, elm, elder, &c. may be planted during this &c.
month. See November. Old hedges which have hedges
become open below should be plashed. See December.

Forest trees for ornamental plantations, coppices, or Of forest
woods, may be planted either now, or at any time from trees.
the fall of the leaf till the rise of the sap in spring. See
October.

Sect. IV. Nursery.

Prune and transplant shrubs, fruit and forest trees, ment of
Trim the stems of forest trees, and cut off all Ir-Shrubs and
regular trees.
regular rambling shoots of shrubs, and reduce them to a regular neat form. This work may be executed any time this month, even during frost, when little else can be done. All kinds of hardy deciduous shrubs, fruit, and forest trees, may be transplanted during open weather.

Dig ground in open weather, and wheel out dung in frost.

Vacant compartments of ground may be dug any time during open weather; and likewise after the necessary pruning has been given to the trees and shrubs, the ground between the rows may be dug, and all weeds carefully buried.

The young plants of many of the tenderer kinds of trees and shrubs, such as cedar of Lebanon, and some other species of pine, cypress, Chinese Juniper, strawberry-tree, &c. require to be protected during frost. If they have been raised in boxes or pots, they may be placed in garden frames and occasionally covered with the glasses; but care must be taken always to remove the glasses in mild open weather. If the plants stand in beds in the open ground, they may be covered with mats supported on hoops, which must be removed during favourable weather, or a covering of pease straw, or something of that nature may answer the purpose.

Layers of many kinds of trees and shrubs may be made any time this month during open weather; many of them which are laid now will be well rooted and fit for removing by October; for the method, see NOVEMBER.

Put in cuttings of honeysuckles, gooseberries, currants, &c. indeed most kinds of trees and shrubs may be propagated by cuttings. For this purpose select the strongest shoots of last year's growth; take them off by a clean cut with a sharp knife, and reduce them to the length of ten, twelve, or fifteen inches, by cutting off part of their smaller extremities. Plant them in rows a foot apart, and at the distance of four or five inches from one another in the rows, taking care to insert one-third or one-half of their length into the ground. Though cuttings will grow when their smaller extremities are put into the ground, they never succeed so well in this inverted position, therefore in planting, attention should be paid to place them in their natural position. Older and longer branches of some trees and shrubs, viz. willow, elder, &c. may be employed as cuttings.

Gooseberries, currants, roses, lilacs, and many other shrubs and trees, may be propagated by suckers or offsets from the roots; these may be taken off any time this month, and planted in rows. Previous to their being planted it would be proper to trim off part of their extremities.

PART V. Green-House and Hot-House.

During frost, keep the glasses shut; but whenever the weather is mild, give the green-house air by opening the glasses more or less according to the state of the weather; even in the brightest mild days during this month the glasses should not be opened until about ten o'clock in the morning, and ought to be shut again about three in the afternoon. In dull foggy days, even though the weather be mild, they should be opened but little, and that for a short time, and in very damp weather, not at all. When very severe frost prevails, fires must be put on, and the flues gently warmed; but the temperature of the air should not be raised higher than merely to keep off the effects of the external frost. A little fire should likewise be put on during very wet weather to banish the damp. Water should be given to such plants as require it, but sparingly. Succulent plants, such as aloes, &c. require little or no water at this season. All dead and decayed leaves should be carefully picked off, and the green-house kept clean.

Particular attention must be kept to the pine apple pine apple plants which are to produce fruit the ensuing summer, plants required for use in the greenhouse, and as many of them in the course of this month begin to give straws flowers. If due attention be now paid to keep up a proper heat, both in the tanned bed and in the air of the hot-house, the plants may receive such a check as will considerably affect the size of the future fruit. The bark bed must be carefully examined; and if the bark be much decayed and the heat found on the decline, a quantity of fresh tanners' bark should be prepared to be added as a refreshment to the old. The pots containing the pine apple plants should then be taken out of the tan pots, and a quantity of the decayed tan removed from the surface and sides of the pots, to make room for the fresh tan which is to be added. The old tan must likewise be turned up from the bottom, and well mixed with the new, after which the pots must be again plunged into the tan. But if, on examination, the heat of the tan pit be found good, and the tan not much decayed, it will be sufficient to turn the old tan, and to mix it well together without making any addition of new. This operation will revive the heat of the bed, and preserve it in good condition for some time to come. The heat of the air in the house must likewise be attended to, and regulated by the thermometer and by due attention to the fires. Moderate watering must be given once a week or ten days, according as the pine apple plants may seem to require it; and care must be taken not to pour any of the water into their hearts or among their leaves.

The other plants in the hot-house must be regularly watered; but those of a succulent nature, such as the different species of aloe, euphorbias, mesembryanthemum, &c. require very little water at a time, and that but seldom.

Kidney beans, sown in pots or in narrow boxes of Kidney about two or three feet long, may be reared in the hot-house. Those sown this month will produce fruit in April or March. When sown in pots, two or three may be put into each, and covered about an inch deep: When in boxes they may be planted to the depth of an inch along the middle, at the distance of two or three inches from one another. The pots or boxes may be placed on the crib of the bark bed, on shelves, or in any convenient situation, within the house, where they may not encumber the other plants. After the plants have come up, they should be regularly and frequently watered. The kinds commonly used for this purpose are the early speckled dwarf, negro dwarf, and dun-coloured dwarf.

Cucumbers may be raised with tolerable success in the hot-house, which will produce fruit early in spring. If the plants have been raised in small pots, plunged in the tan of the bark bed, or in hot-beds made of horse dung, they should be transplanted into larger pots or boxes, in which they may remain and produce fruit;
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or the seeds may be sown at once in the pots where they are to remain. In this case six or eight seeds may be sown in each pot, or patches containing that number may be sown at proper intervals in long narrow boxes. When the plants have come up, only two or three of the strongest should be left in each pot or patch. The pots or boxes may be placed in any convenient situation in the hot-house, but will succeed best on a shelf fixed near the top of the house, within a short distance of the glass. The plants must be frequently watered, and have some small rods fixed near them, to which the runners may be fastened.

FEbruary.

SECT. I. Kitchen Garden.

Admit air to cauliflower plants. The cauliflower plants, which are under frames, should have plenty of air. Indeed, whenever the weather will permit, the glasses ought to be taken off entirely.

About the end of the month, if the weather be mild, some of the strongest plants may be transplanted into the situations where they are to remain. They ought to be planted in good well-manured ground, in a warm situation, at the distance of two feet and a half each way from one another. The same attention must be paid to cauliflowers under bell or hand-glasses. When more than two plants happen to be under one glass, the weakest of them should be planted out about the end of the month, if the weather be mild, and only one or two should be left under each glass: but if the weather is unsettled or severe, transplanting ought to be deferred till next month.

Sow cauliflower seeds may be sown any time this month to produce plants to succeed those that have been preserved during winter under frames or hand-glasses, or to supply the place of those which may have been cut off by the severity of the weather.

For this purpose make a slight hot-bed of horse dung, to the height of 20 inches or two feet; cover it with a light rich earth to the depth of four or five inches, on the surface of which sow the seeds, and cover them to the depth of a quarter of an inch with earth of the same description. After the seed has been sown, a frame and glasses should be put on, if one can be spared for this purpose; and when the plants begin to appear above ground, they should have plenty of air, whenever the weather will permit, otherwise they will be drawn up and become weak. The glasses, therefore, (unless in very severe weather) should be raised every day, and in mild ones taken off entirely. When there are no glasses to spare, the bed may be covered during the night, and in severe weather, with mats properly fixed over it. The plants should be sprinkled with water from time to time, if moderate showers should not render this unnecessary.

Cabbage plants, if tolerably strong, should be transplanted in the course of this month. See Planting out cauliflowers, January.

About the middle, or towards the end of the month, sow some cabbage and savoy seed to raise plants for late crops in summer and autumn. Both the early and late kinds of cabbage may be sown now, but it is better to sow them in August; but if none were sown in autumn, or if the plants raised then have been cut off by the severity of the winter, a quantity of both early and late cabbage should be sown the first opportunity this month. That the plants may sooner acquire sufficient strength for planting out, it would be proper to sow them in a slight hot-bed.

When a small salad is required, let some seeds of small mustard, cress, radish, rape &c. be sown regularly every ten to eight or ten days during the course of the month. See January.

Earth up celery in open dry weather if the plants Celery have advanced much above ground. Sow some upright celery seed for an early crop about the middle or towards the end of the month, in a small bed of rich light earth in a warm situation. There are three ways in which this may be performed. 1st The earth of the bed should be well broken with the spade; the seed sown on the rough surface and raked in. 2dly, The surface of the bed may be made smooth; the seed sown and covered to the depth of a quarter of an inch with light rich earth. 3dly, A quantity of earth, to the depth of about half an inch, should be removed with the back of a rake from the surface of the bed into the alleys, which, after the seed has been sown, should be gently replaced with the rake. Those who are very anxious to have early celery, should sow some in a slight hot-bed. The plants raised now will be fit for use in June or July; but it would be advisable to sow few at this season, as they will be very apt to pipe or run up to seed before they acquire sufficient size: there are two kinds of celery, the Italian, and turnip-rooted or celeriac.

About the beginning of this month sow some short Radishes topped radishes to succeed those sown last month, and some salmon and Italian radishes at any time during the month. See January.

Some round-leaved spinach may be sown any time in Spinach the course of the month, to succeed that which was sown last month. See January.

Some early peas may be sown this month. This is Peas. likewise a proper season for sowing a full crop of late peas, such as marrowfat, rounccivals, Carolina, and sugar peas, &c. For the distances at which they are to be sown, see January.

This is the proper time to plant beans. For the method and distances, see January.

Such peas and beans as are sufficiently advanced in growth should now be earthed up.

In mild open weather sow some seeds of green and Earth up white cos lettuce, likewise some Sicilian, imperial, brown Dutch, and common cabbage lettuce. See January.

If young lettuce plants are wanted for transplanting early, they should be sown in a slight hot-bed or in some warm sheltered situation; and when they have advanced to the height of about two inches, they may be planted out in the open ground. Lettuces that have stood the winter in frames, under hand-glasses, or in warm borders, should be thinned and left standing at the distance of one foot from each other, and those that are drawn out should be planted in some proper situation.

Sow and transplant lettuce at least one spade deep or two, if the depth of the soil will
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February. Pleasure or Flower Garden.

&c. They ought to be covered with the glasses, some time previous to the application of fire-heat, and if the houses have been constructed with pits for containing hot-beds of tanners bark or horse dung, a quantity of either should be got ready. If tanners bark is to be used, it ought to be spread out and exposed to the air, that it may dry, for if it be put in too wet it will either not heat at all, or heat violently and soon rot, but if properly dried, the heat will be moderate and last for a long time. When horse dung is to be used, it ought to be forked up into a heap and allowed to remain for a few days, during which time it should be turned two or three times with a fork that it may be thoroughly mixed. Slight fires should be applied for two or three days at first, which may be gradually increased. They ought to be kindled about sunset, and supplied with fuel from time to time till about ten o'clock, which will keep the house in a proper heat until morning, when the fires should again be set a going, if the heat has declined, but it will seldom be necessary at this season to keep the fires burning all day. The fuel employed may be either coal, wood, peat, or turf: of these coal is best, because it makes the strongest, the most durable, and most easily managed fire. The heat of each house should be regulated by a thermometer. The degree of warmth kept up at this season, should not much exceed the 60° of Fahrenheit. When the sun shines bright, the heat must be regulated by opening the glasses more or less, and admitting the external air. Besides the trees that may be trained to the wall or front of the house, pots or boxes containing cherry or peach trees may be introduced; likewise pots of kidney beans, strawberries, &c. roses, and a variety of other flowers. The trees and plants within the house must be duly watered, and have plenty of air admitted to them whenever the weather will permit. When the fruit approach to maturity a greater heat should be maintained within the house, which may be effected during the day by the rays of the sun, and sparing admission of the external air, and during the night (if the weather be cold) by fire.

SECT. III. The Pleasure or Flower Garden.

100 Toward the end of the month, you may sow some tender annuals, such as balsam, cockscobs, globe amaranthus, ice plants, egg plants, &c. They must be sown in a hot-bed, which is to be formed and earthed over in the same way as seed beds for cucumbers and melons. See JANUARY. The seeds may either be sown in the earth of the bed, or in pots plunged into the earth. Or a few may be sown in pots, and introduced into a cucumber or melon bed. When the plants have acquired sufficient strength to admit of being transplanted, they should be put into separate pots and transferred to other hot-beds. See APRIL.

101 About the end of the month, you may sow some seed of mignonette, ten weeks stock, larkspur, flos Adonis, convolvulus, lupines, scarlet, sweet-scented, and Tangier peas, candytuft, dwarf lychias, Venus’s looking glass, Lobell’s catchfly, Venus’s navelwort, dwarf poppy, annual sunflower, oriental mallow, lavaters, hawkweed, and many others. They must be sown in places where they are to remain, for none of these plants succeed so well when they are transplanted.

Dig small patches with a trowel in the flower borders, break the earth well, remove part of it from the surface with the edge of the towel, and sow the seeds, which should be covered with the earth which had been moved aside from the surface of the patches. The smaller seeds, such as mignonette, ten weeks stock, larkspur, &c. should be covered to the depth of about a quarter of an inch; the larger ones, such as lupines, painted and sweet peas, annual sunflower, &c. may be covered to the depth of an inch. After the plants have advanced a little in growth, they should be thinned out in proportion to their size, viz. one sunflower should be left in a place, two plants of lavaters and oriental mallow, four or five of the larger, and six or eight of the smaller, and so on in proportion.

Most kinds of hardy perennials and biennials may be planted out this month, viz. polyanthuses, prim-Perennials, roses, London pride, violets, double daisies, double chamomile, saxifrage, rose campion, rockets, campanulas, catchfly, scarlet lychias, double feverfew, bachelor’s button, carnations, pinks, sweet William, colombine, monkshood, tree primrose, fexglove, goldenrod, perennial asters, perennial sun-flower, holyboks, French honeysuckles, wallflowers, and many others.

Where auricula plants are much valued, and where there are many of the finer varieties, they are commonly kept in pots. During mild weather any time this month, it would be proper to give them some fresh earth. Clear away all dead leaves from the plants, remove some of the old earth from the sides of the pot all around, as far as you can do it without injuring the roots, and fill the pots with fresh earth prepared for the purpose. See SEPTEMBER.

Auricula and polyanthus seed may be sown any time this month, either in the open grounds or in pots. When sown in pots or boxes they are more easily moved to proper situations during different seasons. Sow them in light rich earth, and cover them to the depth of about a quarter of an inch. The pots or boxes should be placed in a situation sheltered from the north, and exposed to the morning and mid-day sun, from which they ought to be removed in April to a more shady place. They will be fit for transplanting in the month of June. See JUNE.

About the end of the month plant out the carnations Transplant which were raised last year by cuttings or layering, carnations, into pots or borders where they are to remain to produce flowers in the ensuing summer.

Any time this month you may transplant evergreen Ever绿trees, and shrubs; such as pines, firs, evergreen oaks, green bollies, yews, cypress, cedars, phillyreas, arbutuses, laurels, laurustinus, &c.

The finer sorts of tulips, hyacinths, anenomes, ranun- 106 lculus, &c. should be protected during severe weather, &c. as they begin to appear above ground. For the method of sheltering them, see JANUARY.

Grass walks and lawns ought to be kept clean, poled and rolled at least once a week if the weather permit it. After being rolled with a wooden roller to take off the worm casts, a heavy stone or iron one should be passed over them to render them firm. Their edges ought likewise to be cut with an edging iron about the end.
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Whip-grafting being the most expeditious and successful method of grafting, is the most commonly practised in all the nurseries; it is always performed upon small stocks, from about the size of a goose-quill to half an inch or a little more or less in diameter, but the nearer the stock and graft approach in size, the better; and is called whip-grafting, because the grafts and stock being nearly of a size, are sloped on one side so as to fit each other, and tied together in the manner of whips or joints of angling rods &c., and the method is as follows. Having the scions or grafts, knife, bandages, and clay ready, begin the work by cutting off the head of the stock at some smooth part; this done, cut one side sloping upwards, about an inch and a half or near two inches in length, and making a notch or small slit near the upper part of the slope downwards, about half an inch long, to receive the tongue of the scion; then prepare the scion, cutting it to five or six inches in length, forming the lower end also in a sloping manner, so as exactly to fit the sloped part of the stock, as if cut from the same place, that the bark of both may join evenly in every part, and make a slit so as to form a tongue to fit the slit made in the slope of the stock; then place the graft, inserting the tongue of it into the slit of the stock, applying the parts as evenly and close as possible, and immediately tie the parts close together with a string of baw, passing closely several times round the stock and graft; then clay the whole over near an inch thick all round, from about half an inch or more below the bottom of the graft, to an inch above the top of the stock, finishing the whole coat of clay in a kind of oval form, closing it effectually about the scion, so that neither air nor water may penetrate. The clay must be examined from time to time, for should it crack much, or fall off, a quantity of fresh clay ought to be applied immediately. This sort of grafting may also be performed upon the young shoots of any bearing tree, if you wish to alter the kind of fruit or to have more kinds than one on the same tree. By the middle or latter end of May the graft will be well united with the stock, as will be evident from the shooting of the buds of the graft, when the clay should be removed; but the bass bandage should remain until the united parts seem to swell, and be too much confined, then the bandage should be taken off entirely.

Cleft-grafting is so called because the stock being too large for whip-grafting, is cleft or slit down the middle, for the reception of the graft, and is performed in stocks from one to two inches diameter or upwards. First, with a strong knife take off the head of the stock with a sloping cut about an inch and a half long, then cleave the stock with a strong knife or chisel and mallet across the slope to the depth of about two inches, or long enough to admit the graft, leaving the instrument in to keep the cleft open. Prepare the scion by cutting it to such length as to leave four or five eyes, sloping the lower part of it on each side, wedge fashion, to the length of an inch and a half or two inches, making one edge very thin, and leaving the other much thicker with the back on; then place it in the cleft at the back part.

(a) Stocks which are raised from seed, generally grow more freely and vigorously than those raised from cuttings or layers, and on that account are called free stocks.
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part of the stock, with the thickest edge outwards to the whole depth of the slope, taking care that the bark of the stock and graft join exactly; when the knife or chisel is removed, each side of the cleft will press on the graft and hold it fast. It must then be bound with a bass bandage and clayed over as in whip-grafting, leaving three or four of the eyes of the scion uncovered.

If large stocks or branches are to be grafted in this way, they must be cut horizontally and smoothed, and may be cleft quite across, and a graft inserted on each side. More clefts indeed than one may be made, and two grafts put in each. This method of grafting may be performed on the branches or stems of old trees, with a view to produce vigorous branches or change the kind of fruit.

Towards the latter end of May or beginning of June the junction of the graft with the stock will be effectually formed, when the clay may be removed, and in a fortnight afterwards the bass bandage may also be taken away.

Crown-grafting is commonly practised upon such stocks as are too large to cleave, and is often performed upon the large branches of apple and pear trees, &c. that already bear fruit, when it is intended to change the sorts, or supply the tree with a number of new vigorous branches. It is termed crown-grafting, because, after the stock or branch has been cut over, several grafts are inserted all around between the wood and bark, so as to produce a crown-like appearance; this kind of grafting should not be performed until March or early in April, for then the sap being in motion renders the bark and wood of the stock much easier to be separated for the admission of the graft. The manner of performing this sort of grafting is as follows: first cut off the head of the stock horizontally, and pare the top smooth; then having the grafts, cut one side of each flat, and somewhat sloping, an inch and a half, forming a sort of shoulder at the top of the slope to rest upon the crown of the stock; after the stock of the stock has been raised by means of a wedge, so as to admit the scion between the bark and wood, let the scion be thrust down to the shoulder with its cut side next the wood of the stock: in this manner three, four, or more grafts may be inserted into one stock or branch. After the grafts have been inserted, let them be tied tight, and let the clay be applied so as to raise an inch above the top of the stock, taking care to form it so as to prevent the admission of water, which would injure the grafts. Crown-grafting may also be performed by making several clefts in the crown of the stock, and inserting the grafts into the clefts. The grafts will be pretty well united with the stock by the end of May or beginning of June, when the clay and bandage may be taken away.

The trees grafted by this method will succeed very well; but for the first two or three years the grafts are liable to be blown out of the stock by violent winds, to prevent which, long sticks must be tied to the stock or branch, to which they may be fixed.

Cheek-grafting is thus executed. Cut the head of the stock off horizontally, and pare the top smooth; then cut one side sloping an inch and a half or two inches deep, and cut the lower part of the graft sloping the same length, making a sort of shoulder at the top of the sloped part; it is then to be placed upon the

sloped part of the stock, resting the shoulder upon the crown of it; bind it with bass, and finish it with a covering of clay as in whip-grafting.

Side-grafting is done by inserting grafts into the sides of the branches without cutting them over, and may be practised upon trees to fill up any vacancy, or for the purpose of variety, to have several sorts of apples, pears, plums, &c. upon the same tree. It is performed thus. Fix upon such parts of the branches where wood is wanted to furnish the head or part of the tree; there slope off the bark and a little of the wood, and cut the lower end of the grafts to fit the part as near as possible; then join them to the branch and tie them with bass, and clay them over.

Root-grafting. This is done by whip-grafting scions Root-upon pieces of the root of any tree of the same genus, grafting, and planting the root where it is to remain; it will take root, draw nourishment, and feed the graft.

Grafting by approach, or inarching, is preferred when inarching the stocks designed to be grafted, and the tree from which the graft is intended to be taken, either grow so near, or can be placed so near together, that the branch or graft may be made to approach the stock, without separating it from the tree till after its union or junction with the stock, so that the branch or graft being bent to the stock they together form a sort of arch, whence it is called grafting by approach, or inarching. It is commonly practised upon such trees as are with difficulty made to succeed by any of the former ways of grafting. When intended to propagate any kind of tree or shrub by this method of grafting; if the tree be hard enough to grow in the open ground, a proper quantity of young plants for stocks must be set round it, and when grown of a proper height, the work of inarching must be performed; if the branches of the tree you intend to take grafts from be too high for the stocks, in that case the stocks planted in pots, must be placed on a slight stage or some support of that nature, of such a height as to make them reach the branches. Inarching is sometimes performed with the head of the stock cut off, sometimes it is allowed to remain; when the head of the stock is cut off, the work is more easily performed, and is generally more successful, because the stock having no top of its own to support, will transmit all the nourishment taken up by its roots into the graft; when the stocks are properly placed, make the branches approach to them, and mark on the branches the places where they will most easily join to the stock, and in those parts of each branch, pare away the bark and part of the wood two or three inches in length, and in the same manner pare the stock at the proper place; then make a slit upwards in the branch so as to form a sort of tongue, and make a slit downwards in the stock to admit it; let the parts be then joined, sloping the tongue of the graft into the slit of the stock so as to make the whole join in an exact manner; then tie them close together with bass, and afterwards cover the whole with a proper quantity of clay, as before directed in the other methods. After this, let a stout stake be fixed for the support of each graft, to which the stock and graft may be fixed, to prevent their being disjoined by the wind. If this operation be performed in spring, the graft and stock will be united in four months, when the branch may be separated from the parent plant; this should be done cautiously and with a sharp-knife, lest the graft should be
be shaken and loosened from the stock. If the head of the stock were not removed previous to inarching, it should now be cut off close to the insertion of the graft, and all the old clay and bandages should be taken away and replaced with new, which should be allowed to remain a few weeks longer. If the graft and stock do not seem perfectly united the first autumn after they have been inarched, they should be allowed to stand till next autumn: for were the branch to be cut off from the parent plant before a complete union was formed between it and the stock, the operation would prove abortive.

An anonymous author has given, in a treatise published at Hamburg under the title Amanities Hortenses Nova, a new method of grafting trees, so as to have very beautiful pyramids of fruit upon them, which will exceed in flavour, beauty, and quantity, all that can otherwise be produced. This he says he had long experienced, and gives the following method of doing it. The trees are to be transplanted in autumn, and all their branches cut off: early in the following summer the young shoots are to be pulled off, and the buds are then to be engrafted in them in an inverted position. This he says, not only adds to the beauty of the pyramids, but also makes the branches more fruitful. These are to be closely connected to the trunk, and are to be fastened with the common ligature; they are to be placed circularly round the tree, three buds in each circle, and these circles at six inches distance from each other. The old trees may be grafted in this manner, the success having been found very good in those of twenty years standing; but the most eligible trees are those which are young, vigorous, and full of juice, and are not above an inch or two thick. When these young trees are transplanted, they must be fenced round with poles to defend them from the violence of the wind. The buds engrafted must be small, that the wounds made in the bark to receive them, not being very large, may heal the sooner; and if the buds do not succeed, which will be perceived in a fortnight, there must be others put in their place. The wound made to receive these buds must be a straight cut, parallel to the horizon, and the piece of bark taken out, must be downwards that the rain may not get in at the wound. In the autumn of the same year this will be a green flourishing pyramid, and the next summer it will flower, and ripen its fruit in autumn.

Mr Fairman, of Kent, gives an account of a method of renewing decayed trees, by what he calls extreme branch-grafting, which has been published in the Memoirs of the Society of Arts for 1802. It is addressed to the Secretary.

"Sir,

"From much conversation with Mr Bucknnall, on the idea of improving standard fruit trees, we could not but remark that in apple orchards, even in such as are most valuable, some were to be seen that were stunted and barren, which not only occasioned a loss in the production, but made a break in the rows, and spoiled the beauty and uniformity of the plantation.

"To bring these trees into an equal state of bearing, size, and appearance, in a short time, is an object of the greatest importance in the system of orcharding, and also for the recovery of old barren trees, which are fallen into decay, not so much from age as from the losses of their fruits being of the worn out, and deemed nearly lost, varieties.

"Having long entertained these thoughts, and been by no means attentive to the accomplishment of the design, I attempted to change their fruits by a new mode of engrafting, and am bold enough to assert that I have most fortunately succeeded in my experiments; working, if I am to be allowed to say it, from the errors of other practitioners, as also from those of my own habits.

"My name having several times appeared in the Transactions of the Society for the Encouragement of Arts, &c.; and having the honour of being a member of that Society, I thought no pains or expense would be too much for the completion of so desirable an improvement. Under these impressions, and having many trees of this description, I made an experiment on three of them in March 1798, each being nearly a hundred years old. They were not decayed in their bodies, but little in their branches. Two of these were golden pippins, and the other was a golden rennet: each had likewise been past a bearing state for several years. I also followed up the practice on many more the succeeding spring, and that of the last year, to the number of forty at least, in my different plantations (c).

"The attempt has gone so far beyond my utmost expectation, that I beg of you, Sir, to introduce the system to the society for their approbation; and I hope it will deserve the honour of a place in their valuable Transactions.

"I directed the process to be conducted as follows: cut out all the spray wood, and make the tree a perfect skeleton, leaving all the healthy limbs; then clean the branches, and cut the top of each branch off, where it would measure from an inch to two inches in diameter. Some of the branches must of course be taken off, where it is a little larger, and some smaller, to preserve a head or canopy of the tree; and it will be necessary to take out the branches which cross others, and observe the arms are left to fork off; so that no considerable opening is to be perceived when you stand under the tree, but that they may represent a uniform head. I must here remark to the practitioner, when he is preparing the tree as I directed, that he should leave the branches sufficiently long to allow of two or three inches to be taken off by the saw, that all the splintered parts may be removed.

"The trees being thus prepared, put in one or two grafts at the extremity of each branch: and from this circumstance I wish to have the method called extreme branch grafting. A cement, hereafter described, must be used instead of clay, and the grafts tied with bass or soft string. As there was a considerable quantity of moss on the bodies and branches of the trees, I ordered my gardener to scrape it off, which is effectually done when they are wet, by a stubbed birch broom. I then ordered

(c) The average expense I calculated at 2s. 6d. each tree.
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One another. The plants will appear above ground in four or five weeks, when they ought to be kept clear of weeds and watered occasionally during dry weather. The plants raised now will be fit for transplanting next spring into beds, where they are to remain and produce crops, or into plots, to remain for a year or two till they be fit for forcing.

This a proper season for making plantations of asparagus, for which purpose young plants of one or two years old are commonly used. They succeed best in a bed and deep light soil, and in an exposed situation. The ground should be well manured, dug to the depth of 12 or 15 inches, and divided into beds of the breadth of four feet and a half, in which the asparagus may be planted in rows, 10 or 12 inches apart, and about the same distance from each other in the rows. The usual mode of planting them is to stretch a garden line along the bed, and to form a drill with a spade, to the depth of about six inches, in which the asparagus roots are placed with their crowns or buds uppermost.

A crop of onions may be sown in beds when it is an object to make the most of the ground.

The surface of asparagus beds should be loosened or dressed over with a fork, in the course of this month. The instrument commonly made use of for this purpose, is a fork with three flat blunt prongs. Care must be taken not to dig too deep, lest the tops of the asparagus roots should receive injury. Immediately after the surfaces of the beds have been loosened, they should be raked over; for if the raking were to be deferred for some time till the buds of the asparagus approach the surface of the ground, they might be broken by the teeth of the rake. Asparagus beds still continue to produce good crops for 10 or 12 years, if properly managed. They ought not to be cut till the third or fourth year after they have been planted in rich soils; however, a few of the strongest shoots may be cut even in the second, but it should be done sparingly. When asparagus has advanced to the height of three or four inches above ground, it should be collected for the table; but as the shoots are commonly cut about three inches under the surface of the ground, care must be taken not to injure the rising buds (for several buds rise in succession from the same root), for this reason, it is commonly cut with an instrument made on purpose, called an asparagus knife, which should be introduced close by the shoot to the requisite depth, and directed so as to cut it off obliquely.

Artichoke plants, that were earthed up during winter to protect them from frost, should now be examined, and if their stems appear to push up vigorously, and the earth ought to be removed and levelled. The soil should likewise be loosened from the plants, and if many shoots proceed from the same root, they should all be taken away except three of the strongest. The redundant shoots, if carefully detached from the main roots may be employed to form new plantations; the earth, therefore, should be so far removed as to allow the band to be introduced to slip them close to their insertion.

Plantations of young artichokes are made towards the end of this or in the course of next month, as soon, indeed, as the offsets (the only way in which this plant is propagated) can be procured. For this purpose choose a plot of good ground, dig in a good quantity of

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March. Kitchen Garden.

Sect. I. Kitchen Garden.

We need not here give a detailed account of the methods of performing many of the things mentioned under this head, in the two preceding months, though most of them might be performed now with better prospect of success, as this is the principal month in the year for sowing and planting full crops of the greater part of kitchen-garden vegetables. We shall, therefore, merely enumerate them. Make hot-beds. Sow cucumbers and melons. Transplant and sow cauliflower. Transplant and sow cabbage. Transplant and sow lettuce. Sow spinach, onions, leeks, radishes, carrots, parsnips, beets, bananas, peas, turnips, celery, small salad, parsley, salsify, and Hamburg parsley. Plant shallot, garlic, scorzonera, and rockambole.

Broccoli.

Some seed of the early purple and cauliflower broccoli should be sown, both about the beginning and towards the end of the month, in a bed of rich earth, in an open situation, to raise plants to be fit for the table the following autumn. For the subsequent management, see April, May, June, and July.

The seeds of the sea cabbage (crambe maritima) may be sown any time this month, in narrow beds of light earth, about four feet wide, for the convenience of weeding. They may either be sown all over the surface of the bed, tolerably thick, when they are to be transplanted, or in drills a foot and a half or two feet apart, where they are to remain. Those plants are perennial, and every year push up thick succulent shoots. They should be covered some time during the course of the winter, with dry earth, to the depth of a few inches, by which the young shoots, as they come up in spring, are blanched and become fit for use. They should be cut as soon as they appear above ground, or very soon after, in the manner of asparagus.

Colesworts.

Sow brown and green cole, or bore cole.

Any time in the course of the month some seeds of brown and green cole (kale) may be sown in an open situation, for when they are shaded they are apt to grow up tall and weak. The plants raised now will be fit for planting out in summer, and may be cut for use any time from autumn to spring.

Asparagus.

About the beginning of this month asparagus seed may be sown in narrow beds of good earth in an open situation. The seed may be scattered regularly all over the surface of the bed, raked in, and then receive a slight covering of earth from the alleys, or in drills, about an inch deep, at the distance of six inches from
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Sect. II. Fruit Garden.

All kinds of fruit trees mentioned under this head last month may be pruned now, though it ought to be performed as near the beginning of the month as possible; for if the weather has been mild during the preceding month, many of the trees will have advanced too far to be in a state proper for pruning. Figs, however, on account of the late period at which they begin to push, may be safely pruned; indeed this is the best season for pruning them.

Fruit trees may still be planted, though the earlier in the month the better; for if mild weather prevails, the buds of the trees will have advanced so far before the end of the month, as to render transplanting less safe. For the method, see October. The duration of the planting season depends more on the mildness and severity of the weather than the time of the year.

When apricot, nectarine, and peach trees are in flower, they should be protected during frost with large garden-mats fixed to the top of the walls by hooks, and fastened at the bottom to prevent them from being agitated by the wind so as to dash off the blossoms. These mats must be removed during the mildest part of the day, unless when the weather is very severe, and without sunshine. Instead of mats, old fish-nets doubled may be used for this purpose, and need not be removed during the day; a number of small branches of evergreens (well clad with leaves) fixed amongst the branches of the trees in flower, will also afford shelter to the blossoms and setting fruit.

Dress strawberry beds, if not done last month. See February.

Fruit trees on hot walls, in peach, cherry, and vine-houses, must be duly attended to, must receive air and water regularly, and have the fires put out on every evening and cold morning.

Sect. III. Flower Garden and Pleasure Ground.

If any early annuals, such as balsams, cockscamb, &c. were sown last month, they will be fit for planting out into small pots or a hot-bed prepared for the purpose. This hot-bed should be raised to the height of two feet; and when the violent heat has subsided, covered over to the depth of six inches with rich dry earth. The plants may be put in at the distance of three or four inches from one another, or rather in small pots, because from these they can be more easily removed into larger ones at a subsequent period. Due attention must be paid to give them water and air when requisite; and linings of fresh dung must be applied to the bed whenever the heat begins to decline. If properly taken care of, they will be fit for final transplantation in May or June.

If no tender annuals were sown in February, some may be sown any time this month.

Sow less tender or half-hardy annuals, such as China aster, Indian pink, capsicum, French and African marigold, chrysanthemum, tree and purple amaranthus, and Chinese hollyhock.

Form a slight hot-bed any time this month, which and hardy seeds need not be raised higher than two feet, and earth it over to the depth of about six inches. The seed may be sown in narrow drills, at the distance of two or three inches from one another, and each kind, separately or in pots, plunged in the earth of the bed. After the plants have come up, they will require plenty of free air and moderate watering; and when they have acquired the height of two or three inches, they must be gradually hardened to bear the open air, by taking the lights entirely off in mild warm days. Instead of hot-bed frames and lights, oil-paper frames, or hand-glasses, may be made use of. The plants raised now will be fit for transplanting into the flower border in May. If hardy annuals were not sown last month, they may be sown any time during the present.

Cuttings of double chrysanthemums which were planted late autumn in pots or boxes, should be planted out into pots or flower borders if mild weather prevails. Chrysanthemums, Auricula plants in pots should be protected from rain and frost, and should still be kept covered with hopped calixes, which may be occasionally thrown, for should they be exposed to much rain or severe weather now when their flower-stalks begin to advance, the future bloom might be injured. Keep the pots clear of weeds, and give them a little water in dry weather, or expose them to a gentle shower. If the pots received no fresh earth last month, let them receive some now.

Let the hopes mentioned the two preceding months still continue over the beds of tulips, hyacinths, ranunculus, &c. For if severe weather occurs, the beds must be protected by a covering of mats, as already mentioned. See January. When the stalks of hyacinths, particularly double ones, have advanced almost to their full height, they are apt to be borne down by the weight of their own flowers, therefore a neat small stick ought to be fixed in the ground close to every plant, to which the flower-stalks should be fastened by a piece of brass or other soft ligature.

Ranunculuses and anemones may still be planted; they run well, will succeed the early ones, and flower in June and and July months.

Towards the end of the month, seeds of biennial and Sow biennial and perennial flowers may be sown, such as carnations, natal, &c. pink, sweetwilliams, wallflowers, and stock jet; flowers of all sorts, also rose campion, catchfly, scarlet lychnis, colchicums, Greek valerian, paeonies, auriculas, stachys, and Canterbury bells; likewise hollyhocks, French honeysuckles, rocketes, honesty or satin flower, tree primrose, shrubby mallow, broad-leaved campanula, foxglove, snapdragon or frogmouth, &c.

Biennial and perennial plants may likewise be transplanted at this season.

Trees and shrubs, both deciduous and evergreen, may Plant trees still be planted; but that work should be finished before the end of the month.

Sect. IV: Nursery.

Fruit trees, elms, &c. may be engrafted; and the ingrafting shoots of trees engrafted last year should be so short ened about the time their buds begin to swell, as to leave a few or five buds, which will push out branches to form a head. The shoots of last year’s growth of trees bud-year, 160ed the preceding summer should likewise be shortened, and the heads of trees budded last summer should be cut off about four inches above the bud, which will
the title of wine is an article that frequently occurs in Kent, Surrey, and other counties. And the wines of Gloucestershire within a century after the Conquest were little inferior to the French in sweetness. It is alleged that a black grape very similar to the black muscadine was introduced from Gaul into Britain, about the middle of the third century. To these proofs of the antiquity of vineyards in Britain, we shall add the following account of the vineyard at Pains-hill, Surrey, (the most extensive one at present in England), given by the original proprietor, the honourable Charles Hamilton, to Sir Edward Barry, and published in his Treatise on Wines, p. 468.

"The vineyard at Pains-hill is situated on the south side of a gentle hill, the soil a gravelly sand: it is planted entirely with two kinds of Burgundy grapes, the Auvernat, which is the most delicate, but the tenderest; and the Miller grape, commonly called the black cluster, which is more hardy. The first year I attempted to make red wine in the usual way, by threading the grapes, then letting them ferment in a vat, till all the husks and impurities formed a thick crust at the top: the boiling ceased, and clear wine was drawn off from the bottom. This essay did not succeed; the wine was so very harsh and austere, that I despaired of ever making red wine fit to drink; but through that harshness I perceived a flavour something like that of some small French white wines, which made me hope I should succeed better with white wine. That experiment succeeded far beyond my most sanguine expectation; for the very first year I made white wine, it nearly resembled the flavour of Champagne; and in two or three years more, as the vines grew stronger, to my great amazement my wine had a finer flavour than the best Champagne I ever tasted. The first running was as clear as spirits; the second was cuil de perdrix; and both of them sparkled and creamed in the glass like Champagne. It would be endless to mention how many great judges of wine were deceived by my wine, and thought it superior to any Champagne they ever drank; but such is the prejudice of most people against any thing of English growth, I generally found it most prudent not to declare where it grew, till after they had passed their verdict upon it. The surest proof I can give of its excellence is, that I have sold it to wine merchants for fifty guineas a hogshead; and one wine merchant to whom I sold five hundred pounds worth at one time assured me, he sold some of the best of it from 7s. 6d. to 10s. 6d. per bottle. After many years experience, the best method I found of making and managing it was this: I let the grapes hang till they had got all the maturity the season would give them, then they were carefully cut off with scissors, and brought home to the wine barn, in small quantities, to prevent their heating, or pressing another; then they were all picked off the stalks, and all the mousy or green ones were discarded, before they were put upon the press; where they were all pressed in a few hours after they were gathered: much would run from them, before the press squeezed them, from their own weight one upon another. This running was as clear as water, and sweet as syrup; and all this of the first pressing, and part of the second continued white; the other pressings grew reddish, and were not mixed with the best. As fast as the wine run from the press into a large receiver, it was put into the hogsheads, and closely bunged up. In a few hours one would hear the fermentation begin, which would soon burst the casks, if not guarded against, by hooping them strongly with iron, and securing them in strong wooden frames, and the heads with wedges. In the height of fermentation, I have frequently seen the wine oozing through the pores of the staves. The hogsheads were left all the depth of winter in the cold barn, to reap the benefit of the frosts. When the fermentation was over, which was easily discovered by the cessation of noise and oozing, but to be more certain, by pegging the cask, when it would be quite clear, then it was racked off into clean hogsheads, and carried to the vaults, before any warmth of weather could raise a second fermentation. In March, the hogsheads were examined; if any were not quite fine, they were fined down with common fish glue in the usual manner; those that were fine of themselves were not fined down, and all were bottled about the end of March; and in about six weeks more would be in perfect order for drinking, and would be in their prime for about one year; but the second year the flavour and sweetness would abate, and would gradually decline, till at last it lost all flavour and sweetness; and some that I kept sixteen years became so like old hock, that it might pass for such to one who was not a perfect connoisseur. The only art I ever used in it, was putting three pounds of white sugar-candy to some of the hogsheads, when the wine was first turned from the press, in order to conform to a rage that prevailed, to drink none but very sweet Champagne. I am convinced much good wine might be made in many parts of the south of England. Many parts are south of Pains-hill; many soils may be yet fitter for it; and many situations must be so; for mine was much exposed to the south-west wind (the worst of all for vines), and the declivity was rather too steep; yet with these disadvantages it succeeded many years. Indeed the uncertainty of our climate is against it, and many fine crops have been spoiled by May frosts and wet summers; but one good year balances many disappointments."

In a dissertation on the growth of wine in England by F.X. Visper, printed at Bath 1786, there is a method of training vines along the surface of the ground proposed, which seems well adapted to the northerly climate of Britain, for which the Rev. M. L. Broog obtained a patent. Mr Visper acknowledges that he took the first hint from the following passage, from Lord Chancellor Bacon: "The lowness of the fruit boughs makes the fruit greater, and causes it to ripen better; for we always see in apricots, peaches, and mello-cottens; upon a wall, the largest fruit is towards the bottom; and in France, the grapes that make the wine grow upon low vines bound to small stakes, while the raised vines in arbours make verjuce." He adds "It is reported, that in some places vines are suffered to grow like herbs, spreading upon the ground, and the grapes of these vines are very large; it were proper to try whether plants usually sustained by props, will not bear large leaves and fruit if laid along the ground."
Sow and transplant tender annuals. See February and March. Protect hyacinths, ranunculus, and anemones, planted in beds, from heavy rain and frost, as directed in January and February; likewise, when they are in flower, from very bright sunshine, from about two hours before till two or three after noon; but in this case the covering should be raised to a considerable height, to admit air, and allow them to be viewed.

Plant tuberoses in a hot-bed or hot-house, and give them but little water till they have come above ground.

Evergreen shrubs and trees may still be planted, but the earlier in the month the better.

Grass walks and lawns should be poled, rolled, and mown. Gravel walks may be broken up and turned.

Look over newly engrafted trees, and see if the clay keeps close about the grafts, as it is apt to crack and fall off; when you find it any way defective as to the air and rain to the graft, then remove it and apply fresh clay in its stead. All shoots which rise from the stalk below the graft must be taken off whenever they are produced; for if permitted to remain, they would rob the graft of nourishment, and prevent it shooting freely.

Trees that were budded last year, will now begin to push out their first shoots. Should they be infested with insects, so as to cause any of their leaves to curl, these should be picked off, and pains taken to destroy the vermin. Shoots that proceed from the stock under the bud must be rubbed off as soon as they appear.

The sowing and transplanting of young trees and transplanted young shrubs from the seed-bed, or where they stand too thick, should be finished early in the month, and if very dry weather prevail, water should be given to seed-beds, cuttings, and newly transplanted trees and shrubs.

A proper degree of warmth, both in the bark bed and in the air of the hot-house, is requisite for fruiting pine apple plants. Water may be more frequently given, and air admitted more freely, because the weather will be milder; and in other respects they must be managed as directed in March. The succession pine apple plants, or such as are to fruit next year, should be shifted into larger pots, (viz. 2 quarts) the size commonly made use of. When the plants are healthy, they should be turned out of the pots with the ball of earth about their roots as entire as possible, and put them into larger ones with an additional quantity of fresh earth; but should the plants be sickly, infested with insects, or appear to have bad roots, the whole of the earth should be shaken off, and the roots trimmed, a few of the under leaves stripped off the stem, and the plants then put into pots filled entirely with fresh earth.

After the plants have been thus shifted, they should have a moderate quantity of water given them frequently, which will promote their growth. The young pine apple plants which were raised from suckers, or crowns last season should likewise be shifted into larger pots, if their roots appear to have filled those in which they have stood during the winter; if healthy, they should be turned out of the pots with the ball of earth entire; if otherwise, they must be treated like the succession plants as above.

This is a proper season for propagating hot-house Plants. Cuttings of green-house plants may likewise be struck in the bark bed of the hot-house, and kept there till fit for transplanting.

Melons require attention, particularly when their fruit are setting. The heat of the hot-beds must be kept up by proper linings; water must be given moderately, and air admitted regularly. In warm weather when the sun shines bright, the plants should be shaded from its rays for an hour or two about midday, by a covering of mats or something of that nature. A piece of tile or slate should be placed under each fruit after it is set, to prevent it from coming into contact with the moist earth of the bed, which would injure it, and cause it to drop off. Ridges may be formed for the reception of the melon and cucumber plants, which were sown last or preceding month, to be raised under hand or bell glasses. These ridges should be about four feet wide, and are to be constructed in the same manner as hot-beds. See January. The dung should be raised to the height of two feet and a half, and covered with six or eight inches of rich light earth, and may be made either in trenches about a foot deep or on the surface of the ground. When more than one ridge is to be constructed, they should be placed parallel to one another at the distance of about four feet, which interval should afterwards be filled up with fresh horse dung when the heat in the ridges begins to decline; this will both revive the heat, and when earthed over, will afford room to extend the advancing runners of the plants. As soon as the ridges are earthed over, the hand or bell glasses may be put on along the middle of the bed, at the distance of four feet, when intended for melons, and three feet when for cucumbers; and the following day, or as soon after as the earth under the glasses has become warm, a hole should be made under each, into which two melon or three cucumber plants are to be put with the ball of earth about their roots; the earth should then be well closed about the ball and stem of the plant, a little water given, and the glasses put on. Shade them for a day or two, and give air during the day by raising the glasses. When the plants have filled the glasses, the runners must be trained out from under them, but this should not take place till the end of the month, or some time in June. Old paper frames are sometimes used for covering the ridges. These frames
for blanching; which should be planted out in rows, a foot apart, and at the same distance from one another in the row. Some endive seed should be sown for a principal crop; the green curled is commonly sown for this purpose, because it is least apt to be injured by rain or cold.

The cauliflower, broccoli, and bok-choy plants which were sown last month, should be planted out at the distance of about three inches from one another, in heavy beds; the plants may remain, to acquire strength, till fit for final transplantation in July. Some of the early cauliflower plants, which have formed good heads, should be allowed to stand for seed, which will ripen in September.

About the middle of this month is the best season for sowing a principal crop of turnips; the different kinds commonly sown, are the yellow, white Dutch, round white, stone-turnip, Swedish, black Russian, small French round. The large white Norfolk, green topped, and red-topped, are chiefly used for field culture.

Plant out leeks in rows nine inches asunder, and about six inches from one another in the row; it is an usual practice to trim off the extremities of their leaves and their roots of before they are planted.

Plant out pot-herbs, such as thyme, savory, sweet-marjoram and hyssop; likewise angelica, marigolds, clary, &c. A rainy or dull day should be chosen, and the plants put in at the distance of six inches from one another; occasional watering will be necessary, till they have taken root. Cuttings or slips of sage, hyssop, rue, rosemary, lavender, &c. may be planted in a shady situation, and occasionally watered.

**Sect. IV. Nursery.**

About the end of the month you may inoculate fruit-tree peaches, nectarines, apricots, and roses; for the method, inoculated. See July.

If any of the trees that were budded last summer, or grafted last spring, have made very vigorous shoots, stakes should be driven into the ground close to the stocks, to which both the stocks and shoots must be fixed.

Propagate both deciduous and evergreen shrubs by layers, particularly such as do not push out roots freely except from the new wood.

**Sect. V. Green-house and Hot-house.**

If the green-house plants were not placed in the open air last month, on account of the coldness of the weather, they may be safely trusted out now. These plants may be propagated this month by cuttings, layers, inarching, &c.

Hot-house plants may likewise be propagated now, and should receive a plentiful allowance of air and water; pine apple plants which are approaching to maturity should be sparingly watered, because too much water would injure the flavour of the fruit.

**JULY.**

**Sect. I. Kitchen Garden.**

Plant out cabbages, savoys, broccoli, bok-choy, endive and celery; for the methods see the former months. Sow some broccoli seed about the beginning of the month. Sow some endive seed for a winter crop; the green curled endive is the best for this purpose, but some

The first sort of *Ananas* is the most common in Europe; but the second sort is much preferable to it, the fruit of this being larger and much better flavoured: the juice of this sort is not so astringent as that of the first; so that this fruit may be eaten in greater quantity, with less danger. This sort frequently produces suckers immediately under the fruit, whereby it may be increased much better than the common sort; so that in a few years it may be the best common sort in Britain.

The third sort is preserved for curiosity by way of variety; but the fruit is not worth any thing.

The sort with very smooth green leaves, was raised from seeds taken out of a rotten fruit, which came from the West Indies to the late Henry Heathcote, Esq., from whom Mr. Miller received one plant, which produced large fruit: this is what the people of America call the pine apple.

AUGUST.

SECT. I. Kitchen Garden.

Sow some prickly-seeded, or triangular-leaved *spinach*, for a winter and spring crop; for though the crops of round-seeded *spinach* produce larger and more succulent leaves, the prickly-seeded is to be preferred now, because it is by much theharder of the two. After the plants have got their first leaves about an inch broad, they should be thinned to the distance of four inches from one another, and kept free from weeds.

Sow some cabbage seed, both of the early and late kinds, to produce plants for next year.

Sow some onions, to be used when young in winter *Oniosum*, or spring, or to produce a crop of early onions this summer. The Strasburgh or any other kind may be sown now, but the Welsh onion is very hardy, and stands the winter well; for though their tops should be destroyed by the severity of the weather, they will push up again from the root in the spring: this onion, however, does not produce bulbs.

Towards the end of the month sow some *cauliflower* seed for plants for an early crop next summer, which may be protected during the winter, either under hot-bed frames, bell or hand-glasses, or in a well-sheltered border exposed to the south. Between the 18th and 24th of this month is, perhaps, the best time to sow these seeds. The London gardeners, who sow great quantities, are accustomed to sow them on a particular day, viz. the 21st of this month. If they be sown too early, they are apt to button, as the gardeners term it, i.e. run up to seed without producing heads of a proper size; and if they be sown too late, the plants do not acquire sufficient strength, before winter, to enable them to support the severity of the weather.

Sow some lettuce seed about the middle of the month, *Lactuca*, both to supply the table late in the autumn, or beginning of winter, and to plant out into well-sheltered borders, or under hot-bed frames, to stand during winter.
Part III.

GARDENING.

August.

Fruit Garden.

Plant out broccoli, savoys, bore-cole, and celery, for the use of winter and spring.

The cardoons which were planted in June should have some earth laid up to their stems, to blanch them and render them fit for the table. That this may be accomplished the more easily, tie up the leaves of each plant, with a piece of bass mat or small straw rope, and apply some earth close round the stem, which earthing must be repeated at intervals, till it rise to the height of two feet.

The principal crops of onions will be fit for taking up in the course of this month. Choose a dry day for taking them up; take off the stalks within two or three inches of the bulb; spread them in some dry place, exposed to the sunshine, for 10 or 12 days, that they may be thoroughly dried.

Sect. II. Fruit Garden.

Dress the vines, figs, and other wall trees; remove all foreright and superfluous branches, and nail the others close into the wall, that the rays of the sun may have free access to the fruit.

Vines in the vineyard likewise should be fixed to the stakes, and cleared of all superfluous shoots.

Sect. III. Flower Garden, or Pleasure Ground.

About the end of the month, you may propagate by slips fibrous-rooted perennial plants, such as double rose campion, catchfly, double scarlet lychnis, double rocket, double dogged robin, bachelors button, gentianella, polyanthuses, auriculas, double daises, &c. As these plants frequently grow in tufts, they may be taken up and divided, taking care that every slip be provided with some roots.

Auricula plants in pots should receive fresh earth.

Auricula and polyanthus seed may be sown any time this month, but will not come up till spring.

Layers of carnations, double sweetwilliams, and pinks, that are properly rooted, may be separated from the parent plant, and planted into borders or pots. Replanting and pipings of pinks and carnations, may be planted out into beds or borders.

Towards the end of the month the seeds of bulbous-rooted flowers, such as tulips, hyacinths, narcissus, iris, crocuses, fritillaries, crown imperial, lilies, and snowdrops; likewise, the seeds of sneemoe, ranunculus, and cyclamen, may be sown in beds or boxes, to obtain new varieties. They must be protected during winter from frost; and when they appear above ground in spring, they must be kept clear of weeds.

Plant out seedling biennials and perennials. About the end of this month hedges should receive their second clipping.

Sect. IV. Nursery.

Budding may still be performed about the beginning of the month, and those trees which were budded three weeks or a month ago, should be examined. If the buds remain plump and fresh, there is reason to believe that they have succeeded; in that case the bandages must be loosened.

Sect. V. Green-house and Hot-house.

Green-house plants, in the open air, must be managed as already directed.

The plants in the hot-house must receive a plentiful allowance of air and water.

Succession pineapple plants, that are to produce fruit next year, should be shifted into larger pots, viz. twenties or sixteens, about the beginning of the month. The plants should be turned out of the old pots and placed in the new ones, a quantity of light rich earth being previously put into the bottom of each. Each pot should then be filled with some of the same earth, watered, and plunged into the tan, which, at the same time, should be turned over and receive an addition of about one-third of fresh tan.

SEPTEMBER.

Sect. I. Kitchen Garden.

Plant some brown Dutch, cos, and common cabbage lettuce, in a well-sheltered situation, exposed to the mid-day sun, to be covered with hot-bed frames and glasses which should not be put over them till some time next month.

Plant out from the seed-bed the cauliflowers that were sown last month, into well-sheltered borders, at flowers the distance of three or four inches from one another, taking care not to plant them so deep as to cover their hearts with earth. These plants may be either planted out again next month under garden frames, bell or hand-glasses to stand during the winter, or may remain where planted.

Plant broccoli, savoys, bore-cole, celery, and endive. Broccoli, Earth up celery and cardoons.

Tie up the leaves of endive with a piece of bass mat, or something of that nature, to blanch them, and prepare them for the table.

Mushroom beds may be formed any time this month. Prepare as spawn will very easily be procured during August, irion of September, or October. The spawn has the appearance of a white mould shooting out in strings, which, when bruised, smells like mushrooms. It may be obtained either from old mushroom beds, old hot-beds, or dung hills that are principally composed of horse dung, and from pasture fields, indeed in any place where horse or sheep's dung has lain for some time undisturbed and not exposed to much moisture and may be preserved for a considerable length of time, in a proper state for using. If spawn is not otherwise to be procured, some may be produced by laying a quantity of horse dung and rich earth in alternate layers, and covered with straw to exclude the rain and air; for the more these are excluded, the sooner the spawn will appear, which commonly happens in about two months after the dung and earth have been laid together. Mushroom beds should be formed of dung that has been spread out for some time, without having been fermented, and may be made two or three feet broad, and of any length. A stratum of dung about a foot thick, should be laid first, which should be covered with rich earth to the depth of about four inches, then ano

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SEPTEMBER.

FRUIT GARDEN.

GARDENING.

Part III.

SECT. III. Flower Garden, or Pleasure Ground.

TRANPLANT and propagate fibrous-rooted perennial plants by slips.

Towards the end of the month, hyacinths, tulips, Tulipa, &c., and other bulbs, may be planted. See OCTOBER.

SECT. IV. Nursery.

TRANPLANT evergreens towards the end of the Transplant month, such as Portugal laurels, laurustinus, arbus- and propag- gate ever- greens, &c.

Both evergreens and deciduous trees and shrubs may be propagated by layers or cuttings about the end of the month.

SECT. V. Green-house and Hot-house.

About the end of the month, if the weather be TENDER cold, orange and lemon trees, and many of the ten-plants er kinds of green-house plants, should be removed taken into the house.

About the end of this month or beginning of next, Tanned the tan-bed in the hot-house should be refreshed with a RENewed quantity of new tan, one half or two-thirds according as the old tan may be more or less decayed.

OCTOBER.

SECT. I. Kitchen Garden.

Plant out some of the lettuces that were raised in Plant out August, into a well-sheltered border, or into a hot-bed lettuces frame, to supply the table during winter and spring.

Cauliflowers that were planted out last month from the Cauli- seed-bed, may now be planted under hot bed frames, at flowers or the distance of about four inches from one another, or for frames, under bell or hand glasses. Four or five plants may be put under each hard grass, all of which should be removed to the winter) may again be planted out in the spring, except one, or at most two, of the strongest, which should be allowed to remain and produce heads. See FEBRUARY.

Propagate aromatic vegetables by slips, such as thyme, Propagate mint, balm, sage, &c.

Asparagus beds should receive their winter dressing, 246 i.e. their stalks should be cut down, and the leaves be- tween the beds should be dug, and a little of the earth from the alleys spread over the surface of each bed. Asparagus beds require some dung once every two years, which should be applied at this season. Before the alleys are dug, a little well rotten dung should be spread over the surface of the beds, dug in with a fork, and covered with a little of the earth from the alleys. Where forced asparagus is required early in winter, a hot-bed may be made any time this month. See JANUARY.

Plant some early Mazagan beans, and hotpaw peas, 247 about the end of the month, to stand the winter, and produce a crop early in summer.

SECT. II. Fruit Garden.

Winter pears and apples should in general be ga- Gather the end of the month, most of the late pears and apples will be fit for taking down, to be laid up for keeping. See OCTOBER.
GARDENING.

Part III.

Sect. II. Fruit Garden.

The best time for pruning vines is immediately after the fall of the leaf, because the greatest possible time in that way is allowed for healing the wounds. Prune vines that are cut about the time of the rise of the sap in the spring, are apt to bleed profusely; this happens sometimes even to those that are pruned in the course of the winter. It is a common error, in pruning vines, to allow the branches to grow too close together, particularly in those varieties which grow vigorously, and have very large leaves; for, in summer, when the leaves are fully expanded, they are so much crowded together as to exclude the rays of the sun from the fruit. When pruning is properly performed, the young branches should be left at the distance of from one foot or two feet, and even upwards, from one another; but this in a great measure must be regulated by the size of their leaves. The Syrian grape has leaves about a foot and a half broad, with foot-stalks six inches long. The black Hamburg has leaves twelve to thirteen inches broad, with foot-stalks seven inches long. The black cluster on the contrary has leaves five inches broad, with foot-stalks three inches long. Blue Frontignac and claret grape have leaves six inches broad, with foot-stalks about four inches long. When vines are weakly, each shoot should be shortened so as to leave only three or four eyes; when they are moderately vigorous, each should be left about a foot long. When very vigorous, some of the shoots may be left three or four feet long or more; the shoots of vines, however, that are trained to the rafters of a vineyard or pine-stove may be left eighteen or twenty feet long. It has been observed, that both the largest grapes and finest clusters are produced on shoots of a considerable length. When vines have been allowed to run into confusion, much time and pains are requisite to reduce them to regularity; but when they have been trained regularly from the beginning, pruning is easily and expeditiously performed.

If the following directions for training vines in a vineyard be observed, they will easily be kept in order, and plentiful crops of good fruit may be expected.

Vines may be planted both on the back wall and front of a vineyard; those on the back wall should be planted from six to twelve feet asunder, according to the vigour of growth of the particular sort, and in such a position that the two uppermost buds may point east and west; those on the front should be planted so as one may be trained to each rafter. When the vines begin to grow, all the buds except the two uppermost must be rubbed off from those on the back wall, and all except the uppermost from those on the front wall. If any of the plants shew fruit the first year, the clusters should be rubbed off, as well as the tendrils and lateral shoots, and the principal shoots should be trained regularly to the trellis as they advance in growth. Fries should be put in the vineyard during the spring, to encourage an early growth in the vines, that they may have full time to ripen their wood. In the month of June the glasses may be taken off altogether, but should be put on again in September, and continued till the fall of the leaf, when the vines should be pruned. The two shoots which each vine on the back wall was permitted to push, should be cut down to their third or fourth bud, according...
GARDENING.

Part III.

December. Plant now or any time during the winter when the weather is open.

Sect. IV. The Nursery.

Transplant young trees and shrubs, and protect tender seedlings during severe weather.

Sect. V. Green-House and Hot-House.

The plants in the green-house should have air during the day, whenever the weather will permit, and should receive but little water. The plants in the hot-house should likewise receive air during the day in favourable weather, and fires must be put on every evening, but seldom need to be continued during the day, except the weather is very severe.

DECEMBER.

Sect. I. Kitchen Garden.

The cauliflower plants and lettuce planted under hot-bed frames, or under bell or band-glasses, should be exposed to the air during the mild days, and protected during severe weather with a covering of mats or straw. In dry weather celery and cardoon should be earthed up, and endive tied up for blanching.

In this month there is nothing to be done either in the fruit garden, nursery garden, or hot-house, that has not already been taken notice of in the preceding months.

Here we shall add some observations on the construction of green-houses and hot-houses.

A green-house constructed for the protection of such vegetables as cannot stand in the open air during winter, may vary in form and dimensions according to the fancy of the proprietor, and the number of plants it is intended to contain. When the front only is of glass, which formerly was the only, and even still is the prevalent, mode of constructing green-houses, the pillars between the sashes ought to be as narrow as the weight they have to support will admit of, and formed so as to give the least possible obstruction to the light; they may be either of stone, brick, wood, or cast iron. The height of the sashes should equal or not exceed the width of the house, that a sufficient quantity of light may be thrown on the plants which stand near the back wall, otherwise they will lose colour, become unhealthy and deformed; for not only the colour, but the vigour, and even the form of vegetables, depends on the light. When one half or the whole of the roof is of glass, which ought to be the case, there is no necessity for attending to the proportion the height ought to bear to the width of the house. The ends of the house should also be of glass, unless when it is connected with a series of other buildings. The pots containing the plants are commonly set on benches, which gradually increase in height as they recede from the front; however, when the roof is of glass, the arrangement may be different. Every green-house ought to be furnished with flues; for though many winters may occur in which the application of fire heat may not be necessary, yet such intense frosts at times prevail as would infaill-
cinnebar, with a faint blue tinge. 4. The Almonde, a garnet only a little paler than that called the rock-
ribbon.

GARNET-COLOUR. See Colouring of Glass.

to imitate Garnets. The making the counterfeit
garnet in paste is done as follows.—Take prepared cry-
stal two ounces, common red-lead six ounces, mangan-
ese 16 grains, zaffire three grains; mix all well, put
them into a crucible, cover it with a lid, and set in a
potter’s kiln for 24 hours. Or take crystal two
ounces, minium five ounces and a half, manganese 15
grains, zaffire four grains: mix them well together;
and let all be baked, in a pot well luted, in a kiln, 24
hours.

GARONNE, a large river of France, which has its
source in the Pyrenean mountains, and falls into the
sea 60 miles below Bordeaux.

GARONNE, Upper a department in the south of
France. The south part extends to the Pyrenees, and
is rugged and mountainous: the north part has a hilly
or undulating surface. It produces corn, wine, olives,
silk, figs, almonds, and abounds in pastureage. The
mountains contain mines of copper, lead, iron, and
coal. The population in 1815 was 357,000. Thou-
louse is the chief town.

GARRICK, David, Esq. the great Roscius of his
age and country, who for nearly 40 years shone
the brightest luminary in the hemisphere of the stage, was
born at the Angel Inn at Hereford, in the year 1716.
His father, Captain Peter Garrick, was a French re-
freuge, and had a troop of horse which were then quar-
tered in that city. This rank he maintained in the ar-
my for several years, and had a majority at the time of
his death; that event, however, prevented him from
ever enjoining it. Mr Garrick received the first rudi-
ments of his education at the free-school at Litchfield;
which he afterwards completed at Rochester, under
the celebrated Mr Colson, since mathematician professor
at Cambridge. Dr Johnson and he were fellow-stu-
dents at the same school; and it is a curious fact, that
these two celebrated geniuses came up to London in the
same coach, with the intention of pushing themselves
into active life. On the 4th of March 1736, he was
entered at the honourable society of Lincoln’s Inn.
The study of the law, however, he soon quitted; and
followed for some time the employment of a wine mer-
chant: but that too disgusting him, he gave way at last
to the irresistible bias of his mind, and joined a travel-
ing company of comedians at Ipswich in Suffolk, where
he went by the name of Lydle. Having in this poor
school of Apollo got some acquaintance with the thea-
tric art, he burst at once upon the world, in the year
1740, in all the lustre of perfection, at the little theatre
in Goodman’s Fields, then under the direction
of Henry Giffard.

The character he first performed was Richard III.
in which, like the sun bursting from behind a cloud,
he displayed in the earliest dawn even more than me-
ridian brightness. His excellence dazzled and aston-
nished every one; and the seeing a young man, in no
more than his 24th year, and a novice in reality to
the stage, reaching at one single step to that height of
perfection which maturity of years and long practical
experience had not been able to bestow on the most
capital performers of the English stage, was a pheno-
menon that could not but become the object of uni-
versal speculation and of as universal admiration. The
theatres at the west end of the town were deserted;
Goodman’s Fields, from being the rendezvous of ci-
tizens and citizens wives alone, became the resort of all
ranks of men; and Mr Garrick continued to act till
the close of the season.

Having the advantage of terms offered him for the
performing in Dublin during some part of the summer
(1741), he went over thither, where he found the
same just homage paid to his merit of which he had re-
ceived from his own countrymen. To the service of
the latter, however, he esteemed himself more imme-
diately bound; and therefore in the ensuing winter,
engaged himself to Mr Fleetwood, then manager of
Drury Lane; in which theatre he continued till the
year 1745, when he again went over to Ireland, and
continued there the whole season, joint manager with
Mr Sheridan in the direction and profits of the theatre
royal in Smock Alley. From thence he returned to
England, and was engaged for the season of 1746 with
Mr Rich at Covent Garden. This was his last per-
formance as a hired actor: for in the close of that sea-
son, Mr Fleetwood’s patent for the management of Dru-
ry Lane being expired, and that gentleman having no
inclination further to pursue a design by which, from
his want of acquaintance with the proper conduct of it,
or some other cause, he had considerably impaired his
fortune; Mr Garrick, in conjunction with Mr Lacy,
purchased the property of that theatre, together with
the renewal of the patent; and in the winter of 1747,
opened it with the greatest part of Mr Fleetwood’s
company, and with the great additional strength of Mr
Barry, Mrs Pritchard, and Mrs Cibber, from Covent
Garden.

Were we to trace Mr Garrick through the several
occurrences of his life,—a life so active, so busy, and so
full of occurrences as his, we should swell this account
to many pages. Suffice it to say, he continued in the
un molested enjoyment of his fame and unrivalled ex-
ocellence to the moment of his retirement. His uni-
versality of excellence was never once attacked by com-
petition. Tragedy, comedy, and farce, the lover and
the hero, the jealous husband who suspects his wife
without cause, and the thoughtless lively rake who at-
tacks her without design, were all alike his own. Rage
and ridicule, doubt and despair, transport and tender-
ness, compassion and contempt; love, jealousy, fear,
 fury, and simplicity; all took in turn possession of his
features, while each of them in turn appeared to be
the sole possessor of his heart. In the several charac-
ters of Lear and Hamlet, Richard, Dorilas, Romeo,
and Rosignone; in his Ranger, Bayes, Druggier, Kite-
l, Bruce, and Benedict, you saw the most curious con-
tractions that your ideas attached to them all. In
short, Nature, the mistress from whom alone this great
performer borrowed all his lessons, being in herself in-
exhaustible, this her darling son, marked out for her
truest representative, found an unlimited scope for
change and diversity in his manner of copying from
her various productions. There is one part of theat-
rical conduct which ought unquestionably to be recor-
ded to Mr Garrick’s honour, since the cause of virtue
and morality, and the formation of public manners, are
considerably dependent upon it; and that is, the zeal
with which he aimed to banish from the stage all those
plays which carry with them an immoral tendency.
GARRICK

and to prune from those which do not absolutely, on the whole, promote the interests of vice, such scenes of licentiousness and liberty, as a redundancy of wit and too great liveliness of imagination have induced some of our comic writers to indulge themselves in, and to which the sympathetic disposition of our age of gallantry and intrigue has given sanction. The purity of the English stage has certainly been much more fully established during the administration of this theatrical minister, than it had ever been during preceding managements. He seems to have carried his modest, moral, chaste, and pious principles with him into the very management of the theatre itself, and rescued performers from that obloquy which had attached to the profession. Of those who were accounted blackguards, unworthy the association of the world, he made gentlemen, united them with society, and introduced them to all the domestic comforts of life. The theatre was no longer esteemed the receptacle of all vice; and the moral, the serious, the religious part of mankind, did not hesitate to partake of the rational entertainment of a play, and pass a cheerful evening undisguised with the licentiousness, and uncorrupted by the immorality, of the exhibition.

Notwithstanding the numberless and laborious avocations attendant on his profession as an actor, and his station as a manager; yet still his active genius was perpetually bursting forth in various little productions in the dramatic and poetical way, whose merit cannot but make us regret his want of time for the pursuit of more extensive and important works. It is certain that his merit as an author is not of the first magnitude: but his great knowledge of men and manners, of stage effect, and his happy turn for lively and striking satire, made him generally successful; and his prologues and epilogues in particular, which are almost innumerable, possess such a degree of happiness, both in the conception and execution, as to stand unequaled. His ode on the death of Mr Pelham ran through four editions in less than six weeks. His Ode on Shakespeare is a masterly piece of poetry; and when delivered by himself, was a most capital exhibition. His alterations of Shakespeare and other authors have been at times successful, and at times exploded. The exclusion of the grave diggers scene from Hamlet will never be forgotten to him by the inhabitants of the gallery at Drury. Though necessary to the chasteness of the scene, they cannot bear to lose so much true sterling wit and humour; and it must be owned, that exuberances of that kind, though they hurt the uniformity, yet increase the luxuriance of the tree. Among his alterations the following are part: Every Man in his Humour, altered from Ben Johnson; Romeo and Juliet, Winter's Tale, Catherine and Petruchio, Cymbeline, Hamlet, &c. altered and made up from Shakespeare; Gamesters, a comedy, from Shirley; Isabella, from Southern. To these we add, as original productions, The Farmer's Return, and Linco's Travels. interludes; Guardian, Lethe, Lying Valet, Miss in her Teens, Male Coquet, Irish Widow, and other comedies in two acts; Enchanter, a musical entertainment; Lilliput: the Christmas Tale is ascribed to him, and many others.

We now bring him to the period of his retirement in the spring of 1775; when, full of fame, with the acquirement of a splendid fortune, and growing into years, he thought proper to seek the vale of life, to enjoy that dignified and honourable ease which was compatible with his public situation, and which he had so well earned by the activity and the merits of his dramatic reign. But very short indeed was the period allotted to him for this precious enjoyment: for on the 20th of January 1779, he departed this life; leaving on no rival in excellence upon earth to compensate for his loss, or a hope of our ever meeting with his like again.

GARRISON, in the art of war, a body of forces, disposed in a fortress, to defend it against the enemy, or to keep the inhabitants in subjection: or even to be subsisted during the winter season: hence garrison and winter quarters are sometimes used indifferently for the same thing; and sometimes they denote different things. In the latter case, a garrison is a place wherein forces are maintained to secure it, and where they keep regular guard, as a frontier town, a citadel, castle, tower, &c. The garrison should be always stronger than the townsmen.

Du Cange derives the word from the corrupt Latin garrinet, which the latter writers use to signify all manner of munition, arms, victuals, &c. necessary for the defence of a place, and sustaining of a siege.

Winter quarters signify a place where a number of forces are laid up in the winter season, without keeping the regular guard.

GARSTANG, a town in Lancashire, 227 miles from London. It is near a mile in length, but built in a very irregular manner, with dirty streets, and very indifferent houses. The population amounts to 790 persons. The church is a stately Gothic structure. By the late inland navigation, it has communication with the rivers Mersey, Dee, Ribble, Ouse, Trent, Darwent, Severn, Humber, Thames, Avon, &c. which navigation, including its windings, extends above 200 miles, in the counties of Lincoln, Nottingham, York, Westmorland, Chester, &c. W. Long. 2. 42. N. Lat. 53. 52.

GARTER, a ligature for tying up the stocking; but particularly used for the badge of a noble order of knights, hence denominated the Order of the Garter, a military order of knighthood, the most noble and ancient of any lay order in the world, instituted by Edward III. The knights companions are generally princes and peers; and the king of England is the sovereign or chief of the order. The number of knights was originally 26: but six were added in 1786, on account of the increase of the royal family. They are a college or corporation, having a great and little seal.

Their officers are a prelate, chancellor, register, king-at-arms, and usher of the black rod. They have also a dean, and 12 canons and petty canons, vergers, and 26 pensioners or poor knights. The prelate is the head. This office is vested in the bishop of Winchester, and has ever been so. Next to the prelate is the chancellor: which office is vested in the bishop of Salisbury, who keeps the seals, &c. The next is the register, who by his oath is to enter upon the registry, the scrutinies, elections, penalties, and other acts of the order, with all fidelity: The dean of Windsor is always register ex officio. The fourth officer is Garter and king-at-arms, being two distinct offices united in one person.
to have been instituted on occasion of the victory obtained by Edward over the French at the battle of Cressy; that prince, say some historians, ordered his garter to be displayed, as a signal of battle: in commemoration whereof, he made a garter the principal ornament of the order, erected in memory of this signal victory, and a symbol of the indissoluble union of the knights.

It appears from Rastell's Chronicle, lib. vi. quoted by Granger in the supplement to his Biographical History, that this order was devised by Richard I. at the siege of the city of Acre, when he caused twenty-six knights, who firmly stood by him, to wear thongs of blue leather about their legs, and that it was perfected in the nineteenth year of Edward III.

In 1551, Edward VI. made some alterations in the ritual of this order: that prince composed it in Latin, the original whereof is still extant in his own hand writing. He there ordained, that the order should no longer be called the order of St George, but that of the Garter; and, instead of the george, hung at the collar, he substituted a cavalier, bearing a book on the point of his sword, with the word *protectio* graven on the sword, and *verbum Dei* on the book: with a buckle in the left hand, and the word *fides* thereon. Larrey.

**GARTER, principal King at Arms.** This office was instituted by Henry V.

Garter, and principal king at arms, are two distinct offices united in one person: Garter's employment is to attend the service of the order of the Garter; for which he is allowed a mantle and badge, a house in Windsor castle, and pensions both from the sovereign and knights, and lastly, fees. He also carries the rod and sceptre at every feast of St George, when the sovereign is present, and notifies the election of such as are newly chosen; attends the solemnity of their installations, takes care of placing their arms over their seats; and carries the garter to foreign kings and princes, for which services it has been usual to join him in commission with some peer, or other person of distinction.

Garter's oath relates only to services being performed within the order, and is taken in chapter before the sovereign knights. His oath, as king at arms, is taken before the earl marshal.

**GAR** is also a term in heraldry, signifying the moity or half of a bend.

**GARTH** is used in some parts of England for a little backside or close. It is an ancient British word. Garde, in that language, signifies garden, and is pronounced and written *garth*. This word is also used for a dam or weir, &c.

**GART Men**, is used in our statutes for those who catch fish by means of fish garts, or garts. By statute it is ordained, that no fisher, nor garth men, shall use any nets or engines to destroy the fry of fish, &c. 17 Ric. II. cap. 9. The word is supposed to be derived from the Scotch word *gart*, which signifies forced or compelled; because fish are forced by the wear to pass in a loop, where they are taken.

**GARTH, Sir Samuel**, an excellent English poet and physician, was descended from a good family in Yorkshire. He was admitted into the college of physicians at London in 1663. He at that time zealously promoted and encouraged the erecting of the dispensary for the relief of the sick poor, by giving them advice gratis, and medicines at low rates. This work of charity having exposed him and many other physicians to the envy and resentment of several persons of the same faculty as well as apothecaries, he ridiculed them, with a peculiar spirit and vivacity, in a poem called the *Dispensary*, in six cantos, highly esteemed. He was one of the most eminent members of the famous society called the *Kit Kat Club*, which consisted of noblemen and gentlemen distinguished by their excellent parts and affection to the house of Hanover. Upon the accession of George I. he was knighted, and made physician in ordinary to his majesty, and physician general to the army. Nor were these more than just rewards even of his physical merit. He had gone through the office of censor of the college in 1702; and had practised always with great reputation, and a strict regard to the honour and interest of the faculty, never stooping to prostitute the dignity of his profession, through mean and sordid views of self-interest, to any, even the most popular and wealthy characters. In a steady adherence to this noble principle, he concurred with the much celebrated Dr Radcliffe, with whom he was also often joined in physical consultations. He had a very extensive practice, but was very moderate in his views of advancing his own fortune; his humanity and good nature inclining him more to make use of the great interest he had with persons in power, for the support and encouragement of other men of letters. He chose to live with the great in that degree of independency and freedom which became a man possessed of a superior genius, whereof he was daily giving fresh proofs to the public. One of his last performances in polite letters, was his translation of the whole fourteenth book, and the story of Cinna in the fifteenth book, of Ovid's *Metamorphoses*. These, together with an English version of the rest, were published in 1717; and he has prefixed an excellent preface to the whole, wherein he not only gives an idea of the work, and points out its principal beauties, but shows the uses of the poem, and how it may be read to most profit. The distemper which seized him the ensuing year, and ended not but with his life, caused a general concern; which was particularly testified by Lord Lansdowne, a brother poet. He died, after a short illness, which he bore with great patience, in January 1719.

**GARVE, Christian**, an eminent German philosopher. See Supplement.

**GARUMNA, or Garonne**, a noble and navigable river of Gaul, which, rising from the Pyrenees, formerly bounded Aquitain on the north (Cesair); but by the new regulation of Augustus divided it in the middle, emptying itself to the north of Bordeaux, in the Aquitanian ocean. Mela observes concerning it, that unless it is swelled by winter rains, or the melting of the snow, it is for a great part of the year shoal and scarcely navigable; but when increased by the meeting tide, whereby its waters are impelled, it is somewhat fuller; and the farther the river advances, it is broader, till at length it resembles a large frith or arm of the sea, not only bearing large vessels, but al-
degree of doctor at the age of 20, after a disputation on the nature of solids, containing an abstract of the system which he himself followed through life.

He travelled through various parts of Europe, and when he returned to Heidelberg by the way of Stras- borough, he was appointed city-physician at Deventer in the province of Overysel; but he soon after removed to Amsterdam. Boerhaave never lost sight of his favourite pupil; for when the infirmities of old age and indefatigable labour made him anxious to resign his chair, Gaubius on his recommendation was appointed to succeed him. He published his instructions for writing Recipes in the year 1738, by which he acquired great and justly merited approbation, as he reduced the art from a mere mechanical to a scientific form. His Principles of Nosology is perhaps his most masterly performance, as it evinced that he was highly worthy of such a preceptor. His next publication, which appeared in 1771, was his "Adversaria variis Argumentis," a work which was particularly interesting to chemists; and his oration on the 200th anniversary of the academy of Leyden attracted considerable notice, as in it he traced out, with his accustomed acumen, the chief epochs of the arts and sciences in Holland.

He was likewise the author of numerous and valuable papers in the Transactions of the Society of Haerlem, and was editor of many excellent performances, among which we may rank Cramer’s Elementa artis doctissimus: Albionis de presugienda vita et morte, and Swammerdam’s Book of Nature, which he partly translated. His literary merit spread his fame so far beyond the bounds of his native country, that pupils repaired to Leyden from every quarter of Europe. In addition to his widely extended reputation, he was blessed with the enjoyment of good health till he was 70 years of age, and died on the 29th of November 1780, in his seventy-fifth year.

One work of his, entitled "Institutiones Pathologicae Medicinae," was deemed so valuable by Professor Ackerman, and of such singular advantage in academical lectures, that he gave the world a fourth edition of it, published at Nuremberg in 1787.

GAUDEN, Dr Joseph, son of John Gauden vicar of Mayfield in Essex, was born there in 1605. At the commencement of the civil war, he was chaplain to Robert earl of Warwick, who taking part with the parliament against the king, was followed by his chaplain. Upon the establishment of the Presbyterian model of church government, he complied with the ruling powers, and was nominated one of the assembly of divines who met at Westminster in 1643, and took the covenant; yet having offered some scruples and objections to it, his name was afterwards struck out of the list. Nor did he espouse the parliament cause any longer than they adhered to their first avowed principles of reforming only, instead of destroying, monarchy and episcopacy. In this spirit he was one of those divines who signed a protestation to the army against the violent proceedings that affected the life of the king: and a few days after his execution published the famous Eikon Basilike, A Portraiture of his Sacred Majesty in his Solitude and Sufferings; which ran through 50 editions in the course of a year. Upon the return of Charles II. he was promoted to the see of Exeter; and in 1662 was removed to Worcester, much to his regret.

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Vol. IX. Part II.
GAV

regret, having flattered himself with the hopes of a
translation to Winchester; and his death happened the
same year. He wrote many controversial pieces suited
to the circumstances of the times, and to his own views
from them. The Eikon Basilike above mentioned he
published as the king's private meditations: though on
this point there has been a long controversy. After
the bishop's death, his widow, in a letter to one of her
sons, calls it The Jewel; and said, her husband had
hoped to make a fortune by it; and that she had a
letter of a very great man's, which would clear up that
he write it. This assertion, as the earl of Clarendon
had predicted, was eagerly espoused by the anti-ro-
yalists, in the view of disparaging Charles I. But it
has been observed, that Gauden had too luxuriat an im-
agination, which betrayed him into a rankness of style
in the Asiatic way; and from thence, as Bishop Bur-
net argues with others, it may be certainly concluded,
that he, but the king himself, was the true author of
the Eikon Basilike; in which there is a nobleness
and justness of thought, with a greatness of style, that
made it be looked on as the best written book in the
English language.

GAVEL or GABEL, among builders. See GABEL.

GADEL, in Law, tribute, toll, custom, or yearly re-
venue; of which we had in old time several kinds.
See GABEL.

GAVEL Kind, a tenure or custom belonging to lands
in the county of Kent. The word is said by Lambard
to be compounded of three Saxon words, gyfel, eal, kyn,
"omniae cognitioe prosequi data." Verstegan calls it
gavelkind, quasi "give all kind," that is, to each child
his part: and Taylor, in his history of gavelkind, de-
rivates it from the British gavel, that is, a hold or tenure,
and cemned, "generatio aut familia;" and so gavel cen-
ned might signify tenura generationis.---It is universally
known what struggles the Kentish men made to pre-
serv their ancient liberties, and with how much suc-
cess those struggles were attended. And as it is prin-
cipally here that we meet with the custom of gavel-
kind (though it was and is to be found in some other
parts of the kingdom), we may fairly conclude, that
this was a part of those liberties: agreeable to Mr Sei-
den's opinion, that gavelkind, before the Norman con-
quest, was the general custom of the realm. The dis-
tinguished properties of this tenure are various: some
of the principles are these: 1. The tenant is of age
sufficient to alienate his estate by seisinment, at the age
of 15. 2. The estate does not escheat in case of an
attinder and executors for felony; their maxim being,
"the father to the bough, the son to the plough." 3.
In most places he had the power of devising lands by
will, before the statute for that purpose was made.
4. The lands descend, not to the eldest, youngest, or
any on son only, but to all the sons together; which
was indeed anciently the most usual course of descent,
all over England, though in particular places particular
customs prevailed.

GAVELET, in Law, an ancient and special cessan-
vit used in Kent, where the custom of gavelkind con-
tinues, by which the tenant, if he withdraws his rent and
services due to the lord, forfeits his land and tenements.
The process of the gavellet is thus. The lord is first
to seek by the steward of his court, from three weeks
to three weeks, to find some distress upon the tenen-
ment, till the fourth court; and if at that time he
find none, at this fourth court it is awarded, that he
take the tenement in his hand in name of a distress,
and keep it a year and a day without manuring; with-
in which time, if the tenant pay his arrears, and make
reasonable amends for the withholding, he shall have
and enjoy his tenement as before: if he come not be-
fore the year and day be past, the lord is to go to the
next county court with witnesses of what had passed,
as his own court, and pronounce there his process, to
have further witnesses; and they by the award of his
own court, he shall enter and manure the tenement as
his own: so that if the tenant desired afterwards to
have and hold it as before, he must agree with the
lord; according to this old saying: "Has he not since
any thing given, or any thing paid, then let him pay
five pound for his were, e'er he become healdar again."9
Other copies have the first part with some variation;
"Let him nine times pay, and nine times repay.""Gavelet,
in London, is a writ used in the husting,
given to lords of rents in the city of London. Here
the parties, tenant and demandant, appear by seire
forces, to show cause why the one should not have his
tenement again on payment of his rent, of the other
recover the lands on default thereof.

GAUGAMEL, in Ancient Geography, a village
of Asturias, lying between the rivers Lyones and Tigris;
famous for Alexander's victory over Darius. It is said
to have been allowed to Darius Hystaspes for the
maintenance of a camel; and hence the name. It was
not far from a more considerable place called Arbela;
whence the latter gave the name to the victory. See
Arbela.

GAUGE-POINT of a solid measure, the diameter
of a circle whose area is equal to the solid content of
the same measure.

GAUGER, a king's officer, who is appointed to
examine all tons, pipes, hogsheds, and barrels, of wine,
beer, ale, oil, honey, &c. and give them a mark of
allowance, before they are sold in any place within the
extent of his office.

GAUGHING. See GEOMETRY.

GAUGHING-Rod, an instrument used in gauging or
measuring the contents of any vessel. That usually
employed is the four-foot gauging rod. It is com-
monly made of box, and consists of four rules, each a
foot long and about three-eighths of an inch square,
joined together by three brass joints; by which means
the rod is rendered four feet long when the four rules
are quite opened, and but one foot when they are all
folded together. On the first face of this rod, mark-
ed 4, are placed two diagonal lines: one for beer and
the other for wine: by means of which the content of
any common vessel in beer or wine gallons may be rea-
dily found, by putting the rod in at the bung hole of
the vessel till it meets the intersection of the head of
the vessel with the staves opposite to the bung hole.
For distinction of this line, there is written thereon,
bear and wine gallons. On the second face, 5, are a
line of inches and the gauge-line; which is a line ex-
pressing the areas of circles, whose diameters are the
correspondent inches in ale gallons. At the begining
is written, ale area. On the third face, 6, are three
scales of lines; the first, at the end of which is written
hogsheds, is for finding how many gallons there are in
GAZ

was entirely set aside by one Gauri, who conquered Khorassan, the reigning prince, and bestowed his dominions on his own nephew Gayathoddin Mohammed. These new sultans proved greater conquerors than the former, and extended their dominions farther than even Mahmoud Gazni himself had done. They did not, however, long enjoy the sovereignty of Gazz; for in 1218, Jenghiz Khan having conquered the greatest part of China and almost all Tartary, began to turn his arms westward, and set out against the sultan of Gazz at the head of 700,000 men.

To oppose this formidable army, Mohammed, the reigning sultan, could mustcr only 400,000 men; and, in the first battle, 150,000 of his troops are said to have perished. After this victory, Jenghiz Khan advanced; Mohammed, not daring to risk a second battle, the loss of which would have been attended with the entire ruin of his kingdom. He therefore distributed his army amongst the strongest fortified towns he had in his dominions; all of which Jenghiz Khan took one after another. The rapid progress of his conquests, indeed, almost exceeded belief. In 1219 and 1220, he had reduced Zarnuk, Nur, Bokhara, Otrar, Sagamak, Uzbek, Alashash, Jund, Tonkast, Khojast, and Samarcand. Mohammed, in the mean time, fled to Bokhara; but on the approach of Jenghiz Khan’s army, quitted that place, and fled to Samarcand. When this last city was also in danger of being invested, the sultan did not think proper to trust himself in it more than in the other, though it was garrisoned by 110,000 of his bravest troops; and therefore fled through byways into the province of Ghilan in Persia, where he took refuge in a strong fortress called Estabad. But being also found out in this retreat, he fled to an island in the Caspian sea called Abiskun; where he ended his days, leaving his empire, such as it was, to his son Jaloloddin.

The new sultan was a man of great bravery and experience in war; but nothing was able to stop the progress of the Moguls. In 1220 and 1221, they made themselves masters of all the kingdom of Tartary, of Khazistan and Khorassan, committing everywhere such massacres as were never heard of before or since that time. In the mean time Jaloloddin assembled his forces with the utmost diligence, and defeated two detachments of the Mogul army. This happened while Jenghiz Khan was besieging Bamiyan; but answered little other purpose, than serving to bring upon that city the terrible destruction of which an account is given under the article BAMIYAN. Immediately after the reduction of that city, Jenghiz Khan marched towards Gazz; which was very strongly fortified, and where he expected to have found Jaloloddin. But he had left the place 15 days before; and, as Jenghiz Khan’s army was much reduced, he might perhaps have stood his ground, had it not been for an accident. He had been lately joined by three Turkish commanders, each of whom had a body of 10,000 men under his command. After his victories over the Moguls, these officers demanded the greatest share of the spoils; which being refused, they separated themselves from the sultan. He used his utmost endeavours to make them hearken to reason; and sent several messages and letters to them, representing the inevitable ruin which must attend their separation, as Jenghiz Khan

3 N
was advancing against them with his whole army. At last they were persuaded to lay aside their animosities; but it was now too late; for Jenghiz Khan, being informed of what passed, detached 60,000 horse to prevent their joining the sultan's army; who, finding himself deprived of this powerful aid, retired towards the river Indus. When he arrived there, he stopped in a place where the stream was most rapid and the passage confined, with a view both to prevent his soldiers from placing any hopes of safety in flight, and to hinder the whole Mogul army from attacking him at once. Ever since his departure from Gazna he had been tormented with a colic: yet, at a time when he suffered most, hearing that the enemy's vanguard was arrived at a place in that neighbourhood called Herder, he quitted his litter, and, mounting a horse, marched with some of his chosen soldiers in the night; surprised the Moguls in their camp; and having cut them almost all in pieces, without the loss of a single man on his side, returned with a considerable booty.

Jenghiz Khan, finding by this that he had a vigilant enemy to deal with, proceeded with great circumspection. When he came near the Indus, he drew out his army in bataille: to Jagatay, one of his sons, he gave the command of the right wing; to Otkay, another son, he gave the command of the left: and put himself in the centre, with 6000 of his guards. On the other side, Jaloloddin prepared for battle like one who had no resource but in victory. He first sent the boats on the Indus farther off; reserving only one to carry over his mother, wife, and children: but unluckily the boat split when they were going to embark, so that they were forced to remain in the camp. The sultan took to himself the command of the main body of the army. His left wing, drawn up under shelter of a mountain which hindered the whole right wing of the Moguls from engaging at once, was commanded by his vizir; and his right by a lord named Amin Malek. This lord began the fight; and forced the enemy's left wing, notwithstanding the great disparity of numbers, to give ground. The right wing of the Moguls likewise wanting room to extend itself, the sultan made use of his left as a body of reserve, detaching from thence some squadrons to the assistance of the troops who stood in need of them. He also took one part of them with him when he went at the head of his main body to charge that of Jenghiz Khan; which he did with so much resolution and vigour, that he not only put it in disorder, but penetrated into the place where Jenghiz Khan had originally taken his station: but that prince having had a horse killed under him, was retired from thence, to give orders for all the troops to engage.

This disadvantage had like to have lost the Moguls the battle; for a report being immediately spread that the enemy had broken through the main body, the troops were so much discouraged, that they would certainly have fled, had not Jenghiz Khan encouraged them by riding from place to place in order to show himself. At last, however, Jaloloddin's men, who were in all but 50,000, having fought a whole day with ten times their number, were seized with fear and fled. One part of them retired to the rocks which were on the shore of the Indus, where the enemy's horse could not follow them; others threw themselves into the river, where many were drowned, though some had the good fortune to cross over in safety; while the rest surrounding their prince, continued the fight through despair. The sultan, however, considering that he had scarce 7000 men left, began to think of providing for his own safety: therefore, having hidden a final adieu to his mother, wife, and children, he mounted a fresh horse, and spurred him into the river, which he crossed in safety, and even stopped in the middle of it to insult Jenghiz Khan, who was now arrived at the bank. His family fell into the hands of the Moguls; who killed all the males, and carried the women into captivity.

Jaloloddin being now securely landed in India, got up into a tree in order to preserve himself from wild beasts. Next day, as he walked melancholy among the rocks, he perceived a troop of his soldiers, with some officers, three of whom proved to be his particular friends. These, at the beginning of the defeat, had found a boat in which they had sailed all night, with much danger from the rocks, shelves, and rapid current of the river. Soon after, he saw 500 horse coming towards him; who informed him of 4000 more that had escaped by swimming over the river; and these also soon after joined the rest. In the mean time an officer of his household, named Jamalarresud, knowing that his master and many of his people were escaped, ventured to load a very large boat with arms, provisions, money, and stuff to clothe the soldiers; with which he crossed the river. For this important service Jaloloddin made him steward of his household, and surnamed him the Chosen or the Glory of the Faith. For some time after, the sultan's affairs seemed to go on prosperously: he gained some battles in India; but the princes of that country, envying his prosperity, contrived against him, and obliged him to repass the Indus. Here he again attempted to make head against the Moguls; but was at last defeated and killed by them, and a final end put to the once mighty empire of Gazna.

The metropolis was reduced by force; who no sooner entered the country in which it was situated, than he committed the most horrid cruelties. The city was well provided with all things necessary for sustaining a siege; had a strong garrison, and a brave and resolute governor. The inhabitants, expecting no mercy from Jenghiz Khan, who they knew had sworn their ruin, were resolved to make a desperate defence. They made frequent sallies on the besiegers, several times overthrew their works, and broke above 100 of their battering rams. But one night, after an obstinate fight, part of the city walls fell down; and a great number of Moguls having filled up the ditch, entered the city sword in hand. The governor perceiving all was lost, at the head of his bravest soldiers rushed into the thickest of his enemies, where he and his followers were all slain. However, Gazna was not entirely destroyed, nor were the people all killed; for after the massacre had continued for four or five hours, Otkay ordered it to cease, and taxed those who were left alive at a certain rate, in order to redeem themselves and the city. It does not, however, appear that after this time the city of Gazna ever made any considerable figure.—It was taken by the Moguls in the year 1222.
GED

GED BRES. See Gabres.

Gecko, in Natural History, a name given by the Indians to their terrible poison, which kills when mixed with the blood even in the smallest quantity. They say that this gecko is a venomous fowl or humour vomited out of the mouths of their most poisonous serpents, which they procure in this fatal strength, by hanging up the creatures by the tails, and whipping them to enrage them: they collect this in proper vessels as it falls; and when they use it, they either poison a weapon with it, or wounding any part of the flesh introduce the smallest quantity imaginable into it; and this is said to be immediate death.

GEC. See Lacerta, Reptilology Index.

GED, William, an ingenious though unsuccessful artist, who was a goldsmith in Edinburgh, deserves to be recorded for his attempt to introduce an improvement in the art of printing. The invention, first practised by Ged in 1725, was simply this: From any type of Greek or Roman, any other character, be formed a plate for every page, or sheet, of a book, from which he printed, instead of using a type for every letter, as is done in the common way. This was first practised, but on blocks of wood, by the Chinese and Japanese, and pursued in the first essays of Coster the European inventor of the present art. "This improvement (says James Ged the inventor's son) is principally considerable in three most important articles, viz. expense, correctness, beauty and uniformity."

In July 1729, William Ged entered into partnership with William Fennor, a London stationer, who was to have half the profits, in consideration of his advancing all the money requisite. To supply this, Mr John James, then architect at Greenwich (who built Sir Gregory Page's house, Bloomsbury church, &c.), was taken into the scheme, and afterwards his brother Mr Thomas James, a letter founder, and James Ged the inventor's son. In 1730, these partners applied to the university of Cambridge for printing Bibles and common prayer books by blocks instead of single types; and, in consequence, a lease was sealed to them, April 23, 1731. In their attempt they sunk a large sum of money, and finished only two prayer books; so that it was forced to be relinquished, and the lease was afterwards given up. Ged imputed his disappointment to the villany of the pressmen, and the ill treatment of his partners (which he specifies at large), particularly Fennor, whom John James and he were advised to prosecute, but declined it. He returned to Scotland in 1736, where he gave his friends a specimen of his performance, by an edition of Sallust. But being still unsuccessful, and finding no redress from Fennor, who died insolvent, he was preparing again to set out for London, in order to join with his son James as a printer there, when he died October 19, 1749. Ged's son attempted unsuccessfully, in 1751, to revive this invention; Messrs Tilloc and Foulis about the year 1782 practised it on a small scale at Glasgow; and of late years many beautiful editions of the classics have been printed in this way by Didot of Paris, and Wilson and Company of London.

GEDDES, Alexander, a learned Scots Catholic divine and eminent biblical critic, was born in the parish of Ruthven in Banffshire, in the year 1737. His parents were respectable, although not opulent. His father was a farmer, who deemed no trouble too great, in order to procure for his children as liberal an education as possible. Both father and mother were of the Catholic persuasion, and the only book of consequence which the former had in his library was an English translation of the bible, in which young Geddes was instructed with such care and attention, that he was able to give an account of the history of it before he had reached the eleventh year of his age. The first instructions he received, after those of his parents, were communicated by a school-mistress in the vicinity, by whom he was so much distinguished, that it became the first mental gratification which, in his own opinion, he ever felt. He was next put under the tuition of a young man from the city of Aberdeen, who had been engaged by the laird for the education of his own children; and afterwards went to a place called Sealan, in the Highlands, where those were to be trained up who desired to devote themselves to the Catholic priesthood, and to finish their education at some foreign university. Here it was, in this obscure retreat, that Geddes laid the foundation of that intimate acquaintance with the learned languages, by which he was so eminently distinguished in the subsequent part of his life. He went to the Scots university at Paris in the year 1758, and soon after began the study of rhetoric in the college of Navarre. By the strength of his genius and his indefatigable attention, he was soon at the head of this class, although he had to contend with two veterans, and became the favourite of Vicaiire the professor, whose friendship lasted to the close of life. Instead of entering into the philosophical class at the usual time, he studied that subject at home, in order to facilitate his theological studies, on which he entered under M. M. Buré and de Sauvent, at the college of Navarre, and Lavocat at the Sorbonne was his Hebrew preceptor. So great, or rather astonishing, was his progress, that Professor Lavocat urged him strongly to continue at Paris; but his friends prevailed with him to return to his native country in 1764. His first charge as a priest was in a Catholic chapel in the county of Angus, from which he removed to Traquair in 1765, and became chaplain to the earl of that name, where he remained for about three years. This situation was most agreeable to his literary pursuits, as he had unlimited access to a very extensive library, which greatly assisted him in the prosecution of his darling studies. He left the earl's house in the year 1768, and returned to Paris, where he devoted his time during the following winter to the perusal of books and manuscripts in the king's libraries, making large extracts from scarce copies, particularly such as were in the Hebrew tongue. In the spring of 1769, he returned to his native country, and became pastor of a congregation at Achinbalrig in Banffshire, where he was for some time involved in pecuniary difficulties, out of which he was exonerated by the liberality of the then Duke of Norfolk. These were occasioned by the debts he incurred in building a new chapel for his flock, and in making the parson's house one of the neatest and most convenient in Scotland. With the view of bettering his circumstances he commenced farmer; but as he had to borrow money to stock his farm, and as the crops failed for three successive seasons, he was under the necessity of abandoning this scheme in a much poorer state than when he
In the year 1792, the first volume of his translation was published, dedicated to his patron Lord Petre, containing the first six books of the Old Testament. Soon after this volume made its appearance, three apostolic vicars, calling themselves the bishops of Rama, Acanthos, and Centuriae, issued a pastoral letter addressed to their respective flocks over which they presided, warning them against the reception of Dr Geddes's translation. In his reply to the bishop of Centuriae we find these words: "Perhaps, my lord, you wish to have another occasion of exercising your episcopal authority, and of playing with censures as children do with a new ball.—I wish your lordship much joy of the bauble; but however, my lord, beware of playing too often with it. Read St Chrysostom on Ecclesiastical Censures, and learn from him a little more moderation. Permit an old priest to tell you, that it is a very great ornament in a young bishop. As to myself, my lord, I am not afraid of your threats, and shall laugh at your censures as long as I am conscious that I deserve them not.—You cannot hinder me from praying at home; and at home I will pray, in defiance of your censure, as often as I please. The chief Bishop of our souls is always accessible; and through him I can all the time have free access to the Father, who will not reject me, but for voluntary unrepentant crimes. In the panoply of conscious innocence, the whole thunder of the Vatican would in vain be levelled at my head."

The second volume of his translation, owing to a variety of interruptions, did not make its appearance till the year 1797, to which was prefixed a dedication to her royal highness the duchess of Gloucester, as an "early, spontaneous, and liberal encourager of the work." In this volume the doctor gives up, and boldly combats, the absolute inspiration of scripture, believing that the Hebrew, like all other historians, wrote from such human documents as they could find, and were of consequence liable to similar mistakes. This latitude of thinking naturally led the doctor to give up as fabulous, and wholly unworthy of the divine philanthropy, every command, precept, and injunction, which appeared unworthy even of human authority. He denied of consequence, that the command given to destroy the Canaanites could have God for its author. This volume of Critical Remarks was published in 1800, in which he enters into an able vindication of his own theory, which rather increased than diminished the number of enemies, for as he wrote to please no party, he foresaw that he would have enemies in every party, and so it happened.

Dr Geddes was a man of extensive literature, uncommon liberality of thinking, the friend of all mankind; a man of integrity, honour, and benevolence; in the strictest sense of the word, a truly genuine Catholic, and whose love of truth was so invincible, that neither hopes nor fears could induce him to conceal it. His prospectus of a new translation of the Bible in 4to was published in 1786, and a letter to the bishop of London on the same subject in 1787. His proposals were printed in 1788. As a controversial writer, Dr Geddes was eminently distinguished by his letter to Dr Priestley, in defence of the divinity of Jesus Christ, and by one to a member of parliament, on the expediency of a general repeal of the penal statutes.
commonly allowed to stand in the following order: 

The diamond the hardest of all; then the ruby, sapphire, jacinth, emerald, amethyst, garnet, carnelian, chalcedony, onyx, jasper, sgate, porphyry, and marble. 

This difference, however, is not regular and constant, but frequently varies. Good crystals may be allowed to succeed the onyx; but the whole family of metallic glassy floors seems to be still softer. — In point of colour, the diamond is valued for its transparency, the ruby for its purple, the sapphire for its blue, the emerald for its green, the jacinth for its orange, the amethyst carnelian for its carvan, the onyx for its tawney, the jasper, sgate, and porphyry, for their vermilions, green, and variegated colours, and the garnet for its transparent blood red. 

All these gems are sometimes found coloured and spotted, and sometimes quite limpid and colourless. In this case the diamond cutter or polisher knows how to distinguish their different species by their different degrees of hardness upon the mill. For the cutting or polishing of gems, the five powders of the fragments that are next in degree of hardness is always required to grind away the softer; but as none of them are harder than the diamond, this can only be polished by its own powder. 

Crostok observes, in general, that the colour of the rubies and emeralds are said to remain in the fire, while that of the topaz flies off: hence it is usual to burn the topaz, and thence substitute it for the diamond. "Their colours (says our author) are commonly supposed to depend upon metallic vapours; but may not be more justly supposed to arise from a phlogiston united with a metallic or some other earth? because we find that metallic earths which are perfectly well calcined give no colour to any glass: and that the manganese, on the other hand, gives more colour than can be ascribed to the small quantity of metal which is to be extracted from it." M. Magellan is of opinion, that their colour is owing chiefly to the mixture of iron which enters their composition; but approves the sentiment of Crostok, that phlogiston has a share in their production, it being well known that the calcines of iron when dephlogisticated produce the red and yellow colours of marble, and when phlogisticated to a certain degree produce the blue or green colours. 

With regard to the texture of gems, M. Magellan observes, that all of them are foliated or laminated, and of various degrees of hardness. Whenever the edges of these lamine are sensible to the eye, they have a fibrous appearance, and reflect various shades of colour, which change successively according to their angular position to the eye. These are called by the French chatoyantes; and what is a blemish in their transparency, often enhances their value on account of their scarcity. But when the substance of a gem is composed of a broken texture, consisting of various sets of lamens differently inclined to each other, it emits at the same time various irradiations of different colours, which succeed one another according to their angle of position. This kind of gems has obtained the name of opake, and are valued in proportion to the brilliancy, beauty, and variety of their colours. Their crystallization, no doubt, depends on the same cause which produces that of salts, earths, and metals, which is treated of under the article Crystallization. The following table shows the component parts of gems according to the analysis of Bergman and M. Achard; the letter B prefixed to each denoting Bergman's analysis, and A that of Achard.

<table>
<thead>
<tr>
<th>Gem</th>
<th>Bergman</th>
<th>Achard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red oriental ruby</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Ditto</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Blue oriental sapphire</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Ditto</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Yellow topaz from Saxony</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Green oriental emerald</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Ditto</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Yellow brown orient. hyacinth</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Ditto</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Tourmalin from Ceylon</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Ditto from Brasil</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Ditto from Tyrol</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Garnet from Bohemia</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

But later analyses show that the component parts are different from the above, particularly the colouring matters which are here ascribed to iron. See MINERALOGY.

The chrysopele from Koseinitz in Silesia was likewise analyzed by M. Achard; who found that it contained 456 grains of silicious earth, 13 of calcareous, six of magnesia, three of copper, and two of iron. "This (says M. Magellan) seems to be the only gem that contains no argillaceous earth."

Imitation or Counterfeiting of Gems in Glass. The art of imitating gems in glass is too considerable to be passed without notice; some of the leading compositions therein we shall mention upon the authority of Neri and others.

These gems are made of pastes; and are noway inferior to the native stones, when carefully made and well polished, in brightness or transparency, but want their hardness.

The general rules to be observed in making the pastes are these: 1. That all the vessels in which they are made be firmly luted, and the lute left to dry before they are put into the fire. 2. That such vessels be chosen for the work as will bear the fire well. 3. That the powders be prepared on a porphyrion stone; not in a mortar, which would communicate a tinge to them. 4. That the just proportion in the quantity of the several ingredients be nicely observed. 5. That the materials be all well mixed; and, if not sufficiently baked the first time, to be committed to the fire again, without breaking the pot; for if this be not observed, they will be full of blisters and air bladders. 6. That a small cavity be always left at the top of the pot, to give room to the swelling of the ingredients.

To make paste of extreme hardness, and capable of all the colours of the gems, with great lustre and beauty.—Take of prepared crystal, ten pounds; salt of poverine, six pounds; sulphur of lead, two pounds; mix all these well together into a fine powder; make the whole with common water into a hard paste; and make this paste into small cakes of about three ounces weight each, with a hole made in their middle; dry them in the sun, and afterwards calcine them in the straight part of a potter's furnace. After this, pow-
der them, and levigate them to a perfect fineness on a porphry stone, and set this powder in pots in a glass furnace to purify for three days: then cast the whole into water, and afterwards return it into the furnace, where let it stand 15 days, in which time all foreign and blisters will disappear, and the paste will greatly resemble the natural gems. To give this the colour of the emerald, add to it brass thrice calcined; for a sea green, brass simply calcined to a redness; for a sapphire, add zaffer, with manganese; and for a topaz, manganese and tartar. All the gems are thus imitated in this, by the same way of working as the making of coloured glasses; and this is so hard, that they very much approach the natural gems.

The colour of all the counterfeit gems made of the several pastes, may be made deeper or lighter according to the work for which the stones are designed; and it is a necessary general rule, that small stones for rings, &c. require a deeper colour, and large ones a paler. Besides the colours made from manganese, verdigris, and tartar, which are the ingredients commonly used, there are other very fine ones which care and skill may prepare. Very fine red may be made from gold, and one not much inferior to that from iron; a very fine green from brass or copper; a sky colour from silver, and a much finer one from the granates of Bohemia.

A very singular and excellent way of making the paste to imitate the coloured gems is this: Take a quantity of saccharum saturni, or sugar of lead, made with vinegar in the common way; set it in sand, in a glass body well luted from the neck downwards; leave the mouth of the glass open, and continue the fire 24 hours; then take out the salt, and if it be not red but yellowish, powder it fine, and return it into the vessel, and keep it in the sand heat 24 hours more, till it becomes as red as cinnabar. The fire must not be made so strong as to melt it, for then all the process is spoiled. Four distilled vinegar on this calcined salt, and separate the solution from the dung; let the decanted liquor stand six days in an earthen vessel, to give time for the finer sediment to subside; filter this liquor, and evaporate it in a glass body, and there will remain a most pure salt of lead; dry this well, then dissolve it in fair water; let the solution stand six days in a glazed pan; let it subside, then filter the clear solution, and evaporate it to a yet more pure white and sweet salt; repeat this operation three times; put the now perfectly pure salt into a glass vessel, set it in a sand heat for several days, and it will be calcined to a fine impalpable powder of a lively red. This is called the sulphur of lead.

Take all the ingredients as in the common composition of the pastes of the several colours, only instead of red lead, use this powder; and the produce will well reward the trouble of the operation, as experience has often proved.

A paste proper for receiving colours may be readily made by well pounding and mixing six pounds of white sand cleansed, three pounds of red lead, two pounds of purified pearl ashes, and one pound of nitre. A softer paste may be made in the same manner, of six pounds of white sand cleansed; red lead, and purified pearl ashes, of each three pounds; one pound of nitre, half a pound of borax, and three ounces of arsenic. For common use a pound of common salt may be substituted for the borax. This glass will be very soft, and will not bear much wear if employed for rings, buckles, or such imitations of stones as are exposed to much rubbing; but for ear-rings, ornaments worn on the breast, and those little used, it may last a considerable time.

In order to give paste different colours, the process is as follows: For Amethyst. Take ten pounds of either of the compositions described under Colouring of Glass, one ounce and a half of manganese, and one drachm of zaffer; powder and fuse them together.

Black. Take ten pounds of either of the compositions just referred to, one ounce of zaffer, six drachms of manganese, and five drachms of iron, highly calcined; and proceed as before.

Blue. Take of the same composition, ten pounds; of zaffer, six drachms; and of manganese, two drachms; and proceed as with the foregoing.

Chrysolite. Take of either of the compositions for paste above described, prepared without saltpetre, ten pounds, and of calcined iron five drachms; and pursue the same process as with the rest.

Red Cornelian. Take of the compositions mentioned under Colouring of Glass, two pounds; of glass of antimony, one pound; of the calcined vitriol called scarlet ochre, two ounces; and of manganese, one drachm. Fuse the glass of antimony and manganese with the composition; then powder them, and mix them with the other, by grinding them together, and fuse them with a gentle heat.

White Cornelian. Take of the composition just referred to, two pounds; of yellow ochre well washed, two drachms; and of calcined bones, one ounce. Mix them, and fuse them with a gentle heat.

Diamond. Take of the white sand, six pounds; of red lead, four pounds; of pearl ashes, purified, three pounds; of nitre two pounds; of arsenic five ounces; and of manganese, one scruple. Powder and fuse them.

Aigue-marine. Take ten pounds of the composition under Glass; three ounces of copper highly calcined with sulphur; and one scruple of zaffer. Proceed as before.

Emerald. Take of the same composition with the last, nine pounds; three ounces of copper precipitated from aquafortis; and two drachms of precipitated iron. See Emerald, Mineralogy Index.

Garnet. Take two pounds of the composition under Glass; two pounds of the glass of antimony, and two drachms of manganese. For cornelian garnet, take of the composition for paste, described in this article, two pounds; one pound of glass of antimony, and half an ounce of iron, highly calcined: mix the iron with the uncoloured paste, and fuse them: then add the glass of antimony powdered, and continue them in the heat till the whole is incorporated.

Gold or full Yellow. Take of the composition for paste ten pounds; and one ounce and a half of iron strongly calcined; proceeding as with the others.

Deep Purple. Take of either of the compositions for paste, ten pounds; of manganese, one ounce; and of zaffer, half an ounce.

Ruby. Take one pound of either of the compositions
Much of the success in the art of making coloured stones depends on the accurate proportion of the substances made use of to form the crystal which serves as a base to the fictitious stones. After having tried a great variety of receipts, our author found they might be reduced to the following.

1. Take two parts and a half of lead in scales, one part and a half of rock crystal or prepared flints, half a part of nitre, as much borax, and a quarter part of glass of arsenic. These being well pulverized and mixed together, are to be put into a Hessian crucible, and submitted to the fire. When the mixture is well melted, pour it into cold water; then melt it again a second and a third time; taking care, after each melting, to throw it into fresh cold water, and to separate from it the lead that may be revived. The same crucible should not be used a second time, because the glass of lead is apt to penetrate it in such a manner as to run the risk of losing the contents. One must also be careful to cover the crucible well, to prevent any coals getting into it, which would reduce the caix of lead, and spoil the composition.

2. Take two parts and a half of white cersere, one part of prepared flints, half a part of salt of tartar, and a quarter part of calcined borax: melt the mixture in a Hessian crucible, and then pour it into cold water; it is then to be melted again, and washed a second and a third time, the same precautions being observed as for the first base.

3. Take two parts minium, one part rock crystal, half a part of nitre, and as much salt of tartar: this mixture being melted, must be treated as the former.

4. Take three parts of calcined borax, one part of prepared rock crystal, and one part of salt of tartar; these being well mixed and melted together, must be poured into warm water: the water being decanted, and the mass dried, an equal quantity of minium must be added to it; it is then to be melted and washed several times as directed above.

5. That called by our author the Magence base, and which he considers as one of the finest crystalline compositions hitherto known, is thus composed: Take three parts of fixed alkali of tartar, one part of rock crystal or flint pulverized: the mixture to be well baked together, and then left to cool. It is afterwards poured into a crucible of hot water to dissolve the frit; the solution of the frit is then received into a stone-ware pan, and aquafortis added gradually to the solution till it no longer effervesces: this water being decanted, the frit must be washed in warm water till it has no longer any taste: the frit is then dried, and mixed with one part and a half of fine cersere or white lead in scales; and this mixture must be well levigated with a little distilled water. To one part and a half of this powder dried add an ounce of calcined borax: let the whole be well mixed in a marble mortar, then melted and poured into cold water as the other bases already described. These fusions and lotions having been repeated, and the mixture dried and powdered, a 12th part of nitre must be added to it, and then melted for the last time; when a very fine crystal will be found in the crucible.

6. As a composition for furnishing very fine white stones: Take eight ounces of cersere, three ounces of rock
G E M

G E M

rock crystal pulverized, two ounces of borax finely powdered, and half a grain of manganese: having melted and washed this mixture in the manner directed above, it will produce a very fine white crystal.

H. Of the Colours. The calces of metals, as already observed, are the substances employed to colour factitious gems; and on the preparation of these calces depends the vividness of their colours.

a, From Gold.] To obtain the mineral purple known by the name of precipitate of Cassius, M. Fontaniu employs the following different processes.

1. Dissolve some pure gold in aqua regia, prepared with three parts of precipitated nitrous acid and one part of marine acid; and to hasten the dissolution, the matras should be placed in a sand bath. Into this solution pour a solution of tin in aqua regia. The mixture becomes turbid, and the gold is precipitated with a portion of the tin, in the form of a reddish powder; which after being washed and dried, is called precipitate of Cassius.—The aqua regia employed to dissolve the tin is composed of five parts of nitrous acid and one part of marine acid: to eight ounces of this aqua regia, are added sixteen ounces of distilled water. Some leaves of Malaca tin, about the size and thickness of a thimble, are then put into this diluted aqua regia, till it will dissolve no more of them: which operation our author observes, requires commonly twelve or fourteen days; though it might probably be hastened by beating the tin still thinner, and then rolling it into the form of a hollow cylinder, or turning it round into spiral convolutions, and thus exposing a greater extent of surface to the action of the menstruum. In order to prepare more readily the precipitate of Cassius, M. Fontaniu puts into a large jug eight ounces of solution of tin, to which he adds four pints of distilled water: he afterwards pours into this metallic eye some solution of gold, drop by drop, taking care to stir the whole with a glass tube: when the mixture becomes of a deep purple colour, he ceases dropping the solution of gold; and in order to hasten the precipitation of the mineral purple, pours into the mixture a pint of fresh urine. Six or seven hours after, the precipitate is collected at the bottom of the vessel; the fluid is then decanted; and the precipitate, washed once or twice, is dried till it becomes a brown powder.

2. Pour into a vessel of fine tin with a thick bottom four ounces of the solution of gold; three minutes after add two pints of distilled water. Let this mixture stand in the tin vessel during seven hours, taking care to stir it every hour with a glass tube; afterwards pour it into a conical glass jug, and add to it a pint of new urine: the mineral purple is soon precipitated, and then is to be washed and dried.

3. Distil in a glass retort placed in a bath of ashes, some gold dissolved in aqua regia, made with three parts nitrous and one part marine acid; when the acid is passed over and the gold contained in the retort appears dry, leave the vessel to cool, then pour into it some new aqua regia, and proceed to distil as before. Replace the aqua regia twice upon the gold, and distil the same. After these four operations, pour by little and little into the retort some oil of tartar per deliquium, which will occasion a brisk effervescence: when this ceases, distil the mixture till it becomes dry, and then put some warm water into the retort.

Shake the whole and pour it into a cucurbit, when a precipitate is deposited, the colour of which is sometimes brown and sometimes yellow: After having washed this precipitate, dry it. Our author says, this mineral purple was much superior to the foregoing, since two grains of it only were sufficient to an ounce of the base, whilst it required of the other two a 20th part of the base. And he adds, that he found a means of exalting the colour of the precipitate of Cassius, by putting to it a sixth part of its weight of glass of anti-mony finely powdered, and of nitre in the proportion of a drachm to eight ounces of the base.

b, From Silver.] The oxide of silver, being vitrified, produces a yellowish grey colour. This oxide enters only into the composition of the yellow artificial diamond and the opal. M. Fontaniu introduces it into the base in the form of luna cornes.

In order to prepare it, he directs to dissolve the silver in precipitated nitrous acid, and afterwards to pour into it a solution of sea salt: a white precipitate is obtained; which, being washed and dried, melts very readily in the fire, and is soon volatilized if mixed with vitrifiable and yellow oxide. To be he yellow diamond, 25 grains of this luna cornes are put to announce of the fourth base: the dose of silver may be diminished according to the shade of yellow that one wishes to procure.

c, From Copper.] The oxide of copper imparts to white glass the finest green colour; but if this metal be not exactly in a state of oxide, it produces a brownish red colour. Mountain blue verdigris, and the residue of its distillation, are the different preparations of copper which our author employs to make the artificial emeralds.

d, From Iron.] Although it has been asserted that the oxides of iron introduce a very fine transparent red colour into white glass, M. Fontaniu could only obtain from it a pale red a little opaque. The oxide of iron that he employed was in the proportion of the 20th part of the base.

There are several ways of preparing the oxide of iron called crocus Martinus, or saffron of Mars. In general, it is necessary to be prepared in the following manner: the magnet ceases to attract it: thus one may use the scales of iron found upon the bars of the furnaces which serve to distil aquafortis. By digesting filings of steel with distilled vinegar, then evaporating and replacing the vinegar 10 or 12 times upon these filings and drying them alternately, an oxide of iron is obtained, which must be sifted through a silk sieve, and then calcined. The oxide of iron thus obtained by the vinegar, our author says, only introduced into his bases a green colour inclining to a yellow.

By the following process a saffron of Mars of the finest red colour is obtained: Let an ounce of iron filings be dissolved in nitrous acid in a glass retort, and distilled over a sand bath to dryness. After having replaced the acid or the dry oxide, and re-distilled it a second and a third time, it is then edulcorated with spirits of wine, and afterwards washed with distilled water.

e, From the Magnet.] It is necessary to calcine the magnet before it be introduced into the vitrifications: Having therefore torrefied the magnet during two hours,
hours, it must be washed and dried. It is only employed in the composition of the opal.

f, From Cobalt. The oxide of cobalt is only proper to introduce a blue colour into glass; but this metal is rarely found free from iron and bismuth, and therefore it is first necessary to separate them from it. It is done by calcining the ore of cobalt in order to disengage the arsenic; afterwards the oxide must be distilled in a retort with sal ammoniac, and the iron and the bismuth are found sublimed with this salt. The distillation must be repeated with the sal ammoniac. If this salt is no longer coloured yellow. The cobalt which remains in the cornute is then calcined in a potsherd, and becomes a very pure oxide; which being introduced into the base, in the proportion of a good part, gives it a very fine blue colour, the intensity of which may be increased at discretion by the addition of oxide of cobalt. In order to prepare black enamel resembling that which is called black agate of Iceland; melt together a pound and a half of one of the bases, two ounces of the oxide of cobalt, two ounces of coccus Maris prepared with vinegar, and two ounces of manganese.

g, From Tin. The oxide of tin, which is of a white colour, renders opaque the glass with which it is melted, and forms white enamel. For this purpose, calcine the patty of tin; then wash and dry it, and sift it through a silk sieve. Take six pounds of the second base, the same quantity of the calcined patty of tin, and 48 grains of manganese.

h, From Antimony. Antimony is only susceptible of vitrification in a certain state of oxidation, and then it produces a reddish or hyacinth coloured glass; but if the antimony be in a state of absolute calx, such as the diaphoretic antimony, then it is no longer vitrifiable, and may be substituted for oxide of tin to make white enamel. M. Fontanieu introduces the glass of antimony in the composition of artificial topazes. For the oriental topaz, he takes 24 ounces of the first base, and five drachms of the glass of antimony. To imitate the topaz of Saxony, he adds to each ounce of the base five grains of the glass of antimony. For the topaz of Berzelius, he takes 24 ounces of the first base, one ounce 24 grains of glass of antimony, and 8 grains of the precipitate of Caesius.

i, From Manganese. This mineral employed in a small quantity, renders the glass whiter; a larger quantity produces a very fine violet colour, and a still larger dose of it renders the glass black and opaque.

There are two ways of preparing manganese. 1. The simplest consists in exposing it to a red heat, and then quenching it with distilled vinegar; it is afterwards dried and powdered, in order to pass it through a silk sieve. 2. Handique de Blancour describes the second manner of preparing the manganese, proper to furnish a red colour, and names it fusible manganese. Take of manganese of Piedmont one pound; torrefy and pulverize it; then mix it with a pound of nitre, and calcine the mixture during 24 hours; afterwards wash it repeatedly in warm water, till the water of the liquors has no longer any taste; dry the manganese, and mix with it an equal weight of sal ammoniac; levigate this mixture on a slab of porphyry with oil of vitriol diluted with water to the strength of vinegar. Dry the mixture, and introduce it into a cornute; distil by a graduated fire; and when the sal ammoniac is sublimed weigh it, and add to the mixture an equal quantity. Then distil and sublime as before, and repeat the operation six times, being careful at each time to mix the sal ammoniac and the manganese upon the porphyry with diluted oil of vitriol.

At Turnhaut in Bohemia, there is sold a fusible glass of a yellow colour, very like that of the topaz of Brazil, which, when exposed to a degree of fire in a cupel sufficient to reden it, becomes of a very fine ruby colour, more or less deep according to the degree of fire to which it has been exposed. Our author assayed this glass, and found it to contain a great deal of lead, but was not able to discover any gold in it.

III. Of the different degrees of fire necessary for Factitious Gems. Our author observes, that there are three degrees of heat very different in their energy. The fire kept up in the wind furnaces in the laboratories of chemists, is less active than that whose effect is accelerated by the means of bellows; and a fire supported by wood, and kept up during 60 hours without interruption, produces singular effects in vitrification, and renders the glass finer and less alterable.

When recourse is had to the forge, in order to operate a vitrification, it is necessary to turn about the crucible from time to time, that the mass may melt equally. Some coal also should be replaced, in proportion as it consumes towards the nozzle of the bellows; for without this precaution, we should run the risk of cooling the crucible opposite to the flame, and probably of cracking it, when all the melted mass running among the coals would be totally lost. Though this is the readiest way of melting, it should not be employed out of choice; for the crucible often breaks, or coals get into it, which may reduce the lead to the metallic state.

The wind furnace is either square or round. A small cake of baked clay or brick, of the thickness of an inch, is placed upon the grate; and upon this cake is placed the crucible, surrounded with coals. The degree of heat produced by this furnace is much less than that of the forge: but in order to succeed in the vitrification, M. Fontanieu recommends the use of a furnace described by Knuckel, of which, the interior part is so disposed, that we may place crucibles at three different heights; and the name of chambers is given to those steps upon which the crucibles are placed.

It is obvious, that the degree of heat cannot be equal in the said three chambers. In the first or lowest chamber the heat is greatest, afterwards in the next, and lastly, in the highest. We should begin by placing the crucibles according to their size, in these different chambers; by which means the best effect in vitrification is produced.

In order to conduct the fire well, only three billets of white wood should be put into the furnace at a time for the first 20 hours, four billets at a time for the next 20 hours, and six billets for the last 30 hours; in all 60 hours. The furnace is then left to cool, care being taken to stop the air hole with some lute; and in about 48 hours after, when the kiln is quite cold, the crucible is to be withdrawn.

IV. The Compositions. 1. For the white diamond; 3 O 2...
with no small emolument, by that ingenious seal engraver Mr Deuchar of Edinburgh. The only respect in which it is inferior to the other more operose and expensive methods, consists in the chance of air bubbles arising in pouring on the plaster; which chance, however, is less in proportion to the fineness of the gypsum employed. When air bubbles do occur, the casts may be laid aside, as it is so easy to replace them.

The application of pastes to multiply and preserve the impressions of cameiex and intaglios, is an object very interesting to artists and to antiquaries, as well as to men of learning and taste in the fine arts.

This art, though only lately restored in any degree of perfection, is of very considerable antiquity. The great prices which the ancients paid for the elegant gems engraved by the celebrated Greek artists, could not but early suggest to them the idea of multiplying their numbers, by taking off their impressions in wax, in sulphur, in plaster, or in clay; but more particularly in coloured glass, or that vitrified substance commonly called pastes.

As the impressions on paste are durable, and imitate the colours and brilliancy of the original stones, they thus preserve in a manner the gems themselves. This art was therefore practised not only by the Greeks, but by all the nations who cultivated Grecian taste.

Many of the finest gems of antiquity are now lost, and their impressions are to be found only on ancient pastes. Great therefore is the value of these pastes. Numerous collections of them have been formed by the curious. Instances of this are found in the Florentine Museum, in Stosch’s work on ancient gems with inscriptions, in Winklemann’s description of Stosch’s cabinet, and in the noble collection of Mr Charles Townley in London.

The art of taking impressions of gems seems not to have been altogether lost even in the Gothic ages; for Heraclius, who probably lived in the ninth century, and wrote a book De coloribus et artibus Romanorum, teaches in very plain though not elegant terms how to make them. Indeed, some of the few persons who then possessed the art, and possessed it with any degree of the times, sold pastes for original gems. Thus the famous emerald of the abbey of Reichsburg near Constance, although a present made by Charlemagne, is now found to be a piece of glass. And thus the celebrated emerald vase in the cathedral of Genoa is likewise found to be a piece of paste (A). The Genoese got this vase at the taking of Cessare in the year 1301 as an equivalent for a large sum of money; nor was any imposition then suspected, for in the year 1319 they pawned it for 1200 marks of gold.

But this ingenious art, revived indeed in Italy in the time of Laurence of Medici and Pope Leo X., was not cultivated in an extensive manner till the beginning of the present century, when M. Homberg restored it, as already mentioned. In this he is said to have been greatly assisted and encouraged by the then duke of Orleans, regent of France, who used to amuse himself with that celebrated chemist in taking off impressions in paste from the king of France’s, from his own, and other collections of gems.

According to the French Encyclopedists, M. Claude the elder, an engraver of some note, who died at Paris in 1781, learned this art from his royal highness, to whose household his father or he seems to have belonged. Mademoiselle Felox next cultivated this art, and it is believed still carries it on. She had been taught by her father, who in quality of garçon de chambre to the regent had often assisted in the laboratory of his master, where he acquired this knowledge. Her collection consists of 1800 articles.

Baron Stosch, a Prussian, who travelled over Europe in quest of original engraved stones and impressions of ancient gems for the elegant work which he published and Picart engraved (B), was well acquainted with this art. He had taught it to his servant Christian Dehn, who settled at Rome, where he made and sold his well known sulphur impressions and pastes. He had collected 2500 articles. Dolce has arranged them in a scientific order, and given a descriptive catalogue of them as same as the originals.

It was chiefly from Dehn’s collection that the taste for sulphurs and pastes has become so universal. They are great objects of study, and often require much learning to explain them. They have unquestionably served to extend and improve the art of engraving on stones; and have been of infinite use to painters, to statuaries, and to other artists, as well as to men of classical learning and fine taste.

It is very difficult to take off impressions, and perfectly to imitate various-coloured cameos. It cannot be properly done in wax, sulphur, plaster, or glass of one colour only. The difficulties arising from their size and form, and from the various nature of the different sorts of glass which do not well unite into different strata, are very numerous: nor could the completest success in this chemical and mechanical branch of the art produce a tolerable cameo. Impressions or imitations, if assisted by the tool of the engraver, do not succeed; because the outer work of most of the originals require to be filled up with clay or wax, that the mould may come off safe without injuring them. Hence the impressions from these moulds come off hard and destitute of delicacy, sharpness, and precision of outline, till the underworking of the mould is cut away. But Mr Woffenstein at Rome, by his genius, perseverance, and the assistance of able artists, has overcome these difficulties; and has had the satisfaction of succeeding, and producing variegated cameos which can hardly be distinguished from the originals.

Mr Lippart of Dresden, an ingenious glazier, and an enthusiast in the fine arts, practised this branch not unsuccessfully; but not finding sufficient encouragement for his pastes of coloured glass, or perhaps from local difficulties in making them well and cheap, he abandoned

(A) See M. de la Condamine’s Diss. in Memoir. de l’Acad. Roy. de Paris, 1757.

(B) Gemme antique colorate, sculptorum nominibus insigne, were incise per Bernardum Picart. Amsterdam. 1724, folio.
The word גמרא, gemara, is commonly supposed to denote a supplement; but in strictness it rather signifies complement, perfection: being formed of the Chaldee גמא, gemar, or הגים, to finish, perfect, or complete anything.

The rabbis call the Pentateuch simply the law: the first part of the Talmud, which is only an explication of that law, or an application thereof to particular cases, with the decisions of the ancient rabbis therein, they call the Мишנה, i.e. “second law.” and the second part, which is a more extensive and ample explication of the same law, and a collection of decisions of the rabbins posterior to the Mishna, they call גמרא, q. d. “perfection, completion, finishing;” because they esteem it the finishing of the law, or an explication beyond which there is nothing farther to be desired.

The Gemara is usually called simply תלמוד, the common name of the whole work. In this sense we say, there are two Gemaras or Talmuds; that of Jerusalem and that of Babylon: though in strictness the Gemara is only an explication of the Mishna, given by the Jewish doctors in their schools: much as the commentators of our school divines on St Thomas, or the master of the sentences, are an explication of the writings of those authors.

A commentary, Moses Tilletmont observes, was wrote on the Mishna, by one Johanan, whom the Jews place about the end of the second century; but Fa. Morin proves, from the work itself, wherein mention is made of the Turks, that it was not wrote till the time of Heraclius, or about the year 620; and this is what is called the גמרא, or תלמוד of ירושלים, which the Jews do not use or esteem much because of its obscurity.

They set a much greater value on the Gemara, or תלמוד of בבלוניא, begun by one Assa; discontinued for 73 years, on occasion of the wars with the Saracens and Persians; and finished by one Josa, about the close of the seventh century. See תלמוד.

Though the name Talmud, in its latitude, includes both the Mishna and the two Gemaras; yet it is properly that of Assa and Josa alone which is meant under that name. This the Jews prize above all their other writings, and even set it on a level with Scripture itself: in effect, they conceive it as the word of God, derived by tradition from Moses, and preserved without interruption to their time. R. Jehuda, and afterwards R. Johanan, R. Assa, and R. Josa, fearing the traditions should be lost in the dispersion of the Jews, collected them into the Mishna and the Gemara. See כראים and רביןיס.

GEMINI, in Astronomy, the Twins; a constellation or sign of the zodiac, the third in order, representing Castor and Pollux; and it is marked thus, ξικ. The stars in the sign Gemini, in Ptolemy’s catalogue, are 25; in Tycho’s, 25; in Hevelius’s, 38; in the Britannic catalogue, 85.

GEMINIANI, a celebrated musician and composer, was born at Lucca, in the year 1620. He received his first instructions in music from Alessandro Scarlatti; and after that became a pupil of Carlo Ambrosio Lunati, surnamed Il Gobbo, a most celebrated performer on the violin; after which he became a disciple of Corelli, and under him finished his studies on that instrument. In the year 1714 he came to England; where Geminiani, in a short time he so recommended himself by his exquisite performance, that all who professed to love and understand music were captivated with hearing him.—Many of the nobility laid claim to the honour of being his patrons; but he seemed chiefly to attach himself to Baron Kilmansedge, chamberlain to King George I. as elector of Hanover, and a favourite of that prince. In 1716, he published and dedicated to his patron 12 sonatas a violino violino e cembalo: the first six with fugues, or double stops as they are vulgarly called; the last with airs of various measures, such as allemandes, courantes, and jiggs. This publication was so well relished by the baron, that he mentioned Geminiani to the king as an excellent performer; in consequence of which our musician had the honour to perform before his majesty, in concert with the celebrated Handel, who played on the harpsichord. But though Geminiani was exceedingly admired, yet he had not a talent at associating music with poetry, nor do we find that he ever became a public performer: he was therefore obliged to depend for his subsistence on the friendship of his patrons and the profits which accrued to him from his lessons. He had also the misfortune to be an enthusiast in painting, and the versatility of his temper was such, that, in order to gratify this passion, he not only suspended his studies, and neglected to exercise his talents, but involved himself in debts. In 1727, he was offered the place of master and composer of the state music in Ireland; but this could not be conferred on a Catholic, and Geminiani refused to change his religion: upon which it was given to Matthew Dubourg, a young man who had been one of his pupils, and was a celebrated performer on the violin. Geminiani then set himself to compose parts to the opera quinta of Corelli; or, in other words, to make concertos of the first six of his solos. This work he completed, and, with the help of a subscription, at the head of which were the names of the royal family, published in 1726. In 1733, he published his opera seconda, which contains a celebrated masque that goes by his name. He published many other pieces, the profits of which did not, however, mend his circumstances; but this perhaps was owing to his rambling disposition and enthusiastic fondness of painting. He was also an utter stranger to the business of an orchestra, and had no idea of the labour and pains necessary in the instruction of singers for the performance of music to which they were strangers. The consequence of this was, that a concerto spirituale, which he had advertised for his own benefit in 1748, failed in the performance. The audience, however, compassionate his distress, and sat very silent till the books were changed; when the performance was continued with compositions of the author’s own, and which he executed in such a manner as was never forgotten. The profits arising from this performance enabled him to take a journey to Paris; where he stayed long enough to get plates engraved for a score of solos, and the parts of two operas of concertos. About the year 1755 he returned to England, and advertised them for sale.—In 1761 Geminiani went over to Ireland, and was kindly entertained there by Mr Matthew Dubourg, who had been his pupil, and was then master of the king’s band in Ireland. This person through the course
Gemini, course of his life had ever been disposed to render him friendly offices; and it was but a short time after Gemini's arrival at Dublin that he was called upon to do him the last. It appears that Gemini had spent many years in compiling an elaborate treatise on music, which he intended for publication; but soon after his arrival at Dublin, by the treachery of a female servant, who, it was said, was recommended to him for no other end than that she might steal it, it was conveyed away, and could not be recovered. The greatness of this loss, and his inability to repair it, made a deep impression on his mind; and, as it is conjectured, hastened his end; at least he survived it but a short time, ending his days on the 7th of September 1762.

The following list comprises the whole of his publications, except two or three articles of small account: Twelve solos for a violin, opera prima; six concertos in seven parts, opera secunda; six concertos in seven parts, opera terza; twelve solos for a violin, opera quarta; six solos for a violoncello, opera quinta; the same made into solos for a violin; six concertos from his opera quarta; six concertos in eight parts, opera settima; rules for playing in taste; a treatise on good taste; the art of playing the violin; 12 sonatas from his first solos, opera undecima; Ripieno parts to ditto; lessons for the harpsichord; Guido Armonico; supplement to ditto; the art of accompaniment, two books; his first two operas of concertos in score; and the Enchanted Forest.—Of his solos the opera prima is esteemed the best. Of his concertos some are excellent, others of them scarce pass the bounds of mediocrity. The sixth of the third opera not only surpasses all the rest, but in the opinion of the best judges of harmony, is the finest instrumental composition extant.

GEMMA, or Bud, in Botany: a compendium or epitome of a plant, seated upon the stem and branches, and covered with scales, in order to defend the tender rudiments enclosed from cold and other external injuries, till, their parts being unfolded, they acquire strength, and render any further protection unnecessary.

Buds, together with bulbs, which are a species of buds generally seated upon near the root, constitute that part of the herb called by Linnaeus hybernacula; that is, the winter quarters of the future vegetable: a very proper appellation, as it is during that severe season that the tender rudiments are protected in the manner just mentioned.

Plants, considered in analogy to animals, may probably enough be reckoned both viviparous and oviparous. Seeds are the vegetable eggs; buds, living fetsuses, or infant plants, which renew the species as certainly as the seeds.

Buds are placed at the extremity of the young shoots, and along the branches, being fixed by a short footstalk upon a kind of brackets, the remainder of the leaves, in the wings or angles of which the buds in question were formed the preceding year. They are sometimes placed single; sometimes two by two, and those either opposite or alternate; sometimes collected in greater numbers in whirls or rings.

With respect to their construction, buds are composed of several parts artificially arranged. Externally, we find a number of scales that are pretty hard, frequently armed with hairs, hollowed like a spoon, and placed over each other like tiles. These scales are fixed into the inner plates of the bark, of which they appear to be a prolongation. Their use is to defend the internal parts of the bud; which, being unfolded, will produce, some, flowers, leaves, and stipules; others, footstalks and scales. All these parts, while they remain in the bud, are tender, delicate, folded over each other, and covered with a thick clammy juice, which is sometimes resinous and odoriferous, as in the tamarac tree. This juice serves not only to defend the more tender parts of the embryo plant from cold, the assaults of insects, and other external injuries; but likewise from excessive perspiration, which, in its young and infant state, would be very destructive. It is copious in the buds of horse chestnut, poplar, and willow trees.

In general, we may distinguish three kinds of buds; that containing the flower, that containing the leaves, and that containing both flower and leaves.

The first, termed gemma florifer, and by the French bouton à fleur or à fruits, contains the rudiments of one or several flowers, folded over each other, and surrounded with scales. In several trees, this kind of bud is commonly found at the extremity of certain small branches, which are shorter, rougher, and less garnished with leaves, than the rest. The external scales of this species of bud are harder than the internal; both are furnished with hairs, and in general more swelled than those of the second sort. The bud containing the flower too is commonly thicker, shorter, almost square, less uniform, and less pointed; being generally terminated obtusely. It is called by Pliny occlus gemma; and is employed in that species of grafting called inoculation, or budding.

The second species of bud, viz. that containing the leaves, termed gemma foliifer, and by the French bouton à feuilles ou à bois, contains the rudiments of several leaves, which are variously folded over each other, and outwardly surrounded by scales, from which the small stipule that are seated on the foot of the young branches are chiefly produced. These buds are commonly more pointed than the former sort. In the hazel nut, however, they are perfectly round; and in horse chestnut, very thick.

The third sort of bud is smaller than either of the preceding; and produces both flowers and leaves, though not always in the same manner. Sometimes the flowers and leaves are unfolded at the same time. This mode of the flower and leaf bud is termed by Linnaeus gemma foliifer et florifer. Sometimes the leaves proceed or emerge out of this kind of bud upon a small branch, which afterwards produces flowers. This mode of the flower and leaf bud is termed by Linnaeus gemma foliifer florifer, and is the most common bud of any.

Such buds as produce branches adorned only with leaves, are called barren; such as contain both leaves and flowers, fertile. From the bulk of the bud we may often with ease forestal whether it contains leaves only, or leaves and flowers together, as in cherry and pear trees.

Neither the buds produced on or near the root, called by some authors turiones, nor those produced on the trunk, and from the angles or wings of the leaves, contain, in strict propriety, an entire delineation of the plant: since the roots are wanting; and in various
GENERALISSIMO, called also captain general, and simply general, is an officer who commands all the military powers of a nation; who gives orders to all the other general officers; and receives no orders himself but from the king.

M. Balzac observes, that the cardinal de Richelieu first coined this word, of his own absolute authority, upon his going to command the French army in Italy.

GENERATE, in Music, is used to signify the operation of that mechanical power in nature, which every sound has in producing one or more different sounds. Thus any given sound, however simple, produces along with itself, its octave, and two other sounds extremely sharp, viz. its twelfth above, that is to say, the octave of its fifth; and the other the seventeenth above, or, in other words, the double octave of its third major.

Whether we suppose this production of sounds to result from an aptitude in the texture and magnitude of certain particles in the air, for conveying to our ears vibrations that bear those proportions, one to another, as being determined at once by the partial and total oscillations of any musical string; or from whatever else it is that, by a sort of nature we choose to trace it; the power of one sound thus to produce another, when in action, is said to generate. The same word is applied, by Signior Tartini and his followers, to any two sounds which, simultaneously heard, produce a third.

GENERALLY, or GENITIVUS, is used, by some mathematical writers, for whatever is produced, either in arithmetic, by the multiplication, division, or extraction of roots; or in geometry, by the invention of the contents, areas, and sides; or of extreme and mean proportions, without arithmetical addition and subtraction.

GENERATING LINE, or FIGURE, in Geometry, is that which, by its motion of revolution, produces any other figure, plane or solid. See GENESIS.

GENERATION, in Physiology, the act of procreation and producing a being similar to the parent. See ANATOMY, No. 157.

GENERATION OF FISHES. See COMPARATIVE ANATOMY, No. 304, and Ichthyology.

GENERATION OF PLANTS. See Botany.

GENERATION OF INSECTS. See COMPARATIVE ANATOMY, p. 312, and Entomology, p. 234.

PARTS OF GENERATION. See Anatomy, No. 157.

GENERATION, in Mathematics, is used for formation or production. Thus we meet with the generation of equations, curves, solids, &c.

GENERATION, in Theology. The Father is said by some divines to have produced his Word or Son from all eternity, by way of generation; on which occasion the word generation raises a peculiar idea: that procession, which is really effected in the way of understanding, is called generation, because, in virtue thereof, the Word becomes like to him from whom he takes this original; or, as St. Paul expresses it, is the figure or image of his substance, i.e. of his being and nature. And hence it is, they say, that the second Person in the Trinity is called the Son.

GENERATION is also used, though somewhat improperly, for genealogy, or the series of children issued from the same stock. Thus the gospel of St. Matthew commences with the book of the generation of Jesus Christ,
with the treaty concluded with Berne and Friburg in Geneva.

the year 1526; in consequence of which the duke was in a short time deprived of his authority, the bishop driven from the city, and the reformed religion and a republican form of government introduced. A long war commenced with Savoy on this account; but the Genevans proved an overmatch for their enemies by their own bravery and the assistance afforded by the inhabitants of Berne. In 1584, the republic concluded a treaty with Zurich and Berne, by which it is allied to the Swiss cantons. The house of Savoy made their last attempt against Geneva in 1602, when the city was treacherously attacked in the night time during a profound peace. Two hundred soldiers had scaled the walls, and got into the town before the alarm was given; but they were repulsed by the desperate valour of a few citizens, who perished in the encounter. A petard had been fastened to one of the gates by the Savoyards; but the gunner was killed before it could be discharged. The war occasioned by this treachery was next year concluded by a solemn treaty, which has ever since been observed on both sides: though the independence of Geneva was not formally acknowledged by the king of Sardinia till the year 1754.

The restoration of tranquility from without, in consequence of the above treaty, was however soon followed by the fumes of internal discord, so common in popular governments; so that during the whole of the last century the history of Geneva affords little more than an account of the struggles betwixt the aristocratical and popular parties. About the beginning of the present century the power of the grand council became almost absolute; but in order to restrain its authority, an edict was procured in 1707 by the popular party, enacting, that every five years a general council of the citizens and burgesses should be summoned to deliberate upon the affairs of the republic. In consequence of this law a general assembly was convened in 1712; and the very first act of that assembly was to abrogate the edict by which it had been convened. A proceeding so extraordinary can scarcely be accounted for on the principles of popular fickleness and inconstancy. Rousseau, in his Miscellaneous Works, ascribes it to the artifices of the magistrates, and the equivocal terms marked upon the billets then in use. For the question being put, "Whether the opinion of the councils for abolishing the periodical assemblies should pass into a law?" the words approbation or rejection, put upon the billets by which the votes were given, might be interpreted either way. Thus, if the billet was chosen on which the word approbation was written, the opinion of the councils which rejected the assemblies was approved; and by the word rejection, the periodical assembly was rejected of course. Hence several of the citizens complained that they had been deceived, and that they never meant to reject the general assembly, but only the opinion of the councils.

In consequence of the abolition of the general assemblies, the power of the aristocratical party was greatly augmented; till at length the inhabitants exerting themselves with uncommon spirit and perseverance, found means to limit the power of the magistrates, and enlarge their own rights. In 1776, as Mr. Cox informs us, the government might be considered as a mean betwixt...
twixt that of the aristocratical and popular cantons of Switzerland. The members of the senate, or little council of 25, enjoyed in their corporate capacity several very considerable prerogatives. By them half the members of the great council were named; the principal magistrates were supplied from their own body; they convened the great and general councils, deliberating previously upon every question which was to be brought before these councils. They were vested also with the chief executive power, the administration of finances, and had in a certain degree the jurisdiction in civil and criminal causes. Most of the smaller posts were likewise filled by them; and they enjoyed the sole privilege of conferring the burguership. These, and other prerogatives, however, were balanced by those of the great council and the privileges of the general council. The former had a right to choose the members of the senate from their own body; receiving appeals in all causes above a certain value, pardoning criminals, &c. besides which they had the important privilege of approving or rejecting whatever was proposed by the senate to be laid before the people.

The general council or assembly of the people is composed of the citizens and burgurers of the town; their number in general amounting to 1,500, though usually not more than 1,200 were present; the remainder residing in foreign countries, or being otherwise absent. It meets twice a-year, chooses the principal magistrates, approves or rejects the laws and regulations proposed by the other councils, imposes taxes, contracts alliances, declares war or peace, and nomi- nates half the members of the great council, &c. But the principal check to the power of the senate arose from the right of re-election, or the power of annually expelling four members from the senate at the nomination of the syndics or principal magistrates, and from the right of representation. The syndics are four in number, chosen annually from the senate by the general council; and three years elapsed before the same members can be again appointed. In choosing these magistrates, the senate appointed from its own body eight candidates, from whom the four syndics were to be chosen by the general council. The latter, however, had in their power to reject not only the first eight candidates, but also the whole body of senators in succession: in which case, four members of the senate retired into the great council: and their places were filled by an equal number from that council. With regard to the power of representation, every citizen or burguer has the privilege of applying to the senate in order to procure a new regulation in this respect, or of remonstrating against any act of the magistracy. To these remonstrances the magistrates were obliged to give an explicit answer; for if a satisfactory answer was not given to one, a second was immediately presented. The representation was made by a greater or smaller number of citizens according to the importance of the point in question.

Since 1776, however, several changes have taken place. This right of re-election, which the aristocratical party were obliged to yield to the people in 1768, soon proved very disagreeable, being considered by the former as a kind of ostracism; for which reason they caught at every opportunity of procuring its abolition. They were now distinguished by the title of negatives, while the popular party had that of representatives; and the point in dispute was the compilation of a new code of laws. This measure the negatives opposed, as supposing that it would tend to reduce their prerogatives; while, on the other hand, the representatives used their utmost endeavours to promote it, in hopes of having their privileges augmented by this means. At last in the month of January 1777, the negatives were obliged to comply with the demands of their antagonists; and a committee for forming a new code of laws was appointed by the concurrence of the little, great, and general councils. The committee was to last for two years, and the code to be laid before the three councils for their joint approbation or rejection. A sketch of the first part of the code was presented to the little and great councils on the first of September 1779, that they might profit by their observations before it was presented to the general council. Great disputes arose; and at length it was carried by the negatives that the code should be rejected and the committee dissolved. The opposite party complained of this unconstitutional, and violent disputes ensued; the issue of which was, that the great council offered to compile the code, and submit it to the decision of the public. This did not give satisfaction to the popular party; who considered it as insidious: the contentsions revived with more fury than ever, until at length the negatives supposing, or pretending to suppose, that their country was in danger, applied to the guarantees, France, Zurich, and Berne, entreating them to protect the laws and constitution. This was productive of no good effect; so that the negatives found no other method of gaining their point than by sowing dissension among the different classes of inhabitants. The natives were discontented and jealous on account of many exclusive privileges enjoyed by that class named citiens: they were besides exasperated against them for having, in 1770, banished eight of the principal natives, who pretended that the right of burguership belonged to the natives as well as to the citizens, and demanded that this right ought to be constitutionally conferred instead of being purchased. The natives, in hopes of making such a considerable addition to their party, courted the natives by all the methods they could think of, promising by a public declaration that they were ready to confer upon them those privileges of trade and commerce which had hitherto been confined exclusively to the citizens. The designs of the negatives were likewise openly favoured by the court of France, and dispatches were even written to the French resident at Geneva to be communicated to the principal natives who sided with the aristocratical party. The attorney-general, conceiving this mode of interference to be highly unconstitutional, presented a spirited remonstrance; by which the French court were so much displeased, that they procured his deposition from his post; and thus their party was somewhat increased among the natives. The representatives were by no means negligent in their endeavours to conciliate the favour of the same party, and even promised what they had hitherto opposed in the strongest manner, viz. to facilitate the acquisition of the burguership, and to bestow it as the recompense of industry and good behaviour. Thus two parties were formed among the natives themselves; and the dissensions becoming
GENA

in force; but in the mean time the syndics found
means to obtain from the generals a delay of 24 hours.
During this interval, not only men of all ages prepared
for the approaching danger, but even women and chil-
dren tore the pavement from the streets, carrying the
stones up to the tops of the houses, with a view of
rolling them down upon the enemy in case they should
force their way into the town. About 80 women
and girls, dressed in uniforms, offered to form them-

New constitution established.

2. The abolition of that right by which the general
council nominated half the vacancies in the great coun-
cil.
3. The right of remonstrating was taken from
the citizens at large, and vested in 36 adjutants, who
might be present in the great council the first Monday
of every month. They enjoyed a right of represent-
ation, and in consequence of that had a deliberative
voice; but on the whole were so insignificant, that
they were nicknamed Les Images, or "The shadows."
4. The introduction of the graubeau, or annual con-
firmation of the members of the great council and of
the great council, vested entirely in the latter. By this
law part of the authority both of the senate and general
council was transferred to the great council; and by
subjecting the senate to this annual revision; its power
was greatly lessened, and it was made in fact depend-
ent upon the general councils.
5. The circles or clubs in which it was customary to convene the citizens,
and all public assemblies whatever, were prohibited; and
so rigorously was this carried into execution, that the
society of arts was prohibited from meeting.
6. The militia were abolished; firing at marks, even
with bows and arrows, was prohibited; and the town,
instead of being guarded by the citizens, was now put
under the care of 1000 foreign soldiers, whose colonel
and major were both to be foreigners. These troops
were to take an oath of fidelity to the republic, and of
obedience to the great council and the committee of
war; but were under the immediate command and in-
spection of the latter, and subject to the superior con-
trust of the former.
7. No person was permitted to bear arms, whether citizen, native, or inhabitant.
8. Several taxes were imposed without the consent of the
general council; but in time to come it was provided,
that every change or augmentation of the revenue
should be submitted to that body.
9. Several privi-
leges with regard to trade and commerce, formerly pos-
sessed by the citizens alone, were now granted both to
citizens and inhabitants.

It is not to be supposed that this revolution would
be agreeable to people who had such a strong sense of
liberty, and had been accustomed to put such a value
upon it, as the Genevans. From what has been already
related, it might seem reasonable to conclude, that an
almost universal emigration would have taken place:
but after their resentment had time to subside, most of
those who fled at first, thought proper to return; and,
in the opinion of Mr Coxe, not more than 600 finally
left their country on account of the revolution in
1782. The emigrants principally settled at Brussels
and Constance, where they introduced the arts of
printing, lenses and watchmaking. Soon after the re-
volution, indeed, a memorial, signed by above 1000
persons of both sexes, all of them either possessed of
some property or versed in trade or manufactures, was
presented to the earl of Temple, then lord lieutenant
of Ireland, expressing a desire to settle in that kingdom.
The proposal met with general approbation; the Irish
parliament voted 50,000L towards defraying the ex-
penses of their journey, and affording them a proper
number of settlement in the island. Lands were purchased for
Genoese in a convenient situation near Waterford; part
of New Geneva was actually completed at the expense of
10,000L; a charter was granted with very con-
considerable privileges; the standard of gold was alter-
ed
GENEVA, or Gin, among distillers, an ordinary malt spirit, distilled a second time, with the addition of some juniper berries.

Originally, the berries were added to the malt in the grinding; so that the spirit thus obtained was flavoured with the berries from the first, and exceeded all that could be made by any other method. At present, they leave out the berries entirely, and give their spirits a flavour by distilling them with a proper quantity of oil of turpentine; which though it nearly resembles the flavour of juniper berries, has none of their valuable virtues.

GENEVIENVE, fathers or religious of; the name of a congregation of regular canons of the order of St. Augustine, established in France.

The congregation of St. Genevieve is a reform of the Augustine canons. It was begun by St. Charles Faure, in the abbey of St. Vincent de Senlis, of which he was a member, in the year 1618.

In the year 1634, the abbey was made elective; and a general chapter, composed of the superiors of 15 houses who had now received the reform, chose F. Faure conditor of the abbey of St. Genevieve, and general of the whole congregation. Such were its beginnings.

It has since increased very much, and it now consists of above a hundred monasteries; in some whereof the religious are employed in the administration of the parishes and hospitals: and in others, in the celebration of divine service, and the instruction of ecclesiastics in seminaries for the purpose.

The congregation takes its name from the abbey of St. Genevieve, which is the chief of the order, and whose abbot is the general thereof. The abbey itself took its name from St. Genevieve, the patroness of the city of Paris, who died in the year 512. Five years after her death, Clavis erected the church of St. Genevieve, under the name and invocation of St. Peter, where her relics are still, or were till lately preserved, her shrine visited, and her image carried with great processions and ceremonies upon extraordinary occasions, as when some great favour is to be entreated of heaven.

GENGIS KHAN, the renowned sovereign of the Moguls, a barbarous and bloody conqueror. See JENGHIZ KHAN, and (History of the) MOGULS.

GENIAL, an epithet given by the Pagans to certain gods who were supposed to preside over generation.

The genial gods, says Festus, were earth, air, fire, and water. The twelve signs, together with the sun and moon, were sometimes also ranked in the number.

GENII, a sort of intermediate beings, by the Mahometans believed to exist, between men and angels. They are of a grosser fabric than the latter, but much more active and powerful than the former. Some of them are good, others bad, and they are capable of future salvation or damnation like men. The orientals pretend that these genii inhabited the world many thousand years before the creation of Adam, under the reigns of several princes, who all bore the common name of Solomon; that falling at length into an almost general corruption, Ebis was sent to drive them into a remote part of the earth, there to be confined; and that some of that generation still remaining were by Tahmusrath, one of the ancient kings of Persia, forced to retreat into the famous mountain of Kof; of whose successions and wars they have many fabulous and romantic stories. They also made several ranks and degrees among this kind of beings (if they are not rather different
GENIUS

The Platonists, and other eastern philosophers, supposed the genus to inhabit the vast region or extent of air between earth and heaven. They were a sort of intermediate powers, who did the office of mediators between gods and men. They were the interpreters and agents of the gods; communicated the wills of the deities to men; and the prayers and vows of men to the gods. As it was unbecoming the majesty of the gods to enter into such trifling concerns, this became the lot of the genus, whose nature was a mean between the two; who derived immortality from the one, and passions from the other; and who had a body framed of an aerial matter. Most of the philosophers, however, held, that the genus of particular men were born with them, and died; and Plutarch attributes the ceasing of oracles partly to the death of the genus.—See Oracle.

The heathens, who considered the genus as the guardians of particular persons, believed that they rejoiced and were afflicted at all the good and ill fortune that befell their wards. They never, or very rarely, appeared to them; and then only in favour of some person of extraordinary virtue or dignity. They likewise held a great difference between the genus of different men; and that some were much more powerful than others: on which principle it was, that a wizard in Apollonius of Tarentum's book at a distance from Octavius, by reason of Antony's genius was inferior to and stood in awe of that of Octavius. There were also evil genii, who took a pleasure in persecuting men, and bringing them evil tidings: such was that mentioned by Plutarch which appeared to Brutus the night before the battle of Philippi. These were also called larves and lemures. See Larves and Lemures.

GENIUS, in matters of literature, &c. a natural talent or disposition to do one thing more than another; or the aptitude a man has received from nature to perform well and easily that which others can do but indifferently and with a great deal of pains.

To know the bent of nature is the most important concern. Men come into the world with a genius determined not only to a certain art, but to certain parts of that art, in which alone they are capable of success. If they quit their sphere, they fall even below mediocrity in their profession. Art and industry add much to natural endowments, but cannot supply them where they are wanting. Every thing depends on genius. A painter often pleases without observing rules; whilst another displeases though he observes them, because he has not the happiness of being born with a genius for painting.

A man born with a genius for commanding an army, and capable of becoming a great general by the help of experience, is one whose organical conformation is such, that his valour is no obstruction to his presence of mind, and his presence of mind makes no abatement of his valour. Such a disposition of mind cannot be acquired by art: it can be possessed only by a person who has brought it with him into the world. What has been said of these two arts may be equally applied to all other professions. The administration of great concerns, the art of putting people to those employment for which they are naturally fitted by body of physic, and even gaming itself, all require a genius. Nature has thought fit to make a distribution of her talents
induced the inhabitants so submit themselves for 20 years to the dominion of Henry VII, emperor of Germany. That emperor, however, died in August 1512; and the vicar he had left soon after went to Pisa, upon which the dissensions in Genoa revived with greater fury than ever. In 1377, a quarrel happened between the families of Spinola and Doria; which came to such a height, that both parties fought in the streets for 24 days without intermission, raised battering engines against each other's houses, and killed the city with blood. At last the Spinola quit the city, and retired to their territories in the Apennine mountains. The civil war continued till the year 1331; when, by the mediation of the king of Naples, it was concluded, that all exiles should return to the city; that the republic should be governed by the king's vicar; and all the offices of the state be equally divided between the Guelphs and the Gibellines, the two contending parties.

By this ruinous war, the coast of Genoa, formerly adorned with palaces and vineyards, was now reduced to the appearance of a barren waste. So great was the general desolation, that according to Petrarch, the spectators who sailed along were struck with astonishment and horror. Villani, a cotemporary author, relates, that it was supposed by the learned, that greater exploits had not been performed at the siege of Troy; and that the losses each party had sustained would have been sufficient to have purchased a kingdom, the Genoese republic being in his time the richest and most powerful state in Christendom. The annalist Stella informs us, that, before the war, the most extravagant profusion and luxury prevailed among the Genoese: but that, towards the end, many noble families were reduced to indigence and poverty; so that about 100 years after, it became fashionable for the nobles to live in a plain manner, without any show or magnificence.

In 1336, both parties, suspending their mutual animosities, sent two fleets of 20 galleys each into the German ocean, to the assistance of the king of France, who was engaged in a war with Edward III, king of England. This naval expedition proved the cause of a most remarkable revolution in the Genoese government. The sailors of the fleet, thinking themselves injured by their officers, whom they accused of defrauding them of their pay, proceeded to an open mutiny; and having expelled the admiral, and other commanders, seized the galleys. The king of France being chosen arbitrator, decided in favour of the officers, and imprisoned 16 of the chiefs of the mutineers. Upon this several of the sailors left the fleet, and returned to Genoa; where they went round the coast, repeating their mutinous complaints, which were greatly hearkened to, upon a false report that the mutineers who had been imprisoned were broke upon the wheel. The factious spirit increased: and at last the Genoese insisted in a tumultuous manner for having an abbot of their own choosing, and 20 of the people with the consent of the captains of the republic assembled for that purpose. While the mob were impatiently expecting their decision, a mechanic, generally accounted a fool, mounted a wooden bench, and called out that one Simon Bucanigree should be chosen abbot. This being instantly echoed by the populace, he was first declared abbot, then lord, and at last duke of Genoa.

This new expedient did not at all answer the purpose. The dissensions continued as violent as ever, notwithstanding the power of the new magistrates; and by these perpetual divisions the republic was at last so much weakened, that in 1390 the king of France was declared lord of Genoa. Under the French government, however, they soon became exceedingly impatient; and, in 1422, the duke of Milan obtained the sovereignty. With this situation they were equally displeased, and therefore revolted in 1436. Twenty-two years after, finding themselves pressed by a powerful fleet and army sent by Alphonso king of Naples, they again conferred the sovereignty of their state, upon the king of France. In 1460, they revolted from the French; and, four years after, put themselves again under the protection of the duke of Milan; from whom they revolted in 1478. He was again declared sovereign of the republic in 1488; and, 11 years after, the city and territories of Genoa were conquered by Louis XII, of France.

The almost unparalleled sickness of the Genoese disposition was not to be corrected by this misfortune. They revolted in 1506; but next year were again subdued by Louis. Six years after, they again revolted: and in 1516, the city was taken and plundered by the Spaniards. In 1528, Andrew Doria, a Genoese admiral in the service of the French, undertook to rescue his country from the dominion of foreign princes, and restore it to its liberty. Knowing well the fickle disposition of his countrymen, he took all occasions of exciting discontentments among them against the government. He persuaded them, that the French (who had again obtained the sovereignty) had left them only a shadow of liberty, while they pretended to protect them from their enemies. To the nobility he represented the disgrace of suffering the government to be vested in the hands of foreigners less worthy of authority than themselves. Thus he soon formed a strong faction, and formed his plan; for the execution of which he took the most proper time, namely, when almost three-fourths of the French garrison had been carried off by the plague. He advanced with 500 men; and his friends having opened the gates of the city to him, he seized the principal posts, and thus became master of it without drawing his sword. The garrison retired to the forts, where they soon after capitulated, and being driven out of the city, Doria re-established the ancient form of government. See DORIA.

The republic hath since continued to preserve her liberty, though greatly fallen from her ancient splendour, and now become a very inconsiderable state. In 1684, the Genoese had the misfortune to fall under the resentment of Louis XIV, at which time the city was almost destroyed by a formidable bombardment. In the year 1688, it was bombarded by Admiral Byng, and forced to capitulate; but there were at that time no views of making a permanent conquest of the city. In 1730, the island of Corsica revolted from the Genoese, and could never afterwards be reduced by them; for which reason it was sold to the French, who in the year 1770 totally reduced it.
of 60,000 men which he was promised, Massena had no more than 20,000 after all his unwearied exertions, and with these he had to defend an extent of country from Mount Cenis to the frontiers of Tuscany. He wisely dismissed all the former generals, independent of their merit, because the soldiers associated with them the idea of former misery and disgrace. In addition to the superior strength of the Austrian army, Massena found a formidable insurrection raised against him in the eastern territory of the Genoese republic. The passage by sea was obstructed by the British fleet, and his expected succours from Marseilles once reached him in part. As he could not meet the army in the field by which he was blockaded, his only alternative was to remain in Genoa, every moment in dread of perishing by famine, if not speedily relieved. After enduring great hardships, humanity for the starving inhabitants induced him to surrender.

The victory of Marengo however restored it again to the French; and after being indulged with a nominal independence for some time, it was incorporated with France in 1805. When Bonaparte sustained his great reverses in 1814, Genoa surrendered to a British force, under a promise of independence, which promise was however broken, and the city with its territory was annexed to Sardinia. When the insurrection took place in this kingdom in March 1821, Genoa gladly seized the opportunity to throw off the foreign yoke. But the failure of the revolution in Piedmont led to the suppression of the independence of Genoa.

GENSING. See PANAX, BOTANY INDEX.

GENTIANA, Gentian, a genus of plants belonging to the gentianaceae class; and in the natural method ranking under the 20th order, Rotaceae. See BOTANY INDEX.

GENTILE, in matters of religion, a Pagan, or worshipper of false gods.

The origin of this word is deduced from the Jews, who called all those who were not of their name goyim, i.e. gentes, which in the Greek translations of the Old Testament is rendered εονθος; in which sense it frequently occurs in the New Testament; as in Matt. vi. 32. "All these things the nations or Gentiles seek." Whence the Latin church also used gentes in the same sense as our Gentiles, especially in the New Testament. But the word gentes soon got another signification, and no longer meant all such as were not Jews; but those only who were neither Jews nor Christians, but followed the superstitions of the Greeks and Romans, &c. In this sense it continued among the Christian writers, till their manner of speech, together with their religion, was publicly and by authority received in the empire; when gentiles, from gentes, came into use: and then both words had two significations, viz. in treatises or laws concerning religion, they signified Pagans, neither Jews nor Christians; and in civil affairs, they were used for all such as were not Romans.

GENTILE, in the Roman law and history, a name which sometimes expresses what the Romans otherwise called barbarians, whether they were allies of Rome or not: but this word was used in a more particular sense for all strangers and foreigners not subject to the Roman empire.

GENTILESCHI, Horatio, an Italian painter, was born at Pisa in 1563. After having made himself famous at Florence, Rome, Genoa, and other parts of Italy, he removed to Savoy; from whence he went to France, and at last, upon the invitation of Charles I., came over to England. He was well received by that king, who appointed him lodgings in his court, together with a considerable salary; and employed him in his palace at Greenwich, and other public places. The most remarkable of his performances in England, were the ceilings of Greenwich, and York house. He did also a Madonna, a Magdalen, and Lot with his two daughters, for King Charles; all which he performed admirably well. After the death of the king, when his collection was exposed to sale, nine pictures of Gentileschi were sold for 600l. and are now said to be the ornaments of the hall in Marlborough house. His most esteemed piece abroad was the portico of Cardinal Bentivoglio's palace at Rome. He made several attempts in face painting, but with little success; his talent lying altogether in histories, with figures as big as the life. He was much in favour with the duke of Buckingham, and many others of the nobility. After 12 years continuance in England, he died here at 84 years of age, and was buried in the queen's chapel at Somerset-house. His print is among the heads of Vandyke, he having been drawn by that great master. He left behind him a daughter, Artemisia Gentileschi, who was but little inferior to her father in history painting, and excelled him in portrait.

GENTILIS, Albericus, professor of civil law at Oxford; an Italian by birth. He had quitted Italy with his father, on account of religion. He wrote several works; three books, in particular, De Jure Belli, which have not been unserviceable to Grotius. He died at London in 1608.

GENTILIS, Scipio, brother to the former, and as celebrated a civilian as he, forsook his nativ country that he might openly profess the Protestant religion. He was counsellor of the city of Nuremberg, and professor of law with uncommon reputation. He was a great humanist; and in his lectures, as well as books, mixed the flowers of polite learning with the thorns of the law. He died in 1616.

GENTLEMAN. Under this denomination are comprehended all above the rank of yeomen, whereby See Esquires.

A gentleman is usually defined to be one, who, without any title, bears a coat of arms, or whose ancestors have been freemen: and by the coat that a gentleman giveth, he is known to be, or not to be, descended from those of his name that lived many hundred years since.

The word is formed of the Erculch gentilhomme; or rather of gentil, "fine, fashionable, or becoming," and the Saxon man, q. d. honestus, or honesto loco natus.—The same signification has the Italian gentiluomo, and the Spanish hidalgo, or hijo doľgo, that is, the son of somebody, or a person of note.—If we go farther back, we shall find gentleman originally derived from the Latin gentilis homo; which was used among the Romans for a race of noble persons of the same name, born of free or ingenuous parents, and whose ancestors had never been slaves or put to death by law. Thus Cicero in his Topics, "Gentiles sunt, qui inter se eodem sunt nomine, ab ingenuus ortundi, quorum majorum nemo servitatem servivit, qui copiae non sunt diminutā."
Some boldly that it was formed from gentile, i.e. pagan; and that the ancient Franks, who conquered Gaul, which was then converted to Christianity, were called gentiles by the natives, as being yet heathens.—Others relate, that towards the declension of the Roman empire, as recorded by Ammianus Marcellinus, there were two companies of brave soldiers, the one called gentiles, and the other scutarii; and that it was hence we derive the names gentleman and esquire. See ESQUIRE. This sentiment is confirmed by Pasquier, who supposes the appellation gentiles and esquire to have been transmitted to us from the Roman soldiers; it being that the gentiles and scutarii, who were the bravest of the soldiers, that the principal beneficences and portions of land were assigned. See BENEFICE. The Gauls observing, that during the empire of the Romans, the scutarii and gentiles had the best tenements or appointments of all the soldiers on the frontiers of the provinces, became insensibly accustomed to apply the same names, gentilhomme and esquire, to such as they found their kings gave the best provisions or appointments to.

GENTLEMAN Usher of the Black Rod. See ROD.

GENTLEMEN of the Chapel; officers whose duty and attendance is in the royal chapel, being in number 32. Twelve of them are priests; the other 20, commonly called clerks of the chapel, assist in the performance of divine service. One of the first 12 is chosen for confessor of the household; whose office is to read prayers every morning to the household servants, to visit the sick, examine and prepare communicants, and administer the sacrament. One of 20 clerks, well versed in music, is the keeper of the organs and the children, to instruct them in music, and whatever else is necessary for the service of the chapel; a second is likewise an organist; a third, a lutist; and a fourth a violist. There are likewise three vergers, so called from the silver rods they carry in their hands; being a serjeant, a yeoman, and grooms of the vestry; the first attends the dean and subdean, and finds surplices and other necessaries for the chapel; the second has the whole care of the chapel, keeps the pews, and seats of the nobility and gentry; the groom has his attendance within the chapel door, and looks after it.

GENTOOS, in modern history, according to the common acceptation of the term, denote the professors of the religion of the Bramins or Brachmans, who inhabit the country called Hindustan, in the East Indies, from the word sthon, a region, and hind or hindoo; which Ferlahthah, as we learn from Colonel Dow’s translation of his history, supposes to have been a son of Ham the son of Noah. It is observed, however, that Hindoo is not the name by which the inhabitants originally styled themselves; but according to the idiom of the Shanascrit which they use, jumodeep from jemboom, a jackal, an animal common in their country; and deep, a large portion of land surrounded by the sea; or bhertchhun, from khun, i.e. a continent, and bharrhut, the name of one of the first Indian rajahs. It has also to be observed, that they have assumed the name of Hindoo only since the era of the Tartar government, to distinguish themselves from their conquerors the Mussulmans. The term Gento or Gent, in the Shanascrit dialect, denotes animal in general, and in its more confined sense, mankinds, and is never appropriated particularly to such as follow the doctrines of Brahma. These are divided into four great tribes, each of which has its own separate appellation; but they have no common or collective term that comprehends the whole nation under the idea prefixed by the Europeans to the word Gentoo. Mr. Halhed, in the preface to his translation of the Code of Gentoo Laws, conjectures that the Portuguese, on their first arrival in India, hearing the word frequently in the mouths of the natives, as applied to mankind in general, might adopt it for the domestic appellation of the Indians themselves, or perhaps their bigotry might force from the word Gentoo a fanciful allusion to gentile or Pagan. The Hindoo, or Gentoo, vie with the Chinese as to the antiquity of their nation. They reckon the duration of the world by four jognes, or distinct ages; the first the Suttee jogue, or age of purity, which is said to have lasted about 3,200,000 years; during which the life of man was 100,000 years, and his stature 21 cubits: the second, the Tribh jogue, or the age in which one-third of mankind were reprobate; which consisted of 2,400,000 years, when men lived to the age of 10,000 years: the third, the Dwarer jogue, in which half of the human race became depraved, which endured to 600,000 years, when men’s lives were reduced to 1000 years: and fourthly, the Collc jogue, in which all mankind were corrupted, or rather diminished, which the word collc imports. This is the present era, which they suppose will subsist for 400,000 years, of which near 300 are already past; and man’s life in this period is limited to 100 years. It is supposed by many authors, that most of the Goosho shasters, or scriptures, were composed about the beginning of the Collc jogue; but an objection occurs against this supposition, viz. that the shasters take no notice of the deluge; to which the Bramins reply, that all their scriptures were written before the time of Noah, and the deluge never extended to Hindostan. Nevertheless, it appears from the shasters themselves, that they claim a much higher antiquity than this; instances of which are recited by Mr. Halhed.

The doctrine of transmigratio is one of the distinguishing tenets of the Gentoo. With regard to this subject, it is their opinion, according to Mr. Halwell, that those souls which have attained to a certain degree of purity, either by the innocence of their manners or the severity of their mortifications, are removed to regions of happiness proportioned to their respective merits; but that those who cannot so far surmount the prevalence of bad example, and the powerful degeneracy of the times, as to deserve such a promotion, are condemned to undergo continual alteration in the animation of successive animal forms, until, at the stated period, another renovation of the four jognes shall commence, upon the dissolution of the present. They imagine six different spheres above this earth; the highest of which, called suttee, is the residence of Brahma, and his particular favourites. This sphere is also the habitation of those men who never uttered a falsehood, and of those women who have voluntarily burned themselves with their husbands; the propriety of which practice is expressly enjoined in the code of the Gentoo laws. This code, printed by the East India Company in 1776, is a very curious collection of Hin-
do jurisprudence, which was selected by the most experienced pundits or lawyers from curious originals in the Sanscrit language, who were employed for this purpose from May 1773 to February 1775; afterwards translated into the Persian idioms, and then into the English language by Mr. Halhed.

The several institutes contained in this collection are introduced with the religion of the Gentoo, and revered as the highest authority. The curious reader will discover an astonishing similarity between the institutes of this code and many of the ordinances of the Jewish law: between the character of the bramins or priests, and the Levites; and between the ceremony of the scape goat under the Mosaic dispensation, and a Gentoo ceremony called the ashammed jug, in which a horse answers the purpose of the goat. Many obsolete customs and usages alluded to in many parts of the Old Testament, may also receive illustrations from the institutes of this code. It appears from the code, that the bramins, who are the priests and legislators of the country, have resigned all the secular and executive power into the hands of another cast or tribe; and no bramin has been properly capable of the magistracy since the time of the sottie joghee. The only privilege of importance which they have appropriated to themselves, is an exemption from all capital punishment: they may be degraded, branded, imprisoned for life, or sent into perpetual exile; but it is everywhere expressly ordained, that a bramin shall not be put to death on any account whatsoever.

We have already observed, that the Hindoos are divided into four great and original tribes, which according to the Gentoo theology proceeded from the four different members of Brahma, the supposed immediate agent of the creation under the spirit of the Almighty. These tribes are the Bramins, which proceeded from his mouth, and whose office is to pray, read, and instruct; the Cheftere, which proceed from his arms, whose office is to draw the bow, to fight, and to govern; the Bice, proceeding from the belly or thighs, who are to provide the necessaries of life by agriculture and traffic; and the Soonder, from the feet, which are ordained to labour, serve, and travel.

Few Christians, says the translator of the Gentoo code, have expressed themselves with a more becoming reverence of the grand and impartial designs of Providence, in all his works, or with a more extensive charity towards all their fellow creatures of every profession, than the Gentoo's. It is indeed an article of faith among the Bramins, that God's all merciful power would not have permitted such a number of different religions, if he had not found a pleasure in beholding their varieties.

GENUFLEXION, (of genus, "knee," and flecto, "I bend," the act of bowing or bending the knee; or rather of kneeling down.

The Jesuit Rosweyd, in his Onomasticon, shows, that genuflexion, or kneeling, has been a very ancient custom in the church, and even under the Old Testament dispensation; and that this practice was observed throughout all the year, excepting on Sundays, and during the time from Easter to Whitsantide, when kneeling was forbidden by the council of Nice.

Others have shown, that the custom of not kneeling on Sunday had obtained from the time of the apostles, as appears from St. Irenaeus, and Tertullian; and the Ethiopian church, scrupulously attached to the ancient ceremonies, still retain that of not kneeling at divine service. The Russians esteem it an indecent posture to worship God on the knees. Add, that the Jews usually prayed standing. Rosweyd gives the reasons of the prohibition of genuflexion on Sundays, &c. from St. Basil, Anastasius, St. Justin, &c.

Baronius is of opinion, that genuflexion was not established in the year of Christ 58, from that passage in Acts xx. 36, where St. Paul is expressly mentioned to kneel down at prayer; but Saurin shows, that nothing can be thence concluded. The same author remarks, also, that the primitive Christians carried the practice of genuflexion so far, that some of them had worn cavities in the floor where they prayed: and St. Jerome relates of St. James, that he had contracted a hardness on his knees equal to that of camels.

GENUS, among metaphysicians and logicians, denotes a number of beings which agree in certain general properties common to them all: so that a genus is nothing else but an abstract idea, expressed by some general name or term. See Logic and Metaphysics.

GENUS, is also used for a character or manner applicable to every thing of a certain nature or condition: in which sense it serves to make capital divisions in divers sciences, as medicine, natural history, &c.

GENUS, in Rhetoric, is a subject distinguish with the art of rhetoric, as also orations or discourses produced thereby, into three genera or kinds, demonstrative, deliberative, and judiciary. To the demonstrative kind belong panegyrics, eulogisms, epitaphs, funerals, bazaargues, &c. To the deliberative belong persuasions, dissuasions, commendations, &c. To the judiciary kind belong defences and accusations.

GENUS, in Medicine. See Medicine, under the Nosology.

GENUS, in Natural History, a subdivision of any class or order of natural beings, whether of the animal, vegetable, or mineral kingdoms, which agree in certain common characters. See Natural History.

GENUS, in Music, by the ancients called genus melodie, is a certain manner of dividing and subdividing the principles of melody; that is, the consonant and dissonant intervals, into their concisuous parts.

The moderns considering the octave as the most perfect of intervals, and that wherein all the concords depend, in the present theory of music, the division of that interval is considered as containing the true division of the whole scale.

But the ancients went to work somewhat differently: the diatessaron, or fourth, was the least interval which they admitted as concord; and therefore they sought first how that might be most conveniently divided; from whence they constituted the diapente and diapason.

The diatessaron being thus, as it were, the root and foundation of the scale, what they called the genera, or kinds, arose from its various divisions; and hence they defined the genus modulandi to be the manner of dividing the tetrachord and disposing its four sounds as to succession.

The genera of music were three, the enharmonic, chromatic, and diatonic. The two first were variously subdivided;
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We propose in this article to offer only an introductory outline of descriptive geography, as the several quarters of the globe, and their subdivisions into empires, kingdoms, and states, are described as peculiarly as is compatible with the limits of this work, under the several articles to which they belong in the general alphabet.

Our attention will be chiefly directed to physical geography, especially that part of it which describes the construction and use of globes, maps, and charts.

Physical geography is properly a branch of mixed mathematics, and its principles depend on geometry, and its kindred sciences, trigonometry and perspective. It is intimately connected with astronomy; and as these two sciences mutually illustrate each other, they are commonly taught at the same time. The physical changes that take place on the earth, as far as it is considered in its general character of an individual of the solar system, have been already explained under Astronomy; and we shall have little here to add respecting them, except as they are modified by the situation of the observer on different parts of the earth's surface.

The principles and practice of physical geography, though strictly dependent on pure mathematics, may be, for the most part, explained in a popular way, so as to be understood by the generality of readers. This popular view of the subject we shall attempt in the present article, throwing every thing that is purely mathematical into the form of notes. It must be evident, however, that a reader who is conversant with mathematics will study physical geography to more advantage; and for this purpose, it will be sufficient to possess a moderate acquaintance with arithmetic, the elements of geometry, plane trigonometry, spheres, and perspective.

It is scarcely necessary to enlarge on the importance or utility of geography. It is one of those sciences, the knowledge of which is most constantly required by the traveller, under which denomination we may class the soldier, the sailor, the merchant, as well as those who travel for pleasure or curiosity, a previous knowledge of the countries, through which he is to pass, is always useful, and often indispensable. To the politician a comprehensive knowledge of geography is of the highest importance. If he is ignorant of the extent, form, boundaries, appearances, climates, &c. of the country with which he is at war, he will plan his hostile expeditions without effect, and will send his invading armies only to perish among the defiles of the enemy, or to meet a more inglorious and deplorable fate from the diseases of the climate.

Even, if we consider geography as a study of mere amusement and curiosity, it forms one of the most rational and interesting studies in which we can engage. Nothing can be more gratifying to the observer of mankind than to survey the manners and customs of various...
PART II. PRINCIPLES AND PRACTICE OF GEOGRAPHY.

CHAP. I. Of the Surface and General Divisions of the Earth.

IT has been supposed, by the less enlightened part of mankind in all ages, that the surface of the earth is nearly a plane, bounded on all sides by the sky. It was shown, however, in the article Astronomy, (No 269—272.) that the earth is of a spherical figure, and an account was there given of the manner in which the true form of it was determined. Independently of the considerations there detailed, the spherical figure of the earth may be inferred, in a popular view, from the following facts.

1. When we stand on the sea-shore while the sea is perfectly calm, we easily perceive that the surface of the water is not quite plain, but convex or rounded; and if we are on one side of a broad river or arm of the sea, as the frith of Forth, and, with our eyes near the water, look towards the opposite coast, we shall plainly see the water elevated between our eyes and the opposite shore, so as to prevent our seeing the land near the edge of the water.

2. When we observe a ship leaving the shore, and going out to sea, we first lose sight of the hull, then of the sails and lower rigging, and lastly of the upper part of the masts. Again, when a ship is approaching the shore, the first part of her that is seen from the land is the topmast, then the sails and rigging appear, and lastly the hull comes gradually into view. These appearances can arise only from the ship's sailing on a convex surface; as, if the surface of the sea were plain, a ship on its first appearance would be visible, though very small, in all its parts at the same time, or rather the hull would first appear, as being most distinguishable; and, in going out of sight, it would in the same manner disappear at once, or the hull would be the last part of which we should lose sight.

3. Many navigators sent on voyages of discovery, have, by keeping the same course, at length arrived at the port from which they set out, having literally sailed round the globe. This could not happen if the sea were a plain.

4. When we travel to a considerable distance, in a direction due north or due south, a number of new stars successively appear in the heavens, in the quarter to which we are travelling; while many of those in the opposite quarter gradually and successively disappear, and are seen no more till we return in a contrary direction.

5. In an eclipse of the moon, which has been shown (Astronomy, No 190.) to be owing to the obscuration of the moon's surface by the shadow of the earth, the boundary of the obscured part of the moon is always circular. Now, it is evident that no body, which is not spherical, can, in all situations, cast a circular shadow.

The diameter of the earth is generally computed at 7958 miles, though Mr. Vince makes it 7930, nearer the medium derived from a comparison of the polar with the equatorial axis. Taking this last, therefore, as the mean diameter, the circumference will be = 24,912 miles, and consequently the extent of the superficies will be = 197,552,160 miles, of which it is computed that at least two-thirds are covered with water.

In the above computation no account is taken of the mountains and other eminences on the surface of the globe; for, although these are of considerable consequence in a geographical point of view, as they constitute the most natural and remarkable boundaries of countries, and by their influence on the soil and climate of the different regions, contribute in a great degree to form those shades of distinction which diversify the inhabitants of the several quarters of the earth, they are, however, too trifling when compared with the diameter of so great a body, to make any sensible error in the calculation.

The surface of the earth is exceedingly diversified, almost everywhere rising into hills and mountains, or sinking into valleys; and plains of any great extent are extremely rare. Among the most extensive plains, are the sandy deserts of Arabia and Africa, the internal part of European Russia, and a tract of considerable extent in the later kingdom of Poland, now called Prussian Poland. But the most remarkable extent of level ground, is the vast platform of Tibet in Asia, which forms an immense table, supported by mountains running in every direction, and is the most elevated tract of level country on the globe. The chief elevations or mountains that occur, with their elevation, &c. will be mentioned under Geology. The greatest concavities of the globe are those which are occupied by the waters of the sea, and of these by far the largest forms the bed of the Pacific ocean, which stretching from the eastern shores of New Holland to the western coast of America, covers nearly half the globe. The concavity next in size and importance, is that which forms the bed of the Atlantic ocean, extending between the new and the old worlds; and a third concavity is filled by the Indian ocean. Smaller collections of water, though still large enough to receive the name of oceans, fill up the remaining concavities, and take the names of Arctic and Antarctic oceans.

Smaller collections of water that communicate freely with the oceans, are called seas, (vid. A; fig. r.), and of these the principal are the Mediterranean, the Baltic, the Black sea, and the White sea. These seas sometimes take their names from the country near which they flow; as the Irish sea and the German ocean. Some large bodies of water which appear to have no immediate connexion with the great body of waters, being everywhere surrounded by land, are yet called seas; as the Caspian sea.

A part of the sea running up within the land, so as to form a hollow, if it be large, it is called a bay or gulf; as the bay of Biscay, gulf of Mexico: if small, a creek, road, or haven.

When two large bodies of water communicate by a narrow pass between two adjacent lands, this pass is
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A body of land that is almost entirely surrounded by water is called a peninsula, as e, fig. 1.; as the peninsula of Malacca, the Mores, or Grecian Peloponnesus, &c. Indeed the continent of Africa may be considered as a vast peninsula, being united to Asia only by the small isthmus of Suez.

The narrow neck of land which joins a peninsula to Isthmus, the main land, or which connects two tracts of country together, is called an isthmus, as d. The most remarkable isthmuses are the isthmus of Darien, connecting the continents of North and South America, and the isthmus of Suez, joining Africa to Asia.

A narrow tract of land stretching far out into the Promontory sea, being united to the main land by an isthmus, is called a promontory, and its extremity next the sea, is called a cape, as e, f, g, fig. 1. The most remarkable capes are the Cape of Good Hope, at the southern extremity of Africa; Cape Horn at the southern extremity of South America; the North Cape at the northern extremity of Europe; and Cape Talmara, at the northern extremity of Asia.

It may assist the memory of the young geographer, to compare together the above divisions of land and water. We may remark that the large bodies of land, called continents, correspond to the extensive tracts of water called oceans; that islands are analogous to lakes; peninsulas to seas or gulfs; isthmuses to straits; promontories to creeks, &c.

The inhabited parts of the earth are calculated to occupy a space of 38,990,569 square miles, of which the four quarters into which the globe is usually divided are supposed to have the following proportions:

<table>
<thead>
<tr>
<th></th>
<th>In Europe</th>
<th>In Asia</th>
<th>In Africa</th>
<th>In America</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>4,456,065</td>
<td>10,768,823</td>
<td>9,654,807</td>
<td>14,110,874</td>
</tr>
</tbody>
</table>

The whole population of the earth has been computed at 700,700,000 souls; and of these:

<table>
<thead>
<tr>
<th></th>
<th>In Asia</th>
<th>In Europe</th>
<th>In Africa</th>
<th>In America</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia is supposed to contain</td>
<td>500,000,000</td>
<td>500,000,000</td>
<td>500,000,000</td>
<td>500,000,000</td>
</tr>
<tr>
<td>Europe</td>
<td>150,000,000</td>
<td>150,000,000</td>
<td>150,000,000</td>
<td>150,000,000</td>
</tr>
<tr>
<td>Africa</td>
<td>30,000,000</td>
<td>30,000,000</td>
<td>30,000,000</td>
<td>30,000,000</td>
</tr>
<tr>
<td>America</td>
<td>20,000,000</td>
<td>20,000,000</td>
<td>20,000,000</td>
<td>20,000,000</td>
</tr>
</tbody>
</table>

Hence the proportional number of inhabitants to every square mile in each quarter is as follows:

<table>
<thead>
<tr>
<th></th>
<th>In Asia</th>
<th>In Europe</th>
<th>In Africa</th>
<th>In America</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Asia</td>
<td>46</td>
<td>Europe</td>
<td>34</td>
<td>America</td>
</tr>
<tr>
<td>In Europe</td>
<td></td>
<td>Africa</td>
<td>3</td>
<td>3 to every two square miles</td>
</tr>
</tbody>
</table>

CHAP. II. Of the Construction and Use of the Globes.

SECT. I. Description and Use of the Terrestrial Globes.

For the purpose of representing more accurately the nature of the globe which we inhabit, geometers have long had recourse to the spherical balls, on the face of which are drawn the various divisions of the earth, and which are fitted up with such an apparatus, as enables us to illustrate and explain the phenomena produced by the motions.
north latitudes, because the places lie in the northern hemisphere. Let there be two other places, WV, in the southern hemisphere; the latitude of W will be measured by the degrees of the arc intercepted between W and a; and the latitude of V by the arc intercepted between V and m; and these will be called south latitudes. Further, let the circle c, e, d, w, g, be drawn parallel to the equator; this circle is called a parallel of latitude, and as it does not pass through the centre, it is evidently less than the equator, or it is a small circle. Now, all the arcs, such as e, c, a, g, &c. intercepted between the parallel and the equator, must be equal, since the circle is parallel to the equator; and hence every point in this parallel, or every place on the earth through which it is supposed to pass, has the same latitude.

Latitude is the same all over the earth, being constantly measured from the equator to the poles. The longitude of a place is measured by the degrees of an arc of the equator, intercepted between some particular meridian, and the meridian passing through the place. Thus, suppose G to represent the particular meridian, and m to represent the place whose longitude is required; the longitude of m is measured by the arc mG of the equator, intercepted between a, the point where the meridian of G meets the equator, and m the point of the equator where it is cut by the meridian of the place m. The particular meridian from which we begin to reckon the degrees of longitude is called the prime or first meridian, and it is different in different countries.

The method of estimating the distances of places by longitudes and latitudes, is of considerable antiquity, and was employed by Eratosthenes, who first introduced a regular parallel of latitude, which began at the straits of Gibraltar, passed eastwards through the island of Rhodes to the mountains of India; all the intermediate places through which it passed being carefully noted. Soon after drawing this parallel through Rhodes, which was long considered with a degree of preference, Eratosthenes undertook to trace a meridian, passing through Rhodes and Alexandria, as far as Syene and Mercò. Pythis of Marseilles, according to Strabo, considering the island of Thule as the most western point of the then known world, began to count the longitude from thence, while Marianus of Tyre placed their first meridian at the Fortunate islands, or the Canaries; but they did not determine which was the westernmost of these islands, and consequently which ought to serve as a first meridian. Among the Arabs, Alfragan, Albagous, Nasir Eddin, and Ulug Beg, also reckoned from the Fortunate islands; but Albulafia began to reckon his longitude from a meridian 10° to the eastward of that of Ptolemy, probably because it passed through the western extremity of Africa, where, according to him, were situated the pillars of Hercules; or because it passed through Cadiz, which was at that time rendered famous by the conquests of the Moors in Spain.

When the Azores were discovered by the Portuguese in 1448, some geographers made use of the island of Tercera as the first meridian. Other geographers, at Bleau, father and son, placed the first meridian at the Peak of Teneriffe, a mountain so far elevated above the sea, that it may be easily known by navigators; while others have made the island of St Philip, one of the Cape de Verds, the first meridian, because they conceived this to be the place where the magnetic needle had no variation. For a long time it was customary to reckon the longitude in most countries from the Isle of Ferro, one of the Canary isles; but it is now customary for each nation to reckon the longitude, either from the metropolis of the country, or from the national observatory situated near it. Thus in France, Paris is the first meridian, and in Great Britain, the Royal Observatory of Greenwich. As in several good maps, the Isle of Ferro is still used as a first meridian, it may be proper to remark, that the observatory at Greenwich lies 17° 45' to the east of Ferro. Hence it is very easy to reduce the longitude of Ferro to that of Greenwich; for if the longitude required be east, we have only to subtract 17° 45' from the longitude of Ferro, and the remainder is the longitude east from London; on the other hand, if the place be west from Ferro, we obtain the longitude west from London by adding to that of Ferro 17° 45'. If the place lies between Ferro and London, its longitude from London will be obtained by subtracting its longitude east from Ferro from 17° 45'. It is evident that by the reverse of this method, we may reduce the longitude from London to that of Ferro.

In the diagram referred to above, if G represent the observatory of Greenwich, a will be the point from which we begin to reckon the degrees of longitude, and all places situated to the east of a, such as R, m, will have east longitude, while those situated to the west, as n, will have west longitude. In reckoning the longitude, we sometimes number the degrees only as far as 180°, but at other times they are numbered all round the equator from the point a; for instance 180°, till we come to a again; hence the direction a, R, m, n, we should say that every place was in so many degrees east longitude, while if we reckon in the direction n, E, we should say that all the places had so many degrees west longitude, all round the equator. To accommodate the globe to both these modes of reckoning the longitude, the equator is usually divided both ways, in a continued series from 0 at the first meridian to 360°.

It is evident, that as the parallels of latitude become smaller as they approach the poles, the arcs of these parallels intercepted between the same two meridians will be also smaller as we proceed from the equator to the poles, though in fact they consist of the same absolute number of degrees. Hence it will be easy to see that a degree of longitude must be smaller towards the poles than at the equator, and must become gradually smaller and smaller till we arrive at the poles, where it will be equal to nothing. Thus the arc Gm contains the same number of degrees as the arc a, m, though the former arc is much smaller than the latter. As a degree of longitude is therefore different at every degree of latitude, it becomes necessary to ascertain the relative proportion between the two; and for this purpose the following table has been constructed, which shows the absolute measure of a degree of longitude in geographical miles and parts of a mile for every degree of latitude, taking the degree of longitude at the equator, equal to 60 geographical miles.
### Table I. Showing the length of a degree of longitude for every degree of latitude, in geographical miles.

<table>
<thead>
<tr>
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<tbody>
<tr>
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<td>50.88</td>
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<tr>
<td>3</td>
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<td>18</td>
<td>57.04</td>
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<td>48</td>
<td>40.15</td>
<td>63</td>
<td>27.24</td>
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<tr>
<td>4</td>
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<td>56.38</td>
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<td>38.57</td>
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<td>25.36</td>
</tr>
<tr>
<td>6</td>
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<td>21</td>
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<td>67</td>
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<td>55.23</td>
<td>38</td>
<td>47.28</td>
<td>53</td>
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<td>68</td>
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<td>9</td>
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<td>24</td>
<td>54.81</td>
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<td>46.62</td>
<td>54</td>
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<tr>
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<td>55</td>
<td>34.41</td>
<td>70</td>
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<td>58.80</td>
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<td>54.00</td>
<td>41</td>
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<td>56</td>
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<td>71</td>
<td>19.54</td>
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<td>12</td>
<td>58.48</td>
<td>27</td>
<td>53.44</td>
<td>42</td>
<td>44.72</td>
<td>57</td>
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<td>72</td>
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<td>53.00</td>
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<td>31.79</td>
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<td>44</td>
<td>43.16</td>
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<td>58.00</td>
<td>30</td>
<td>51.96</td>
<td>45</td>
<td>42.43</td>
<td>60</td>
<td>30.00</td>
<td>75</td>
<td>15.52</td>
</tr>
</tbody>
</table>

As it is often more convenient to estimate degrees of longitude in English statute miles, we have added the following

### Table II. Showing the length of a degree of longitude for every degree of latitude, in English statute miles.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
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<td>56.682</td>
<td>51</td>
<td>43.548</td>
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<td>63.696</td>
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<td>62.192</td>
<td>42</td>
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<tr>
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<td>50.660</td>
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<td>35.468</td>
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<td>65.688</td>
<td>28</td>
<td>61.101</td>
<td>44</td>
<td>49.773</td>
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<td>60.523</td>
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<td>48.931</td>
<td>61</td>
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<td>48.070</td>
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<td>59.316</td>
<td>47</td>
<td>47.194</td>
<td>63</td>
<td>31.461</td>
</tr>
</tbody>
</table>

Hence it appears that the degrees of latitude are all equal, and that a degree of longitude at the equator is equal to a degree of latitude, as each is the 1/360th of a great circle. In the second of the above tables, a degree of longitude at the equator is estimated at 69.2 English miles, or about 69°. The length of a degree in miles is usually estimated at 69°, but this is too much. Hence, to reduce degrees of latitude, and those of longitude near the equator, to English miles, it is necessary to multiply them by 69.2, or, if great accuracy is not required, by 70.

### Problem 1. To find the latitude and longitude of a given place.

Bring the place below the graduated edge of the bracen meridian, and the degree of the meridian that lies immediately over the place is its latitude. Observe where the meridian cuts the equator, and that degree will be the longitude of the place.

**Example. To find the latitude and longitude of Edinburgh.**—Bringing Edinburgh below the meridian, we find over it nearly the 56th degree of north latitude (56° 30' N.) and the point where the meridian cuts the equator is nearly 0° 18' 30" W. Long. degrees west from London.

N. B. The longitude and latitude of places cannot be ascertained exactly by the globes, as these are not calculated to show the fractional parts of a degree; but they may be found with sufficient correctness for ordinary purposes.

**Corollary I.** The difference of latitude and longitude
Part II.

The **Ecliptic** (Astronomy, No. 43.) is a great circle drawn on the globe, crossing the equator obliquely in two points, called the equinoctial points. (Astronomy, No. 44.) This circle extends on each side of the equator to the latitude of 23° 28', and is divided into 12 great parts corresponding to the 12 signs of the zodiac (see Astronomy, No. 52), and marked with their characters, and each sign is subdivided into 30 degrees. The ecliptic has also its poles, which are two points that are distant 90° every way from the circle on each side. As the ecliptic declines from the equator 23° 28', its poles are consequently distant from those of the equator, or of the globe, by the same measure. This circle properly belongs to the celestial globe, but as it is extremely useful in performing many geographical problems, it is always drawn on both globes, and requires to be noticed here, since it determines the position of several of the circles which we are about to mention.

**Tropics.**

Through those two points of the ecliptic, where it is at the greatest distance from the equator, there are drawn on the globes two circles parallel to the equator, called tropics. That in the northern hemisphere is called the **Tropic of Cancer**, as it passes through the sign Cancer; and, for a similar reason, that which is in the southern hemisphere is called the **Tropic of Capricorn**. The two points through which they are drawn are called **solstitial points**. The imaginary line which corresponds to the tropic of Cancer on the earth passes from near Mount Atlas on the western coast of Africa, past Syene in Ethiopia: thence, over the Red sea, it passes to Mount Sinai, by Mecca the city of Mahomet, across Arabia Felix to the extremity of Persia, the East Indies, China, over the Pacific ocean to Mexico, and the island of Cuba. The tropic of Capricorn takes a much less interesting course, passing through the country of the Hottentots, across Brazil, to Paraguay and Peru. If the poles of the ecliptic be supposed to revolve about the poles of the earth, they will describe two circles parallel to the equator, and 23° 28' distant from it. Two such circles are drawn on the globes, and are called **Polar Circles**, that in the north being called the **Arctic Polar Circle**, or merely the **Arctic Circle**, while that in the south is called the **Antarctic Polar Circle**, or **Antarctic Circle**.

Both the tropics and the polar circles are marked on the globes by dotted lines, to distinguish them from the other parallels.

The meridional circles that pass through the equinoctial and solstitial points are called **Colures**; the former being called the **Equinoctial** and the latter the **Solstitial Colure**.

For an account of the variety of day and night in different parts of the globe, see Astronomy, Part II. ch. i. sect. 2.

**Zones.**

By means of the tropics and polar circles, the earth is supposed to be divided into five spaces, to which the ancients gave the name of **Zones**, or **Belts**. Thus the space included between the two tropics was called the **Torrid Zone**, because it was supposed to be so much heated or roasted by the vertical sun, which there prevails, as to be uninhabitable. The ancient terms are still occasionally used, but the countries between the tropics are now more commonly called the **Intratropical Regions**. The two spaces included between each tropic and its corresponding polar circle were called **Temperate Zones**, and were distinguished according to their position into **Northern** and **Southern Temperate Zones**. Lastly, the spaces between the polar circles and the poles were called the northern and southern **Frigid Zones**, and were supposed uninhabitable from excessive cold. These last are usually denominated the **Polar Regions**.

The countries lying between the tropics are the **Countries greater part of Africa**, the southern parts of Arabia, between the eastern and western peninsulas of India; all those clusters of islands lying between the southern continent of Asia and New Holland, called the Sunas, Moluccas, Philippine, Celebes, and Caroline islands; the northern half of New Holland, New Guinea, New Britain; most of the groups of islands in the Pacific ocean, as the New Hebrides, New Caledonia, the Friendly and Society isles, the Sandwich and Navigators isles; the West India islands; the greater part of South America; the Cape de Verd islands, and those of St Helena, Ascension, St Matthew, and St Thomas. See the map of the world in Plate CXXXVI. or the plain chart in Plate CXXXVII.

All places situated between the tropics have the sun vertical twice in the year, at noon; but the time of the year when this happens is different in the different latitudes; at the equator, the sun is vertical when he is in the equinoctial points, or when he has no declination. The inhabitants of the other **intratropical regions** have the sun vertical when his declination is equal to their latitude, and on the same side of the equator. Thus, the inhabitants of New Caledonia, about 20° S. Lat. have the sun vertical when his declination is 20° S.

To illustrate this, it will be sufficient to observe that, as the ecliptic is that circle in the heavens in which the sun is supposed to move, the sun's rays are perpendicular successively to every point of the earth which lies below that point of the ecliptic in which the sun happens to be, and he will therefore be vertical to all the places through which the ecliptic (continued to the earth) passes successively.

The inhabitants of the torrid zone have their shadows **Amphiscis** at noon day sometimes to the south, i.e., when the sun's declination is north, and sometimes to the north, i.e., when the sun's declination is south. They were therefore called by the ancients **Amphiscis**, from **φυ», about, and **σκώ», shadow. See Amphiscis and Ascii.**

In the north temperate zone are situated the whole of **Countries Europe except Lapland; Barbary, and part of Egypt, in the temperate zone of Africa; nearly the whole continent of Asia; a great part of North America; the Azores, and the Canary and Madeira islands.**

In the south temperate zone lie the southern part of Africa, the southern half of New Holland, New Zealand, and the southern part of South America.

In the temperate zones the sun is never vertical, and the length of the days and nights differs much more than in the torrid zone.

The inhabitants of these regions have their shadows **Heteroscis** at noon always in the same direction; those in the north temperate zone having them directed to the north,
Part II. G E O G R A P H Y.

IV. Egypt and the Canaries in Africa; Delhi, the capital of the Mogul empire, in Asia; most of the gulf of Mexico, and East Florida, in North America; and the Havanah in the West Indies.

V. Gibraltar; part of the Mediterranean sea; the Barbary coast in Africa; Jerusalem, Isphahan, capital of Persia, and Nankin, in China, in Asia; and California, New Mexico, West Florida, Georgia, and the Carolinas in North America.

VI. In Europe, Lisbon, Madrid, the islands of Minorca and Sardinia, and part of Greece or the Morea; in Asia, Asia Minor, part of the Caspian sea, Samarakand, Pekin, Corea, and Japan; and in North America, Maryland, Philadelphia, and Williamsburgh in Virginia.

VII. In Europe, the northern provinces of Spain, the southern provinces of France, Turin, Genoa, Rome, and Constantinople; in Asia, the rest of the Caspian, and part of Tartary; and in North America, Boston and New York.

VIII. Paris and Vienna, in Europe; and New Scotland, Newfoundland, and Canada, in North America.

IX. London, Flanders, Prague, Dresden, Cracow, in Europe; the southern provinces of Russia, and the middle of Tartary in Asia; and the northern part of Newfoundland, in America.

X. Dublin, York, Holland, Hanover, Warsaw; the west of Tartary, Labrador, and New South Wales, in North America.

XI. Newcastle, Edinburgh, Copenhagen, and Moscow.

XII. Southern part of Sweden; and Tobolsk in Siberia.

XIII. Stockholm; and the Orkney isles.

XIV. Bergen in Norway, and St Petersburg.

XV. Hudson’s Straits in North America.

XVI. Most of Siberia; and the southern parts of Greenland.

XVII. Drontheim in Norway.

XVIII. Part of Finland in the Russian empire.

XIX. Archangel on the White sea.

XX. Iceland.

XXI. Northern parts of Russia in Europe, and Siberia in Asia.

XXII. New North Wales, in North America.

XXIII. Davis’s Straits, in North America.

XXIV. Samoa in Asia.

XXV. Northern parts of Lapland.

XXVI. West Greenland.

XXVII. Southern part of Nova Zembla.

XXVIII. Northern part of Nova Zembla.

XXIX. Spitzbergen.

XXX. Unknown.

The only parts of the terrestrial globe that we have yet to describe and illustrate are the Quadrant of Altitude, and the Wooden Horizon; and these it is necessary to explain, before we proceed to consider the remaining problems performed with this globe.

The Quadrant of Altitude is a thin flexible slip of brass, graduated into 90°, and made to fix on any part of the brazen meridian by means of a nut and screw. Quadrant Round this nut it moves on a pivot, and by its flexibility altitude may be applied close to the surface of the globe.

The quadrant of altitude is used to measure the distances of places from each other on the terrestrial globe, and to ascertain the altitudes of the sun, stars, &c. on the celestial globe.

To measure the distance between two places on the globe, nothing more is required than to stretch the graduated edge of the quadrant between them, and mark the number of degrees intercepted. These reduced to geographical, or to English miles (by N° 63.) give the absolute distance between the places. It is most convenient to bring one of the places to the zenith, which may be done by rectifying the globe for the latitude of that place as immediately to be explained, and then to stretch the quadrant to the other place, the distance marked, subtracted from 90°, gives the true distance in degrees. If the distance required be greater than 90°, it is proper to rectify the globe for the antipodes of the given places, and add the distance observed to 90°: the sum is the distance required.

It has been very generally stated that the bearing of one of the places from the other may be found by observing, on the wooden horizon, in what point of the compass the quadrant of altitude, thus fixed in the zenith, cuts the horizon. This is considered by Mr Patteson as a mistake: “For (says he) supposing one of the places to lie due east of the other, they are in the same parallel of latitude, and consequently it is impossible that the prime vertical of either of them (that is a circle cutting the east and west points of the horizon), should pass through the other, unless they both lay under the equator.” A line showing the bearings of places is called a rhumb line. The lines of north and south on the globe, being meridians, and those of east and west being parallels of latitude, are consequently circles; but all the remaining rhumbs are a kind of spiral lines.

The globes are supported by a wooden frame ending aboven in a broad flat margin, on which is pasted a paper marked with several graduated circles. This broad margin is called the wooden horizon, and represents the visible and the invisible hemispheres. On the paper with which the wooden horizon is covered, are drawn four concentric circles. The innermost of these is divided into 360 degrees, divided into four quadrants. The second circle is marked with the points of the compass, i.e. the four cardinal points, east, west, north, and south (D), each being subdivided into eight parts or rhumbs, (see Compass). The circle next to that just mentioned contains the twelve signs of the zodiac, distinguished by their proper names and characters; and

(d) The cardinal points of the compass are thus determined. The two points in which the meridian of any place when produced so as to pass through the nearest pole, cuts the horizon, (using this in an astronomical sense, see Astronomy,) are the north and south points; the former being that point where the meridian first cuts the horizon in the northern hemisphere, and the south, that where it first meets the horizon in the southern hemisphere. Again, the two points where a great circle, passing through the zenith at right angles with the meridian, (and
and each sign is divided into 30 degrees. The last 
circle shews the months and days corresponding to each 
sign.

This wooden ring can represent the rational horizon 
of any place marked on the terrestrial globe only, when 
that place is situated in the zenith; and the method of 
bringing the place into this situation is called rectifying 
the globe.

To rectify the globe.

Problem VIII. To rectify the globe according to 
the latitude of any place.

Find the latitude of the place, (by Problem 1.) and 
see whether it be north or south. Then elevate the 
pole of the globe which is in the same hemisphere with 
the latitude, as far above the wooden horizon as is 
equal to the latitude; bring the given place to the bra 
zen meridian, and it will be in the zenith.

Example. To rectify the globe for the latitude of 
Edinburgh. The latitude of Edinburgh is 55° 58' N, 
therefore raise the north pole 55° 58' above the horizon, 
and bring Edinburgh below the brass meridian.

It is for the purpose of more easily rectifying the 
globe, that one half of the brass meridian is graduated 
from the poles to the equator; as, where this is not done, it is necessary to take the complement of the lat 
titude, or the difference between it and 90°, which in 
some cases requires a calculation.

The place being brought below the meridian, when 
the pole is elevated to the proper degree, it is evidently 
in the zenith, or 90° distant every way from the hor 
zon. Thus, in the above example, if we count the de 
gress from that part of the meridian below which 
Edinburgh is situated, we shall find that they amount 
to 90° each way; for counting from Edinburgh along 
the meridian to the north pole, we have 34° 2'; 
which added to 55° 58', the elevation of the pole, gives 
90° on that side. Again, counting from the same point 
of the meridian towards the southern part of the hor 
zon, we have 55° 58', as far as the equator, and 34° 
2' from thence to the horizon, making, as before, 90°, 
and as the graduated edge of the meridian is 90° both 
from the eastern and western side of the horizon, Edi 
burgh, in this situation of the globe, is in the zenith.

When either of the poles of the globe is thus ele 
vated above the horizon, so as not to be in the zenith, 
the globe is said to be in the position of an oblique 
sphere, in which the equator and all its parallels are 
equally divided by the horizon. This is the most com 
mon situation of the earth, or it is the situation which it has with respect to all its inhabitants, except those at the 
equator and the poles. To the inhabitants of an ob 
lique sphere the pole of their hemisphere is elevated 
above the horizon as many degrees as are equal to their 
latitude, and the opposite pole is depressed as much be 
low the horizon, so that the stars only at the former 
are seen; the sun and all the heavenly bodies rise and 
set obliquely, the seasons are variable, and the days and 
nights unequal. This position of the sphere is repre 
sented at fig. 6, where the equator EQ, and the para 
lels cut the horizon HO obliquely, and the axis PS is 
inclined to it. Hence this position is called oblique.

If the globe is placed in such a position that any 
point of the equator is in the zenith, it is said to be in 
the position of a right or direct sphere, because the equa 

tor and its parallels are vertical, or over the horizon at 
right angles. This position is seen at fig. 7, where the 
axis PS is in the plane of the horizon, and the equator 
EQ is in a plane perpendicular to it. The in 
habitants of such a sphere, which are the inhabitants of 
the earth below the line, have no elevation of the poles, 
and consequently no latitude: they can see the stars at 
both poles, all the stars rise, culminate, and set to 
them; and the sun always moves in a curve at right 
angles to their horizon, and is an equal number of hours 
above and below it, making the days and nights always 
equal.

If the globe be so placed that one of the poles is in 
Parallel of the zenith, and consequently the other in the nadir, it 
is in the position of a parallel sphere; so called because 
the equator EQ (fig. 8) coincides with the horizon, 
and the parallels are of course parallel to it; while all the 
meridians cut the horizon at right angles. The in 
habitants of a sphere, in this position, have the greatest 
possible latitude; the stars, which are situated in the 
hemisphere to which the inhabitants belong, never set, 
but describe circles all around; while those of the con 
trary hemisphere never rise: the sun is above the hor 
zon for six months, during which it is day, and is be 
low the horizon for an equal interval, when it is night.

The wooden horizon is a necessary part of the appa 
ratus of both globes; but it has been shewn, that in the 
terrestrial globe, it can represent the rational horizon 
of a place, only when the globe is rectified for the lat 
titude of that place. In the celestial globe, it represents 
the rational horizon in all positions.

In Adam's globes there is a thin brass semicircle 
NHS (fig. 5.) that is moveable about the poles, and 
has a small thin circle N sliding on it. This semicircle 
is graduated into two quadrants, the degrees of which 
are marked both ways from the equator to the poles in 
the terrestrial globe: this semicircle represents a move 
able meridian; and the small sliding circle, which is 
marked with a few of the points of the compass, is 
called a visible horizon, the use of which will appear 
presently.

Before we proceed to the remaining problems on the 
terrestrial globe, it will be proper to take notice of some 
geographical principles that are connected with the ho 
rizon.

It is evident, that the extent of the sensible horizon 
of an observer depends on the height of his eye above 
the level surface of the earth. An eye placed on the 
surface of the earth sees scarcely any thing around it; 
but if it is elevated above that surface, it sees farther in 
proportion to its elevation, provided always that its 
view is not obstructed by intervening objects. Thus, in 
an extensive plain, the eye can see farther, if elevated 
to

called the prime vertical) cuts the horizon, are the east and west points; the former being on the left hand of a 
person facing the sun at noonday, while the latter is on his right hand.
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To perform the same problem by Adams's globes.
Rectify the globe for the declination, bring the given place to the meridian, and set the horary index at 12 as before; then turn the globe towards the west, till the given place reach the western edge of the horizon, and the index will point to the time of sunrise. The time of sunset will be known, in like manner, by bringing the place to the eastern side of the horizon.

If the hour circle in the ordinary globes has a double row of figures, the sun's rising and setting may be found at the same time; for if the place be brought to the eastern part of the horizon, the time of sunrise will be shewn by the index, in that circle where the hours increase towards the east; and the time cut by the index in the circle where the hours increase towards the west, will shew the time of sunset.

Ex. 1. Required the time of the sun's rising and setting at London, on the 29th August? Ans. The sun rises at nine minutes after five, and sets nine minutes before seven.

Ex. 2. Required the time of sunrise and sunset at Edinburgh on the 1st of June? Ans. For sunrise, 27 minutes after three; for sunset, 33 minutes after eight.

To find the sun's declination for any given time.

Find the sun's place for the given day by Prob. X, and bring it to the braken meridian. The degree marked on the meridian immediately over the place is the declination required.

Ex. Required the sun's declination for 18th March? The sun's place for the given day is 20° 7' of Ψ, and this being brought to the meridian, will be immediately below 3° 54' S., which is therefore the declination required.

From the above example, it is evident that the method of finding the declination of the sun corresponds to that of finding the latitude of a place on the globe, given in Problem I., the sun's declination being measured in the same way by an arc of the meridian intersected between the equator and the sun's place in the eclipitic (Ψ).

Problem XI. To rectify the globe for the sun's place and the day of the month.

Find the sun's declination for the given day, by Problem XI.; then elevate the pole that is in the same hemisphere with the degree of declination, as many degrees as are equal to the declination.

Ex. Rectify the globe for the sun's place on the 6th October? Ans. The sun's declination on that day is 5° S. therefore the south pole must be elevated 5° above the horizon.

Rectifying the globe for the sun's declination corresponds to the rectifying of it for the latitude of a given place. See No. 88.

Problem XII. To find the time of the sun's rising and setting at a given place, for any given day.

Rectify the globe for the declination on the given day, and bring the given place to the meridian, and set the index of the hour circle at XII. Turn the globe, till the given place come to the eastern edge of the horizon, and the time of sunrise will be shown by the position of the index. Then turn the globe till the given place come to the western part of the horizon, and the position of the index will point out the time of sunset.

(r) For a table of the sun's declination corresponding to his true place, see Vol. III. p. 170.
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Part II.

Principles and Practice.

A. From D draw BD touching the circle ADL in D, and let the sun set in the line AD; then the ray SB will be reflected into the situation BA, and will enter the eye, because from a principle in optics the angle of incidence DRC is equal to the angle of reflection ABE. See Optics. This ray SB, or BA, will therefore be the first that reaches the eye at dawn in the morning, and the last that falls on the eye at night, when twilight ceases, because as the sun gets lower down, the particles of the air at B will no longer be illuminated.

The depth of the sun below the horizon at the beginning of the morning or end of the evening twilight, is determined by observing the moment when the air first begins to shine in the morning, or ceases to shine in the evening; then finding the sun's place for that time, and hence the time till his rising in the horizon, or after his disappearance below. This depth of the sun below the horizon has been variously stated by different astronomers, but it is now generally estimated at 15°. Accordingly in Mr. Adams's globes there is a circular wire fixed 18° below the horizon, to represent the limits of the crepusculum (see PWY, fig. 5-).

As the cause of twilight is not constant, its limits must continually vary; for if the exhalations in the atmosphere be more copious or more extensive than usual, the morning twilight will begin sooner, and that of the evening last longer than ordinary; as the more copious the exhalations, the more rays will be reflected from them, and consequently the more they will shine, and again, the higher they are, the sooner they will be illuminated by the sun. From this circumstance the evening twilight is commonly longer than the morning, at the same time, and in the same place. The refraction is also greater according as the air is more dense, and not only is the brightness of the atmosphere variable, but the same takes place in its height above the earth; therefore, the twilight is longest in hot weather, and in hot countries, all other things being equal. The chief differences, however, arise from the different situations of places on the earth, or from the difference of the sun's place in the heavens. Thus, the twilight is longest when the earth is in the position of a parallel sphere, and shortest in that of a right sphere (see No. 90); and in an oblique sphere, the twilight continues longer at any place, in proportion as that place is nearer to either of the poles; a circumstance which affords considerable relief to the inhabitants of the northern countries in their long winter nights. Twilight continues longest in all places of north latitude, when the sun is in the tropic of Cancer, and to those in south latitude when he is in the tropic of Capricorn. The time of the shortest twilight also varies in different latitudes; thus, in England, the shortest twilight is about the beginning of October and of March, when the sun is in 30° and 13°; hence, when the difference between the sun's declination and the depth of the equator is less than 18°, so that the sun does not descend more than 18° below the horizon, the twilight will continue through the whole night, as happens in Britain from the 22d of May to the 22d of July.

In the latitude of 40° N. twilight continues for the whole night, only on the 21st of June, or the time of the summer solstices; but at all places farther to the north it continues for a certain number of days before and after the summer solstice.

Near the north pole there is continual twilight from the 22d of September, the time of the sun's permanent absence, to the 12th of November. It then ceases till about the 30th of January, when it again appears, and continues till the 21st of March, the time of the sun's permanent appearance. Hence the inhabitants of those places nearest the pole, though they never see the sun for nearly six months, have, however, the benefit of twilight for above the half of that time, and are entirely excluded from the sun's light little more than 12 weeks, during six of which the moon is constantly above the horizon.

Were it not for the gradual change from light to dark, it would be of darkness, and vice versa, which is the consequence of twilight, much inconvenience would arise. A sudden change from the darkness of midnight to the full splendour of the sun, and the reverse, would injure the sight, and would, in many cases, be productive of much danger to travellers, who would be overtaken by utter darkness before they had time to prepare for its approach.

PROBLEM XXV. To find where it is twilight at any given time.

Find where the sun is vertical at the given time, and rectify the globe for the latitude of that place. Observe what places are within the limits of twilight, or not quite 18° below the horizon. To those which are situated within the western zone, between the horizon and the parallel of 18°, it will be twilight in the morning; and those which are in the eastern zone will have it twilight in the evening.

This problem may be more conveniently performed by rectifying the globe for the antipodes of the place which has the sun then vertical, and observing what places are situated in the zone formed above the horizon, between it and a parallel circle of 18°.

Ex. It is required to find where it is twilight on the 4th of June, when it is three o'clock P.M. at London. Ans. Kamchatka, the Sandwich Isles, and the Marquesas, have twilight in the morning; and the inhabitants of Madagascar, of Tibet, and the eastern part of Persia, have twilight in the evening.

PROBLEM XXVI. To find the duration of twilight at a given place on any given day.

Rectify the globe for the latitude of the place; find the sun's place for the given day by Problem X, and bring it below the meridian, and set the hourly index to XII. Turn the globe till the sun's place be just within the circle that marks the limits of twilight, and the index will show the beginning of twilight. Subtract the time of the beginning of twilight from the time of sunrise at the given place (found by Problem XII), and the remainder will show the duration of twilight at the given place.

Note.—The above rule will answer both for the ordinary globes, and for those of Adams, except that in the latter the sun's place must be brought below the western part of the horizon. A more convenient way in both globes will be, to bring that point of the ecliptic which is opposite to the sun's place, 18° above the
GEOGRAPHY.

Problem XXVII. To show the cause of day and night by the globe.

It will have appeared, from the consideration of the cause of day and night given under the article Astronomy, that only that half of the earth which is opposite to the sun, is illuminated by his rays, while that which is turned from him is involved in darkness. As the earth revolves on its axis from west to east, in the space of 24 hours, every place on the earth in the course of that time alternately enjoys the light of the sun, and is deprived of it.

To illustrate this by the globe, rectify the globe for the sun's declination, so as to place the sun in the zenith, and the horizon will represent the boundary between light and darkness; that hemisphere which is above the horizon being illuminated by the sun's rays, and that which is below the horizon being deprived of light. If now a patch is put on the globe, so as to represent any place, and if the globe be made to revolve from west to east; when the place is brought to the western edge of the horizon, the sun will appear to the inhabitants of that place to be rising in the east, though, in fact, the appearance arises from the place itself coming beyond the limit of darkness. As the globe continues to turn, the place rises towards the meridian, and this produces the appearance as if the sun were advancing towards the meridian in a contrary direction. When the place comes below the meridian, it is noon to that place, and the sun appears to have attained its greatest height.

As the place proceeds towards the east, it gradually recedes from the meridian, and the sun appears descending in the west. When it reaches the eastern edge of the horizon, and is proceeding below the boundary of light and darkness, the sun appears to be setting; and during the whole time that the place is moving below the horizon, the sun will not appear till the place once more rises in the west.

Problem XXVIII. To find at what places an eclipse of the moon is visible at any given time.

Find the place to which the sun is vertical at the given time, and rectify the globe for the latitude of that place. As the moon is opposite to the sun, which illuminates the inferior hemisphere of the globe, the eclipse of the moon will be visible to all the places that lie below the horizon.

As the places below the horizon are not easily examined, this problem may be more conveniently performed by rectifying the globe for the antipodes of the place to which the sun is vertical at the given time, rather than for the place itself; as in this latter position of the globe the moon being in opposition to the sun, will be vertical to the place below the zenith, and its eclipse will be visible at all the places now above the horizon.

Ex. 1. On the 4th of January 1806, at 55 minutes past 11 P.M. reckoning the time at Greenwich, there was an eclipse of the moon. It is required to find those places to which the eclipse was visible? Ans. Through the greatest part of Africa, in some part of Europe, in Asia, South America, and a great part of North America.

Ex. 2. On the 10th of May 1808, when it is eight o'clock A.M. at Greenwich, the moon will be totally eclipsed. In what places will the eclipse be visible? Ans. In most parts of America, in the islands in the Pacific ocean, and on the eastern coast of New Holland.

Sect. II. Of the Use of the Celestial Globe.

The celestial globe, with respect to the circles that are described on it, and the apparatus with which it is furnished, scarcely differs from the terrestrial globe, which has been so fully described in the preceding section. The surface of the celestial globe is made to represent all the stars that are commonly visible to the naked eye, arranged under their constellations, and bounded by the figures which have been given to those constellations by the early astronomers. (See fig. 5). In Adams's celestial globe the movable semicircle (No. 97) turning round the poles represents a circle of declination, and the small circle on it, an artificial sun or planet.

Both the globes are often furnished with a mariner's compass, which is usually placed in the lower part of the frame.

It must here be remarked, that the representation of the heavens on the celestial globe, though probably much more accurate than that of the earth on the terrestrial, is not so natural as the latter; for, in viewing the stars on the external surface of a globe, the spectator sees them in an opposite position to that in which he observes them in the heavens, so that to form a just conception of their exact situation, he must suppose his eye to be seated in the centre of the globe. Hence, if a large hollow hemisphere were made of glass, and if the stars in the corresponding hemisphere of the framework were painted in transparent colours on its surface; an eye situated in the centre of such a hemisphere
GEOGRAPHY:

Problem I. To place the celestial globe in such a situation as that it shall exhibit an accurate representation of the face of the heavens at any given place, and at any given time.

Rectify the globe for the latitude of the place, as in Problem VII. of the terrestrial globe, or by setting the pole of the celestial globe pointing to the pole of the earth, by means of the compass that is usually annexed to the globes; find the sun’s place in the ecliptic; bring this to the meridian, and set the hour index at noon. Again, make the globe turn on其i axis till the index point to the given time, and in this position the globe will exactly represent the face of the heavens, corresponding to the given time and place; every constellation and star in the heavens answering in position to those on the globe. Hence, by examining the globe, it will immediately be seen what stars are above or below the horizon, which are on the eastern and western parts of the heavens, which have just risen above the horizon, and which are about to sink below it.

As this problem will be found extremely useful to the student of astronomy, we shall here quote the example given in illustration of it by Messrs. Bruce of Newcastle.

"Required the situation of the stars for the latitude of Newcastle, on October 6th, at eight o’clock in the evening?"

"In our present survey of the heavens, we shall commence at the north point of the horizon and proceed round eastward; noticing the different constellations, and the relative situation of the principal stars in these constellations.

"The first star which strikes the eye of the observer, in the north-east part of the heavens, is Castor, in the constellation Auriga, or the Waggoner: It is of the first magnitude, of the altitude of 23°, nearly the fourth part of the distance from the horizon to the zenith. There are two stars of the second magnitude, which form with Castor a triangle: — The star which forms the short side of the triangle is in the right shoulder of Auriga, and is marked β; it lies at the distance of about 8° from Castor, further to the north; its altitude is 15°: — The star forming the longer side of the triangle is in the Bull’s northern horn; its distance from Castor is more than 20°; its altitude not more than 5°, and azimuth N. E. There are three stars of the fourth magnitude, a little to the south of Castor, that bear the name of the Kid.

If a line be drawn through the two stars that form the upper side of the triangle, and continued to the horizon, it will point out Castor, in Gemini just rising, azimuth E. N. E.: it is between the first and second magnitude. The other stars in this constellation have not yet risen.

"A line drawn between Castor and Capella, and continued higher in the heavens, will point out Perseus, in which there are three stars, one of the second magnitude, named Algernib, and two of the third magnitude, one on each side of Algernib, at the distance of about 5°: they form a line a little curved on the side next Auriga. The altitude of Algernib is 37°, azimuth N. E. by E.

"A little to the south of Perseus is the Head of Medusa, which Perseus is holding in his hand. Besides two or three small stars it contains one of the second, and one of the third magnitude. The name of the brightest is Algol; altitude 33°, azimuth E. N. E. Algol is only 10° distant from Algernib.

"Directly below the Head of Medusa, about 14° above the horizon, are the Pleiades or seven stars: They are seated in the shoulder of Taurus, and are so easily known, that no description is necessary. Aldebaran, a star of the first magnitude, which forms the eye of Taurus, is just rising; azimuth E. N. E. A vertical circle drawn through Algol will point to it. There are two stars of the third magnitude, and several smaller very near Aldebaran, which form with it a triangle. The whole cluster is called the Hyades.

"A line drawn from Aldebaran through Algol, and continued to the zenith, will direct to Cassiopeia. This contains five stars of the third magnitude, besides several of the fourth: it is in form something like the letter Y, or, as some think, an inverted chair. It is situated above Perseus, within 30° of the zenith. The altitude of the brightest star, α, called Schedar, is 60°; azimuth, E. N. E."

"Below Cassiopeia and west of Perseus is Andromeda, which contains three stars of the second magnitude. A line from Algernib, parallel to the horizon towards the south, will pass very near these three stars; and, as they are all of the same magnitude, and placed nearly at the same distance of 15° from each other, they may easily be known. The name of the star nearest Perseus, and which is in the foot of Andromeda, marked γ, is Almack: its altitude is 40°; azimuth E. N. E. The name of β, in the girdle, is Mirach: its altitude 44°; azimuth E. The altitude of α, in the head of Andromeda, is 46°; azimuth E. S. E."

"About 18° below Mirach are two stars in Aries, not more than 5° distant from each other, forming with Mirach an isosceles triangle: the most eastern star, α, is of the second magnitude; the other, β, of the third, attended by a smaller star, marked γ, of the fourth magnitude. A line drawn from Mirach, perpendicular to the horizon, will pass between the two, and besides, will point to a star of the second magnitude, directly E. not above 3° from the horizon.

"This star is the first of Cetus, marked α, and is of the second magnitude: it is named Menkar. A line drawn from Capella through the Pleiades will also point to it. Cetus is a large constellation, and contains eight stars of the third magnitude; they all lie to the west of Menkar; β, a star in the tail, is more than 40° distant from it. The azimuth of β is S. E. by E; altitude nearly the same as Menkar.

"The constellation Pisces is situated next to Aries; it contains one star of the third magnitude, marked α: its altitude is 10°, azimuth E. by S. It is distant from Menkar 15°. A line drawn from Almack, through α in Aries, will point to it.

"If we return again to α in the head of Andromeda, we shall find three other stars nearer the meridian, which,
with it, form a square. These stars are in Pegasus, and
are placed at the distance of 15° from each other; they
are all of the second magnitude. The two stars form-
ing the western side of the square are called—the
upper one Scheat, which is marked α, and which is
in the thigh of Pegasus; the under one Markab, which
is marked α, and which is in the wing; the lowest star
in the eastern side of the square is in the tip of the wing,
and is marked γ. The altitude of Scheat is 55°; azi-
muth S. E. 4. E. Altitude of Markab, 43°; azimuth
S. E. by S. 4. E.

A line drawn through γ and α (the diagonal in the
square of Pegasus) and continued to the meridian, will
point out Cygnus, a remarkable constellation in the
form of a large cross, in which there is a star of the
second magnitude, named Deneb or Arided; it is mark-
ed α, and is almost directly upon the meridian at the
altitude of 80°. Cygnus contains six stars of the third
magnitude. The constellation Cepheus, which contains
no remarkable stars, is situated between Cygnus and the
north pole.

Below Pegasus, and nearer the meridian, is Aqui-
rus, containing four stars of the third magnitude. A
line drawn from α in Andromeda, through Markab,
will point to γ in Aquarius. Its altitude is 32°; azi-
muth S. 8. E.

A bright star of the first magnitude named Pome-
haut, in Piscis Australis, is then upon the horizon; azi-
muth S. 8. E.

Delphinus is a small constellation, situated about 30°
below Cygnus upon the meridian; it contains five stars
of the third magnitude, four of them being placed close
together, and forming the figure of a rhombus or loz-
engue. A line drawn through the two under stars of
the square will point to it. Its altitude is about 5°.

A little to the west of Delphinus, but not quite so
high, is Aquila, containing one very bright star of the
first magnitude, named Altair. It may very easily be
known from having a star on each side of it of the third
magnitude, forming a straight line. The length of the
line is only about 5°; altitude of Altair 40°; azimuth
S. 8. W.

Considerably above Altair, and a little to the W.
of Cygnus, is Lyra, containing a star of the first mag-
nitude, one of the most brilliant in the firmament.
It is called Lyra or Vega, and is 35° to the N. W. of
Altair; altitude 60°; azimuth W. S. W. Lyra,
Altair, and Arided, form a large triangle.

We come now to notice three constellations, which
occupy a large space in the western side of the heavens:
these are Hercules immediately below Lyra; Serpen-
tarius between Hercules and the horizon, extending a lit-
tle more towards the south; and Boötes, reaching from
the horizon W. N. W. to the altitude of 45°.

Hercules contains eight stars of the third mag-
nitude; the star in the head, a, named Ras Algethi, is
within 5° of α in the head of Serpentarius. This last
is the star of the second magnitude, and is named Ras
Albaghe: its altitude is 30°; azimuth, S. W. by
W. 4. W. A line drawn from Lyra, perpendicular
to the horizon, will pass between these two stars.
The other stars in Hercules extend towards the zenith, and
these in Serpentarius towards the horizon.

The constellation Boötes may easily be known from
the brilliancy of Arcturus, a star of the first magnitude,
and supposed to be the nearest to our system of any in
the southern hemisphere: it is within 20° of the ho-

"Between Serpentarius and Boötes is Serpens, con-
taining one star of the second magnitude, and sight of
the third: in Serpens is nearly at the same distance
from the horizon, as Arcturus; azimuth W.

"Above Serpens, and a little to the east of Boötes,
is the Northern Crown, containing one star of the second
magnitude, named Gemma, and several of the third,
which have the appearance of a semicircle. A line
drawn from Lyra to Arcturus will pass through this
constellation.

"We come now to Ursa Major, a constellation
containing one star of the first, three of the second, and
seven of the third magnitude. It may easily be distin-
guished by these seven stars, which, from their
resemblance to a waggon, are called Charles's Wain.
The four stars in the form of a long square, are the
four wheels of the waggon; the three stars in the tail
of the Bear, are the three horses, which appear fixed
to one of the wheels. The two hind wheels, α named
Dubhe, and β, are called the pointers, from their al-
ways pointing nearly to the north pole. Hence the
pole star may be known. The altitude of Dubhe is
50°; azimuth N. by W. 4. W. The distance between
the two pointers is 5°; the distance between the pole
star and Dubhe, the upper pointer, is 30°.

"Ursa Minor, besides the pole star of the second
magnitude, situated in the tail, contains three of the
third, and three of the fourth magnitude. These form
some resemblance to the figure of Charles's Wain in-
verted, and may easily be traced.

"Draco, containing four stars of the second and
seven of the third magnitude, spreads itself in the heavens
near Ursa Minor: the four stars in the head are in the
form of a rhombus or lozenge: the tail is between the
pole star and Charles's Wain.

"Besides these constellations, there are a number of
others, which, as they contain no remarkable stars, we
have not described; an enumeration of these will suf-
fice. The Lynx, between Ursa Major and Aries; Came-
lopardalus, between Ursa Major and Cassiopeia;
Muscus, and the Greater and Less Triangles between
Aries and Perseus, Aculus, close to the head of Pe-
gusus; Sagittarius setting in the south-west; Antinous
and Sobieski's Shield below Aquila; the Fox and
Goose between Aquila and Cygnus; the Greyhounds
and Bernice's Hair between Boötes and Ursa Major,
and Leo Minor below Ursa Major**

The astronomical terms that we must here employ
in describing the method of performing the problem
on the celestial globe, will be found explained in the
article Astronomy, or under their proper heads in the
general alphabet of this work. See Ascension, Azi-
muth, Declination, &c.

* Bruno's Introduction to Geography and Astron-
omy, p. 31.

** See Ascension, Azimuth, Declination, &c.
To know whether the hour is in the forenoon or afternoon, it is necessary to observe, that if the star be to the east of the sun, it will reach the meridian later than the sun, but if it be to the west of that luminary, it will come to the meridian sooner: hence, in the former case, the hour will be P. M. and in the latter A. M.

Ex. 1. At what hour does Sirius come to the meridian on the 9th of February? Ans. At 7 minutes past 9 P. M.

Ex. 2. Required the hour when Castor passes the meridian on the same day. Ans. At 52 minutes past 9 P. M.

PROBLEM VI. Having any star given, and a given hour, to find on what day the star will come to the meridian at a given hour.

Bring the given star below the meridian, and set the hour index to the given hour. Make the globe revolve till the index come to twelve at noon; and the day of the month which corresponds to the degree of the ecliptic then below the meridian, found in the calendar circle of the wooden horizon, will be the day required.

Ex. 1. On what day does Algenib, the first star of Perseus, come to the meridian at midnight? Ans. On the 13th of November.

Ex. 2. On what day does Arcturus come to the meridian at 9 o'clock P. M.? Ans. On the 10th of June.

PROBLEM VII. Having the latitude, the day of the month, and the hour of the night given, to find the altitude and azimuth of any given star.

Rectify the globe for the given latitude; bring the sun’s place below the meridian, and set the hour index at XII. then turn the globe till the index point at the given hour. Fix the quadrant of altitude at 90° from the horizon, that is, in the zenith, and bring its graduated edge over the place of the star: the degree of the quadrant intercepted between the horizon and the star is the altitude required; and the distance between the foot of the quadrant and the nearest part of the horizon, will be the azimuth.

It is evident that this problem on the celestial globe is exactly similar to Problem XII. on the terrestrial globe, for finding the altitude of the sun.

Ex. 1. What will be the altitude and azimuth of Cor Hydryne on the 21st of December at London, at 4 o’clock A. M.? Ans. The altitude 30°, the azimuth S. 14° W.

Ex. 2. Suppose an observer at the Cape of Good Hope, on the 21st of June at midnight; required the altitude and azimuth of Arcturus to him? Ans. Altitude 12°, azimuth N. 55° W.

PROBLEM VIII. Having given the azimuth of any given star, and the day of the month in a given latitude; to find the hour of the night, and altitude of the star.

Rectify the globe as in the last problem; fix the quadrant of altitude in the zenith, and bring it to the given azimuth. Turn the globe till the star comes below 3° 2'
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This problem may be applied to the regulating of clocks and watches, by reducing apparent to real time, as explained under Astronomy.

PROBLEM XII. To find the rising, setting, and culminating of any star or planet, its continuance above the horizon, its oblique ascension and descent, and its eastern and western amplitude; the place and day being given.

Rectify the globe as in the foregoing problems; bring the given star or the given planet (finding its place in an ephemeris for the given day, and marking it by a patch on the globe) to the eastern part of the horizon, and the index of the hour circle will point out the time of rising: the degree of the equator that comes to the horizon with the given star or planet, marks its oblique ascension, and the eastern amplitude is shown by the distance of the star or planet from the eastern part of the horizon.

Bring the star or planet to the meridian, and the index will point to the time of its culminating.

Move the globe till the star or planet come to the western part of the horizon, and the time of its setting, its oblique descent, and its western amplitude may be found in the same manner as directed above; for its rising, oblique ascension, and eastern amplitude, the number of hours passed over by the index, while the star or planet is moving from east to west, will show the time of its continuance above the horizon.

Ex. 1. Required the above circumstances with respect to Sirius on the 14th of March at London. Ans. It rises at 24 minutes past two P.M.; comes to the meridian, or culminates, at 27 minutes past six P.M.; and sets at half-past eleven P.M. Hence it remains above the horizon nine hours and six minutes. Its oblique ascension is 120° 47', its oblique descent 77° 17', and its amplitude 27° S.

Ex. 2. It is required to find the situation of the several planets on the 10th of January 1806. Ans. Jupiter is about 22° to the west of the sun, and rises south-east by east at 20 minutes before seven A.M. Venus is an evening star, and sets about half past eight. Mars is a very little to the east of the sun, and rises and sets so near the same time with the sun, that he cannot be seen. Jupiter is a morning star, and rises about six o'clock. Saturn is a little to the east of the star Spica Virginis, and rises about half an hour after midnight. Herschel is very near Saturn, and rises about the same time.

PROBLEM XIII. To find those stars which never rise, and those which never set, in a given latitude.

Rectify the globe for the latitude of the place; then, holding a black lead pencil so as to touch the surface of the globe at the northern point of the horizon, turn the globe, so that the pencil may describe a circle; all the stars which are between this circle and the elevated pole, never set. Again, holding the pencil at the southern point of the horizon, turn the globe so as to describe another circle there, and all the stars that are between that circle and the pole, below the horizon, never rise.

If the place is in southern latitude, the stars that never set are found by describing a circle at the southern point
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Throughout almost the whole year, the moon rises later every successive day, by above three quarters of an hour; but at a considerable distance from the equator, as in the latitude of Britain, France, and some other countries, a remarkable anomaly takes place in the moon’s motion about the time of harvest. At this season, when the moon is about full, the rises for several nights successively at about 17 minutes later only than on the preceding day. This is attended with considerable advantage, for as the moon rises before twilight is well ended, the light is as it were prolonged, and thus an opportunity given to the industrious farmer to continue longer in the field, for the purpose of gathering in the fruits of the earth. From the advantage derived from the full moon at the season of harvest, it has been called the harvest moon. The following problem has been contrived for the purpose of illustrating the phenomenon by means of the globe.

PROBLEM XIV.

Rectify the globe for any considerable northern latitude, suppose that of London. As the angle which the moon’s orbit makes with the ecliptic is but small, we may suppose, without any considerable error, her orbit to be represented by the ecliptic. In September the sun is in the beginning of ♄, so that the moon, when full, being in opposition to the sun, must be in or near the beginning of ♄. Pluck a patch, therefore, in the globe at the first point of ♄ in the ecliptic; and as the moon’s mean motion is about 13° in a day, put another patch on the ecliptic 13° beyond the former, and it will point out the moon’s place the night after it is full. A third and fourth patch, put at the distance of 13° further on, will show the moon’s place on the second and third nights after full, &c. Now, bring the first patch to the horizon, and observe the hour pointed out by the index; turn the globe till the second patch comes to the horizon, and it will appear by the index that there are only 17 minutes between the time of the first patch rising, and that of the second. This small difference in the motion of the moon evidently arises from the small angle which her orbit makes with the horizon. The remaining patches will come to the horizon with a little greater difference of time, and this difference will gradually increase as the moon advances in the ecliptic; but for the first week after the full moon at harvest the difference will not be more than two hours. If patches be continued on to the first point in ♄, it will be found that the time of their ‘rising,’ or coming to the horizon, will increase considerably till the last will be above 1½ hour later in coming to the horizon, because that point of the ecliptic makes the greatest angle with the horizon.

The point of the ecliptic, which makes the least angle with the horizon at rising, makes the greatest angle at setting; and, consequently, when the difference is least at the time of rising, it is greatest at the time of setting.

PROBLEM XV. To explain the equation of time by the globe.

The difference between apparent time and mean or equal time, has been explained in Astronomy, from No. 50 to 60; and the method of computing the equation of time is also there described.

To explain the equation of time on the globe, make, with a black lead pencil, marks all round the equator and ecliptic, beginning with ♄, at equal distances from each other, suppose about 15°. Then, on turning the globe, it will be seen that all the marks on the first quadrant of the ecliptic, reckoned from ♄ to ♄, come to the brazen meridian sooner than the corresponding marks on the first quadrant of the equator. Now, as the former marks represent time as measured by the sun, or a dial, and the latter represent it as measured by an accurate clock, it will be evident, that through the first quarter the dial is faster than the clock.

Still turning the globe, it will be seen that the marks on the second quarter of the ecliptic, reckoned from ♄ to ♄, come to the meridian later than the corresponding marks of the equator; consequently in this quarter the sun or the dial is slower than the clock. By moving the globe round, and marking the approach of the dots in the third quadrant, it will be seen that, as in the first, the dial now precedes the clock, and in the fourth quadrant, that it is behind it, according to the explanation given in Astronomy.

Sect. III. Of the Construction of Globes.

The construction of globes is of considerable importance; as, in performing the problems in which they are constructed, very much depends on the accuracy with which they have been constructed. We shall here, therefore, describe pretty minutely the methods in which the artists of Britain and France make their globes.

There are certain general circumstances which are attended to in the construction of every globe. There is first provided a wooden axis, somewhat less than the intended diameter of the globe, and to the extremities of this axis, which is the basis of the whole succeeding structure, there are fixed two metallic wires, to serve as poles. Now, two hemispherical caps formed on a wooden mould or clock, are applied in the axis. These caps are composed of pasteboard, or folds of paper laid one over another on the mould, till they are of the thickness of a crown piece; and after the whole has stood to dry, and has become a solid body, an incision is made with a sharp knife along the middle, and the two caps are thus slipped off the mould. These caps are now to be applied on the poles of the axis, as they were before on those of the mould; and to fix them

(1) This problem may be performed without the globe, by the following method. Find the latitude of the place in a table, and subtract it from 90°; the remainder will be the complement of the latitude. Then, if the declination of the given star be of the same name with the co-latitude, and exceed it in quantity, it will never set. If it be of a contrary name, and exceed it, it will never rise.
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When the rudiments of the globe are thus laid, the artist proceeds to strengthen the work, and make the surface smooth and equal. For this purpose, the two poles are fixed in a metallic semicircle, of the proposed size; and a composition made of whitening, mixed with water and glue, heated, melted, and incorporated together, is daubed all over the paper surface. While the plaster is applied, the globe is turned round in the semicircle, the edge of which paves away all the matter that is superfluous and exceeds the proper dimensions, and spreads the rest over those parts that require it. After this operation the ball stands to dry, and when it is thoroughly dried, it is again put in the semicircle, and fresh plaster applied to it; and thus they continue to apply composition and dry the ball alternately, till the surface accurately touches the semicircle in every point, when it becomes perfectly firm, smooth, and equal.

When the ball of the globe is thus finished, the map, containing a delineation of the surface of the earth, is to be pasted on the globe. For this purpose, the map is engraved in several gores or gussets, so that when these are accurately joined together on the spherical surface, they may cover every part of the ball, without overlapping each other. The greatest nicety is required in forming these engraved gussets, as well as in the accuracy of the engraving, as in the choice and shape of the paper employed. The method of describing the gores or gussets, usually employed by the British artists, is as follows.

1. From the given diameter of the globe there is found a right line AB (fig. 12.), equal to the circumference of a great circle corresponding to that diameter; and this line is divided into 12 equal parts.

2. Through the several points of division, 1, 2, 3, 4, &c. with a distance equal to ten of the divisions, arches are described crossing each other as in D and E; and these figures are pasted on the globe, so as when joined together to cover its whole surface.

3. Each part of the line AB is divided into 30 equal parts, so that the whole line, which may represent the equator, is divided into 360°.

4. From the points D and E, which represent the poles, with a distance = 939°, there are described arches a b, a b, (fig. 13.) which form twelfth parts of the polar circles.

5. In a similar manner about the same poles D and E, with a distance = 66°, reckoned from the equator, there are described other arches, c d, c d, which are the twelfth parts of the tropics.

6. In forming the celestial globe, through the point of the equator marked e (fig. 13.) representing the right ascension of a given star, and through the two poles D and E, there is drawn an arch of a circle; and if the complement of the destination from the pole D be taken in the compasses, and an arch be described, intersecting the former in the point i, this point i will be the place of the given star.

7. In this way all the stars of each constellation are laid down, and the circumscribing outline of the constellation is drawn as figured in the tables of Bayer, Flamsteed, &c.

8. In the same manner are determined the declinations and right ascensions of every degree of the ecliptic, &c.

The above is the method described by Mr. Chambers, of laying down or delineating the gores of a celestial globe. Those of the terrestrial globe are delineated in much the same manner, only that every place is laid down on the gores, according to its longitude and latitude, determined by the intersection of circles; and then the outline of the coast, boundaries of countries, &c. are added, like the figures of the constellations above mentioned.

9. When the surface of the globe has thus been projected on a plane, the gussets are to be engraved on copper, to save the trouble of making a new projection for every globe.

10. In the mean time, a ball of paper, plaster, or the like, of the intended diameter of the globe, is prepared in the manner above described, and by means of a semicircle and style, great circles are drawn on its surface, so as to divide it into a number of equal parts, corresponding to the number of gussets; and subdividing each of these according to the other lines and divisions of the globe. When the ball is thus prepared, the gussets are to be accurately cut from the printed engraving, and pasted on the ball.

When the papers have been thus pasted on, and suffered to dry, nothing remains but to colour and illuminate the globe, and to cover it with a thin layer of the finest varnish, that it may the better resist dust and moisture. The ball of the globe is now finished, and is to be hung in a strong brass meridian furnished with hour circles and a quadrant of altitude, and fitted into a strong wooden horizon.

The method employed by the French artists in projecting the gussets of globes, is thus described by M. forming the gores.

"To form celestial and terrestrial globes, it is necessary to engrave gores, which are a sort of projection or development of the globe. The length PC (fig. 14.) of the axis of the curve, is equal to a fourth part of the circumference of the intended globe; the intervals of the parallels on the axis PC are all equal; the radii of the circles KD I, which represent the parallels, are equal to the co-tangents of the latitude; and the arches of each, such as KI, are nearly equal to the number of degrees that correspond to the breadth of the gusset (usually 50°), multiplied by the sin of the latitude; thus, there will be found no difficulty in tracing them; but the principal difficulty proceeds from the change which those parts of the gores undergo, when they are glued upon the globe; as, in order to adjust them to the space which they ought to occupy, it is necessary to make the paper lose on the sides than in the middle, because the sides are too long.

"The method employed by artists for engraving these gores, is thus described by Bion (Usages des Globes, tom. iii.), and by Robert de Vaugondy in the seventh volume of the Encyclopédie, and this method is sufficient for practical purposes.

"Draw on the paper a line AC, equal to the absciss of 35°, to make the half breadth of the gore; and a perpendicular PC, equal to three times the chord of 35°, to make the half length: for these papers, the dimensions of which will be equal to the chords, become equal to the areas themselves when they are pasted on the globe. Divide the height CP into nine parts, if the parallels are to be drawn in every 10°; divide also the quadrant BE into nine equal parts; through each division
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vision point of the quadrant, as G, and through the corresponding point D of the right line CP, draw the perpendiculars HGF and DF, the meeting of which in F gives one of the points of the curve BFF, which will terminate the circumference of the globe. When a sufficient number of points are thus found, trace the outline PFB with a curved rule. By this construction are given the great breadths, which are on the globe, in the ratio of the cosines of the latitudes, supposing those breadths taken perpendicular to CD, which is not very exact; but it is impossible to prescribe a rigid operation sufficient to make a plane which shall cover a curved surface, and that on a right line AB shall make lines PA, PC, PD, equal to each other, as they ought to be on the globe. To describe the circle KDI, which is at the distance of 30° from the equator, there must be taken above O, a point that shall be distant from D the value of the tangent of 60°, which may be taken either from tables, or may be measured on a circle equal to the circumference of the globe that is to be drawn; this point will serve as a centre for the parallel DI, which ought to pass through the point D; for it is supposed equal to that of a cone circumscribing the globe, and which would touch it at the point D.

The meridians are traced to every 10°, by dividing each parallel as KL into three equal parts at the points L and M, and drawing from the pole F; through all these points of division, curves which represent the intermediate meridians lying between PA and PB, such as BR and ST (fig. 15).

The ecliptic AQ (fig. 15) is traced by means of the known declination, from different points of the equator, as found in the tables; for 10° it is equal to 8° 58′; for 20°=7° 50′=BQ 20; for 30°=11° 29′.

In general, it is observed that the paper on which the maps are printed, such as that called in France colombier, contracts itself 7%, or a line in six inches, upon an average, when it is dried after printing; hence it is necessary to prevent this inconvenience in engraving the globes: if, however, notwithstanding this, the gores are still found too short, it must be remedied by taking from the surface of the ball a little of the white with which it is covered; thus making the dimensions of the ball correspond to those of the gores as they are printed. But, what is singular, in drawing the gore, moistened with the paste to apply it on the globe, the axis GH lengthens, and the side AN shortens in such a manner that neither the length of the side ACK, nor that of the axis GEH of the gore are exactly equal to the quarter of the circumference of the quarter of the globe, when compared to the figure on the copper, or to the numbers shown on the side of fig. 15.

Mr. Bousen having made several experiments on the dimensions which the gores take after being covered with paste in order to apply them to the globe, especially of the paper called jessine, which had been employed in covering globes of a foot in diameter; found that it was necessary to give to the gore engraved on copper the dimensions laid down in fig. 15. Supposing that the radius of the globe contains 720 parts, the half of the breadth of the gore AG=188.5; the distance AC for the parallel of 10° taken on the straight line LM is 128.5, the small deviation from the parallel of 10° in the middle of the globe ED is 4, the line ABN is a straight line, the radius of the parallel of 10° or of the circle CET, is 4083, &c. The small circular cap which is placed under H, has its radius 253, instead of 247, which it would have if the size of 20° had been the radius of it.

Gloves are made of various sizes, from a diameter of three inches, to that of as many feet; but their most usual diameter is that of 19 inches, which are sufficiently large for most of the purposes for which globes are employed. Some large globes were made about 100 years ago, in France, by P. Coronelli, a Franciscan monk, which were in considerable reputation. They were engraved, and the plates are still to be seen at Paris, at the house of M. Desnos, in the Rue St Jacques. There are some large globes at Cambridge, which were drawn by the hand; but the largest globes of which we have any account, are those which were made for the late unfortunate Louis XVI, and were kept in the palace of Marly. They were 12 feet in diameter, and we believe, are still existing at Paris, where they occupy four entire rooms, each of them being partly in an upper room, and partly in that below it, the floor of the upper room forming the horizon.

The account which we have given of the method of constructing globes, will be useful to those who purchase these instruments; but to assist them still further, we shall subjoin the following practical rules for the choice of globes.

1. The papers should be well and neatly pasted on the globes, which may be known by the lines and circles meeting exactly, and continuing all the way over the whole; the circles not breaking into several arches, nor the papers either coming short, or lapping over one another.

2. The colours should be transparent, and not laid too thick upon the globe, to hide the names of the places.

3. The globe should hang evenly between the brass meridian and the wooden horizon, not inclining either to the one side or the other.

4. The globe should move as close to the horizon and the meridian as it conveniently may, otherwise there will be too much trouble to find against what part of the globe any degree of the meridian or horizon is.

5. The equinoctial line should be even with the horizon all round, when the north or south pole is elevated 90° above the horizon.

6. The equinoctial line should cut the horizon in the east and west points, in all the elevations of the pole from 0 to 90°.

7. The degree of the brass meridian marked 0, should be exactly over the equinoctial line of the globe.

8. Exactly half of the brass meridian should be above the horizon, which may be known by bringing any of the decimal divisions on the meridian to the north point of the horizon, and finding their complement to 90° on the south point.

9. When the quadrant of altitude is placed as far from the equator, or the brass meridian, as the pole is elevated above the horizon, the beginning of the degrees of the quadrant should reach just to the plane surface of the horizon.

10. When the index of the hour circle passes from one...
one hour to another, 15 degrees of the equator must pass under the graduated edge of the brazen meridian.

128. The wooden horizon should be made substantial and strong; it being generally observed, that, in most globes, the horizon is the first part that fails, on account of its having been made too slight.

In using a globe, the eastern side of the horizon should be kept towards the observer, (unless in particular problems which require a different position); and that side may be known by the word east on the horizon. In this position the observer will have the graduated side of the meridian towards him, and the quadrant of altitude directly before him; and the globe will be exactly divided into two equal parts by the graduated side of the meridian.

In performing some problems, it will be necessary to turn about the whole globe and horizon, in order to look at the west side; but this turning will be apt to disturb the ball, so as to shift away that degree of the globe which was before set to the horizon or meridian. This inconvenience may be avoided by thrusting the feather end of a quill between the ball of the globe and the brazen meridian, and thus, without injuring the surface of the globe, it will be kept from turning in the meridian, while the whole is moved round, so as to examine the western side.

We have already mentioned some improvements which have been made on the globes, for the purpose of remedying the defect in the old construction, of placing the hour circles on the outside of the brazen meridian. Some other improvements and modifications have been contrived by various artists; but of these we shall only mention those of Mr. Senex, Mr. B. Martin, Mr. Smeaton, and Mr. Adams.

Mr. John Senex, F. R. S. invented a contrivance for remedying these defects, by fixing the poles of the diurnal motion to two shoulders or arms of brass, at the distance of 23½ from the poles of the ecliptic. These shoulders are strongly fastened at the other end to an iron axis, which passes through the poles of the ecliptic, and is made to move round with very stiff motion; so that when it is adjusted to any point of the ecliptic which the equator is made to intersect, the diurnal motion of the globe on its axis will not disturb it. When it is to be adjusted for any particular time, either past or future, one of the brazen shoulders is brought under the meridian, and held fast to it with one hand, while the globe is turned about with the other; so that the point of the ecliptic which the equator is to intersect may pass under the degree of the brazen meridian; then holding a pencil to that point, and turning the globe about, it will describe the equator according to its position at the time required; and transferring the pencil to 23½ and 66½ degrees on the brazen meridian, the tropics and polar circles will be so described for the same time. By this contrivance, the celestial globe may be so adjusted, as to exhibit not only the rising and setting of the stars in all ages and in all latitudes, but likewise the other phenomena that depend upon the motion of the diurnal round the annual axis. Senex’s celestial globes, especially the two greatest, of 27 and 28 inches in diameter, have been constructed upon this principle; so that by means of a nut and screw, the pole of the equator is made to revolve about the pole of the ecliptic.

To represent the above appearances in the most natural and easy manner, Mr. B. Martin applied to the contrivance of Mr. Senex a moveable equinoctial and solstitial colure, a moveable equinoctial circle, and a moveable ecliptic; all so connected together as to represent those imaginary circles in the heavens for any age of the world.

In order to the performance of the problems which relate to the altitudes and azimuths of celestial objects, Mr. Smeaton, F. R. S. has made some improvements applicable to the celestial globe; and to give some idea of the construction, they may be described as follows: Instead of a thin flexible slip of brass, which generally accompanies the quadrant of altitude, Mr. Smeaton substitutes an arch or a circle of the same radius, breadth, and substance, as the brass meridian, divided into degrees, &c. similar to the divisions of that circle, and which, on account of its strength, is not liable to be bent out of the plane of a vertical circle, as is usual with the common quadrant put to globes. That end of this circular arch at which the division begins, rests on the horizon, being filed off square to fit and rest steadily on it throughout its whole breadth; and the upper end of the arch is firmly attached, by means of an arm, to a vertical socket, in such a manner that when the lower end of the arch rests on the horizon, the lower end of this socket shall rest on the upper end of the brass meridian, directly over the zenith of the globe. This socket is fitted to and ground with a steel spindle of the length, so that it will turn freely on it without shaking; and the steel spindle has an apparatus attached to its lower end, by which it can be fastened in a vertical position to the brass meridian, with its centre directly over the zenith point of the globe. The spindle being fixed firmly in this position, and the socket which is attached to the circular arch put on it, and so adjusted that the lower end of the arch just rests on and fits close to the horizon; it is evident that the altitude of any object above the horizon will be shown by the degree which it intersects on this arch, and its azimuth by that end of the arch which rests on the horizon.

Besides this improvement, Mr. Smeaton proposes that, instead of fixing the hour index, as is usually done, on one end of the axis, it be placed in such a manner that its upper surface may move in the plane of the hour circle rather than above it. To effect this, he directs the extremity of the index to be filed-off so as to form a circular arc, of the same radius with the inner edge of the hour circle, to which it is made to fit exactly, and a fine line is drawn in the middle of its upper surface, to point out the hour, instead of the tapering point usually employed. By this contrivance, if the hour circle be made four inches in diameter, the time may be shown to half a minute. For a more particular account of Mr. Smeaton’s improvements, we refer the reader to the 79th volume of the Philosophical Transactions.

Another improvement of the celestial globe, by which it is better adapted to astronomical purposes, is described in the article Astronomy, Vol. III. p. 178.

Besides the modifications in the construction of globes, Adams’s introduced by Mr. Adams, which have been already mentioned...
of the sphere is a circle of 24 hours, fixed to the rings, and on the axis is an index which goes round that circle, if the globe be turned round its axis.

The whole fabric is supported on a pedestal \( N \), and may be elevated or depressed upon the joint \( Q \), to any number of degrees from 0 to 90°, by means of the arc \( P \), which is fixed into the strong brass arm \( Q \), and slides in the upright piece \( R \), in which is a screw at \( r \), to fix it at any proper elevation.

In the box \( T \) are two wheels and two pinions, whose axes come out at \( V \) and \( U \); either of which may be turned by the small winch \( W \). When the winch is put upon the axis \( V \), and turned backward, the terrestrial globe, with its horizon and celestial meridian, keep at rest; and the whole sphere of circles turns round from east, by south, to west, carrying the sun \( Y \), and moon \( Z \), round the same way, causing them to rise above and set below the horizon. But when the winch is put upon the axis \( U \), and turned forward, the sphere with the sun and moon keep at rest; and the earth, with its horizon and meridian, turn round from west, by south, to east; and bring the same points of the horizon to the sun and moon, to which these bodies come when the earth kept at rest, and they were carried round, showing that they rise and set in the same points of the horizon, and at the same times in the hour circle, whether the motion be in the earth or in the heaven. If the earthly globe be turned, the hour index goes round its hour circle; but if the sphere be turned, the hour circle goes round below the index.

And so, by this construction, the machine is equally fitted to shew either the real motion of the earth, or the apparent motion of the heaven.

To rectify the sphere for use, first slacken the screw \( r \) in the upright stem \( R \), and taking hold of the arm \( Q \), move it up or down until the given degree of latitude for any place be at the side of the stem \( R \); and then the axis of the sphere will be properly elevated, so as to stand parallel to the axis of the world, if the machine be set north and south by a small compass; this done, count the latitude from the north pole upon the celestial meridian \( LL \), down towards the north notch of the horizon, and set the horizon to that latitude; the sun \( Y \) comes to the same place \( Y \), the same day of the year in the ecliptic, and the sun will be at its proper place for that day; find the place of the moon's ascending node, and also the place of the moon, by an Ephemeris, and set them right accordingly; lastly, turn the winch \( W \), until either the sun comes to the meridian \( LL \), or until the meridian comes to the sun (according as you want the sphere or the earth to move), and set the hour index to the XII. marked noon, and the whole machine will be rectified. Then turn the winch, and observe when the sun or moon rise and set in the horizon, and the hour index will show the times thereof for the given day.

Those who have made themselves acquainted with the use of the globes, as described in the first and second sections of this chapter, will be at no loss to perform many problems respecting the motions of the heavenly bodies by means of this sphere.

Dr. Long, some years ago, constructed an armillary sphere of glass, in Pembroke Hall at Cambridge. It was 18 feet in diameter, and could contain below it more than 30 persons, sitting in such a manner within the sphere, as to view from its centre the representation of the heavens drawn in its concavity. The lower part of the sphere, or that part which is not visible in the latitude of Britain, is wanting; and the whole apparatus is so contrived, that it may be turned round with as little exertion as is requisite to wind up a common jack. Dr. Long has given a description of this sphere, accompanied with a figure, in his Astronomy.

The invention of the armillary sphere is thought by La Lande to be as ancient as that of astronomy itself. It has been attributed to Atlas, to Hercules, to Anaximander, and Museus; while others have supposed that it originated in Egypt. The sphere of Archimedes, which became so celebrated, appears to have been something like that of Dr. Long, as it was certainly composed of a globe of glass, which, besides containing the circles of the sphere, served as a planetarium, and represented the motions of the planets. Claudian has celebrated it in some beautiful lines. See Archimedes.

A combination of the armillary sphere with a planetarium was constructed by the late Mr. George Adams, and is figured in Plate XIII. Fig. 7. of his Astronomical and Geographical Essays.

**Chap. III. Of the Construction and Use of Maps and Charts.**

**Sect. I. Description of Maps and Charts.**

It has been seen, that the surface of the earth may be delineated, in the most accurate manner, on the surface of a globe or sphere. This method of delineation, however, can be employed only for the purpose of representing the general form and relative proportions of countries on a very confined scale; and it, besides, from its bulk and figure, is not well suited to many of the purposes of the geographer. To obviate these inconveniences, recourse has been had to maps and charts, or delineations of the earth's surface on a plane, where the form and boundaries of the several countries, and the objects most remarkable in each, whether by sea or land, or in the sky, are represented to the eye at a single view, and from any point of the sphere, so as to preserve the same appearance as if they were parts of a spherical surface. In this way, the several countries or districts of the earth may be represented on a larger scale, and delineations of this kind appear of more easy reference.

In maps, the circles of the sphere, and the boundaries of the countries within them, are drawn as they would appear to an eye situated in some point of the sphere, or at a considerable distance above it. In maps of any considerable extent of country, the meridians and parallels of latitude are circular lines, but, if the map represents only a small district, as a province or county, those circles become so large, that they may, without any considerable error, be represented by straight lines. In charts, which are also called hydrographical maps, as they are representations rather of the water than land, the meridians and parallels are usually represented by straight lines, crossing each other at right angles, as in the smaller maps; and, in particular parts, there are drawn lines diverging from several points, in the direction of the points of the compass, in order to mark the
than could be done by the common graver, it occurred to Mr Pinkerton, while preparing his Modern Geography, that this invention might be applied with advantage to the improvement of maps. A set of maps was accordingly engraved by Mr Lowry for Pinkerton's Geography, in which the water was marked by dark parallel lines to discriminate it from the land. These lines are drawn horizontally; and Mr Pinkerton proposed that, in engraving charts, the land should be marked with similar lines drawn in proportion to the coast, while the water should be left blank. This improvement has since been adopted by other constructors of maps and charts, and bids fair to be generally used. The effect is pleasing; and the progress of instruction will be greatly facilitated by the new method, as the extent and bearings of the several countries are seen, as it were, with a glance of the eye. In many of these maps which we have seen, however, the lines are drawn too strongly, which renders the sea so dark, that the names of islands and places on the sea coast can with difficulty be perceived. As the line of coast in these maps is strongly marked, the parallel lines denoting the sea should be engraved in a light and soft style; and in this way Mr Lowry's first specimens are executed.

Sect. II. Of the Construction of Maps and Charts.

The construction of maps consists in making a projection of the surface of the globe on the plane of some one of its circles, supposed to be placed in some particular point. The describing of these projections depends on the principles of perspective, and the projection of the sphere. The general principles will be explained under those articles, but the particular mode of drawing maps properly forms a part of the present treatise.

The methods of constructing maps vary according to the size or scale of the map, and to the projection employed in constructing it.

There are three projections employed in constructing maps, the orthographic, the stereographic, and the globular. In the orthographic projection the eye is supposed to view the part of the globe to be projected, from an infinite distance. In this projection the parts about the middle of the map are very well represented, but those towards the margin are too much contracted.

In the stereographic projection, the eye is supposed to be situated in the surface of the globe to be represented, and looking towards the opposite surface. This is the method usually employed in constructing most maps, especially maps of the world, or planispheres.

In constructing a map of the world, as well as most partial maps, the part of the sphere to be represented is supposed to be in the position of a right sphere (see N° 93.). In this mode of projection, the hemisphere to be represented is supposed to be delineated on the plane of that meridian by which it is bounded, in the same manner as its concave surface, conceiving the sphere to be transparent, would appear to an eye placed in the opposite hemisphere, where the equator crosses a meridian; that is 90° distant from that which forms the plane of the projection. In a delineation of this kind, the meridians and parallels of latitude are represented by arcs of circles, except the equator and the central meridian, which are straight lines; and each parallel or meridian forms an arc of a greater circle, in proportion as it approaches nearer to the centre of the map.

By either of these projections only half the globe can be represented in one projection; but in the map of the world, the two hemispheres are usually drawn on the plane of the same circle, adjacent to each other. By Mercator's projection, usually employed for charts, and to be described presently, the whole globe may be represented in one projection, but much distorted.

In the projection of a map of the world to be formed on the plane of a meridian, the true projections will represent the eastern and western hemispheres of the globe.

When the projection is made on the plane of the equator, in the situation of a parallel sphere, the projections represent the northern and southern hemispheres, which appear as their concave surface would be seen by an eye placed at the opposite pole. In this way the meridians become straight lines diverging from the same centre, and the parallels are circles having the same common centre.

The following is the method of constructing a map of the world, on the plane of a meridian, according to the globular projection. (See fig. 17.)

About the centre C, with any radius as CB, describe a circle, representing the meridian that is to form the projection plane of the hemisphere. Draw the diameters NS, of a map of the world, and AB, crossing each other at right angles, and the former of these will be the central meridian, and the latter the equator. Divide each semidiameter into nine equal parts, and divide each quadrant of the circle also into nine equal parts, each of which will be equal to 1°. If the scale of the map be sufficiently large, each of these may again be divided into ten equal parts or degrees. The next object is to describe the meridians passing through every 10° of the equator. Suppose we are to draw the meridian of 80° west from Greenwich. We have here three points given, the two poles and the point 80° on the equator, and it is easy to describe a circle that shall pass through these three points. This arch will be the meridian. The method of drawing a circle through any three points is, in this case as follows: About the centre S, with the radius SC, describe a circular arc, as XX; and about the centre N, with the same radius, describe the arch ZZ; then about the centre 80° with the same distance, describe arches 1, 2, 3, crossing the former; and draw lines from 2 to 1 on each side of AB, crossing each other, and AB produced, in D. D is the centre of the circular arc, representing the meridian of 80° west from Greenwich, and with the same radius the meridian of 120° west longitude may be drawn. All the other meridians are to be drawn in a similar manner by describing a circular arch through three points N, S, and the required degree. (See Geometry.)

For describing the parallels, suppose that of 60° N. Lat.; about the centre O, with any radius, describe the circle FGH, and about the points 60°, 60°, in the primitive circle, with the same distance, describe the arcs ee, dd, cutting the circle FGH: through the points of intersection draw straight lines, and the point where these lines meet in NS produced, as in I, is the centre of the arch that will represent the parallel of 60°. The other parallels are drawn in a similar manner, observing that the first circle, such as FGH, must have for its centre that point in the central meridian through which the parallel is to be drawn. Fig. 18. represents this projection.
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Equal parts, or geographical miles. Then, because the length in each parallel decreases towards the pole, from the table showing this decrease given in p. 514, take the number of miles answering to the latitude of B, which is 45° nearly, and set it from B, seven times to E, and six times to F; so is FF divided into degrees. Again, from the same table take the number of miles of a degree in the latitude A, viz. 435 nearly; which set off from A, seven times to C, and six times to D. Then from the points of division in the line CD, to the corresponding points in the line EF, draw so many right lines for the meridians. Number the degrees of latitude up both sides of the map, and the degrees of longitude on the top and bottom. Also in some vacant place make a scale of miles, or of degrees, if the map represent a large part of the earth; to serve for finding the distances of places upon the map.

Then make the proper divisions and subdivisions of the country; and having the latitudes and longitudes of the principal places, it will be easy to set them down in the map; for any town, &c. must be placed where the circles of its latitude and longitude intersect. For instance, Gibraltar, whose latitude is 36° 11', and longitude 2° 27', will be at G; and Madrid, whose latitude is 40° 10', and longitude 14° 44', will be at M. In the same manner the mouth of a river may be set down; but to describe the whole course of the river, the latitude and longitude of every turning, and of the towns and bridges by which it passes, must also be remarked down. The same is necessary for woods, forests, mountains, lakes, castles, &c. The boundaries are described by setting down the remarkable places on the sea coast, and drawing a continued line through them all. This method is very proper for small countries.

2d Method. Maps of particular places are but portions of the globe, and may therefore be drawn in the same manner as the whole globe, either by the orthographic or stereographic projection of the sphere. But in partial maps a more easy method is as follows. Having drawn the meridian AB in the last figure, and divided it into equal parts as before, draw lines through all the points of division; put them together to AB, to represent the parallels of latitude. Then to divide these, set off the degrees in each parallel; diminish after the manner directed for the two extreme parallels CD and EF, and through all the corresponding points draw the meridians, which will be curved lines; these were right lines in the last method, because only the extreme parallels were divided according to the table. This method is proper for a large tract, as Europe, &c. in which case the parallels and meridians need be drawn only through every 5° or 10°. This method is much used in drawing maps, as all the parts are nearly of their due magnitude, except being a little distorted towards the outside, from the oblique intersection of the meridians and parallels.

3d Method. Draw PB of a convenient length, for a meridian; divide it into nine equal parts, and through the points of division, describe as many circles for the parallels of latitude, from the centre P, which represents the pole. Suppose AB (fig. 21.) the height of the map; then CD will be the parallel passing through the greatest latitude, and EF will represent the equator. Divide the equator EF into 9 equal parts of the same size as those in AB, both ways beginning AB;
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Problem III. The latitude of a place being given; to find all those places on the same map that have the same latitude.

If a parallel of latitude happen to be drawn on the map through the given place, this problem is easily solved, by tracing along the parallel, and seeing what other places it passes through. If a parallel is not drawn through the given place, take with a pair of compasses the distance of the place from the nearest parallel; then keeping one foot on the parallel, and the other in such a position as to describe a line parallel to the parallel of latitude, move the compasses, and all the places over which the point that is not on the parallel passes, have the same latitude with the given place.

This method will not succeed in maps on which a large tract of country is delineated on a small scale.

Problem IV. Given the longitude of a place; to find on the map all those places that have the same longitude.

Find the longitude of the given place, and if a meridian passes through it, observe all the places that lie under this meridian; or, if a meridian does not pass through the place, find by the compasses, as in the last problem, those places that are situated at the same parallel distance with the given place from the nearest meridian. These places have nearly the same longitude with the given place.

Problem V. To find the antarctic of a given place.

Find the latitude and longitude of the place by Problem I., and find another place of the same longitude, whose latitude is equal to that of the former, but in a contrary direction. The inhabitants of this latter place are the antarctic to the latter.

Ex. Suppose a ship to be in the Indian ocean, in lat. 13° S. and long. 80° E.; it is required to find the antarctic to her present situation. Ans. The place which has nearly the same longitude, and an equal latitude in a contrary direction, viz. 13° N. is Madras.

Problem VI. To find the pericentric of a given place.

Find the longitude of the given place, and subtract it from 180°: the remainder will be the longitude in an opposite direction of the pericentric. Then find a place having an equal longitude with this last, and having the same latitude with that of the given place: this latter is the situation required.

Ex. It is required to find the pericentric to the inhabitants of the gulf of Siam. Ans. The longitude of Siam is 100° 57' E., which, subtracted from 180°, leaves 79° 17' W. Now, the place that has this longitude, and the same latitude with Siam, viz. about 14° N. is the isthmus of Darien.

Problem VII. To find the antipodes of a given place.

This problem is solved on maps in the same manner as on the globe.

Problem VIII. Having the hour at any place given; to find what hour it is in any part of the world.

Find the difference of longitude between the two places, and reduce this to its equal value in time, by
In Analemma, showing the time of sun rising & setting, the length of the Days & Nights, and the point of the Compass on which the Sun rises & sets, for every Degree of Latitude, and for every Degree of the Hour North or South destination.
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Distributed the different portions to the nine tribes at Shiloh; a supposition which is derived from Joshua's account, that they were sent to walk through the land, and that they described it in seven parts in a book. Josephus also relates, that when Joshua sent people from the different tribes to measure the land of promise, he sent with them men well skilled in geometry. All this, however, is no proof that these persons drew a sketch of the country, according to our idea of a map; but probably only wrote down, for the satisfaction of their employers, the extent, boundaries, and general characteristics of the divisions of the land.

Herodotus has given a minute description of a map constructed by Aristagoras, tyrant of Miletus, an abridgement of which will serve to give some notion of the maps of those times. It was drawn upon brass or copper, and seems to have been merely an itinerary containing the route through the countries which were to be traversed in a march which Aristagoras proposed to Cleomenes, king of Sparta, for the purpose of attacking the king of Persia at Susa, that he might thus assist in restoring the Ionians to their liberty. The rivers Hali, Euphrates, and Tigris, which, according to Herodotus, must have been crossed in that expedition, were laid down in this map; and it contained one straight line, called the royal road or high way, which comprehended all the stations or places of encampment, from Sardis, the beginning of the route, to Susa, a distance of 13,500 stadia, or 1587½ Roman miles of 5000 feet each. The number of encampments in this whole route was 113.

Ptolemy of Alexandria, the celebrated geographer mentioned in No. 21, constructed maps to illustrate his description of places, and these are the first that have regular meridians and parallels, the better to define and determine the situation of places. Ptolemy acknowledges that his maps, with the addition of some improvements of his own, the principal of which was certainly the introduction of meridians and parallels, were copied from previous maps made by Maritius Tyrius, &c. They are, however, often very inaccurate.

According to Athenaeus, a work which seems to have contained maps, was written by Baetion, under the title of Alexander's march; and a work on the same subject is mentioned as the production of Amythus. We are informed by Pliny, that this Baetion was one of the surveyors of Alexander's marches; and he quotes the exact number of miles of these marches, according to Baetion's measurement, and confirms their authenticity by the letters of Alexander. Pliny also remarks, that a copy of this conqueror's surveys was given by Zenobius, his treasurer, to the geographer Patrocles, who was admiral of the fleet of Scylaces and Antiochus.

Among the most celebrated of the ancient maps, are the Peutingerian tables, so called, because published by Peutinger of Augsburg. These tables contain an itinerary of the whole Roman empire; all places except seas, wood, and deserts, being laid down according to their measured distances, though without any mention of latitude, longitude, or bearing. A particular description of this monument of antiquity is given in the 18th volume of the History of the Academy of Inscriptions, and in the History of the Academy of Sciences for 1761, from which M. Moitucel has drawn up the following account. The map of Peutinger, as it is in the Vol. IX. Part II.

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original in the imperial library, is exactly one French foot in height, and 20 feet eight inches in length, according to measures taken by Busche, from a copy of the splendid edition given by Scheele in 1753. It comprehends the whole extent of the Roman empire, from Constantinople to the ocean, and from the shores of Africa to the northern parts of Gaul; but the table which it affords of this vast extent of country is by no means calculated to give us an idea of its figure, since the 3° of longitude which it comprehends, occupy 20 feet 8 inches, while the 13° of latitude are comprised within the space of one foot; thus the countries represented are so disfigured, that the Mediterranean appears only like a broad river, and all the countries are so distorted, towards the north and south, that they cannot be recognised.

Most of those who have seen this ancient map, have considered it as the rude and bungling work of a man little conversant with geography, and still less so with mathematics; but Edmund Brutus considers the distortion of this map as similar to what we see in some pieces of perspective, and that it ought to be examined from some certain near point in order to perceive the objects in their natural proportion.

Busche supposed long ago, that this map was constructed with more scientific skill than it appears to be at the first glance; and that the apparent irregularities which we observe in it, might have been introduced designedly, for the purpose of deriving greater advantages as to what was intended for the principal object. In fact, as the Roman routes extended almost entirely from east to west, they paid more attention to the measures in this direction than those between north and south; and the map in this way might have had the greater convenience of being more easily rolled up, and consequently more portable.

Thus far Busche hazarded no more than conjectures; but a labour undertaken by him with a very different view, led him to the true design of the map of Peutinger. He had been tracing a scale of climates, and of the length of the days and nights, for the purpose of attaching it to small maps of the different countries of Europe. As the space occupied by the scale was pretty much extended in height, but had very little breadth, he formed the idea of drawing a kind of map upon two scales, one pretty much extended for the latitude, and the other very much contracted for the longitudes, preserving the hollows of the coasts and boundaries of each state. As this disposition of his map strangely disfigured the countries which it was intended to represent, he was led to imagine that this map might be the reverse of that of Peutinger. This was sufficient to engage him to construct another map upon the same principle; but in which the scale of longitudes was much greater than that of the latitudes. He then saw that he had been right in his supposition, and that the map which he had last constructed had a considerable resemblance to that of Peutinger. This latter is in fact only a plain chart, constructed upon two scales, of which that of the longitudes is very great, and that of the latitudes much smaller.

One difficulty alone arose. By supposing that he observed in this map a custom at present established among geographers, of representing the meridians by lines drawn perpendicular to the base of the chart, and the
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Parallels to the equator by straight lines drawn parallel to this same base, Buache found a considerable error. He soon, however, saw the solution of this difficulty. The method of drawing the meridians parallel to the sides of the chart, is a matter of pure agreement, and had probably not been observed in the map of which we are speaking. The ancient Roman geographers having considered that Italy was naturally divided by the Appenines, according to its length, into two parts that were nearly equal, had therefore delineated the length of Italy from Trent to the end of the peninsula, parallel to the lower margin of the map, and had afterwards arranged the other parts which the map was to contain, conformably to this disposition; and as the length of Italy is not in a direction parallel to the equator, it would happen necessarily that the meridians and parallels, if they had been drawn on this map, would have been parallel neither to the sides nor to the lower margins of the map, and that the vertical line passing through Rome must intersect the gulf of Venice at about the middle: but this line is not a meridian.

Thus, the idea of a work as has been imagined, but has been entirely constructed, according to rule; and it even appears that the author had employed pretty good materials in its compilation, as the positions are laid down in a manner that differs little from modern observation.

From the time of Ptolemy till about the 14th century, no new maps were published; and the first maps of any esteem among the moderns were constructed by Mercator, to whom we are indebted for the projection according to which marine charts are constructed. Mercator was followed by Ortelius, who undertook to construct a new set of maps with the modern divisions of countries and names of places, for want of which the maps of Ptolemy were become almost useless. After Mercator and Ortelius, many others published maps, which were chiefly copied from those above mentioned, till about the middle of the 17th century. After that time, Blaeu published his large atlas, or Cosmographie Blaviana, in which is a pretty accurate description of the earth, sea, and the heavens, comprised in 12 folio volumes. About the same time an atlas in two folio volumes was published in France by M. Sansoon, the maps of which are in general very correct, containing many improvements of the travellers of those times. The maps of Blaeu and Sansoon were copied with little variation both in England, France, and Holland, till from later observations De Lisle, Robert, Wall, &c. published still more accurate and copious sets of maps.

The works of recent travellers and navigators have considerably improved the construction and accuracy of our maps and charts; but there is still much to be done, especially with respect to trigonometrical surveys, before any high degree of correctness can be acquired. Among the latest maps and charts, those constructed by Mr Arrowsmith are in the greatest estimation.

As a collection of good and accurate maps is of the greatest importance in the study of geography and history, we shall here subjoin a list of some of the best modern maps that have been published.

Those maps which may be collected for the purpose of forming an atlas, have been arranged under three heads, according to their size, or the extent of their scale.

Maps.

Maps of Europe.—1st Size. That of De Bouge, published at Vienna, or that by Sortzmann in 16 sheets, which is the better of the two. 2d Size. Arrowsmith's in four sheets. 3d Size. That by Faden in one sheet.

Maps of England.—I. The trigonometrical surveys of the counties, published by Lindsey and Gardner, and by Faden. II. Cary's atlas of the counties, and his England and Wales in 81 sheets. III. Faden's map in one sheet.

Maps of Wales.—I. That of Evans in nine sheets.

Maps of Scotland.—I. The surveys of the several counties. II. Ainslie's nine sheet map. III. An excellent map by General Roy, and Ainslie's reduced map, in one sheet.

Maps of Ireland.—I. Survey of counties. III. A valuable map by Dr Beaumont, in two sheets, or Faden's in one sheet.

Maps of France.—I. Cassini's mentioned above, and the atlas national, in 85 sheets. III. Faden's one sheet map, and a map, in departments, by Belycime, in four sheets.

Maps of the Netherlands.—I. Ferran's map in 25 sheets. II. Atlas de Departement Belge. III. Ferran's map reduced by Faden.

Maps of Holland.—I. Kep's maps of the United Provinces. III. Faden's map of the Seven United Provinces in one sheet.

Maps of Germany.—II. Chausard's map of Germany. III. A map of the Austrian dominions, in one sheet, by Baron Liechtenstein.

Maps of Prussia.—I. Sortzmann's atlas in 21 sheets. III. Sortzmann's reduced, in one sheet.

Maps of Spain.—Lopez's atlas, not, however, very accurate. II. A map of Spain in nine sheets by Montes and Ochlanlere. III. Faden's map in one sheet.

Maps of Portugal.—II. Geoffry's improved by Rainsford, in six sheets. III. De la Rochette's chorographical map in one sheet, published by Faden.

Maps of Italy.—I. The maps of the several states. III. D'Avalibe's map of Italy improved by De la Rochette, in four sheets, published by Faden.

Maps of Turkey in Europe.—II. Arrowsmith's map of Turkey in two sheets. De la Rochette's map of Greece in one sheet.

Maps of Switzerland.—I. Weiss's atlas, published at Strasburg in 1600. III. Weiss's reduced map in one sheet.

Maps of Denmark.—I. Maps of the provinces, under the direction of Bygge. III. Faden's maps of Denmark, Sweden, and Norway, in one sheet.
are most interesting, particularly maps of Europe, Asia, Africa, and North and South America, the British islands, France, Germany, Italy, Russia, and Denmark, which may be collected from the list given at No. 126.

Being provided with these materials, the student should first read over Chap. I. of Part II. of this treatise, or a similar part of some elementary work in geography. On the elementary principles of geography we would recommend the general principles prefixed to Mr. Paterson's general and classical Atlas; and for teaching the use of the globes, Bruce's Introduction to Geography and Astronomy. For a complete account of modern geography we cannot refer to a better work than that of Mr. Pinkerton; and for a combined account of ancient and modern geography, the pupil may have recourse to a work on that subject by Dr. Adam of Edinburgh.

After reading over the preliminary part above mentioned, the pupil may go through the second Chapter of Part II. solving all the problems as he goes along on the terrestrial globe; and thus he may proceed progressively through the whole article, leaving that part of Part I. which treats of the history of geography for the last object of his enquiry.

In studying the particular circumstances of each country, the pupil should always have the map of the country before him; and, as he goes along, should trace there the situation of each particular place; of the principal mountains, lakes, the sources and directions of the rivers, the form and bounding of the shores, &c. In his progressive view of particular geography, it will be proper for the pupil to begin with the country in which he resides; and, after having made himself master of that, to proceed successively to those which border on it, or whose connection with it is the most interesting.

Thus an inhabitant of these islands, after having taken a view of Europe in general, should make himself acquainted with Britain and Ireland (by perusing the articles England, Scotland, and Ireland in this Dictionary or in other works); whence he may proceed to France and its dependencies in the Netherlands, Switzerland, Italy; thence to Germany and the Austrian territories, Prussia, Sweden, Denmark, and Russia; whence he may return to the south of Europe to Spain, Portugal, and Turkey, &c. After Europe, the United States of America will probably be found the most interesting; the pupil may therefore study the geography of North America before that of Asia. From Asia he may proceed to Australia and Polynesia; thence to Africa, and so conclude with South America. Nothing will contribute more to the advancement of geographical studies than the construction of maps. If the pupil has time therefore he should early be instructed in this part of the subject by at first drawing a map of the world according to the directions laid down in No. 112, then one of Europe, and so of other quarters and countries. In constructing this map, it will be proper first to lay down those places which are near the coast, in order to form the outline of the maritime part of the country, and only the most remarkable places inland, especially those which are situated in the course of the principal rivers. In every map the most prominent features of the country, as the mountains, lakes, rivers, and principal cities and towns, should first be attended to, and from these the pupil may be introduced to the other places in the order of their magnitude or importance.

The most agreeable and interesting method of studying particular geography, after having become acquainted with the elementary principles of the science, would be to peruse the best books of voyages and travels; for from those, where the traveller can be depended upon, the most correct systems of geography are compiled. Many of these, however, are too prolix and particular to be put into the hands of most young people, and a judicious abridgement of the best of them will answer every purpose; and perhaps Dr. Mavor's collection may be recommended, as the best of the kind in the English language. For those whose time and convenience will admit of their reading the best writers of voyages and travels, there is no want of such works; and Mr. Pinkerton has given at the end of his excellent work, a list of the best in most languages. We shall here only notice a few of the best and latest.

Pennant's Tours in Britain.
Young's Tours in the British isles.
Saintfond's Travels in England and Scotland.
Young's Travels in France.
Holcroft's Tour in France.
Spallanzani's Travels in the two Sicilies.
Cox's Travels in Russia, &c.
Pallas's Travels in the Russian empire.
Carr's Northern Summer.
Staunton's Account of China.
Barrow's Travels in China.
Percival's Account of Ceylon.
Syme's Embassy to Ava.
Collins's Account of New South Wales.
Bruce's Travels in Abyssinia.
Barrow's Travels in Africa.
Park's Travels in the interior of Africa.
Brown's Travels in Africa.
Sonnini's Travels in Egypt.
Percival's Cape of Good Hope.
Mackenzie's Journey in North America.
Davis's Travels in America.
Mackinnon's Tour in the West Indies; with the voyages of Anson, Byron, Cook, Phipps, Bligh, Wilson, Wallis, La Peyrouse, &c. &c.

INDEX.
GEOL OGY.

Introduction.

the whole; the object of the latter is to give an account
of the creation of the universe, while the former confines itself to the consideration of the planet which we inhabit.

Geology is intimately connected with mineralogy, and may indeed be said to depend on this as its very foundation. Werner, we have seen, considers Geography as a part of Mineralogy; but we are disposed to concur with Mr. Kirwan, who, speaking of mineralogy with respect to its relation to geology, calls it "the alphabet of the huge and mysterious volume of inanimate nature."

Geology may be divided into descriptive and speculative; the former giving a general account of the materials of which the globe is composed, and of their arrangement; while the latter is strictly confined to what may be called a theory of the earth, or an attempt to explain the manner in which the structure and arrangement have been brought about, and the changes that have taken place in the disposition of the component parts of the earth.

The science of geology is of considerable importance in many points of view.

1. The student of natural history cannot but derive a great fund of profit and advantage from a science, which makes him acquainted with so large a department of nature. Mineral bodies, whether we consider them as individuals of nature, or as collected into those masses which form the strata of the earth, and the mountains that rise above its surface, are peculiarly interesting to the naturalist, as well from the variety of form and beauty of appearance which some of them present, as the useful purposes to which many of them are applied. The other kingdoms of nature delight us with the display of order and design exhibited in their organization, or interest us from the intimate connexion which subsists between many of them and ourselves. These are objects of the beautiful; while the stupendous mountain, the awful volcano, the towering cliff, the gloomy mine, and the majestic cavern, are objects of the grand and sublime.

2. To the miner, and all those who are employed in searching the bowels of the earth for the treasures which they contain, geology, as well as mineralogy, forms an essential qualification. Experience has shown that certain minerals and metals are found more frequently attached to some of the stony materials of the earth than to others, and that a few of them are only found in particular strata. Examples of this kind will be given presently. We have also learned that the arrangement of the materials in the earth is so far regular and uniform, that when we know the particular materials near which certain metals and minerals are commonly found, and the usual disposition in these places; and when we find in another situation the same materials disposed in a similar manner, we are pretty certain that the metal or mineral of which we are in search is not far distant. We are therefore encouraged to prosecute the search with every probability of success. Those who undertake to direct an investigation of this kind, or to carry on the operations requisite for the obtaining what is sought, would do well to inform themselves beforehand of such facts as are well established respecting the distribution of the materials of the earth, and the substances usually found connected with them. For want of this necessary information, we often see projectors impose on the credulity, and impoverish the finances, of gentlemen of landed property, who are led to suppose that they possess on some part of their estate a rich vein of metal, seam of coal, etc., the working of which will considerably improve their income.

3. The failure of undertakings of this kind, partly to the villany of the projector, and partly from the ignorance of his employer, shews the advantages that the gentlemen of landed estates would derive from the study of geology. An acquaintance with this science would guard them against the artifices of designing men, and prevent them from embarking in uncertain and expensive projects, the issue of which is too often ruin and disappointment.

4. But the study of geology boasts a still higher advantage. Nothing has more contributed to demonstrate the truth of the divine writings, and to clear up many doubtful passages in them, than the discoveries that have lately been made in the structure and formation of the earth. The original state of the globe is so intimately connected with that which it at present exhibits, that we cannot properly understand the latter without referring to the former; and recent experience has shewn that the obscurity in which the philosophical knowledge of this subject was involved, has been highly favourable to those systems of atheism and infidelity which prevailed in the last age. Much of this obscurity is now removed; and the investigations of Whitehurst, Werner, Kirwan, Howard, and some other geologists, by proving that the supposition of a deluge is the only hypothesis on which we can account for the present state of our globe, have contributed as much to the advancement of true religion as of philosophical knowledge.

So numerous indeed, and so luminous, have been the more modern geological researches, and so obviously connected with the object we have now in view, that since the obscuration or obliteration of the primitive traditions, strange as it may appear, no period has occurred so favourable to the illustration of the original state of the globe as the present, though so far removed from it. At no period has its surface been traversed in so many different directions, or its shape and extent under its different modifications of earth and water been so nearly ascertained, and the relative density of the whole so accurately determined, its solid constituent parts so exactly distinguished, their mutual relation, both as to position and composition, so clearly traced or pursued to such considerable depths, as within these last thirty years. Neither have the testimonies that relate to it been ever so critically examined and carefully weighed, nor consequently so well understood, as within the latter half of the 18th century.†

Geological researches seem at first view to be attended with almost insurmountable difficulty. It is easy now to examine, is infinitely small when compared to that which is entirely beyond our reach: and even much of the elevated parts, that appear above the surface, would seem to be so completely cut off from us by inaccessible precipices, and the ice and snow with which the summits.
mits of some of them are perpetually covered, that our knowledge of their structure and compositions must for ever remain imperfect. Much of these difficulties, however, is rather apparent than real. It is true that our researches can extend but a very little way below the surface; but so far as our experience has yet taught us, any farther investigation would be rather a matter of curiosity than utility. Those metals and minerals which prove of most service to mankind, are found at no very great depth in the earth, and some of them almost on its surface; and when we have penetrated beyond these, the materials discovered are of a nature so uniform, and of a texture so firm and hard, that it is possible they may extend even to the centre. Again, the investigations of Saussure, De Luc, Dolomieu, and Humboldt, have proved that the most dangerous precipices, and the highest summits of those immense mountainous chains which traverse the earth in so many directions, oppose but feeble barriers to persevering industry and philosophic ardour.

The diversity which occurs in the structure and local arrangement of subterraneous substances, seems to throw another difficulty in the way of the geologist; but the farther his researches are extended, the more will this apparent diversity be diminished. The practical skill which some miners possess in many parts of the world, proves that the mazes of this labyrinth are not without a clue; and we may safely conclude, that when our knowledge of the structure of the earth, and the disposition of its materials, shall be still farther extended, the greater part of the obscurities under which the subject is now veiled, will be entirely removed. Multipled observations of later years have enabled us to form certain general conclusions, and lay down certain general laws, which must materially assist future observers.

In the modern improvements of geology, the Germans led the way, and Lehmann may be considered as the father of the science. Eminently skilled in general physics, practical mining, mineralogy, and chemistry, and fully acquainted with the circumstances attending the relative situation of most mineral bodies in very extensive tracts of different countries which he examined, he was enabled to deduce, from a long series of observations, some general conclusions, which have, with some exceptions, been since verified in every part of the world.

Lehmann was followed in his own country by Ferber, Gmelin, Born, and Werner; in Sweden by Bergman, Cronstedt, and Titius; in Italy by Arduini; in Switzerland, by Saussure and De Luc; in Russia, by Pallais; in France, by Delametherie, Saint Fond, Dolomieu, and Lavoisier; and in Britain, by Hutton and Kirwan, names which must ever be held in the highest estimation by the cultivators of this part of natural history.

Before entering on the study of geology, it is necessary to acquire a competent knowledge of chemistry, and a pretty extensive acquaintance with mineralogy; as these sciences form an essential introduction to the more general researches respecting the structure of the earth. The former supplies the means of ascertaining the nature of the substances met with; and the latter must be well understood, before we can arrange these substances under their proper heads, and before we can comprehend the terms employed by geological writers.

The study of this science, like that of some other parts of natural history, particularly botany, can be prosecuted with but little advantage in the closet. The student must examine the declivities of hills, the beds of rivers, the interior of caverns and of mines, the recesses of the ravine, and the utmost summits of the mountain, before he can obtain that degree of knowledge which is necessary to constitute a skilful and philosophic geologist. While making these personal observations, he should study the works of the best writers, and compare the facts related and described by them, with those which he himself has observed. The writings on this subject may be divided into two principal classes, one comprehending those works which contain a systematic account of the whole, or some part of the subject; such as Bergman's Physical Geography, the Geological Essays of Kirwan, the Théorie de la Terre de Delametherie, the writings of Werner, &c.; and the second comprising those works which treat of the geology of particular countries in the familiar style of travels; as Born's Travels in Hungary, Ferber's Travels through Italy, Saussure's Voyage dans les Alpes, Pallais's Travels, Jar's Voyages Metallurgiques, Saint Fond's Travels in England and Scotland, &c. After having acquired a knowledge of the principles and general facts of the science from the former, the student will, by means of the latter, increase his knowledge in the most familiar and agreeable way.

In the sketch of geology which we are to give in Arrng the following article, we shall consider the subject under four general heads, which will be the subject of many chapters.

In the first chapter we shall describe the arrangement and distribution of the materials of which the earth is composed. Here, after giving some general notion of that arrangement, we shall consider each of the principal materials under a separate section, in which we shall first lay down those general marks by which each is distinguished, describe its general arrangement, and mention the places, especially in Britain, where the substance is found in greatest abundance, and those metallic or mineral bodies which are commonly found in connection with it.

After having briefly considered each substance, we shall, in the second chapter, bring the more general distribution of them under one view, still directing our attention to the arrangement of these materials in the British islands.

In the third chapter we shall give a brief outline of the most remarkable theories that have been framed in modern times, to account for the distribution of mineral bodies, and the manner in which we find them now arranged. In this chapter we shall dwell more particularly on the two rival theories which at present divide the geological world, and shall enumerate some of the objections which have been made to each.

In the fourth chapter we shall give some account of the derangement of the substances that compose our globe, so far as it has originated from known causes; and this will lead us to the consideration of Earthquakes and Volcanoes.
G E O L O G Y.

Chap. I.

Division beyond the distribution of the materials into primary and secondary.

In the following short detail, many terms will occur which can be understood only by the mineralogist. They will be fully explained under the article Mineralogy. The names which we shall give to the substances described will be such as have been most generally adopted in this country; but to prevent ambiguity, we shall, where it seems to be necessary, add the synonymous names that occur in the best geological writings.

A. Primitive Compounds.

Sect. I. Of Granite.

Granite described.

The name granite has long been applied to all stones which are composed of an aggregate of quartz, feldspar, and mica, distributed in such a manner as that each of them appear in a separate state; but as this definition has been considered as too loose, and comprehending too many varieties, the name is at present restricted to that kind of granitic stone in which the quartz, feldspar, and mica, are found in grains or crystals. Of the three substances, the feldspar is generally the most abundant, and the mica the least.

Granite is found in the lowest and the highest situations of the earth that have yet been examined. It forms the basis of all the other strata; and though these are sometimes found below it, this situation seems to have been the consequence of some accident, by which the inferior substances were thrown below the granite. Many mountains seem almost entirely composed of granite, as Geporun one of the Rhetic Alps; and there is a high hill of white granite about six miles to the west of Strontian in Scotland. Sometimes large masses of granite are found in a detached situation at some distance from the mountains to which they appear to belong; and these masses seem in some instances to have been broken off, and rolled down the mountain, and in others to have been carried away by irresistible torrents, or dislodged by earthquakes. On the summits of the mountains near Fort Bonnach in Scotland, are found large quantities of detached pieces of granite, some of them of surprising size.

Granite is most commonly found in vast blocks, separated from each other by rifts or chasms, irregularly disposed. This is the case in most mountains, especially in those which have high, pointed spires. The structure of those blocks is pretty uniform, there occurring seldom more than two varieties, one called porphyritic granite, in which the basis is of a fine grain, containing large crystals of feldspar. Of this variety many instances occur in the north of Scotland, and near Carlsbad in Bohemia. The other principal variety is that in which the granite is found in distinct globular concretions, composed of concentric lamellae. This variety was observed by Mr Jameson, on the road between Dresden and Bautzen; and Mr Barrow, in his description of the Cape of Good Hope, mentions several globular concretions of immense size. The isle of Arran in Scotland also affords instances of the same variety. It is also found in Corsica, and is often called Coriscan granite.

It has been doubted by some geologists, whether the true granite is ever found stratified; but numerous instances of its stratification have been lately adduced, that leave no room to doubt that this is sometimes the stratified case. Pallas takes notice of some stratified granite on the banks of the river Berida, where what he considered as perfect primitive granite, compactly crystallized, is disposed in layers of various degrees of thickness, some not exceeding one-eighth of an inch, and bounded both above and below by blocks of solid granite. Again, Pallas’s on the banks of the Gromokles, he observed similar strata, layers of granite running in a direction from north to south, each bed being from one span to three feet six inches in breadth, and consisting of the most perfect primitive granite, which is considered as a continuation of that mineral tract which produces the fullars of the Dnieper. Mr Playfair mentions an example of stratified granite which he saw in Chorley forest in Lancashire, where real granite is disposed in beds on the eastern border of the forest, especially near Mount Strelitz. Another instance of real granite disposed in regular beds, is also mentioned by Mr Playfair as occurring near the village of Priestlaw in Berwickshire. Mr Jameson observed the Riesengebirge, which separates Silesia from Bohemia, to be for 150 miles composed of horizontal strata, and he observed a similar stratification in Saxony and Lubatia.

Granite constitutes the base of most of the British mountains, but is more commonly met with in the north and western parts of the island. There is a considerable mass of granite which runs longitudinally through Cornwall, from Dartmore to the Land’s End. Considerable masses are found in Scotland, but their extent has not been accurately ascertained. According to Mr Playfair, there is no mass of granite in any magnitude in the southern parts, except that of Galloway, which occurs in two large large insulated tracts. Mr Playfair thinks that Mr Dr Hutton greatly underrated the quantity of granite in Scotland, which, especially in the north, he considers as extending over a large district. If we suppose a line to be drawn from a few miles south of Aberdeen, to a few miles south of Fort William, it will, according to Mr Playfair, mark out the central chain of the Grampians, along which line there are many granite mountains, and large tracts in which granite is the prevailing rock.

It is remarkable that in the mountainous regions of Peru, especially in the environs of the volcanoes, granite is found, except in very low situations, at the bottoms of valleys.

Several varieties of granite are subject to decay, from the decomposition of the feldspar which they contain. This circumstance will probably explain a curious fact. It is found that the granite existing in the interior of mountains is much softer than that near the surface, probably from the decay of the feldspar in the latter, while it remains in its original state in the former.

Granite
Granite is by no means abundant in metallic and the richer mineral substances; it, however, contains a considerable variety, some of which have as yet been found in no other substance, especially molybdena. Iron ores are very commonly found in granite, especially the compact brown iron stone. It seems to be owing to the presence of iron that granite assumes that fine reddish colour with which we sometimes see it tinged. One of the most remarkable instances of this kind is afforded by the rocks to the south-east of the valley of Chamouni, at the foot of the Alps. These rocks, from their red appearance, are called "Les Aiguilles Rouges", or the red needles. These rocks were mentioned by Sauvassure, but he had not ascertained their composition. This has since been done by M. Berger, who found them to be composed of granite, with a considerable quantity of oxide of iron. Bismuth, cobalt, blende, galena (an ore of lead), and several ores of copper, are also sometimes met with; but the metal most frequently found in granite is tin, especially in the great mining field in Cornwall.

Sect. II. Gneiss.

Gneiss, by some writers called kneiss, is not unfrequently confounded with granite, from which it differs rather in the arrangement than in the nature of its component parts. These in gneiss are arranged in a schistose or slaty form, whereas in granite, they are in distinct grains or crystals, the layers being generally in the direction of the mica. It sometimes is intimately incorporated with masses of granite, but, in most instances, it reposes on the granite, being generally the second layer. In descending into the valley of Chamouni, Sauvassure observed a fine bed of true granite incorporated with a rock of gneiss, which was arranged in very fine layers. Sometimes the gneiss lies entirely below the granite; but this is uncommon. More generally there is found a vertical mass of granite, with strata of gneiss on each side of it. Very frequently granite and gneiss alternate with each other.

Sometimes whole mountains are composed of gneiss. Thus Ben Lomond scarcely contains any other substance, and the Schaw, which is the most northern point of the northernmost of the Shetland islands, is entirely gneiss. Mountains of this kind are, in general, neither so high nor so steep as those of granite, though Mount Rosa in Italy, and a few others, must be excepted. The summits of these mountains are also generally more rounded than those of granite mountains. The bases of all the Shetland islands seem chiefly composed of gneiss, and the middle part of the Pyrenees is almost wholly formed of this and granite.

It is curious that where gneiss is contiguous to granite, its quartz and feldspar are more apparent, and the mica less so; while, where it is more distant from granite, the contrary happens.

Several metallic ores are found in gneiss, particularly those of iron, as the magnetic iron stone, and martial pyrites; lead ores, tin ores, blende, cobalt, copper, and arsenical pyrites, and not unfrequently silver ores.

Sect. III. Micaeous Schistus.

This is otherwise called schistose mica, and mica slate. It is also composed of the same materials with granite and gneiss, except that it contains little or no feldspar; the quartz and mica being arranged in layers as in gneiss. This substance also is very abundant in most rocks and mountains. It generally composes the third layer or stratum, being immediately above or without the gneiss. It not uncommonly appears to be the only substance composing the hill or mountain, from the gneiss and granite being probably so completely covered as to be out of sight.

Micaeous schistus composes the rocks that are found immediately to the north of Dunkeld in Scotland, and it is here penetrated in every direction by veins of quartz. The southern shores of Loch Tay, the mountains of Glen Lochy, the vale of Tumel between Loch Tumel and Loch Rannoch, contain much of the same substance; and the lower part of Glen Tilt is chiefly composed of it. In the western Highlands towards Ben Lomond, micaeous schistus also abounds, and some of it is found in the north of Argyshire. The Shetland islands are mostly composed of micaeous schistus, in thick layers above the gneiss, with a few masses of granite interspersed.

It not unfrequently happens that a bed of micaeous schistus is intersected by veins of granite. Mr. Jameson observed an example of this in Glen Drummond in Banffshire, and another in the isles, of which he has given a plate. The veins are very large, and run across the strata of schistus in a direction nearly parallel to each other.

The metallic ores found in micaeous schistus, are metals in chiefly those of iron, copper, tin, lead, cobalt, and antimony.

Sect. IV. Quartz.

Quartz is not unfrequently found distinct from feldspar and mica, and sometimes whole mountains are found composed of it. In particular, the mountain of Kultuc, at the south-east end of the lake of Baikal, among the Altaishan mountains, which is 4800 feet long, 350 high, and above 4000 broad, consists entirely of milk-white quartz; and the mountain of Flintberg.

These are thus marked by Mr. Jameson. In its beginning disintegration it splits into masses, having a greater or less tendency to the quadrangular form; but these masses have still a degree of connexion amongst themselves, as is the case upon the mountain top. The next step is the enlargement of the fissures, by which the masses are loosened from their connection, and tumble down from their elevated situations, upon the summits of the neighbouring mountains, or are buried with impetuous velocity down the mountain side, covering the bottom of the glens with their stupendous ruins. Lastly, These detached masses, by the action of the weather, are completely disintegrated, forming a loose sand, which is left upon the tops or sides of the mountains, or is carried in great quantities to the sea shore by the torrents. Jameson's Mineralogy of the Scottish Isles, vol. i. p. 82.
GEOLOGY.

Chap. I.

Arrangement, &c, of the Materials of the Earth.

Sect. I.

There is a variety of porphyry mentioned by Charpentier, a great part of whose composition is indurated clay, and nodules of clay of different colours are found in its substance. Specimens of a similar nature occur in the western islands of Scotland. There is also a species of porphyry nearly allied to hornstone.

The two varieties last mentioned are rich in metallic ores; in the former these being formed of silver, copper, iron, lead, and antimony; and, in the latter, sparry iron ore, native sulphuret of iron, galena, black blende, and ores of bismuth.

A stone of a porphyritic nature is described by Werner under the name of 

GEOLOGY.

Sect. XII. Puddingstone and Breccia.

The distinction between these two stony matters was mentioned in note c: they are both sufficiently common, consisting of different materials. The breccia usually lies in bodies, almost at the top of the original strata, with some of which it sometimes alternates. Stratified breccias, consisting of fragments of flints and jasper, cemented by hardened clay, are frequently found in Russia, and sometimes alternate strata of breccia, porphyry, jasper, and other primary compounds, compose a considerable part of mountains. Some mountains in the north of Scotland contain masses of breccia, composed of fragments of red granite, micaeous schistus, and quartz, in a base of sandstone. Mount Scarden contains strata of this kind, surmounted by a rock of white quartz. Similar appearances take place at Cromarty, at Murray frith, and two or three miles to the south of Aberdeen; but in many of these instances the breccia must be considered as secondary. Much of the northern coast of Scotland abounds with breccia.

Puddingstone is also extremely common. A mountain of it is found in Siberia, near the rivulet of Tulat, being composed of fragments of jasper, chalcedony, aigue marine, and cornelian, cemented by a quartzose matter. Immense heaps, and even a mountain of puddingstone, are found at Meissenheim, in the Palatinate. Puddingstone is found in considerable abundance in passing from Loch Ness to Oban, in Scotland, and between Inverness and Dunolla. Large detached rocks of puddingstone are seen by Pallis in the village of Tumerdski, in the Crimea. Some of these masses are seven or eight fathoms long, lying one above another.

Sect. XIII. Syenite.

This name has been introduced by Werner, to describe a primary rock, essentially composed of grains of feldspar and hornblende, intimately blended together, in which the hornblende is generally most predominant. He first called it greenstone, but afterwards gave it the name of syenite, as he supposed it similar to a stone described by Piny, as found at Syene in Upper Egypt, where it was dug in great quantities, and from thence carried to Rome, for the purpose of building public edifices.

Syenite sometimes contains a few grains of quartz and mica; but these seem to be accidental, and are always in very small quantity. This stone is not commonly stratified.

Syenite usually overlays most of the other primary rocks, and has often a bed of breccia interposed between it and the inferior strata. It is very commonly found reposing on porphyry.

It is found in Saxony, in the environs of Dresden; at Meissen in Thuringia; in Hungary, and in general found in almost all primitive chains of mountains, especially in the Alps. It is doubtless the same which Saussure found in the summit of Mont Blanc, and which he calls granitelle.

Metallic veins are not unfrequently found in syenite. At Scharfenberg, veins of silver and lead are found in it; and it is said, that the veins of strotian in Argyleshire run in a similar rock.

Sect. XIV. Primitive or Granular Limestone.

It was long doubted whether limestone was ever to primitive be found unmixed with organic remains, or primitive limestone; but the observations of late mineralogists and geologists have fully proved, that primitive limestone exists in considerable quantity. This stone is of granular structure, and of a whitish grey colour, though frequently of a dark iron gray, or reddish brown. It is sometimes scaly or lamellar; at others nearly compact, and is now and then found to have a splintery fracture. It is generally unmixed with other primary compounds; but sometimes particles of mica, quartz, hornblende, &c, occur in it.

This stone is always found alternating with the primary strata, especially with gneiss, micaeous, and ar-fonded gillaceous schistus. It sometimes forms whole mountains, as in Stirié, Carnithia, and Carniola, in Switzerland and in the Pyrenees, being often found seven or eight thousand feet high. Three mountains in Switzerland, all exceeding 10,000 feet in height, are chiefly composed of it. In these situations it commonly forms immense blocks, without any regular dip or direction; but it is sometimes stratified, as at Altenberg near the lake of Neuenberg. It is sometimes interposed between syenite and hornblende slate. One of the most singular mountains of granular limestone is that of Filabres in Spain, consisting of a block of white marble three miles in circumference, and 2000 feet high, without any mixture of other earths or stones, and with scarcely any fissure.

A considerable part of Mont Perdu in the Pyrenees is composed of alternate vertical bands of granite, porphyry, limestone, hornblende, and petroiles.

Granular limestone is found in various parts of Britain, especially in the north of Scotland. One of the most remarkable examples of it occurs in the island of Islay;
GEOLOGY.

Perekop, which is minutely described by Pallas. Great Arrange-ment of the summit of Mont Perdu, the highest of the mountains, &c. Pyrenees, is composed of secondary limestone, arranged in nearly vertical strata, and so full of the remains of marine animals as in some places to appear as if composed of nothing else. Here it seems to repose on granular limestone.

The base of Mount Ingleborough in Yorkshire, which is near 30 miles in circuit, consists entirely of limestone, containing vast quantities of sea shells. This stone also forms the principal inferior strata through the greater part of Derbyshire, being arranged in beds of various degrees of thickness, from a few inches to about 200 fathoms in some places, not having been perforated; and abounding with shells, and other marine remains.

It is found in many quarries in Scotland distinctly stratified. Mr. Jameson notices quarries of limestone at Closeburn, and Barjarg, and at Kellhead in Dumfriesshire.

Secondary limestone often contains metallic veins, especially in Derbyshire, where it abounds with gales, found in blende, sulphur pyrites, and copper pyrites. Sulphur is also sometimes found in it. Kirwan remarks, that in the rest of Europe limestone is seldom metalliferous.

The stone commonly called alabaster, employed in making statues and ornaments, is properly a carbonated lime, nearly allied to marble; though it is usually supposed to be a variety of gypsum or plaster stone. There is a gypseous alabaster that will be noticed presently.

Calcareous alabaster is not often white (though as white as alabaster is a common proverb), but generally tinged with iron of a yellow, brown, or reddish cast. It is semipelliculid, and usually so soft as to be scratched by the nail.

It is commonly found in blocks, in marble quarries, as in the island of Paros, and in several parts of Italy, particularly in the territory of Volterra in Tuscany, in Malta, &c. A variety is found in the form of stalactites of a conical or cylindrical form.

SECT. XIX. Gray Wacke.

Gray wacke is a stone composed of fragments of quartz and argillaceous schistus, cemented by an argillaceous matter similar to the schistus, varying in size, eroded from that of a hen’s egg, till they are so minute as to be no longer visible. It sometimes contains a matter similar to siliceous schistus.

There is a variety of this stone, called by Werner gray wacke slate, which is a simple slaty stone, which bears a considerable resemblance to argillaceous schistus. From this, however, it is to be distinguished, according to Mr. Jameson, by the following characters:

"It has seldom a greenish or light yellowish gray colour, as is the case with primitive slate, but is usually ash and smoke gray. It does not shew the silvery continuous lustre of primitive clay slate, but is rather glimmering, which originates from intermixed scales of mica. Quartz scarcely occurs in it in layers, but usually traverses it in the form of veins. Further we do not find crystals of feldspar, selenite, talc, chlorite slate, or magnetic iron stone to be observed in it. It contains petrifications, particularly those varieties that border on gray wacke. It alternates with gray wacke. These stones are distinctly stratified, but the direction of the layers is difficult to observe."

B. Secondary Compounds.

The substances which we are now to notice are distinguished from those which we have been describing, in containing more or less the remains of organized beings. As the inferior strata of these secondary compounds usually contain fewer organic remains than those above them, they are sometimes subdivided into two orders, one of which is considered to be intermediate between the primary and secondary strata. This is Werner’s classification, of which we shall give an account in the next chapter.

SECT. XVIII. Secondary Limestone.

Under this title we shall comprehend what Werner calls transition limestone, foetid limestone, and limestone. Secondary limestone is a calcareous mass, sometimes granular, and sometimes compact, the former approaching to primitive limestone. Its fracture is scaly, and it is sometimes semitransparent. In colour it is very various, sometimes red, or rather blackish, with white veins, consisting of calcareous spar. It is often of a grayish cast. It sometimes forms vast blocks, without any appearance of stratification; at other times it is evidently stratified. It abounds with remains of marine animals, and often contains nodules of agate, and other similar stones.

A variety of calcareous stone is described by mineralogists under the name of swinestone. It is either compact, slaty, or porous, and is said in general to contain no petrifications, though some found in the mountain of Kinnecculla contains many. It is considered by Kirwan as primeval limestone, impregnated with petroleum.

Limestone is sometimes found in oviform balls, commonly containing a grain of sand in them. There is a variety of limestone that is very porous, and abounds in remains of vegetable matter, as impressions of leaves, &c.

Where found.

Secondary limestone is very abundant in most parts of the world, forming a considerable part of many mountains, and being often the principal stratum to a considerable depth below the surface. The mountain Iberg, in the Hartz, is composed of vast masses of it, irregularly rifted; and mountains of a similar kind are found in Siberia and in the Vivares. In some of those mountains vast caverns have been formed. Secondary limestone mountains always repose on some primitive stone; thus, in Siberia their base consists of granite, porphyry or hornblende; in Saxony, of granite, or granular limestone, and sometimes of argillaceous schistus; in Switzerland, these mountains repose on argillaceous schistus or gneiss, or sometimes on calcareous puddingstone. In the Crimea, there is an immense extent of secondary limestone, between Boslof and
G E O L O G Y.

1. Common gypsum is a compact, granulated stone, commonly of a grayish colour, and mixed with impurities, containing a considerable quantity of carbonate of lime. Its texture is seldom laminated, but it appears like coarse loaf sugar. This kind is very abundant, many hills being entirely formed of it. Of these the most remarkable are the plasterhills in the neighbourhood of Paris, those in the canton of Bern in Switzerland, and others among the Alps. Hills of gypsum occur also in Spain and Poland; near the White sea; in Asia, where they are mostly in horizontal strata; in the north Archipelago, between Asia and America. Saussure found a mountain in Switzerland composed of gypsum, sand, and clay. This kind sometimes contains petrifications, and often with the impressions of animal and vegetable matters; some very curious examples of which will be mentioned in a future section. It contains few metals, although copper is sometimes found in it, as are rock-salt and sulphur.

2. Lenticular. Gypsum is a curious variety, which seems peculiar to Montmartre in Paris. In one of the banks in this mountain, specimens of it are found containing little lenticular bodies, distinct and disseminated through the stone matter, so as to form a great part of its mass. A specimen of this kind is figured by Patrin, in his natural history of minerals.

3. The crystalysed gypsum is also found chiefly in the environs of Paris, in crystals that are decaedral, or sometimes like a rhomboïd octaedron, with the pyramids truncated near the base.

4. Fibrous. Gypsum, composed of short brittle threads disposed in bundles, is found in Derbyshire, and near Riom in Auvergne. A very beautiful variety, of a silky feel, and reticulated texture, is described by Patrin, as found in Poland, in the salt mines of Wielitschka; in Russia, near the junction of the river Oka with the Volga; in Spain; and in China.

A variety of gypsum with the appearance of vegetation is found in caverns near the baths at Matlock in Derbyshire. A beautiful specimen of it is figured by Patrin.

5. Gypsum is sometimes found hanging from the sides and roof of caverns in the form of stalactites, a transverse section of which shows their internal structure to be radiated. This variety is very similar called liché.

6. Gypsumous alabaster is very similar to true alabaster, except that it does not, like that, effervesce with acids, and is in general not so strong. It is found in great abundance in Derbyshire in large masses, filling up cavities in argillaceous grit. It never forms a stratum, but is generally attended with gravel, red clay, and shells. Mr. Mawe represents the lower portions as being very strong and compact, so as to form columns and pilasters. This kind is also found in Franche Comté, and on the Marne about six leagues from Paris, at Lagney.

6 Payn's Chalk is a very similar to true chalk, except that it does not, like that, effervesce with acids, and is in general not so strong. It is found in great abundance in Derbyshire in large masses, filling up cavities in argillaceous grit. It never forms a stratum, but is generally attended with gravel, red clay, and shells. Mr. Mawe represents the lower portions as being very strong and compact, so as to form columns and pilasters. This kind is also found in Franche Comté, and on the Marne about six leagues from Paris, at Lagney.

THOUGH FROM THE ORDINARY FORM OR SITUATION OF GYPSUM, AND THE ORGANIC REMAINS SO COMMONLY FOUND IN IT, THERE CAN BE NO DOUBT OF ITS BEING IN MOST CASES A SECONDARY ROCK; YET FROM ITS HAVING BEEN FOUND MIXED WITH MICA IN ST. GOATHARD, IT IS ENUMERATED BY SOME AMONG THE PRIMARY COMPOUNDS.
GEOLOGY

Nearly allied to this is what the miners call rubble, which is a common variety of slate found in many places, and forms one of the most valuable natural manures used in agriculture. This is also found of various degrees of hardness, from a soft powder to a stony consistence, in which last state it forms what Kirwan calls marlrite. In colour, it is usually a reddish white, sometimes verging upon red; and it is not unfrequently found of a yellowish brown or blackish cast. Marl is usually disposed in considerable beds of various degrees of thickness, in valleys and other low lands, especially among the coal strata. Indurated marl occurs in the coal strata of Midlothian, and it is also found in the island of Islay. Powdery marl is seen in Skye.

Sect. XXVI. Marl.

Marl is a substance chiefly composed of sand, clay, marl, and calcareous matter, which is found in many places, and forms one of the most valuable natural manures used in agriculture. This is also found of various degrees of hardness, from a soft powder to a stony consistence, in which last state it forms what Kirwan calls marlrite. In colour, it is usually a reddish white, sometimes verging upon red; and it is not unfrequently found of a yellowish brown or blackish cast. Marl is usually disposed in considerable beds of various degrees of thickness, in valleys and other low lands, especially among the coal strata. Indurated marl occurs in the coal strata of Midlothian, and it is also found in the island of Islay. Powdery marl is seen in Skye.

Sect. XXVII. Argillaceous Ironstone.

This is sometimes called metal stone, and is very argillaceous common in the coal countries. It is very heavy and compact, and of various colours, from a dark brown to a blood red; the latter forms the hematites or bloodstone, one of the richest iron ores. It often contains in it spherical balls like iron bullets. It is disposed in strata alternating with indurated clay, slate clay, marl, or sandstone, seldom far below the surface. It seldom forms very extensive beds, but is often confined to particular spots. Ironstone is found in great abundance in Cumberland, and in most parts of Scotland. It may be seen in the cliffs all along the coast of Fife, from Dysart to St Andrews.

Sect. XXVIII. Wacke and Basalt.

We have already spoken of several stones under the Whinstone name of tropes, that are found both among primitive and secondary compounds. The two substances which we are now to notice are nearly allied to the trapps, and have been classed with them under the general name of whinstone. This is a favourite term among the mineralogists of Scotland, of whom Sir James Hall employs it as a generic name to denote trap, basalt, wacke, grusstein, and basalt porphyry. The term is convenient, but Professor Phil.Trans. Jameson and others of the Wernerian school object to it as too vague and indefinite.

Wacke, or wacken, differs from trap only in being more compact and of a finer grain. It is heavy and very hard, so as often to strike fire with steel; it is dull and opaque, and breaks with an even fracture. Its colour is usually a reddish brown or gray of various shades,
The principal collieries of Britain are those of Newcastle and Whitehaven.

Newcastle is surrounded by collieries to the distance of six or seven leagues, and may, perhaps, be considered as the richest coal district in the world. There are in several of the Newcastle mines not fewer than 16 beds of coal, two of which are considerably thicker than the rest, being each about a fathom in thickness. These are called the main coal, and are distinguished from each other by a considerable number of stony strata. Good coal, in sufficient quantity, is generally found at the depth of more than 100 feet. The bed is five feet thick in some places, and less in others; but, in general, it is easily wrought, and large pieces are brought up. This last circumstance is of considerable advantage, as these pieces are most proper for chamber fires, and easily transported, which makes this kind of coal sell at a higher price. Where the bed of black and bituminous clay is penetrated, the coal is found adhering to it; but this is not always the case, for there are other mines in the neighbourhood where freestone is recovering, which, in the points of contrast, is mixed with coal to the thickness of two or three inches; the latter running, as it were, in splinters into the stone, and having a ligneous appearance, when attentively examined.

At Whitehaven, the beds of coal lie in a direction parallel to each other. Their inclination or dip is nearly to the west, and is from one yard in eight to one in twelve. The strata are frequently interrupted by large fissures, or dykes, some of which remove the strata upwards or downwards, 120 feet. The course of these fissures is almost east and west. In a depth from the surface of 16; and a half fathoms, there are, in these collieries, seven large beds of coal, and 18 thin beds, which cannot, at present, be rendered profitable.

The strata superincumbent on the large beds of coal are, 1st bed, Blue slate. 2d, Gray freestone. 3d, Hard, white freestone. 4th Blue slate, streaked or spotted with freestone. 5th, Gray slate. 6th, Hard, white freestone. The strata immediately beneath these large beds of coal, are from one and a half to six inches thick, and consist of a species of argillaceous earth, or shale. As this earth is of a very soft or friable nature, the weight of the superincumbent strata presses the pillar of coal through it. If the pillar descends a few inches, the roof not equally yielding at the same time, crushes, or breaks into small pieces. When, under these circumstances, the thickness of the bed does not exceed six feet, nor the depth 30 fathoms, the surface of the earth is sensibly affected.

There appear to be two principal belts of coal in this island, extending from the eastern to the western coast, one from Newcastle to Whitehaven, the other from the east coast of Scotland, across the vale of Forth and Clyde, to Ayrshire. Coal is indeed found in many other parts of the island; but the quantity is very trilling. The similarity of situation, and the similar nature of the coal at Whitehaven and Newcastle, would naturally lead us to infer, that the coal at both pieces is from the same seam. But this is placed beyond dispute, by a comparative examination of the strata in both situations. We shall here give two tabular views of the strata, one taken from Saintfond's Travels, and the other from Dr. Dixon's account of the Whitehaven mines, in his literary life of Dr. Brownrigg. Allowing for the different names given by different miners to the same substances, and Dr. Dixon's greater minuteness, there is a wonderful similarity between the two tables.

### Table I. Strata in Restoration Pit, St Anthon's Colliery, Newcastle, to the depth of 135 fathoms.—From Saintfond.

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<td>Soil and clay.</td>
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<td>Brown freestone.</td>
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<td>Coal, I.</td>
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<td>Blue metalstone.</td>
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<td>White girdles.</td>
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<td>Coal, II.</td>
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<td>White and gray freestone.</td>
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<td>Soft blue metal stone.</td>
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GEOLOGY.

Sect. XXXI. Of Fossils and Petrifications.

These organic remains of vegetable and animal matter which are found below the surface of the earth, mixed with the stony matters which are properly the component parts of the earth, are generally called fossils, or extraneous fossils. If they have entirely lost all traces of vegetable or animal matter, and have assumed a stony earthy nature, they are called petrifications.

Some of these organic remains, particularly those of the vegetable kind, are found penetrated with a bituminous substance, so as to be rendered highly inflammable. One of the most curious circumstances attending these fossil bodies is, that they are very commonly natives of a different country from that in which they are found, or are the remains of species that are now no longer known.

We may properly divide these substances into those of the vegetable and those of the animal kingdom.

1. Vegetable fossils. Almost every part of vegetables, the trunks, branches, leaves, and fruits, have been found in a fossil state, or impressions of some of them are seen in various mineral substances, especially in the slaty stone which accompanies coal.

Fig. 6. represents a curious example of this, which was found in the mines at Saint Etienne in France. A, is a fruit resembling that of coffee. B, is a portion of an unknown vegetable, apparently of the verticillate tribe. C, is a species of fern, which is very remarkable, as it is furnished with fructifications. D, is part of a plant with verticillate leaves, probably a species of galium. E, is some exotic fruit.

Whole trees are often found below the surface of the earth, especially in bogs and moors, sometimes retaining much of their vegetable nature, but more commonly either impregnated with bitumen or completely petrified. Subterraneous trees are frequently dug up in the isle of Anglesea; and in the isle of Man there is a marsh six miles long and three broad, in which 45 trees are found in great quantities; and though they are 18 or 20 feet below the surface, they appear as if standing firmly upon their roots. Subterraneous trees, in various states, are frequently found in Ireland, especially in the neighbourhood of Lough Neagh. Much has been written on the subject of these petrifications of Lough Neagh, by Dr Boate, in his Natural History of Ireland; by Mr Molyneux, in the Philosophical Transactions, No. cviii.; and Dr Barton in his Lectures on Natural Philosophy. Some of these trees are represented as of an immense size. One of the most curious instances of vegetable fossils, is that related by Bonampacini, as seen by him at Modena in Italy. At the bottom of wells, that are dug there below stony masses, which appear to have been the foundation of a former city, at the depth of near 30 feet, they find heaps of wheat entire, with their nuts, briars, &c. They find, likewise, every six feet, a layer of earth, alternating with branches and leaves of trees.

At the depth of 28 feet, or thereabouts, they find a chalk that cuts very easily. It is mixed with shells of several sorts, and makes a bed of about 12 feet. After this bed, they find a bed of marly earth, of about two feet, mixed with rushes, leaves, and branches. After this bed comes another chalk bed, of nearly the same thickness with the former, which ends at the depth of 49 feet.

That is followed by another bed of marly earth like the former; after which comes a new chalk bed; and these successive beds are always found in the same order. The auger sometimes finds great trees, which give the workmen much trouble. They see also sometimes at the bottom of these wells, great bones, coals, shunts, and pieces of iron.

These vegetable fossils are generally of a flinty structure, being sometimes rough and sandy; at others so hard and compact as to admit of a fine polish. Some beautiful specimens of petrified wood, of the appearance of stags, are to be seen in cabinets of natural history. That of Beson at Paris contains two examples of this kind, which are figured at fig. 7. and 8. Fig. 7. is a transverse section of a piece of agatized wood, in which the ligneous texture is most completely preserved. Fig. 8. is another more compact, and which has the additional singularity of containing several worms. The white oval spots are supposed to have been eggs, from which the worms had issued. In Dr Miller’s Mineralogical Cabinet there is a similar specimen containing worms and their ova from Siberia, as well as many beautiful specimens of agatized wood from Siberia and Germany.

Among the bituminous vegetable fossils, none have been yet attracted more attention than what is called boxy coal, a substance of an intermediate nature between wood and pitcoal, which is dug up in a common near Chudleigh in Devonshire. It is of a laminated texture, of a chocolate, or sometimes of a shining black colour, like deal boards that had been half charred. It burns heavily, and consumes to light gray ashes. It is regularly stratified among beds of sand and clay, and the beds of coal are sometimes of considerable thickness. Mr Parkinson has collected much information respecting the Remains of former and present state of this coal, in his entertaining letter on fossils.

2. Animal fossils. Fossils of animal matters are still more common than those of vegetables. Shells and bones are found in almost every bed of limestone, and in almost every country, at the bottom of the deepest valleys, and at the tops of very considerable mountains.

In the limestone strata in Derbyshire are found many of those fossils, which are called star-stones, and acrostichum, which appear to be the remains of marine animals called encrini. These are described by Whitehurst, who has given figures of similar animals brought entire from the West Indies. Fig. 9. represents one of these stones.

The isle of Cherze in Dalmatia contains caverns in which are found prodigious quantities of fossil bones of oxen.
GEOLOGY.

Those lately discovered by Ramond on the summit of Mont Perdu, the highest of the Pyrenees, where there are found vast quantities of sea shells and other marine spoils, and even skeletons of animals in a fossil state. Whole skeletons of very large animals have been discovered in a fossil state. Those of elephants have been found buried in the plains of Siberia; and bones of the rhinoceros, the hippopotamus, and the tapir, have been found in other places. A very large skeleton, nearly complete, of an immense animal, similar to the rhinoceros, is preserved in the cabinet of Madrid. It was dug up at Paraguay in South America, at the depth of 150 feet, in a sandy bed, on the banks of the river de la Plata. A description and engraving of it are given by Cuvier, in the Annals of the National Museum, N° 29. It appears to be at least 12 feet long, and the bones are of an immense size.

A prodigious quantity of fossils, both of marine animals, and of quadrupeds, are found in the plaster hills of Montmartre near Paris. An account of these has lately appeared in several numbers of the Annals of the National Museum, by M. Lamarck, accompanied with the anatomical illustrations of Cuvier. These papers are extremely curious, and contain engravings of most of the fossils described, some of which are the remains of unknown animals. Our limits do not permit us to present our readers with even an abstract of these accounts. We shall therefore select only one example.

Fig. 10. represents a block of gypsum, on the surface of which is the skeleton of an animal resembling a mouse, or, according to Cuvier, one of the opossum tribe. The skeleton is nearly entire, and the head, the neck, the spine, the pelvis, one of the fore and hind legs, and part of the tail, are very distinct. There were two pieces of gypsum found together, which appear to have divided the skeleton between them. The animal seems to have been crushed or imbedded in its natural situation.

We have now enumerated the principal materials that compose the external crust of our earth, and have mentioned some of the most material circumstances respecting each. The metallic ores still remain to be considered, and they shall be noticed in describing metallic veins.

CHAP. II. General Distribution of the Materials of the Earth.

The uppermost stratum of the earth, in low situations, is, for the most part, composed of sand or clay, or a mixture of these, forming beds that are either composed of the same mixture, or of alternate layers of the two substances. These beds vary in thickness, in different places; but, in the same place, they usually preserve nearly the same thickness for a considerable extent. Sometimes these beds of clay, sand, and earth, with shells, extend to the depth of some hundred feet. See the annexed table, I. (E).

This table exhibits a view of the arrangement of strata in several countries of Europe; and, with the tables of coal strata, in the last chapter, will give the reader more information on this subject than an elaborate detailed account.

(E) The following works are referred to in the table of strata.

† Buffon, Nat. Hist. vol. 1. art. vii.
‡ Bergman, Descript. Phys. de Terre, sect. viii.
§ Kirwan, Geol. Essays, p. 239.
¶ Whitehurst's Theory of the Earth, sect. xvi.
** Ib. sect. xix.

TABLE.
Table of the order of Strata in Various Parts of Europe.

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GEOLGY.

In our subsequent view of the distribution of the stony matters that compose the earth, we shall consider,
1. The nature, disposition, and structure, of mountains.
2. The nature, direction, &c. of dykes.
3. The nature, direction, &c. of metallic veins.

SECT. I. Of Mountains.

There are no objects on the surface of the earth which are so well calculated to excite the attention of mankind in general, and that of geologists in particular, as those stupendous elevated masses which we call mountains. The term mountain has in general been applied to those parts of the earth which are elevated to a very considerable height above the level surface; and a mountain is in common language distinguished from a hill only by its superior elevation. But as it is found necessary in a scientific point of view to render this distinction more accurate and precise, various geologists have given more correct definitions. By Pini and Mitteracher every elevation whose declivity makes with the horizon an angle of at least 15°, and whose perpendicular height is not less than one-fifth of the declivity, is called a mountain. Werner distinguishes mountains according to their height, into high, middle-seated, and low. A high mountain according to him is that whose perpendicular height exceeds 6000 feet; when the height is not above 5000 nor below 3000 he calls it middle-seated; and when its height is below 3000 feet, he calls it low.

Mountains are either single or in groups; and these groups either consist of several mountains standing nearly each other so as to occupy nearly the centre of a certain space of ground, or they follow each other so as to form a ridge or chain, running across a country, or along its shores. Sometimes these chains run in a longitudinal direction, as is the case with Mount Caucasus and the Uralian mountains in Asia, the Cordilleras in South America, &c. but often they run in a curvilinear direction like a crescent, as the Carpathian mountains, which separate Hungary from the rest of the Austrian territories. It has been supposed by some theoretic writers, that chains of mountains always run in nearly the same direction, which has been conceived to be from east to west; but this is by no means exact, as later observations have shown that they assume different directions according to the form of the country where they are situated. Some writers have laid it down as a general rule, that chains of mountains always extend in a direction nearly parallel to the length of the country; but to this there are also many exceptions. Thus the Uralian mountains, the Carpathians, the Pyrenees, the Himalians in Scotland, and many others, run rather across the country. It often happens that mountains occupy nearly the central parts of a country; and the land generally slopes with a gentle declivity towards one side of the chain, while towards the other it is considerably steeper. This circumstance of one side of a chain of mountains being steeper than the other, has been lately extended to mountains and hills in general; and Dr. Kirwan has written an excellent paper on the subject, from which we shall here extract the most important observations.

That one part of almost every high mountain or hill is steeper than another, could not have escaped the notice of any person who had traversed such mountains; but that nature in the formation of such declivities had any regard to different aspects or points of the compass, seems to have been first remarked by the celebrated Swedish geologist Mr. Tilton, in the 2nd vol. of the Memoirs of Stockholm for 1765. Neither Vernius, Lolojph, nor Buffon in his natural history published in 1784, have noticed this remarkable circumstance.

The observation of Tilton, however, relates only to the extreme ends, and not to the flanks of mountains; the steep side facing the steepest declivity always faces that part of the country where the land lies lowest; and the gentlest, that part of the country where the land lies highest; and that in the southern and eastern parts of Sweden they consequently face the east and south-east; and in the northern the west. The essential part of this observation extends therefore only to the general elevation or depression of the country, and not to the bearings of their declivities.

The discovery that the different declivities of the western flanks of mountains bear an invariable relation to their sides seems to have been first published by Mr. Bergman in his Physical Description of the Earth, of which the second edition appeared in 1773. He there remarked, that in mountains that extend from north to south, the western flank is the steepest, and the eastern the gentlest. And that in mountains which run east and west the southern declivity is the steepest, and the northern the gentlest. Vol. II. § 187.

This assertion he grounds on the observations related in his 1st vol. § 32; namely, that in Scandinavia, the Soevoberg mountains that run north and south, separating Sweden from Norway, the western or Norwegian sides are the steepest, and the eastern or Swedish, the most moderate; the verticality or steepness of the former being to that of the latter as 40 or 50 to 4 or 2.

That the Alps are steeper on their western and southern sides than on the eastern and northern.

That in America the Cordilleras are steeper on the western side, which faces the Pacific ocean, than on the eastern. But he does not notice a few exceptions to this rule in particular cases which will hereafter be mentioned.

Buffon, in the first volume of his Essay on the Earth, published in 1778, p. 128, is the next who notices the general prevalence of this phenomenon, as far as relates to the eastern and western sides of the mountains that extend from north to south; but he is silent with respect to the north and south sides of the mountains that run from east to west; nay, he does not seem to have had a just comprehension of this phenomenon; for he considers it conjointly with the general dip of the regions in which these mountains exist. Thus he tells us, vol. 1. p. 185, that in all continents the general declivity, taking it from the summit of mountains, is always more rapid on the western than on the eastern side; thus the summit of the chain of the Cordilleras is much nearer to the western shore than to the eastern; the chain which divides the whole length of Africa, from the Cape of Good Hope, to the mountains of the Moon,
In Asia.

12. The Ourals, which stretch from north to south, are far steeper on the western than on the southern sides. *Herman Geologie*, p. 90; and 2. Ural Beschreibung, p. 389.

13. The mountain of Armenia, to the west of the Ourals, is steep on its east and north sides; but gentle on the southern and western. *Pallas Voy*, p. 277.

14. The Altaiische mountains are steep on their southern and western sides, but gentle on the northern and eastern. *Foster*, ibid. and *Herman*. 2. Ural Beschreibung, p. 390, in the note.

15. So also are the mountains of Caucasus. 3. *Schrift. Berl. Gelasch. 471*.


17. The Chaints in the Indian peninsula are steep on the western side.

18. The mountains of Syria, which run from north to south, skirting the Mediterranean, are said to be steeper on the western side, facing the Mediterranean. 4. *La Methode*, p. 380.

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**Table of the Heights of Mountains, according to the latest computations.**

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<th>Mountains</th>
<th>Height by Barom.</th>
<th>Height by Geometry.</th>
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<tr>
<td>Cameragh</td>
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<tr>
<td><strong>In France.</strong></td>
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<tr>
<td>Puy de Sansi</td>
<td>6300</td>
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<tr>
<td>Plomb de Cantal</td>
<td>6200</td>
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<tr>
<td>Puy de Dome</td>
<td>5000</td>
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<tr>
<td><strong>In America.</strong></td>
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<tr>
<td>Mont Perdu</td>
<td>11,000</td>
<td></td>
</tr>
<tr>
<td>Canigou</td>
<td>9,000</td>
<td></td>
</tr>
<tr>
<td><strong>Pyrenees.</strong></td>
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<td></td>
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<tr>
<td>Mont Blanc</td>
<td>15,663</td>
<td></td>
</tr>
<tr>
<td>Schreckhorn</td>
<td>13,000 +</td>
<td></td>
</tr>
<tr>
<td>Finsterraar</td>
<td>13,000 +</td>
<td></td>
</tr>
<tr>
<td>Mont Titlis</td>
<td>10,818</td>
<td></td>
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<tr>
<td>Mont Rosa</td>
<td>15,000</td>
<td></td>
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<tr>
<td>Mont Cenis</td>
<td>9,760</td>
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<tr>
<td><strong>In the Tyrol.</strong></td>
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<tr>
<td>Glochern</td>
<td>11,500 Fr.</td>
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<tr>
<td>Ortele</td>
<td>13,000 Fr.</td>
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<tr>
<td>Plessy Kogel</td>
<td>9,748 Fr.</td>
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<td><strong>Germany.</strong></td>
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<tr>
<td>Stuben</td>
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<tr>
<td>Brenner</td>
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<td>Lomnitz peak</td>
<td>8640</td>
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<tr>
<td>Kesmark peak</td>
<td>8,508</td>
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<td>Krivaz</td>
<td>8,543</td>
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<tr>
<td><strong>Sicily.</strong></td>
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<tr>
<td>Etna</td>
<td>10,032</td>
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<tr>
<td><strong>In Denmark, Norway, and Sweden.</strong></td>
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<tr>
<td>Swukku</td>
<td>0900</td>
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<tr>
<td>Arekutan</td>
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<tr>
<td>Kinnecullin</td>
<td>931</td>
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<tr>
<td>Brotack</td>
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In America.

"The Cordilleras run from north to south; their western flanks towards the Pacific are steep, and their eastern descend gradually."

"In Guiana there is a chain of mountains that run from east to west; their southern flanks are steep, their northern gentle. *Voyages de Condamine*, p. 140."*
Many argillites, particularly roof slates, are generally said to have nearly a vertical position; but Voight has shown that it is only their lamellae that are so situated; their horizontal seams, and their walls, discovering their true position; their verticality arising only from the drain of the water, and, consequently, their contraction in that direction; hence those that are most silicified, as they contract less, display less verticality. Sometimes horizontal strata overlap on both sides. Sometimes they are flanked on both sides with vertical strata.

"Much confusion prevails in the structure of the Pyrenees, and of the Grison mountains, and those on the borders of the Baikal, and other great lakes.

"The perturbed state of the strata often proceeds from the decomposition of internal beds of pyrites, to which water has had access; this appears to be the cause of the alterations observed in the mountain of Rabsberg, on the frontiers of Saxony. In this mountain a double direction of the strata of gneiss is observed; between both the strata are vertical, and a large intermediate space is filled with iron ore; but this mountain contains beds of pyrites and vast swallows; most probably then the pyrites swoll, uplifted the whole, and the dissolved iron flowed into the vacancy, from which the water afterwards drained off on the sides.

"In secondary mountains, particularly the calcareous, the greatest disorder often prevails, though in general their stratification is horizontal.

"The calcareous mountains of Savoy are often arched like a lambda, probably from the sinking of the intermediate strata, the intermediate remaining horizontal. Sometimes they assume the form of the letters Z. S. C. or of a disjointed G, the convexities facing each other. So also in the Pyrenees, they sometimes overlap, from an unequal distribution in their original formation, and bend various ways. They assume a spiral form, or that of a horse-shoe placed horizontally.

"According to Lehman, most secondary strata present hollows or monts, (as they are called,) from internal depression. But sometimes also elevations, from an original elevation in the fundamental stone.

"In Scotland, all the secondary strata in the vicinity of primeval mountains, are nearly vertical; but at a greater distance they approach more to an horizontal direction.

We shall now trace the course of the principal mountains on the globe, and in accompanying us, the reader may have before him a good map of the world.

M. Buache places the most elevated points of the great chains of mountains under the equatorial line; but, according to Dallias, the fullest and most continuous lands, and perhaps likewise the most elevated, are to be found at a distance from the equator, and towards the temperate zones. If, in fact, we survey the globe's surface, we shall not be able to perceive that chain of mountains, which running from east to west, and dividing the earth into two portions, ought again to meet. On the contrary, extensive plains seem to accompany the line through almost its whole extent. In Africa, the deserts of Nigritia and those of Upper Ethiopia are on the one side of the line; and on the other are the sandy plains of Nicoco, Cafraria, Monemugi, and Zangaia. From the eastern shores of Africa to the Sunda islands, is a space of 1500 leagues of sea, with almost no islands, except the Laccadive and Maldives; most part of which have little elevation, and which run from north to south. From the Molucca islands and New Guinea, to the western borders of America, the sea occupies a space of 3000 leagues. Though Chimborazo and Pichincha in America, the two highest mountains which have been measured, are near and even under the line, yet from this no conclusion can be drawn; because on one side these mountains run in a direction not parallel to the equator; the Andes or Cordilleras attain a greater elevation as they remove from the equator towards the poles; and a vast plain is found exactly under the line, between the Oroonoko and the river of the Amazonas. Besides, the latter river, which takes its rise in the province of Lima about the 11th degree of south latitude, after crossing the whole of South America from west to east, falls into the ocean exactly under the equator. This shows that there is a descent for the space of 12 degrees or 300 leagues. From the mouth of the river of the Amazonas, to the western shores of Africa, the sea forms another plain of more than 30 degrees.

From the few certain facts and accurate observations which we have received from well informed travellers, we might almost affirm, that the most elevated land on our globe is situated without the tropics in the northern and southern hemispheres. By examining the course of the great rivers, we in fact find that they are in general discharged into three great reservoirs, the one under the line, and the other two towards the poles. This, however, we do not mean to lay down as universally true; for it is allowed, that, besides the two elevated belts, the whole surface of the earth is covered with innumerable mountains, either detached from one another or in a continued chain. In America, the Oroonoko and the river of the Amazonas run towards the line, while the river St Lawrence runs towards the 50th degree of north latitude, and the river de la Plata towards the 40th degree of south latitude. We are still too little acquainted with Africa, which is almost all contained within the tropics, to form any accurate conclusions concerning this subject. Europe and Asia, which form only one great mass, appear to be divided by a mere elevated belt, which extends from the most westerly shores of France to the most easterly of Chins, and to the island of Sugaleen or Anga-bata, following pretty nearly the 50th degree of north latitude. In the new continent, therefore, we may consider that chain where the Mississippi, the river St Lawrence, the Ohio, and the river de los Estrechos, take their rise, as the most elevated situation in North America; whence the Mississippi flows towards the equator; the river St Lawrence towards the north-east, and the rest towards the north-west. In the old continent, the belt formerly mentioned, and to which we may assign about 10 degrees of breadth, may be reckoned from the 45th to the 55th degree of north latitude: for in Europe the Tagus, the Danube, the Dnieper, the Don and the Volga, and in Asia the Indus, the Ganges, the Mero, the Mecon, the Hoang-ho, and the Yang-tze-Kiang, descending as it were from this elevation, fall into the great reservoir between the tropics; whilst towards the north..."
Chap. II: G E O L O G Y.

Judging from those mountains the height of which has been calculated, and from the immense chains with which we are acquainted, we may infer that the highest mountains are to be found in this elevated belt. The Alps of Switzerland and Savoy extend through the 45th, the 46th, and the 47th degrees. Among them we find St Gothard, Furca, Brusning Russ, Whibgis, Scheideck, Gunsgela, Galanda, and lastly that branch of the Swiss Alps which reaches Tirol by the name of Arenal and Arula. In Savoy, we meet with Mont Blanc, the Peak of Argentiere, Corinero, Great and Little St Bernard, Great and Little Cenis, Couplance, Servin, and that branch of the Savoyard Alps which proceeds towards Italy through the duchy of Aost and Montferrat. In this vast heap of elevated peaks, Mont Blanc and St Gothard are particularly distinguished. The Alps, leaving Switzerland and Savoy, and passing through Tirol and Carinela, traverse Salzbourg, Stria, and Austria, and extend their branches through Moravia and Bohemis, as far as Poland and Prussia.—Between the 47th and 48th degrees, we meet with Grimming the highest mountain of Stria, and Priel which is the highest in Austria. Between the 46th and 47th degrees, the Bacher and the Reinschneider, form two remarkable chains. The upper one, which traverses the counties of Transcin, Arrava, Scopus, and the Kreyms, separates Upper Hungary from Silesia, Little Poland, and Red Russia; the inferior one traverses Upper Croatia, Bosnia, Servia, and Transylvania, separates Lower Hungary from Turkey in Europe, and meets the upper chain behind Moldavia, on the confines of Little Tartary. In these mountains are situated the rich mines of Schemnit.

To form a general idea of the great height of this Alpine belt, it is necessary only to remark, that the greatest depth of the wells at Schemnit is 200 toises; and yet it appears from the barometrical calculations of the learned M. Noda, that the greatest depth of those mines is 286 toises higher than the city of Vienna. The granito-argillous mountains of Schemnit, and of the whole of this metallic district, are inferior, however, to the Carpathian mountains. Mount Krivany, in the county of Arrava, and the Carpathian mountains between Red Russia and the Kreyms, appear by their great elevation to rule over the whole of the upper Alpine chain. In the inferior chain we likewise meet with mountains of an extraordinary height; among others, Mount Mediednik, which gives its name to a chain extending far into Bosnia; and Mount Hemus, celebrated even among the ancients. In short, this extensive chain reaches into Asia, and is there confounded with another chain no less famous, which, following exactly the 50th degree of latitude, runs through the whole of Asia. This chain of mountains is described by Dr Pallas in the work above mentioned; and we shall now trace its course in company with this intelligent observer.

Uralian chain.

This author places the head of the mountains of Oural, between the sources of the Yalik and the Bielais, about the 53d degree of latitude, and the 47th of longitude. Here the European Alps, after having traversed Europe, and sent off various branches which we shall afterwards examine, lose their name, which is changed into that of the Uralic or Uralian mountains, and begin their course in Asia. This lofty chain, which separates Great Bulgaria from the deserts of Sichmanka, proceeds through the country of the Eleuths, follows the course of the river Iritis, approaches the lake Teleskina, and afterwards forms a part of the same system of mountains with the Altai chain. There they give rise to the Obi, the Iritis, and the Jenisei, which begin their course about the 50th degree of north latitude, and fall into the Frozen ocean.

The Altai chain, after having embraced and united all the rivers which supply the Jenisei, is continued under the name of Safanes, without the smallest interruption, as far as the Baikal lake. The extension of this chain to the south forms that immense and elevated plain which is lost in Chinese Tartary, which may be compared with the only plain in Quito, and which is called Gobi or Chamo. The Altai afterwards interposing between the source of the Tchikhi and of the rivers which supply the Amur or Sagaleen, rises towards the Lena, approaches the city Jakuck beyond the 60th degree of latitude, runs from that to the sea of Kamtschatka, turns round the Ochokoi and Pensink gulfs, joins the great marine chain of the Kurile isles near Japan, and forms the steep shores of Kamtschatka, between the 55th and 60th degrees of latitude. After running in the same parallel, and giving rise to the Ohio, the Riviere Longue, the river St Lawrence, and the Mississippi, they are lost in Canada. From the eastern shores of America to the western shores of Europe, we find a vast interruption.

The European Alps produce three principal chains—Alpine chains which run towards the equator, and some smaller ones running towards the pole. The first southern chain is sent out through Dauphine; traverses Vivarais, Lyonnais, Auvergne, Cevennes, and Languedoc, and, after joining the Pyrennees, enters Spain. There it divides into two or three ramifications, one of which runs through Navarre, Biscay, Arragon, Castile, Marche, and Sierra Morea, and extends into Portugal. The other, after traversing Andalusia and the kingdom of Granada, and there forming a number of mountains, again makes its appearance, beyond the strait of Gibraltar, in Africa, and coasts along its northern shores, under the name of Mount Atlas.—The second principal chain of the Alps passes out through Savoy and Piedmont; spreads its roughnesses over the states of Genoa and Parma; forms the belt of the Appennines; and after frequently changing its name, and dividing Italy into two parts, terminates in the kingdom of Naples and in Sicily, producing volcanoes in every part of its course. The third chain is sent off from Hungary, and scatters innumerably mountains over all Turkey in Europe, as far as the Morea and the Archipelago at the bottom of the Mediterranean sea. The northern branches, though smaller at first, are no less clearly defined; and some of them even extend their ramifications as far as the Frozen ocean. An Alpine branch, issuing from Savoy through the country of Gex, proceeds through Franche Comté, Suntaw, Alsace, the Palatinates, and Vetterbia.—

4 D 2
Another issue from the territory of Saltzburg, passes along Bohemia, enters Poland, sends off a ramifications into Prussia towards the deserts of Waldow, and after having passed through Russia is lost in the government of Archangel.

The Asiatic Alps send forth in like manner several branches both to the south and north. The Ouralic mountains, between the sources of the Bielaia and the Jaiak, produce three principal branches; the first of which, including the Caspian sea in one of its divisions, enters Circassia through the government of Astracan; passes through Georgia under the name of Caucasian, sends a vast number of ramifications to the west into Asiatic Turkey, and there produces the mountains, Tschider, Ararat, Taurus, Argée, and many others in the three Arabias; while the other division, passing between the Caspian sea and the lake Aral, penetrates through Chorasan into Persia. The second branch, taking a more easterly direction, leaves the country of the Eleuthes; reaches Little Bucharia; and forms the ramparts of Gog and Magog, and the celebrated mountains, formerly known by the name of Cuff, which M. Bailly has made the seat of the war between the Dives and the Peris. It traverses the kingdoms of Casgar and Turkestan, enters through that of Labor into the Mogul territory, and, after giving rise to the elevated desert of Chamo, forms the western peninsula of India. While these two branches run towards the south, the third branch of the Ouralic chain rises towards the north, following almost the 70th degree of longitude, and forms a natural boundary between Europe and Asia; without, however, bounding the immense empire of Russia. This chain, after coming opposite to Nova Zembla, divides into two considerable branches. The one, running to the north-east, passes along the Arctic shores; the other, proceeding towards the north-west, meets the northern European chain, traverses Scandinavia in the shape of a horse shoe, covers the low lands of Finland with rocks; and, as is observed by Dr Pallas, appears to be continued from the North Cape of Norway through the marine chain of Spitzbergen, scattering islands and shelves perhaps throughout the northern ocean, that, passing through the pole, it may join the northern and eastern points of Asia and North America.

The Ouralic, which, in the country of the Mongols, becomes the Altaic chain, proceeds towards the equator. After forming the mountains and caverns wherein, as we are told, the ashes of the Mongol emperors of the race of Gengis-Kan are deposited, together with the vast plain of Chamo, consisting of arid sand, and the frightful rocks and precipices of Tibet, which form the mysterious and desert retreats of the Grand Lama, it crosses the rivers Ava and Memon; contains in its subdivisions the kingdoms of Ava, Pegu, Laos, Tonquin, Cochín-China, and Siam; supports the peninsula of Malacca; and overspreads the Indian ocean with the isles of Sunda, the Moluccas, and the Philippines. From the borders of the Baikal lake and of the province of Selinginskoy a branch is detached, which spreads over Chinese Tartary and China, is continued into Corea, and gives rise to the islands of Japan.

The great chain having extended to the north, near the city of Jakuck, upon the banks of the Lena, sends off one of its branches to the north-west, which, passing between the two Tungus, is lost in marshy grounds lying in the northern parts of the province of Jenisseiskoy. The same chain, after it has reached the eastern part of Asia, is lost in the icy regions of the north about Novo-Tschaltatskoy, or the icy Promontory, and Cape Cauzenskoy.

It will be more difficult, perhaps, to trace the elevated belt in the southern hemisphere beyond the tropic of Capricorn, than it has been to distinguish that towards the north. An immense extent of ocean seems to occupy the whole Antarctic part of the globe. The greatest south latitude of the old continent is not more than 34 degrees, and South America scarcely extends to the 50th degree. In vain has the enterprising Cook attempted to discover regions towards the pole: his progress was constantly interrupted by tremendous mountains and fields of ice. Beyond the 50th degree no land and no habitations are to be found. The islands of New Zealand are the farthest land in these desert seas; and yet the south cape of Taral-Poenamoo extends only to the 48th degree: We do not mention Sandwich land, which is situated in the 58th degree, because it is too small and too low. It must be recollected, however, that, according to the declaration of travellers, the Cordilleras become higher as they advance southward to the straits of Magellan; and that Terra del Fuego, which lies in the latitude of 55, is nothing but a mass of rocks of prodigious elevation. America, however, exhibits to our view elevated points, whence chains of mountains are distributed in different directions over the whole surface of the new continent. There must likewise be great reservoirs, where the most remarkable rivers take their rise, and from which they necessarily descend towards their mouths. In the southern hemisphere, this elevated belt is nearer the equator; and though it does not extend to the 90th degree, it is evidently to be met with, and may be accurately traced, between the 20th and 30th degrees. The high mountains of Tucuman and of Paraguay, which intersect South America about the 25th degree of latitude, may be considered as the American Alps. If we look into the map of the world, we shall be able to distinguish an elevated belt all along this parallel. In Africa, Monomotapa and Caffraria are covered with very high mountains, from which pretty large rivers descend. In the Pacific ocean, we find New Holland, New Caledonia, the New Hebrides, and the Friendly and the Society islands, under the same parallel. We may, therefore, with sufficient propriety, distinguish this parallel by the name of the Southern Alps, as we have already distinguished the elevated belt of the 50th degree of north latitude by that of the Northern Alps. In America, the Rio de la Plata, which, after a course of 500 leagues, falls into the ocean at the 35th degree of south latitude, the Pampas, which rises from the mountains of the Arapes, and falls into the Plata at Corrientes; the great number of rivers which flow into that of the Amazon, such as the Paraba, which receives in its course the tribute of more than 30 other rivers; the Madera, the Cuchiar, the Ucayal, &c. &c. all descend from these southern Alps. From these Alps likewise three considerable branches of mountains are detached, which
large; and it is the course of two dykes, still more remarkable, in the island of Great Cumbrae, in the frith of Clyde.

Geologists, who have treated this subject, do not seem to have marked, with much attention, the course of the dykes. They have mentioned in general terms, that they follow all directions. More extensive observation may probably shew, that the most frequent directions of the principal dykes, is from north to south, or a few points deviation from that course. And if this be established, by a fuller and more accurate history of dykes, the analogy between them and metallic veins will be more complete; for it is observed of the latter, that the most powerful, that is, the most productive, run from north to south.

Dykes do not always run in a straight line. In their course they form certain flexuosities. But, in this winding course, the deviations are usually so small, as to have little effect on the general direction of the dyke, which, upon the whole, may be considered as nearly the same.

The continuity of dykes is sometimes interrupted, exactly in the same manner as frequently happens to the horizontal strata, and which, in technical language, is termed a slip.

In the island of Islay we have observed two dykes of this description, the one on the south side of Lochindal, near the point of Laggan; the other on the shore of the south-east part of the island, a little to the south of the house of Ardmore. In both these dykes, the extent of the separation of the slip was just equal to the thickness of the dyke. The opposite sides were brought exactly into the same line.

After this separation, these dykes, in so far as they could be traced, preserve the same thickness, course, and inclination as formerly.

A very remarkable dyke has been discovered, in the coal field, in the district of Boulogne in France. It runs in the form of a crescent from north to west.

The direction of dykes downwards is seldom perpendicular. This deviation from a line perpendicular to the horizon is called their inclination. The inclination of a dyke is usually denominated the hade or hading. See the article Coalery.

The inclination of different dykes, and even of the same dyke, is various, sometimes approaching to, and sometimes deviating from the perpendicular. The extent of dykes downwards, we believe, has not been ascertained with any degree of accuracy, and the termination of very few has yet been detected. The depth to which researches of this kind can be carried, is comparatively small. With all the ardour, ingenuity, and power of man, investigations to determine this point, will probably always be limited by the extent of his mining operations. The crescent-formed dyke just mentioned, which occurs in a coal-field in the district of Boulogne in France, which consists of a species of marble, found in several quarries in the vicinity, has been traced to the perpendicular depth of 600 feet, where it is succeeded by a schistus rock, which latter, with the same course and inclination, continues to intersect the horizontal strata.

The extent of dykes in length has not been accurately determined. Indeed, it must be extremely difficult to trace them with any degree of certainty. For those which are observed on the sea-coast, where they are most conspicuous, soon disappear in the mountains, on the one hand, or on the other lose themselves in the sea. And, as the extent of the same coal field rarely exceeds a few miles, they have seldom been followed beyond its limits. In many cases, the change in the nature and arrangement of the strata, renders it almost impossible. Some, however, have been traced to a very great extent; one in particular, on the banks of the river Meuse in the Netherlands, has been followed in its direct course, to the distance of four leagues; and of this dyke it is observed, if pursued through all its windings, the extent is not less than six leagues.

The thickness of dykes is various. Sometimes they are observed no thicker than a few inches. From that they increase to one foot, six feet, and very often are found from 10 to 20 feet. There is one in the island of Islay, of the enormous thickness of 69 feet. This immense dyke accompanies a lead vein, about a foot thick, which is included between it and the limestone strata. In this mining field, two whin dykes, one of them 10 feet thick, have been discovered, crossing the metallic veins.

In going downwards, dykes are said to decrease in thickness. This is particularly observed of dykes of smaller magnitude. Of smaller dykes it is also said, that they diminish in thickness towards the extremities.

In one respect, some whin dykes are exactly analogous to metallic veins, in having branches, or in the miners phrase, strings going off and traversing the contiguous strata, and forming in the course they take, an acute angle with the principal dyke. A whin dyke of this description has been observed in the island of Jura, on the shore of the sound. The diverging branch terminated in a point among the horizontal strata, at the distance of a few feet from the great dyke, assuming altogether a wedge-like form.

If we include metallic veins in the account, the vertical strata may be said to be composed of every kind of mineral substance, but almost always different from the intersected horizontal strata. By this last circumstance their occurrence is at once recognized. In general, the dykes that are found in Scotland, whether in the coal countries, or in the western coasts and islands, where they are so frequent, are of that species of stone which comes under the denomination of trap or whinstone.

Dykes, consisting of other species of stone, have also been found in Scotland. On the Mull of Kintoust, which forms the southern headland, at the entrance of Lochindal, in Islay, we observed a small dyke of granite, crossing the headland, which is of granular quartz.

There are some vertical strata of granite in the island of Ecolmkill, of pitchstone in the island of Arran, and of serpentinite at Portree in Banffshire.

Bergman, in his Physical Geography, supposes that granite was never found to be a component part of vertical strata. What has been already mentioned proves the contrary. Granite dykes have also been discovered in other places. Bonaparte has observed dykes of this description on the great road between Antelopes and Cahors in France, traversing horizontal strata of argillaceous schistus, a species of stone which has generally been considered of later formation than granite. These dykes, he observes, are from an inch to
GEOL OGY.

The history of metallic veins, although far from being so full and satisfactory as could be wished, is more complete than that of whin dykes. The latter have excited no further attention than as objects of curiosity to the geologist, or as singular facts in establishing a theory, and when they come in the way of the operations of the miner, to discover their connexion with the contiguous strata; while the wants and luxuries of man have roused ingenuity and exertion in exploring the former, on account of the precious and useful metals with which they are stored. Thus, the splendour and beauty of some metallic substances, and the utility of others, have made them in all ages be esteemed and valued by mankind; and consequently they have been the constant objects of pursuit and investigation. It is obvious that the beauty and utility of metals, on account of which they are so much valued and sought after, excite greater interest in procuring them; on the one hand, the researches and observations of the philosopher in furnishing the history and general principles, and, on the other, the immediate application of this knowledge, and of these principles, in the practice and operations of the miner.

The history of whin dykes, in general, quite analogous to metallic veins; but, of the latter, from what has been stated, we can speak with more certainty and precision.

Three different kinds of metallic veins have been described by geological writers; the perpendicular vein, the pipe vein, and the flat or dilated vein. We shall consider each of these in their order.

1. Of the perpendicular vein.—This kind of metallic vein occurs most frequently. As may be expected, it is various in its course or direction, thickness, and inclination. Metallic veins are found running in every direction; but, in general, the most powerful veins, that is, the most productive, are observed to run from north to south, or at least a few points deviation from that course; and when any deviation happens, it is usually to the east of north, and to the west of south.

The course or direction of a vein is called in technical parlance the "cal vein."
GEOLOGY.

The extent of a vein in the line of bearing, we believe, rarely exceeds the range of mountains in which it is discovered. This is the case with the principal vein at leadhills. It is limited to the chain of mountains in which the operations are now carried on; and although the mines of Wanlockhead are not a mile distant, new veins appear with galena or lead ore, of quite a different quality, and all the accompanying minerals, whether forming part of the vein, or found in cavities, are also quite different from the lead ore and other minerals found in the veins at Leadhills.

The inclination of veins is various. Sometimes they are nearly perpendicular; sometimes they deviate considerably from a perpendicular line; sometimes the same vein in its course downward, inclines to one side; sometimes it is perpendicular, and sometimes it inclines to the other side. When the deviation from the perpendicular does not exceed $10^\circ$, the vein is still considered as a perpendicular or vertical vein. When a vein is inclined, the two sides which include the metallic substances are in very different positions, and have consequently received from the miners different names. That side which supports the metallic ore, or on which it seems to lean, is called the ledger side, or simply the ledger. The opposite side which covers the ore, or which overhangs it, is denominated the hanging side, or simply the hanger. From the inclination of the vein being varied in its course downwards, it must appear that the same sides, according as the inclination varies, must change their position and denomination. This will perhaps be more intelligible by the section at fig. 5, in which AA represents the vein; BB, CC, DD, EE, the strata intersected by it; 1. the hanger; 2. the ledger; 3. the hanger; and, 4. the ledger.

The thickness of veins, and indeed of the same vein, is also extremely various. Sometimes they are only a few inches thick. From this they increase to the thickness of several feet. The veins which were wrought at Leadhills, about seven years ago, were from two to six feet within the sides; but some years before that time the principal vein in those mines, by the addition of two strings or small veins, assumed the extraordinary thickness of 14 feet of pure ore. This unusual appearance, both on account of its richness and grandeur, excited so much attention and admiration, that the countess of Hopetoun undertook a journey to these inferior regions, not less than 150 fathoms below the surface of the earth, to witness the splendour and brilliancy of this subterraneous apartment. The uncommon thickness and abundant richness of this vein are still talked of at Leadhills with enthusiasm. But a thicker vein was once wrought at Llangoat in Wales. Fifteen feet of clean ore were for some time dug out of this vein. These are now fewer, far exceeded by the veins in the Paris mountain in Anglesea, which are described by Mr. Pennant in his Welsh tour. The thickness of one of these veins is 21 feet, and of another 66 feet.

The broadest metallic vein, of which we have any account, is, we believe, that of the Ecton copper mine, in Derbyshire. In this mine there was worked, at one time, a heap of ore, of the astonishing extent of 70 yards from side to side.

The extent of veins downwards has in many cases been ascertained. To the regret and disappointment of the miner, they have been frequently intercepted and entirely cut off by the horizontal strata. The rich vein of lead ore at Llangoat in Wales, which we have already mentioned, was intercepted in this manner by a stratum of black scisto or shiver, the nature of which is not described by Williams, who states the fact.

Their researches to recover their lost wealth, which were prosecuted, proved altogether fruitless. The smallest trace of this unusually productive vein was never afterwards discovered.

Two kinds of perpendicular mineral veins have been observed and described. In the one case the relative position of the strata which contain the metallic sub-cular veins. This case is exactly similar to that of the coal strata when they are intersected by a whin dyke. On one side of the vein the strata are elevated or depressed from their former plane. This is illustrated by fig. 5, where the letters BB, CC, DD, EE, mark the corresponding strata which have been deranged or displaced. In the other kind of vein the metallic substances containing the metallic ores are merely separated without any elevation or depression; for each side of the fissure still remaining in its former plane, the opposite sides of the divided strata exactly correspond to each other. The mines at Brontian in Argyleshire are of this latter description.

Veins of this kind have frequently smaller veins, or, as they are called in the language of the miners, strings, which run off at an acute angle, preserve their course for some distance, not, in general, very great, gradually diminish in thickness, and at last are entirely lost among the contiguous strata. At the place of junction the principal vein is always thicker, as has been already noticed with regard to the unusual thickness of the principal vein at Leadhills.

To this account of perpendicular veins we may add, that some veins are found crossing each other, and that the whin dykes have also been discovered intersecting metallic veins. Examples of the latter occur in the island of Ilay.

2. Of the pipe vein.—The perpendicular vein last described, intersected or cut the strata across. What has been denominated the pipe vein is extremely limited in the line of bearing, but having the same inclination as the strata which include it. It may be considered as in some measure of a circular form, extremely irregular, and always following the course of the strata between which it is included, like the perpendicular veins; sometimes as it dips downwards, it is enlarged; sometimes it is diminished, and sometimes it is so much contracted, that the including strata come into close contact. In a word, this kind of vein is subject to all the irregularities of the veins formerly described, only that its inclination is invariably the same with the accompanying strata.

3. The flat or dilated vein.—This kind of metallic vein, after what has been said with regard to other veins, will require but a short description. It is exactly similar to the pipe vein, only that it is more extended in the line of bearing. It is included between the horizontal strata; and therefore its inclination or dip must be the same as the including strata. A vein of this kind might with more propriety and accuracy be regarded as a metallic horizontal stratum, were it not
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III. Mercury. Species 1. Native Mercury, or Quicksilver. Le Mercure natif. Gediegen Quecksilber. This is found at Idria in the Austrian territories, at Almaden in Spain, in the Palatinate, and a few other places. We are told by Mr. Jameson, that a quantity of quicksilver was discovered some years ago in a pest moss, in the island of Islay, and he thinks it probable that veins of it exist there; but there seems no ground whatever for such expectations.

Species 2. Natural Amalgama. L’Amalgame natif. Naturlicher Amalgam. This consists of mercury and silver, in very variable proportions. It is found at Salmberg in Sweden; at Roseneau in Hungary, and especially at Moschondaldburg in the duchy of Deux Ponts, where it is found mixed with common ferruginous clay, and with other ores of mercury.

Species 3. Mercury Mineralised by the Sulphuric and Muriatic Acids. Mercure Corrodé ou Muriaté. Quecksilber Hornerz. This species was discovered about 30 years ago, in the mines of Moschondaldburg, and at Morefeld, in the duchy of Deux Ponts, by M. Woule, mixed with ferruginous clay, quartz, lithomarga, native quicksilver, and cinnamon. It has also been found at Almaden in Spain, and at Hersowitz in Bohemia; but it is very rare.

Species 4. Native Cinnabar. Le Cinnabre. Zinner. This usually forms a gangart for the other ores of mercury. It occurs in the stratified mountains, pretty near the surface. This ore is found in great many parts of Europe, especially at Almaden in Spain, Idria in the Austrian territories, at Moschondaldburg, in Bohemia, in Saxony, in Hungary, in Transylvania, in the Palatinate, and in France; but in this last it is found but in small quantity.

IV. Silver. Species 1. Native Silver. A particular variety of silver ore. This species, mixed with gold, is very rare. It is principally found in Conigeburg in Norway, and Schlangenburg in Siberia. In the former of these places it is found disseminated through calcareous spar, fluor spar, and rock crystal, in a vein running through a rock of hornblende slate, and accompanied with blende, galena, and pyrites. That of Siberia is found distributed through a mass of heavy spar. Common native silver is found in considerable quantity in Mexico and Peru. It is also met with in Siberia, Saxony, France, Sweden, Norway, in the Hartz, and in Bohemia. It is principally found in the primitive mountains, distributed through masses of heavy spar, quartz, calcareous spar, fluor spar, pyrites, blende, coal, galena, red silver ore, and vitreous silver ore.

Silver has been found in several parts of Britain, especially near Alva in Scotland. It is confidently affirmed, that a mass of capillary silver, weighing 16 oz., was found in the lead mines at Carthoness in the isle of Islay, mixed with galena.

Species 2. Antimonial Native Silver. L’Argent Antimonial. Spécius Silber. This species has hitherto been only found in the mine at St. Wenceslas at Altwolfach, and in the duchy of Wirtemberg, in a vein mixed with calcareous spar, heavy spar, native silver, and quartz.
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Species 4. Magnetic Ironstone. Le Fer Magnétique. Magnetischer Eisenstein.—Of this there are three varieties, the common magnetic ore, which is very common in primitive mountains, especially those that are composed of gneiss and micaceous schistus. It is often in great abundance, forming large beds, or even whole mountains. It is found in greatest quantity in Saxony, Bohemia, Italy, Corsica, Silesia, Siberia, Norway, and especially in Sweden. The second variety, called fibrous magnetic ironstone, is uncommon, but is found at Bilingsburg in Sweden. The third, which Kirwan calls magnetic sand, is found in the banks of some rivers, particularly of the Elbe, as also in Sweden and Italy.

Species 5. Specular Iron-ore. Le Fer Speculaire. Eisenglanz.—This is found in many places, often in considerable quantity, especially in Saxony, Bohemia, France, Normandy, Prussia, Sweden, Siberia, Hungary, Corsica, and the island of Elba. It is generally found only in primitive mountains, sometimes in beds, sometimes in veins, accompanied with quartz, hornstone, martile pyrites, and magnetic iron ore.

Species 6. Red scaly Iron Ore. La Mina de Fer Rouge. Roth-Eisenstein.—This is rather rare, but is found in several parts of Saxony, in the Hartz, in Nassau, in Thuringia and Hungary. Another variety of the same species, the compact red ironstone of Kirwan, is much more common, being found in Saxony, Bohemia, the Hartz, Hesse, Siberia, and in France, sometimes in veins, and sometimes in beds, commonly mixed with the two following species, and with argillaceous ironstone, quartz, hornstone, and calcareous spar.

A third variety, the common hematites or bloodstone, which is one of the most productive iron ore, is always found accompanying the last variety, and is of course met with in most of the situations above enumerated. It is produced in abundance in several parts of England, as in Derbyshire, but more especially at Ulverston in Lancashire, where there is one perpendicular vein of it go yards wide, in a rock of limestone. Large quantities of it are carried to Carron, where it is smelted with the common Carron ironstone.

Species 7. Brown Iron Ore. La Mine de Fer Brune. Braun-eisenstein.—Of this there are several varieties, of which the compact brown ironstone, and the brown hematites, are very common; but the brown scaly iron ore is rather rare. The last is found at Kampendorf in Saxony, at Klaustel, in the Hartz, at Lauterick in the Palatinate, and at Nau in the principality of Bareith.

Species 8. Calcareous Iron Ore. La Fer Spatique. Spathiger-eisenstein.—This is found both in primary and secondary mountains, and there are few veins of iron which do not contain it in greater or less quantity.

Species 9. Black Ironstone. La Mine de Fer Noir. Schwarz-eisenstein.—This is found in the principality of Bareith, in the Hartz, Saxony, Hesse, and Palatinate.

The common argillaceous iron ore of Kirwan, is ranked by Brochant as a variety of this. It is very common in most iron countries, and much of it is found in Britain, especially in Colebrookdale, Shropshire, and in Dean forest in Gloucestershire. The Carron ore is principally of this kind.

Species 10. Lowland Iron Ore. La Mine de Fer de Gazon. Reessen-eisenstein.—There are several varieties of this, all of which are found in low, humid situations, in very extensive beds, alternating with sandstone, clay, &c. This species is much more abundant in the north than in the south of Europe, especially in the duchy of Brandenburg, in Courland, Lithuania, Livonia, Prussia, Prussian Poland, and Lusat.

Species 11. Blue Martial Earth. La Fer Terreux bleue. Blaue-eisenerde.—This is found imbedded in clay and similar earths, and often accompanies the last species. It occurs in Saxony, Silesia, Swabia, Bavaria, Poland, and the Palatinate.

Species 12. Green Martial Earth. La Fer Terreux Vert. Grun-eisenerde.—This species is uncommon, having been found only at Braunsdorf, and Schneeburg in Saxony, in veins, accompanying quartz and sulphur pyrites.

Species 13. Emery. L’Emeril. Schmirgel.—This is found in Saxony, distributed in a bed of hardened sestmites, in sandstone. It is also found in Italy, Spain, Peru, the isle of Naxos in the Archipelago, where there is a cape called by the Italians, Capo Smeriglio, or the Emery Cape. It is often mixed with particles of magnetic iron ore, whence some have supposed the emery to be magnetic.

VII. Lead.

Species 1. La Galène Commune. Gemeiner-Lead. Leglans.—This is the most common and abundant ore of lead, and is found both in primitive and secondary strata, in beds and veins, accompanied with quartz, floor spar, calcareous spar, sparry iron ore, barytic earths, blende, pyrites, and several ores of silver. It is found in great abundance at Leadhills and at Wanlockhead in Dumfriesshire, in Derbyshire, Strotian in Scotland, and in the Mendip hills in Somersetshire. A variety of this, called compact galena, is found in the same situations, especially in Derbyshire. It has often been confounded with graphite, or plumago.

Werner enumerates nearly 20 formations, as he calls them, of galena, but Mr Jameson thinks the galena formation in Dumfriesshire is different from any of these.

Species 2. Blue Lead Ore. La Mine de Plomb Bleue. Blau-bleier.—This species has as yet been found only at Zschopau in Saxony, accompanying floor spar, barytic spar, white and black lead, and malachite.

Species 3. Brown Lead Ore. La Mine de Plomb Brune. Braun-bleier.—This species is also very rare, but is found at the same place with the last, and also in Bohemia, Brittany, and Hungary.

Species 4. Black Lead Ore. La Mine de Plomb Noire. Schwarz-bleier.—This is found in Saxony, at Freyberg, at Zschopau, in Cumberland, in some parts of Scotland, in Poland, and Siberia.

Species 5. White Lead Ore. La Mine de Plomb Blanche. Weiss-bleier.—This is not a very abundant species, but it is found in several lead mines, especially in Bohemia, Saxony, the Hartz, France, Siberia, Hungary, Carinthia, and in some of the British lead mines, especially at Leadhills.

Species 6. Green Lead Ore. Phosphorated lead ore of Kirwan. La Mine de Plomb Vert. Grun-bleier.—This is found in veins, more commonly in the primitive mountains. It is met with in Bohemia, Saxony, Bavaria,
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Bavaria, Siberia, Brissau, France, Peru, and at Lead- 

hills in Scotland.

Species 7. Red Lead Spar. Le Plomb Rouge. Ro-

thes-blierz.—This is one of the rarest ores of lead, be- 

ing as yet only found at Ekatrenburg in Siberia.

Species 8. Yellow Lead Spar. Le Plomb jaune.

Gelbes-blierz.—This has been known only for a few 

years. It has been found at Bleiberg in Carinthia, in 

a gangart of calcareous stone. It has also been found 

near Freyberg in Saxony, at Annenberg in Austria, and 

at Reczchyna in Hungary.

Species 9. Native Vitriol of Lead. Le Vitriol de 

Plomb natif. Naturthe-vitriol.—This is found in 

the isle of Anglesea, in a vein of brown iron ore, mixed 

with copper pyrites. It is also found at Leadhills in 

Scotland.

Species 10. Earthy Lead Ore.—Of this there are 

two varieties, the friable and the indurated. The for- 

mer is found in Saxony, in Lorraine, in Poland, and 

Siberia, Bohemia, and Silesia. The latter is found in 

most lead mines. Mr Jameson notices two varieties of 

lead earth, which he calls white-lead earth, and friable 

lead earth, as met with at Leadhills.

VIII. TIN.

The ores.


This species is very rare, and is, we believe, found only 

in Cornwall, at Wheal rock, among copper pyrites.

Species 2. Common Tinstone. La Pierre d’Etain. 

Zinnstein.—This is found chiefly in primitive rocks, as 

in granite, gneiss, micaceous schistus, and porphyry, 

both in masses and veins. It is the common ore of 

Cornwall, and is found also in Saxony, Bohemia, 

and the East Indies.

Species 3. Wood Tin Ore. L’Etain grenu. Zin- 

nerz.—This is found in Cornwall, in the parishes of 

Colomb, St Denis and Roc, accompanying the for- 

mer.

IX. BISMUTH.

Bismuth ores.

Species 1. Native Bismuth. Bismuth is a very rare 

metal, but is most commonly found in its native state. 

It is usually in a gangart of quartz, calcareous spar, 

and barytic spar. It occurs in Bohemia, in Saxony, in 

the territory of Hainault, in Suabia, in Sweden, and in 

France, in the mines of Brittany.

Species 2. Sulphurated Bismuth. La Galène de Bis-

muth. Wismuth Glanz.—This is very rare. It com-

monly accompanies the former, and is found at Jas-

chimsthal, in Bohemia, at Johann-Georgen-stadt, 

Schwarzenberg, and Altenberg in Saxony, and at Rid-

derby in Sweden.

Species 3. Bismuth Ochre. L’Ochre de Bismuth. 

Wismuth Okker.—This is still more rare than the last, 

and is chiefly found near Schneeburg in Saxony, and at 

Jaschimsthal in Bohemia.

X. ZINC.

Zine ores.

Species 1. Blende. This is sulphurated zinc, and is 

one of the most common ores of that metal. There 

are three varieties; the brown, the yellow, and the 

black. Of these the yellow is the most rare, and is 

found in Saxony, in Bohemia, in the Hartz, in Norway, 

Transylvania, and Hungary. The brown and the 

black are found in most of these places, and besides in 

France and England, especially in Derbyshire.

Species 2. Calamine. La Calamine. Galmel.—Of 

this there are two varieties, compact and striated. Both 

occur only in particular stratiform rocks, often forming 

entire beds with indurated clay, and calcareous spar. 

The latter is usually found in the cavities of the former. 

Both occur in Bohemia, in Carinthia, and in most of 

the German lead mines. They are also found in Brit-

tain, especially at Leadhills, Wanlock-head, and in 

Derbyshire.

XI. ANTIMONY.

Species 1. Native Antimony.—This is very rare. It 

was discovered at Sulbberg in Sweden, in the year 1748, 

in a gangart of some calcareous stone, and it was also 

found some years ago at Allemont in France, accompa-

nying other ores of antimony and of cobalt.

Species 2. Sulphurated Antimony. L’Antimoine 

Grise. Grau-spies glas-erz.—There are several varieties 

of this, as the compact sulphurated antimony, found at 

Braunsdorf in Saxony; at Goldgronach in the principa-

lity of Bareith; at Maguria in Hungary, and Auvergne 

in France: foliated sulphurated antimony, found in 

Braunsdorf and Goldgronach, and in the Hartz, and 

Transylvania: striated sulphurated antimony, found in 

Saxony, Hungary, France, Swabia, Tuscany, Sweden, 

the Hartz, Spain, and in England: plumose antimonial 

ore, found at Freyberg in Saxony, at Braunsdorf 

and Stallberg, and at Chemnitz in Hungary. All these 

varieties are usually found in a quartzose rock.


Roth-spies glas-erz.—This is found at Braunsdorf, at 

Malaska and Kremsnitz, in Hungary, and at Allemont 

in France. It usually accompanies the first and second 

species, especially at Allemont, or the next species, 

which is the case at Braunsdorf.


Weisse-spies glas-erz.—White antimony is extremely 

rare; it is principally found at Przibran in Bohemia, 

in quadrangular, shining tables, disposed in bundles up- 

on galena. It is said also to have been found at Brau-

nsdorf and Malaska.

Species 5. Antimonial Ochre. L’Ocre d’Antimoine. 

Spies glas-okker.—This species is also very rare; it 

is found at Braunsdorf, near Freyberg, and in Hungary, 

always accompanying the second and third species.

XII. COBALT.


Weisse-speis-kobolt.—This is found in Norway, Swe-

den, at Anaberg in Saxony, in Swabia and Sturia; but 

it is very rare. In Saxony and Norway, it occurs in 

beds of micaceous schistus, along with the 5th species, 

and with quartz, hornblende, and pyrites.

Species 2. Dull Grey Cobalt Ore. Le Cobalt gris. 

Grauer-speis-kobolt.—This is found in Saxony, Bo-

hemia, France, Norway, Swabia, Hungary, Sturia, and in 

a few mines in England. It is sometimes mixed with 

ores of silver.

Species 3. Bright White Cobalt Ore. Le Cobalt 

Eclatant. Glanz-kobolt.—This is the most common 

of all the ores of cobalt, and almost always accompa-

nies the ores of nickel, and of silver. It is found in Bo-

hemia,
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Species 4. Black Cobalt Ochre. Le Cobalt Terreux noir. Schwarz-erd-kobold.—This is found in Saxony, in Thuringia, Swabia, Hesse, and Altenburg, in the Tyrol, accompanying other ores of cobalt, and several ores of silver, copper, and iron.

Species 5. Brown Cobalt Ochre. Le Cobalt Terreux brun. Braun-erd-kobold.—This is found in considerable quantity at Saalfeld in Thuringia; at Kamsdorf in Saxony, and at Alperspach in Wirtemberg, accompanying other ores of cobalt.

Species 6. Yellow Cobalt Ochre. Le Cobalt Terreux jaunne. Geber-erd-kobold.—This is one of the rarest ores of cobalt. It is found at Saalfeld in Thuringia, at Alperspach in Wirtemberg, and at Altenburg in Dauphiné in France.

Species 7. Red Cobalt Ore. Le Cobalt Terreux rouge. Roter-erd-kobold. This is found in Saxony, Thuringia, Hesse, Swabia, Bohemia, Allemont in France, and in Norway.

XIII. Nickel.

Species 1. Sulphurated Nickel. Le Kupfer Nickel. Kupfer Nickel.—This is found in veins, both in primitive and secondary mountains, almost always accompanying some of the ores of cobalt, to which it seems to bear some geological relation. It is also found in some silver mines. It is met with in Bohemia, Saxony, Thuringia, the Hartz, in Swabia, Hesse, Allemont in France, and in some parts of Britain. Its usual gangue is quartz, barytic, and calcareous spar.

Species 2. Nickel Ochre. L’Ocre de Nickel. Nickel-ochrer.—This is found in the same situations with the last, from a decomposition of which it appears to be produced.

XIV. Manganese.

Species 1. Grey Ore of Manganese. Le Manganese. Grau-braunstein-erz.—There are several varieties of this, but they are all commonly found near each other, in veins or in masses, commonly in the primitive mountains.

They are found in considerable quantity in many mines in Saxony, Bohemia, Bavaria, and Hungary. They are also met with in France, and in several parts of Britain, as in Derbyshire, Leadhills, and Wansbeckhead; in the Mendip hills, and the isle of Jura.

Species 2. Red Manganese Ore. Le Manganese rouge. Rot-braunstein-erz.—This is very rare, but is found at Catnic, Offenbany, and especially at Nagyag in Transylvania, at which place it is found in a gold mine.

XV. Molybdena.

Species 1. Molybdene sulphure. Wasserbley.—This is found in Bohemia; at several places in Saxony; in Sweden; at Tilott in France, and at Chamouni at the foot of Mont Blanc. It is commonly found in primitive rocks, especially in tin mines.

XVI. Arsenic.

Species 1. Native Arsenic. Le Molybdene sulphure. Wasserbley.—This is found in Bohemia; at several places in Saxony; in Sweden; at Tilott in France, and at Chamouni at the foot of Mont Blanc. It is commonly found in primitive rocks, especially in tin mines.

Species 2. Arsenical Pyrites, or Marcasite. Le Pyrite Arsenicale. Arsenik-kies.—This is found in Bohemia, Saxony, and Silesia, accompanying the common stone, and galena, with some other minerals.

Species 3. Realgar. Le Realgar. Rauschgelb.—This is found in the Bannat, Bohemia, Saxony, Swabia, the Hartz, the Tyrol, Hungary, and in the neighbourhood of volcanoes, especially Atina and Vesuvius. Orpiment, which Brochem makes a variety of realgar, is found in several of the above places, and also in Natale, in Servia, Transylvania, and Wallachia, usually accompanying quartz and clay.

Species 4. Native cale of Arsenic. L’Arsenic oxide natif. Naturleehn arsenik-kalk.—This is very rare, but is found in a small quantity in Bohemia and Joachimsthal, in Saxony, at Raschau, at Salatna, in Transylvania, and in Hungary.

XVII. Tungsten.

Species 1. Tungsten. Le Tungstène. Schwerstein-Tonerz.—This is a very rare mineral, but is found at Schlack enwald in Bohemia, at Ehrnfriederloch in Saxony, and at Riddarkytten, Bisborg in Sweden, usually accompanying quartz, mica, talc, and tin ore.

Species 2. Wolfram.—This is also pretty rare, but is found in Bohemia, Saxony, and at Poldice in Cornwall.

XVIII. Uranium.

Species 1. Sulphurated Uranite. L’Uranite noir. Percherz.—This is found at Joachimsthal in Bohemia, and at Johann-Georgenthal, and Schweiberg in Saxony, accompanying the two following species, and lead and copper ores.

Species 2. Micaceous Uranitic Ore. L’Uranite Micact. Uran-glimmer.—This is found in the Bannat, Saxony, Wirtemberg; near Autun in France, and near Karlsruhe in Cornwall.

Species 3. Uranitic Ochre. L’Ocre d’Uranite Uranokker.—This has been found at Joachimsthal in Bohemia, and at Johann-Georgenthal in Saxony, but it is uncommon.

XIX. Titanium.

Species 1. Menakonite.—This has been found chiefly near Menakon in Cornwall.

Species 2. Titanite. Le Rutile. Rutil.—This is found at Bolinik and Ronitz in Hungary; in New Castle in Spain; at Aschaffenburg in France; at St Vieux in France, and in Mount St Gothard, and some other places in the Alps.

Species 3. Titanitic Siliceous Ore. Le Nigrine. Nigrin.—This has been found near St Gothard in the Alps, at Oblapian in Transylvania, &c.

XX. Tellurium.

Species 1. Sylvanite. Le Sylvane nativ. Cedro Steinsylvan.—This is found chiefly at Faltzberg in Transylvania, but is now become extremely rare. It occurs in
Theories of by the violence of the shock, they at length left between them large cavities filled with nothing but air. These cavities naturally offered a bed to receive the influent waters; and in proportion as they filled, the face of the earth became once more visible. The higher parts of its broken surface, now become the tops of mountains, were the first that appeared; the plains soon after came forward, and at length the whole globe was delivered from the waters, except the places in the lowest situations; so that the ocean and the seas are still a part of the ancient abyss that have not had a place to return to. Islands and rocks are fragments of the earth's former crust; kingdoms and continents are larger masses of its broken substance; and all the inequalities that are to be found on the surface of the present earth, are owing to the accidental confusion into which both earth and waters were then thrown.

SECTION II. Theory of Woodward.

The next who attempted a theory of the earth was Mr Woodward, who in his essay towards a natural history of the earth, endeavoured to give what he considered as a more rational account of its appearances than had been given by any preceding writer. He was indeed much better qualified for such an undertaking than any of his predecessors, as he was one of the most industrious naturalists of his time. Hence though his system must be considered as weak and untenable, his work contains many important facts relating to natural history.

Woodward sets out by asserting that all terrestrial substances are disposed in beds of various natures, lying horizontally, one over the other, like the coats of an onion, and that they are replete with shells and other marine productions; these shells being found in the deepest cavities, and on the tops of the highest mountains. From these observations, which were warranted by the experience of naturalists at that time, but which we now know not to be universally correct, he proceeds to remark that these shells and extraneous fossils are not productions of the earth, but are all actual remains of those animals which they are known to resemble; that all the beds of the earth lie below each other in the order of their specific gravities, and that they are disposed as if they had been left in this situation by subsiding waters. All this is affirmed with much earnestness, although many of the circumstances are contradicted by daily experience. Thus, we not unfrequently meet with layers of stone above the lightest soils, and find the softest earth below a stratum of hard stone. Woodward, however, having taken for granted, that all the strata of the earth are arranged in the order of their specific gravities, the lightest at the top, and the heaviest near the centre, he deduces as a natural consequence, that all the substances of which the earth is composed were once in an actual state of solution. This universal solution he conceives to have happened at the time of the flood. He supposes that at that time a body of water, which was then in the centre of the earth, uniting with that which was found on the surface, so far separated the terrane parts as to mix all together in one fluid mass; the contents of which afterwards sinking according to their respective gravities, produced the present appearances of the earth. Being aware, however, that an objection that fossil substances are not found dissolved, he exempts them from this universal dissolution, and for that purpose, endeavours to show that the parts of animals have a stronger cohesion than those of minerals; and that, while even the hardest rocks may be dissolved, bones and shells may still continue entire.

SECTION III. Theory of Whiston.

Of all the theories of the earth that have been formed, previous to those of Hutton and Werner, none has been more applauded or more opposed than that of Whiston. Nor is this surprising; for this theory being supported with all the parade of mathematical calculation, confounded the ignorant, and produced the approbation of such as desired to be thought learned, since it implied a considerable knowledge of abstract science, even to be capable of comprehending what the writer aimed at. It is not easy to divest this theory of its mathematical garb, but the result of our philosopher's reasoning appears to be as follows.

He supposes the earth to have been originally a comet, and he considers the history of the creation, as given us in scripture, to have its commencement just when it was, by the hand of the Creator, more regularly placed as a planet in our solar system. Before that time, he supposes it to have been a globe without beauty or proportion; a world in disorder, subject to all the vicissitudes which comets endure; some of which have been found, at different times, a thousand times hotter than the melted iron, at others, a thousand times colder than ice. These alternations of heat and cold, continually melting and freezing the surface of the earth, he supposes to have produced, to a certain depth, a chaos entirely resembling that described by the poets, surrounding the solid contents of the earth, which still continued unchanged in the midst, making a great burning globe of more than two thousand leagues in diameter. This surrounding chaos, however, was far from being solid: he compares it to a dense though fluid atmosphere, composed of substances mingled, agitated, and shocked against each other; and in this disorder he describes the earth to have been just at the eve of creation.

But upon its orbit being then changed, when it was more regularly wheeled round the sun, every thing took its proper place, every part of the surrounding fluid then fell into a situation, in proportion as it was light or heavy. The middle or central part, which always remained unchanged, still continued so, retaining a part of that heat which it received, in its primitive approaches towards the sun; which heat he calculates, may continue for about six thousand years. Next to this fell the heavier parts of the chaotic atmosphere, which serve to sustain the lighter; but as in descending they could not entirely be separated from many watery parts with which they were intimately mixed, they drew down a part of these also with them; and these could not mount again after the surface of the earth was consolidated; they therefore surrounded the heavy first descending parts, in the same manner as these surround the central globe. Thus, the entire body of the earth is composed internally of a great burning globe, next which is placed a heavy terrane substance that encompasses...
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The whole economy of the creation being thus adjusted, it only remained to account for the rising and depressions on the surface of the earth, with the other seeming irregularities of its present appearance. The hills and valleys are considered by him as formed by their pressing upon the internal fluid, which sustains the outward shell of earth with greater or less weight; those parts of the earth which are heaviest, sink into the subjacent fluid more deeply, and become valleys; those that are lighter, rise highest upon the earth's surface, and are called mountains.

Such was the face of nature before the deluge; the earth was then more fertile and populous than it is at present; the life of man and animals was extended to ten times its present duration; and all those advantages arose from the superior heat of the central globe, which ever since has been cooling. As its heat was then in full power, the genial principle was also much greater than at present; vegetation and animal increase were carried on with more vigour; and all nature seemed teeming with the seeds of life. But these physical advantages were only productive of moral evil; the warmth which invigorated the body, increased the passions and appetites of the mind; and as man became more powerful, he grew less innocent. It was found necessary to punish this depravity; and all living creatures were overwhelmed by the deluge in universal destruction.

This deluge, which simple believers are willing to ascribe to a miracle, philosophers have been long desirous to account for by natural causes. They have proved that the earth could never supply from any reservoir towards its centre, nor the atmosphere by any discharge from above, such a quantity of water as would cover the surface of the globe to a certain depth over the tops of our highest mountains. Where, therefore, was all this water to be found? Whiston has found enough, and more than a sufficiency, in the tail of a comet; for he seems to allot comets a very active part in the great operations of nature.

He calculates with great seeming precision, the year, the month, and the day of the week on which this comet (which has paid the earth some visits since, though at a kinder distance) involved our globe in its tail. The tail he supposed to be a vaporous fluid substance, exhaled from the body of the comet, by the extreme heat of the sun, and increasing in proportion as it approached that great luminary. It was in this that our globe was involved at the time of the deluge; and as the earth still acted by its natural attraction, it drew to itself all the watery vapours which were in the comet's tail; and the internal waters being also at the same time let loose, in a very short space the tops of the highest mountains were laid under the deep.

The punishment of the deluge being thus completed,
Theories of away from their basis, would appear considerably in
the Earth. Mr Whitehurst attributes the pro-
duction of pit coal also to the deluge, as it is difficult to
account for the deposition of such a quantity of vege-
table matter (supposing pit-coal to be of vegetable
origin) below the surface of the earth, on any other
hypothesis. The animal matters found in a fossil state,
especially those remains of animals which are not now
found upon the earth, can only be accounted for, on
the supposition of a deluge.

Mr Whitehurst, however, is not content with attrib-
ting to the deluge most of the changes which have
taken place on the surface of the earth, but he derives
from the same source the curtailed longevity of man,
and many of the evils incident to mankind. "At that
dreadful era, says he, and not before, the year be-
became divided into summer and winter, spring and autumn,
and the spontaneous products of the earth no longer
sufficed the calls of human nature without art and
labour; wherefore he sowed would expect to reap,
and he who built an hut for his protection, would
naturally expect to enjoy the fruits of his own labour;
and necessity, therefore, was the parent of property, and
property created a thousand imaginary wants, which its
possessors endeavoured to gratify, and their example ex-
cited similar ideas in those who had it not, but never-
theless studiously endeavoured to gratify their artificial
wants by unjustifiable means. Hence the necessity of
laws, dominion, and subordination, which had no exist-
ence in the antediluvian world.

"To that great revolution in the natural world, we
may therefore ascribe many of the evils incident to
mankind; for experience shows, that men who are born
in rude and savage climates are naturally of a ferocious
disposition; and that a fertile soil, which leaves nothing
to wish for, softens their manners, and inclines them to
humanity."

The above is a general outline of Mr Whitehurst's
theory, some parts of which are very ingenious, and are
corroborated by observation, while others are not a
little fanciful and improbable. In his supposition that
the earth was originally in fluid state, he agrees with
most other theorists, as this is a circumstance which ad-
mits of little doubt; though, as Kirwan has shown, it is
not necessary to suppose that the whole mass of the earth
was fluid, but only those parts of it which are near the
surface. In his play of affinities, and consequent separa-
tion of the materials of the earth into homogeneous
masses, Whitehurst has been followed by Mr Kirwan,
who has framed a beautiful and ingenious speculation on
the successive changes that took place from the action
of the materials on each other. 1

Mr Whitehurst has been betrayed by his fondness for
a favourable theory, into several errors respecting the
stratification of the earth, which require to be men-
tioned. Thus, though the arrangement of the strata,
especially where it has not been disturbed by some
evident and violent cause, is extremely uniform; he has,
however, extended this regularity farther than it really
obtains. He tells us that the strata invariably follow
each other, as if it were in an alphabetical order, or a
series of numbers, whatever be their denomination.
Not that they are alike in all the different regions of
the earth, either in quality or in thickness, but that
their order in each particular part, however they may
differ in quality; yet they follow each other in regular
Theories of succession, both as to thickness and quality, is
not, the Earth.

that by knowing the incumbent stratum, together with
the arrangement thereof in any particular part of
the earth, we may come to a perfect knowledge of all the
inferior beds, so far as they have been previously dis-
covered in the adjacent country. With respect to the
strata that accompany coal, some instances are appar-
tently but not really, contradictory to this rule.

We now know, however, that Mr Whitehurst's ob-
servations do not universally apply. In the old mines
in the valley of Planen, in Saxony, the strata, though
they are near each other, vary considerably in thickness,
from that of a few inches to several feet, and the stratum
of coal, in particular, varies from two to thirty-two feet.
Again, in Mount Salive, the strata of coal, though in a
calcareous mountain, vary considerably; and Mr White-
hurst himself informs us, that at Benal moor, those
strata which are in other places the lowest, are found at
the surface. Even in Derbyshire, to which Mr White-
hurst's observations chiefly apply, we are informed that
even when the arrangement is the same, the thickness
of the strata varies considerably.

Sect. VI. Theory of Dr Hutton.

The next theory which we have to consider, is thatTheory was proposed by Dr James Hutton, which has become so
much the object of inquiry and debate, as to give name
to one of the two principal sects into which geologists
are now divided.

The leading principles of the Huttonian theory, as
concisely laid down by one of its greatest admirers and
supporters, are the following.

1. The first circumstance which Dr Hutton has
considered as a general fact is, that by far the greater
part of the bodies which compose the exterior crust of
our globe, bear the marks of being formed of the ma-
terials of mineral and organized bodies, of more ancient
date. The spoils or the wreck of an older world are,
he thinks, everywhere visible in the present, and though
not found in every piece of rock, they are diffused so
generally as to leave no doubt that the strata which
now compose our continents are all formed out of strata
more ancient than themselves.

2. The present rocks, with the exception of such as
are not stratified, having all existed in the form of
loose materials collected at the bottom of the sea, must
have been consolidated and converted into stone by
virtue of some very powerful and general agent. The
consolidating cause which he points out is subterrane-
ous heat, and the objections to this hypothesis have
been attempted to be removed, by the introduction of
a principle new and peculiar to himself. This prin-
ciple is the compression which must have prevailed in
that region where the consolidation of mineral sub-
stances was accomplished. Under the weight of a
superincumbent ocean, heat, however intense, might be
unable to volatilize any part of those substances which,
at the surface, and under the lighter pressure of our
atmosphere, it can entirely consume. The same pres-
sure, by forcing those substances to remain united,
which at the surface are easily separated, might occa-
sion the fusion of some bodies which in our fires are
only calcined.
3. The third general circumstance which this theory is founded on is, that the stratified rocks, instead of being either horizontal or nearly so, as they no doubt were originally, are now found possessing all degrees of elevation, and some of them were perpendicular to the horizon; to which we must add, that those strata which were once at the bottom of the sea, are now raised up, many of them several thousand feet above its surface. From this, as well as from the inflexions, the breaking and separation of the strata, it is inferred, that they have been raised by the action of some expansive force placed under them. This force, which has burst in pieces the solid pavement on which the ocean rests, and has raised up rocks from the bottom of the sea into mountains 15,000 feet above its surface, exceeds any which we see actually exerted, but seems to come nearer to the cause of the volcano or the earthquake than to any other, of which the effects are directly observed. The immense disturbance, therefore, of the strata, is in this theory ascribed to heat acting with an expansive power, and elevating those rocks which it had before consolidated.

4. Among the marks of disturbance in which the mineral kingdom abounds, those great breaches among rocks, which are filled with materials different from the rock on either side, are among the most conspicuous. These are the veins, and comprehend not only the metallic veins, but also those of whinestone, of porphyry, and of granite, all of them substances more or less crystallized, and none of them containing the remains of organized bodies. These are of posterior formation to the strata which they intersect, and in general also they carry with them the marks of the violence with which they have come into their place, and of the disturbances which they have produced on the rocks already formed. The materials of all these veins, Dr Hutton concludes, have been melted by subterraneous heat, and, while in fusion, injected among the fissures and openings of rocks already formed, but thus disturbed, and moved from their original place.

This conclusion he extends to all the masses of whinestone, porphyry, and granite, which are interspersed among the strata, or raised up in pyramids, as they often appear to be, through the midst of them. Thus, in the fusion and injection of the unstratified rocks, we have the third and last great operation which subterraneous heat has performed on mineral substances.

5. From this Dr Hutton proceeds to consider the changes to which mineral bodies are subject when raised into the atmosphere. Here he finds, without any exception, that they are all going to decay; that, from the shore of the sea to the top of the mountain, from the softest clay to the hardest quartz, all are wasting and undergoing a separation of their parts. The bodies thus resolved into their elements, whether chemical or mechanical, are carried down by the rivers to the sea, and are the deposit of this general law; among the highest mountains and the hardest rocks, its effects are most clearly discerned; and it is on the objects which appear the most durable and fixed, that the characters of revolution are most deeply imprinted.


It is not surprising that this theory should have met with many advocates among the more superficial observers of nature. The production of a man in whom geology, observation, and industry, were united, and who passed a considerable part of a long life in chemical and the Earth.

tories, was calculated to dazzle the imagination by the grandeur of its design, and to captivate the judgment by its appearance of regularity and consistence. It has been considered as a peculiar excellence of the theory, that it ascribes to the phenomena of geology an order similar to that which exists in the provinces of nature with which we are best acquainted; that it produces seas and continents, not by accident, but by the operation of regular and uniform causes; that it makes the decay of one part subservient to the restoration of another, and that it gives stability to the whole, not by perpetuating individuals, but by reproducing them in succession.

An hypothesis with such pretensions could not fail of being minutely examined and severely criticized by the more enlightened part of geologists, and accordingly, very serious objections have been made to it by Kirwan and others. We shall state a few of what appear to us to be the most convincing arguments against Dr Hutton's theory, referring those who wish to see a more detailed refutation of it to the geological writings of Kirwan, and A Comparative View of the Huttonian and Neptunian Theories.

Some of the strongest arguments against this theory from the drawn from the nature of caloric, and what we nature and know of its action on other bodies. We know that caloric is of so diffusible a nature, that it is always communicated, from that body or set of bodies, in which it is most abundant, to that in which it is less so, till an equilibrium of temperature is produced. But Dr Hutton's theory supposes a subterraneous heat as constantly existing, capable of fusing the most obdurate rocks, and of raising them by its expansibility from the bottom of the ocean, and yet incapable of extending its influence through the superincumbent strata at all times, so as to fuse or evaporate superior bodies, and gradually expand itself, so as to acquire that equilibrium which is one of its natural effects. Again, supposing such a subterraneous heat to exist, it is surely extraordinary, that substances which we are incapable of fusing by the strongest heat that we can excite, even in the greatest state of division, should, by this subterraneous heat be so completely fused, and in such vast masses, as to have assumed the appearance under which they now present themselves. If the solar rays, in the utmost state of concentration, if a united stream of inflamed hydrogennous and oxygenous gases from the tube of a blow-pipe or gazometer, cannot melt the smallest visible portion of calcareous spar or rock crystal, how can we conceive that the immense mountains of limestone and of quartz which are met with in so many places could have been fused into a state of perfect fluidity? Or even if they could be fused, how is it possible that the carbonic acid of the limestone should not have been dissipated by the heat itself. If we suppose with Dr Hutton, that this subterraneous heat acts with the assistance of immense pressure from the superincumbent strata and waters of the ocean, hence preventing the dissipation of volatile matters, still it should act uniformly, and should fuse all those bodies which come in its way, that are capable of fusion. Now, we know that feldspar, scorial, mica, and chlorite, are much more fusible than quartz, and of course, when a mass compounded of these comes under...
under the influence of this heat, all these more fusible substances should be melted as well as the quartz. But in some stones in which most of these ingredients meet, as in the granite of Portnoy, there is every reason to suppose that some of them have been in a fluid state, while the others were solid or less fluid, as crystals of the latter are impressed on a bed of the former, viz. in the instance cited, crystals of feldspar in a mass of quartz. As it is certain, according to the advocates of the Huttonian theory, that at least the quartz was fluid when it was moulded on the feldspar, how happened it that this comparatively fusible stone was not also melted, and blended in one compact mass with the quartz? We also frequently find crystals of quartz penetrarted by schorl and chlorite, which is a proof that the latter must have been hard while the former was in a fluid state. Hence it is evident that these appearances could not have been the effect of fusion by heat. Again, we find seams of coal penetrated by this laminous and crystals of quartz, an effect which, according to this theory, must have taken place while the quartz was in a state of fusion. But, in this case, the strata of shale, above and below the coal should also have been fused, (shale being much more fusible than quartz), and thus the whole should have acquired a slaty texture; and besides in this intense heat, the coal should have been entirely charred and lost all its vegetable impressions.

The very existence of such a subterraneous heat, that constantly maintains itself without fuel, ready to act on any emergency, when a quantity of the old world has been abraded and translated sufficient to form the materials of a new one, is avowedly hypothetical, as we have no proof that it exists. Nay, we have direct proof, as far as rational induction can carry us, to the contrary. It was long ago observed, by Irving and Foster, that the heat of the sea diminishes in proportion to the depth to which we proceed in examining it, and the same has been more lately proved by Perton, by various trials in many different latitudes. Now the contrary of this ought certainly to happen, (unless this subterraneous heat is entirely unlike common heat) if there constantly existed in the bowels of the earth a heat capable of fusing quartz and limestone.

The structure of whin dykes, detailed in Section II. of last Chapter, affords additional arguments in opposition to the Huttonian theory.

The evidence which Dr Hutton has adduced to prove the subterraneous eruption of dykes, is drawn from the apparent derangement of the horizontal strata at a place where they are intersected by a dyke, and the peculiar appearance of the coal in their immediate vicinity, which he supposes to be in a state of calcination, from having been in contact with the ejected matter of the dyke in fusion. Let us first attend to the effect of this eruption of a dyke, the apparent derangement of the strata; and let us consider for a moment, what must be the mechanical operation of a mass of this liquid matter bursting upwards through the coal strata. Suppose a coal field of a mile square is extent; suppose that the coal and concomitant strata are perfectly regular, having a moderate dip or inclination to the south; and suppose that this coal field is to be intersected by a dyke, ejected in a state of fusion from the bowels of the earth. Considering the nature of the strata which usually accompany coal, such as sandstone, limestone, ironstone, &c. which are very hard and compact, the Earth we must allow, that the resistance from such substances would be very great. In this previous state of circumstances, then, what would be the effect of the eruption of a dyke in the middle of the field, in a direction from north to south? Can it even be imagined, that this liquid mass in its progress upwards through the superincumbent strata to the surface of the earth, would merely destroy the continuity of those strata, and not in its irresistible course, carry along with it part of all the substances composing that strata through which it passed? But further, one of the most obvious consequences of such an eruption, would be the elevation of part of the whole range of the strata on both sides of the dyke, and the extent of this elevation will be in proportion to the power or thickness of the dyke; and, not only is it natural to expect this elevation of the strata to a certain extent, but from the operation of an agent so tremendous and irresistible, that the whole strata should be broken, disjointed, and confused. But does this statement correspond with the phenomena? From the history of dykes traversing coal strata, we know that it does not. On the contrary, the whole of the strata, in most cases, preserve the same thickness, the same parallelism, and the same inclination to the horizon on both sides of the dyke. It is true, the half mile of coal field intersected by a dyke, as we have supposed above, will on one side of it be elevated or depressed. If the dyke, which runs north and south in its course upwards, inclines to the west, the western division will be elevated. But this is not a partial elevation only is the immediate vicinity of the dyke. It extends over the whole field on the west side of the dyke, and the strata continue fair and regular, in all respects corresponding to those from which they have been detached, till they are intersected by another dyke.

From this reasoning, we think the conclusion fair and obvious, that dykes intersecting coal strata have not been formed by subterraneous eruption, and therefore, that the elevation or depression of the strata is not owing to this cause. Dr Hutton's theory, in this respect, is opposed by the facts which it professes to explain, and consequently it is untenable.

Let us now consider the argument drawn from the supposed calcination of the coal which has been in contact with the matter of the dyke in a state of fusion. Here Dr Hutton seems to have overlooked the bounds of his own theory, and lost sight of his own principles, which suppose, that all the strata and stony matters of which the globe is composed, have been consolidated by means of heat; that the exhibition of the common or ordinary phenomena of heat is not to be looked for in the grand processes of nature; because these operations have taken place at great depths in the bowels of the earth, or under immense pressure at the bottom of the seas; and this is the reason that coal, and lime strata, for instance, which have been subjected to this intense degree of heat discover no marks of calcination, the one being deprived of its carbonic acid, and the other of its bismuth. Now, granting this hypothetical argument to be well founded, what is the reason that the coal, which is in contact with a dyke, has undergone the processes of calcination, when this coal is at so great a depth in the bowels of the earth, under as immense pressure, and as much...
Theoria congerie of minerals that are nearly the same in what part of the world the congeries is found. To these congeries Werner has given the name of formations, of which he distinguishes six kinds or classes, four universal, being found all over the globe, and two partial, found only in particular districts. These formations he has arranged according to the order in which he conceives them to have been produced, beginning with that formation which lies next the solid nucleus of the earth, and which may therefore be conceived to be the oldest, and ending with the most superficial, which is considered as the newest formation.

The first of these classes is called by Werner that of primitive formations, which consist of a number of formations lying above each other, being those which are supposed the oldest, as in these no organic remains have been discovered. The substances constituting this class are granite, gneiss, micaceous schistus, argillaceous schistus, primitive limestone, primitive trap, syenite, and porphyry. Of these the granite is the lowest, and therefore is considered as the oldest; and next this follow the others in the order in which we have enumerated them, except that the primitive limestone, and primitive trap, are found in an uncertain order, alternating with gneiss, argillaceous schistus, or micaceous schistus; and are therefore considered as subordinate to these formations.

When the waters had subsided, and the summits of the primitive mountains had been uncovered, organized bodies were produced; and part of these being intercepted among the chemical precipitations which were still going on, and the mechanical precipitations which now began to take place, were carried with these to the flanks of the primitive mountains, and the valleys between them. Hence they produced a second series of formations, which are called by Werner transition formations, or rocks of transition, as he considered them to be deposited during the period when the earth was passing from an uninhabited to an inhabited state. Among these formations, however, the organic remains are but few. The substances composing this class, are transition limestone, gray wacke, gray wacke slate, transition trap, siliceous schistus. Of these the two last are subordinate, alternating with gray wacke slate.

The third formation is what Werner calls floetic formation, or that, in which the beds or strata lie nearly horizontal, appearing as if they had been deposited from water. This formation comprehends most of what are usually called secondary strata. It is divided by Werner into three subformations, named from the variety or situation of the sandstone, which forms a principal part of each; as, 1. Old red sandstone formation, composed of floetic limestone, old red sandstone, and foliated gypsum. 2. Second sandstone formation, composed of sandstone, floetic limestone, and fibrous gypsum.

(f) We may here notice Werner's opinion with respect to the formation and situation of basalt; as this is the only theory of importance respecting it, that has not been mentioned under the article Basaltes. "I am perfectly convinced (says Werner in a late memoir) that all the varieties of basalt have been produced in the humid way, and that they are of a very recent formation; that they formerly composed a great bed of immense extent, covering both the primitive and secondary strata; that time has anew destroyed a considerable part, and has left only the basaltic eminences which we now see." Vid. Jameson's Mineralogy of Dumfries, p. 184.
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A second objection is derived from the difficulty of supposing that these substances could have been consolidated below water, or that the water could completely shut up the pores of a body, to the entire exclusion of itself; so that had the mineral substances been consolidated as here supposed, the solvent ought either to remain within them in a liquid state, or, if evaporated, should have left the pores empty, and the body pervious to water.

Mr. Playfair argues strenuously against the notion of these substances being precipitated from the chaotic fluid, which has been so ingeniously supported by Kirwan, who ascribes the solution of all substances in the chaotic fluid to their being finely pulverized, or created in a state of the most minute division; and the solvent being then insufficient in quantity, he supposes that, on that account, the precipitation took place more rapidly.

"If, says Mr. Playfair, he means by this to say, that a precipitation without solution would take place the sooner, the more inadequate the menstruum was to dissolve the whole, the proposition may be true, but will be of no use to explain the crystallization of minerals, the very object he has in view; because to crystallization it is not a bare subsidence of particles suspended in a fluid, but it is a passage from chemical solution to non-solution, or insolvability, that is required.

"If on the other hand he means to say, that the solution actually took place more quickly, and was more immediately followed by precipitation, because the quantity of the menstruum was insufficient, this is to assert that the weaker the cause, the more instantaneous will be its effect."'

Werner's theory of dykes and veins requires a more particular consideration.

This theory supposes, that the spaces which are now occupied by vertical strata, or dykes, including also metallic veins, were originally fissures, formed by the operation of different causes.

1. The unequal height and density of mountains, are considered as the most general causes of fissures. When the mountains were in a soft and humid state, that side which was least supported not only separated by its own weight, but the whole strata of the side gave way, and sunk below their former plain. This also seems to be the opinion of Saussure, with regard to the formation of fissures. It is not to be expected, that events of this kind should be of frequent occurrence, now that mountains have acquired sufficient firmness and stability to resist the force of gravity, operating in consequence of the inequality of weight and diversity of the materials of which they are composed. Instances, however, of the operation of such causes are not altogether wanting, even in modern times. After a season of excessive rains, in the year 1767, similar fissures were formed in mountains in Bohemia and Lusatia.

2. When the waters covered the surface of the earth, the unequal weight of the mountains was supported by their pressure; but when the waters retreated, this pressure was removed, the equilibrium was destroyed, the unsupported side of the mountain separated and sunk; and in this manner a fissure was formed.

3. The evaporation of the moisture, after the retreat of the waters, and the consequent diminution of bulk by contraction of the substances which enter into the composition of mountains, are also considered as the causes of fissures.

4. Fissures, too, derive their origin from other local and accidental causes, and especially from earthquakes. In the year 1783, when Calabria was afflicted with this most dreadful of all calamities which visit the earth, mountains were separated, exhibiting fissures similar to those which are now occupied by vertical strata.

The second part of the theory is employed in proving that the empty spaces, occasioned by the operation of one or other of the causes which have been enumerated, were filled from above; that the different substances, of which the vertical strata are composed, were held in solution by the waters which covered the earth; and that they were precipitated, by different chemical agents, according to the order of chemical affinity, and deposited in the places which they now occupy. In support of the opinion, that these fissures were filled from above, Werner adds facts of angular and rounded fragments of stones of various species, and organized bodies, as marine shells and vegetables, having been found in vertical strata, at the immense depth of 150 and 200 fathoms. It may be doubted, on good grounds, whether this theory, supported by all the ingenuity and experience of its author, will account in a satisfactory manner, for that regularity of position and arrangement which are discovered in the vertical strata; for, notwithstanding the seeming disorder which a superficial vein may exhibit, they are not less regular and uniform than the horizontal strata. And when our researches are extended beyond the narrow bounds within which they are at present limited, when we are better acquainted with their relative positions and connexions, this uniformity and regularity will become more conspicuous. It may be doubted whether the fortuitous operation of such causes as have been stated, be equal to the effect of the formation of the vertical strata, as they now appear.

But, supposing that fissures were produced by some of the causes which have been mentioned, few of these causes could operate till the retreat of the waters left the mountains uncovered. It was only then that the mountains, by the inequality of height and density, being left unsupported, separated, and sunk from their former situation; it was then only that the process of evaporation could take place, succeeded by diminution of bulk and consequent contraction. In short, none of the causes which have been stated, could have any effect before the waters had retreated, excepting earthquakes; of the operation of which there is no proof previous to that period. The materials which compose the vertical strata, it is said, were formed by deposition from the waters which covered the mountains, holding them in solution. But before the fissures could be formed to receive these materials by precipitation and deposition, the waters had retired. A second deluge must therefore have happened, from the waters of which the various substances which enter into the composition of vertical strata have been deposited. This the theory does not suppose to have taken place; and, without such a supposition, it seems to be attended with considerable difficulty. But another difficulty still remains. It does not appear how the peculiarity of structure,
Theories of structure, which was mentioned in our account of whin dykes, Sect. II. of the last chapter, can be accounted for by the principles of this theory. If it be granted, that the horizontal strata were formed in the humid way, the materials of which they are composed must have been precipitated from the waters which held them in solution, by the laws of chemical affinity. But the vertical strata are supposed to have been formed in the same manner, and according to the same process. Now, this being the case, What is the reason that the vertical strata should exhibit a peculiarity of structure and arrangement, different from the horizontal strata? Some of the whin dykes which have been already described, are very remarkable for this singular structure, especially those which assume the form of prismatic columns. These columns are in the horizontal position; and, excepting the latter circumstance, these dykes, in every respect, resemble a basaltic stratum, in which the columns are perpendicular.

More arguments might be adduced in opposition to the theory of Werner; but we must hasten to conclude this chapter, with mentioning a few of Mr Kirwan's peculiar opinions.

Among these, the manner in which he accounts for the unequal declivities of the sides of mountains, forms one of the most conspicuous objects: and to this we shall principally confine ourselves, and shall give it in his own words, as extracted from his essay on the declivities of mountains, to which we were obliged in the first section of Chap. II.

"To assign the causes of this almost universal allotment of unequal declivities to opposite points, and why the greatest are directed to the west and south, and the gentlest, on the contrary, to the east and north, it is necessary to consider,

"1. That all mountains were formed while covered with water.

"2. That the earth was universally covered with water at two different eras, that of the creation, and that of the Noachian deluge.

"3. That in the first era we must distinguish two different periods, that which preceded the appearance of dry land, and that which succeeded the creation of fish, but before the sea had been reduced nearly to its present level. During the former, the primeval mountains were formed; and during the latter, most of the secondary mountains and strata were formed.

"4. That all mountains extend either from east to west, or from north to south, or in some intermediate direction between these cardinal points, which need not be particularly mentioned here, as the same species of reasoning must be applied to them, as to those to whose aspect they approach most.

"These preliminary circumstances being noticed, we are next to observe that, during the first era, this vast mass of water moved in two general directions, at right angles with each other, the one from east to west, which needs not to be proved, being the course of tides which still continue, but were in that ocean necessarily stronger and higher than at present; the other from north to south, the water tending to these vast abysses then formed in the vicinity of the south pole, as shewn in my former essays. Before either motion could be propagated, a considerable time must have elapsed.

"Now the primeval mountains formed at the commencement of the first era, and before this double direction of the waters took place, must have opposed the Earth a considerable obstacle to the motion of that fluid in the course that crossed that of the direction of these mountains. Thus the mountains that stretch from north to south must have opposed the motion of the waters from east to west; this opposition diminishing the motion of that fluid, disposed it to suffer the earthy particles with which in those early periods it must have been impregnated, to crystalize or be deposited on these eastern flanks, and particularly on those of the highest mountains, for over the lower it could easily pass; these depositions being incessantly repeated at heights gradually diminishing as the level of the waters gradually lowered, must have rendered the eastern declivities or descent, gentle, gradual, and moderate, while the western sides receiving no such accessions from depositions, must have remained steep and craggy.

"Again, the primeval mountains that run from east to west, by opposing a similar resistance to the course of the waters from north to south, must have occasioned similar depositions on the northern sides of these mountains, against which these waters impinged, and thus smoothed them.

"Where mountains intersect each other in an oblique direction, the north-east side of one range being contiguous to the south-west flanks of another range, there the influx of adventitious particles on the north-east side of the one, must have frequently extended to the south-west side of the other, particularly if that influx were strong and copious; thus the Erzgebirge of Saxony, which run from west to east, have their north-east sides contiguous to the south-west side of the Riesengebirge that separate Silesia from Bohemia, and hence these latter are covered with the same beds of gneiss, &c. as the northern sides of the Saxony, and thereby are rendered smooth and gentle, comparatively to the opposite side, which, being sheltered, remains steep and abrupt, which explains the seventh observation.

"The causes here assigned explain why the covering of adventitious strata on the highest mountains is generally thinnest at the greatest height, and thickest towards the foot of the mountain; for the bulk of the water that contained the adventitious particles being proportioned to its depth, and the mass of earthy particles with which it was charged being proportioned to the bulk of the water that contained them, it is plain, that as the height of water gradually decreased, the depositions from it on the higher parts of the mountains must have been less copious than on the lower, where they must have been often repeated.

"Hence, 2. granite mountains, generally the most ancient, frequently have their northern or eastern sides covered with strata of gneiss or micaceous schistus, and this often with argillite or primeval sandstone, or limestone, these being either of somewhat later formation, or longer suspendible in water.

"Hence, 3. different species of stone are often found at different heights of the same range of a mountain, according as the water which conveyed these species, happened to be differently impregnated at different heights. During the first era its depositions formed the primitive stony masses; after which the creation of fish, limestone, sandstone, (puddingstone) and secondary argillites, in which piscine remains are found, were deposited.
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During the second era, that of the Noachian deluge, by reason of the violence and irregularity of its aggression, the depositions were more miscellaneous, and are found at the greatest heights; yet in general they may well be distinguished by the remains of land animals, or of vegetables, or of both, which they present in their strata (or at least by the impressions of vegetables which they bear) as these must have been conveyed after the earth had been inhabited. But mountains regularly stratified bearing such remains, for instance the carboniferous, cannot be deemed to have been formed in a period so tumultuous. During this deluge the waters also held a different course, proceeding at first from south to north, and afterwards in both opposite directions, as shown in treating of that catastrophe in my second essay.

Hence, and from various contingent local causes, as partial inundations, earthquakes, volcanoes, the erosion of rivers, the impaction of strata, disintegration, the disruption of the lofty mounds by which many lakes were anciently hemmed in, several changes were produced in particular countries, that may at first sight appear, though in reality they are not, exceptions to the operations of the general causes already stated.

"Thus the mountains of Kamtschatka had their eastern flanks torn and rendered abrupt by the irruption of the general deluge, probably accompanied by earthquakes. And thus the Meissener had its east and north flanks undermined by the river Warre, as Werner has shown; thus the eight and sixteenth observations are accounted for, as is the thirteenth by the vast inundations so frequent in this country, (1. Pallas, p. 172.), which undermined or corroded its east side, while the western were smoothed by the calcareous depositions from the numerous rivers in its vicinity.

"Hence, 4. we see why on different sides of lofty mountains different species of stones are found, as Pallas and Sauvage have observed (2. Sauv. 581.), as circumstances, of which Sauvage imagined almost inexplicable, but which Dolomieu has since happily explained, by showing that the current which conveyed the calcareous substances to the northern, eastern, and north-eastern sides of the Alps, for instance, was stopped by the height of these mountains, and thus prevented from conveying them to the southern sides, and thus the north-eastern sides were rendered more gentle than the opposite, (3. New Ross. p. 423.), conformably to the theory here given.

Hence, 5. where several lofty ridges run parallel to each other, it must frequently happen that the external should intercept the depositions that do not surround them, and thus leave the internal ridges steep on both sides.

"Hence, 6. low granitic or other primitive hills are frequently overgrown by adventitious strata on all sides, as at Phaethon in the county of Donegal, or are covered on all sides; the impregnated waters either easily passing over them, or stagnating upon them, according to the greater or less rapidity of its course, and the obstacles it met with."

Mr. Kirwan's theory of the formation of whin dykes, is as follows.

He supposes that the dyke existed in the spot where it is found previous to the formation of the horizontal strata; that, during the formation of the latter by deposition, their equal extension on each side of the dyke was obstructed by its height preventing the passage of quakes and the current of waters; that the strata on that side of the dyke which were first formed, occasioned a much more considerable pressure than on the side on which the strata of later formation reposed, and must have pulled the upper and more movable extremity of the slip gradually towards the side on which there was least pressure; on that side it must therefore overhang; this pressure being of earlier date than on the opposite side, must have had a more considerable effect in depressing each particular stratum, and forcing their integrant particles into closer contact, than could have been produced in those of later formation; and consequently the strata must be lower. The ingenious author has added, with good reason, that he is not satisfied with this explanation. It is undoubtedly quite incompatible with the phenomena which it attempts to explain. For it has been already observed, that the fossil and contiguous strata are, in every respect, the same on both sides of a dyke, to whatever distance they may have been elevated or depressed, which demonstrates clearly, that their formation must have been coeval. But, besides, the same derangement takes place in a slip where there is merely a solution of contiguity of the horizontal strata, one side being only elevated or depressed above or below the corresponding side from which it has been detached without having a vertical stratum or dyke interposed.

Chap. IV. Of Earthquakes and Volcanoes.

In the preceding chapters we have given a short account of the materials which constitute the globe of the earth; we have taken a view of the relative position and connexion which subsist among these materials, so far as they are known, and we have considered some of the changes which are supposed to have taken place in their arrangement and distribution, and some of the theories which have been proposed to account for these changes. We have hitherto contemplated nature in a state of seeming repose, conducting her operations by a gradual and silent process, and accomplishing the most beneficial and wonderful effects, unheeded and unobserved. We are now to take a view of those more terrible and sudden changes which are exhibited in the devastation and ruin which accompany the earthquake and the volcano;—changes awful in the contemplation, but dreadful and terrible in their tremendous effects.

Many of the phenomena which accompany earthquakes and volcanoes, are common to both. Earthquakes are frequently the forerunners, and sometimes the attendants, of volcanic eruptions; but earthquakes have often existed, and their terrible effects have been severely felt, where no volcano was ever known.

In the present chapter, we propose to consider the phenomena, history, and causes of earthquakes and volcanoes, which will form the subjects of the two following sections. In the first we shall treat of earthquakes, and in the second of volcanoes.

Sect. I. Of the Phenomena and History of Earthquakes.

Earthquakes have been felt in most countries of the world. There are, however, particular places where earthquakes prevail.
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Earthquakes and eruptions

The first earthquake, the history of which we shall treat in some detail, happened in Calabria, in the year 1538. This earthquake is rather to be considered as an exception to what was said with regard to their not taking place in the neighborhood of a volcano, soon after an eruption. The volcanoes in that vicinity had experienced violent eruptions a very short time before. Five years before, there had been an eruption of Mount Vesuvius, and two years only had elapsed from the time that a similar event had befallen Mount Etna. This mountain, indeed, at the very time, threw out a great body of smoke, which seemed to cover the whole island, and entirely concealed the shores from view. The air over the sea at a little distance was calm and serene, and the surface of the water was perfectly smooth. Seemingly without any cause, it began to be slightly agitated, as happens to the surface of water in a heavy shower of rain. A dreadful noise succeeded, and the smell of sulphureous vapours was perceived. The noise, like the rattling of chariots, grew more frequent and loud, and the shock at last was terribly felt, when the earth was heaved up, or rolled in the form of waves.

This earthquake is particularly described by the celebrated father Kircher. "On the 24th of March, (says he), we departed in a small boat from the harbour of Messina in Sicily, and the same day arrived at the promontory of Pelorus. Our destination was for the city of Euphemia in Calabria, but unfavourable weather obliged us to remain at Pelorus three days. Weighed at length with delay, we determined to proceed on our voyage, and although the sea seemed unusually agitated, yet it did not deter us from embarking. As we approached the gulf of Charybdis, the waters seemed whirled round with such violence, as to form a large hollow in the centre of the vortex. Turning my eye to Mount Etna, I saw it throw out huge volumes of smoke, which entirely covered the island. This awful appearance, with the dreadful noise, and the sulphureous smell which accompanied it, filled me with strong apprehensions that some terrible calamity was approaching. The sea itself exhibited a very unusual appearance, its agitation resembling that of the waters of a lake which is covered with bubbles in a violent shower of rain. My surprise was still increased by the calmness and serenity of the weather; not a breeze stirred, not a cloud obscured the face of the sky, which might be supposed to produce these dreadful commotions. I therefore warned my companions, that the unusual phenomena which we observed, were the forerunners of an earthquake. Soon after we stood in for the shore, and landed at Tropea; but we had scarcely arrived at the Jesuits college in that city, when a horrid sound, which resembled the rattling wheels of an infinite number of chariots, driven furiously along, stunned our ears. Soon after a terrible shaking of the earth began; the ground on which we stood seemed to vibrate, as if we were in the scales of a balance, which continued waving. The motion soon grew more violent; I could no longer keep my legs, but was thrown prostrate upon the ground. After some time had elapsed, when I had recovered from the consternation; and finding that I was unhurt amidst the general crash, I resolved to make the best of quakes and my way to a place of safety, and running as fast as I could, I reached the shore. I soon found the boat in which I had landed, as well as my companions; and leaving this scene of desolation, we proceeded on our voyage along the coast. Next day we arrived at Rochetta, where we landed, although the earth still continued in violent commotion. But we had scarcely reached the inn when we were again obliged to return to the boat. In about half an hour we saw the greatest part of the town, and the view of the inn where we had stopped, levelled with the ground, and most of the inhabitants buried in its ruins. As we proceeded onward, we landed at Lopexium, which is a castle about half way between Tropea and Euphemia, to which we were bound; and here, wherever I looked, nothing but scenes of ruin and horror presented themselves. Towns and cities were levelled with the ground, and Stromboli at the distance of 60 miles threw out an immense body of flames, accompanied with a noise which could be distinctly heard.

But our attention was quickly drawn from more remote to present danger. The rattling sound which immediately precedes an earthquake, again alarmed us; every moment it seemed to grow louder and louder, and to approach nearer the place on which we stood. A dreadful shaking of the earth now began, so that being unable to stand, my companions and I caught hold of whatever shrub was next to us, to support ourselves. After some time the violent commotion ceased, and we stood up, and proposed to prosecute our voyage to Euphemia, which lay within sight; but in the meantime, while we were preparing ourselves, I turned my eyes towards the city, but could see nothing but a thick, black cloud, which seemed to rest on the place. This appeared an extraordinary circumstance, as the sky all round was calm and serene. We waited till the cloud passed away, and then turning to look for the city, it was totally sunk, and where it formerly stood, nothing remained but a dismal and unfordable lake."  

In the year 1693, an earthquake happened in Sicily, in Euphemia, which not only shook the whole island, but also reached to Naples and Malta. Previous to the shock, a black cloud was seen hovering over the city of Catania, which was destroyed at this time. The sea began to be violently agitated; the shocks succeeded like the discharge of a great number of artillery; the motion of the earth was so violent, that no persons could keep their legs. Even those who lay on the ground were tossed from side to side, as on a rolling billow; high walls were razed from their foundations, and were thrown to the distance of several paces. Almost every building in the countries which it visited was thrown down; 54 cities and towns, besides a great number of villages, were either greatly damaged, or totally destroyed. Among those which we have already mentioned, was the city of Catania, one of the most ancient and flourishing in the kingdom. After the thick cloud which remained after the earthquake had dissipated, no remains of this magnificent city could be seen. Of 16,000 inhabitants, not fewer than 16,000 perished by this dreadful calamity.

The terrible earthquake which visited the island of Jamaica in 1692, affords us another example of almost the whole of the phenomena which were enumerated.
as the forerunners or attendants of earthquakes. It was on the 7th of June, in that year, that this dreadful calamity, which in two minutes totally destroyed the town of Port Royal, on the south side of Jamaica, and at that time the capital of the island, took place. The effect of the shock on the surface was immediately preceded by a hollow rattling noise, like that of thunder. The streets were heaved up like waves of the sea, and then instantly thrown down into deep pits. All the wells discharged their waters with prodigious agitation; the sea burst its bounds, and deluged a small part of the town which was not entirely overwhelmed.

The fissures produced in the earth were so great, that one of the streets seemed twice as broad as formerly, and in some places the earth opened and closed again for some time. A great many of these openings were seen at once. In some of them, the houses and inhabitants, and everything that was near, were swallowed up. Some persons were swallowed up in one of these chasms, and what will appear most extraordinary, and indeed almost incredible, were thrown out alive from another. Whole streets sunk in some, and from others an immense body of water was projected high into the air. Smells which were extremely offensive now succeeded; nothing but the distant noise of falling mountains was heard, and the sky, which before the shock was still and serene, assumed a dull red colour.

The effects of this earthquake were not limited to this spot. It was severely felt throughout the whole island, which in many places sustained very material damage. Indeed there were few houses which were not either injured or thrown down. In some places the inhabitants, houses, trees, and whole surface, were swallowed up in the same chasm; and what was formerly dry land was left a pool of water. The wells in almost every corner of the island, whatever was their depth, threw out their water with great violence. The rivers were either entirely stopped, or ceased to flow for 24 hours; and many of them formed to themselves new channels. At the distance of 12 miles from the sea, an immense body of water spouted out from a gap which was formed in the earth, and was projected to a great height in the air. Such was the violence of the shock, that many persons were thrown down on their faces, even in places where the surface of the ground remained unbroken. It was observed that the shock was most severely felt in the immediate vicinity of the mountains. Could this arise from the greater pressure, and consequently the greater resistance, or was it because the force which produced these terrible effects existed near them?

After the great shock which destroyed the town of Port Royal, the inhabitants who escaped went on board ships in the harbour, where many of them remained for two months, during which time the shocks were repeated, and were so frequent, that there were sometimes two or three in the course of an hour. These were still accompanied with the same rattling noise, like that of thunder, or like the rushing noise occasioned by a current of air in rapid motion. They were also attended with what are called brimstone blasts. These, it is probable, were sulphurous vapours which issued from the openings made by the earthquake. The atmosphere, however, seemed to be loaded with noisome vapours, for a very general sickness soon succeeded, which in a short time swept off not fewer than 3000 persons.

But of all the earthquakes, the history of which is on record, that which happened at Lisbon, in the year 1755, was by far the most extensive in its effects, and from its recent occurrence, will probably be deemed the most interesting. In the year 1755, several shocks of earthquakes had been sensibly felt. The four following years were remarkable for excessive drought. The springs which formerly yielded abundance of water, were totally dried up and lost; the winds which chiefly prevailed were from the north and north-east. During this period also there were slight tremors of the earth; the seasons in 1755, were unusually wet, and the summer, as the consequence of this, proved unusually cold. But for the space of 40 days before the earthquake happened, the sky was more clear and serene. On the last day of October the face of the sun was considerably obscured, and a general gloom prevailed over the atmosphere. The day following (the 1st of November) a thick fog arose, but it was soon dissipated by the heat of the sun. Not a breath of wind was stirring; the sea was perfectly calm, and the heat of the weather was equal to that of June or July in this country. At 35 minutes after nine in the morning, without any previous warning, excepting the rattling noise resembling that of distant thunder, the earthquake came on with short, quick vibrations, and shook the very foundation of the city, so that many of the houses instantly fell. A pause, which was indeed just perceptible, succeeded, and the motion changed. The houses were then tossed from side to side, like the motion of a wagon driven violently over rugged stones. It was this second shock which laid great part of the city in ruin, and, as might be expected, great numbers of the inhabitants were destroyed at the same time. The whole duration of the earthquake did not exceed six minutes. When it began, some persons in a boat, at the distance of a mile from the city, and in deep water, thought the boat had struck on a rock, in consequence of the motion which was communicated to it. At the same time they perceived the houses falling on both sides of the river. The bed of the Tagus was in many places raised to the very surface of the water; ships were driven from their anchors or moorings, and were tossed about with great violence; and the persons on board did not for some time know whether they were afloat or aground. A large new pier with several hundreds of people upon it, sunk to an unathomable depth, and not one of the dead bodies was ever found. The bar of the river was at one time seen dry from side to side; but suddenly the sea came rolling in like a mountain, and in one part of the river the water rose in an instant to the extraordinary height of 50 feet. At noon another shock happened; the walls of some houses that remained were seen to open from top to bottom, near a foot wide, and were afterwards so exactly closed, that scarcely any mark of this injury remained.

But what was the most singular circumstance attending this earthquake was, the prodigious extent to which the effects reached. At Colares, 20 miles from Lisbon, and two miles from the sea, the weather was uncommonly warm for the season, on the last day of October. About four o'clock in the afternoon, a fog arose which, proceeding
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Earthquakes and Volcanoes

At the town of Funchal in Madeira, the first shock of this earthquake was felt at 38 minutes past nine. It was preceded by the rattling noise, which seemed to be produced in the air; the shock, it was supposed, continued for more than a minute; the earth moved with a vibratory, undulating motion, and some of the vibrations increased greatly in force. The noise in the air which accompanied the shock, lasted some seconds after the motion of the earth had ceased. At three quarters past eleven, the day being calm and serene, the sea retired suddenly, then, without the least noise, rose with a great swell, overflowed the shore, and entered the city. It rose 15 feet perpendicular above high-water mark. Having thus fluctuated four or five times, it at last subsided, and resumed its former stillness. In the northern part of the island, the inundation was still more violent. It first retired to the distance of 100 paces, and suddenly returning, overflowed the shore, broke down walls of magazines and storehouses, and left behind it great quantities of fish in the streets of a village. At this place the sea rose only once beyond the high-water mark, although it continued to fluctuate much longer before it entirely subsided than at Funchal.

Such were the effects of this earthquake, in those places where it was accompanied with considerable damage. It was, however, perceptibly felt to a great distance in every direction, either by a slight motion of the earth, or by the agitation of the waters. At the island of Antigua the sea rose to such a height as had never been before known, and afterwards the water at the wharfs which used to be six feet deep, was not more than two inches. About two in the afternoon, the sea ebbed and flowed at Barbados in a very unusual manner. It overflowed the wharfs, and rushed into the streets. This flux and reflux continued till 10 at night.

Shocks were distinctly felt in different parts of France, as at Bayonne, Bonnent, and Lyons. The waters were also observed to be agitated in different places, as at Angouleme, and Havre de Grace, but with a less degree of violence than some which have been mentioned. At Angouleme, a subterraneous noise like thunder was heard, and soon after a torrent of water, mixed with red sand, was discharged from an opening in the earth. Most of the springs in the neighbourhood sunk, and continued dry for some time.

The effects of this earthquake were also very perceptible in many places of Germany. Throughout the duchy of Holstein, the waters were greatly agitated, particularly the Elbe and Trave. The water of a lake, called Lische, in Brandenburg, ebbed and flowed six times in half an hour, and although the weather was then perfectly calm, this motion was accompanied with a great noise. A similar agitation took place in the waters of the lakes called Mupelgaat and Neto, but here there was also emitted a most offensive smell.

The sea was greatly agitated round the island of Corsica, and many of the rivers of the island overflowed their banks. The same earthquake was felt in the city of Milan in Italy, and its neighbourhood. Turin in Savoy experienced a very smart shock.

Many of the rivers of Switzerland became all at once muddy, although there had been no rain. The lake of Neuchatel rose to the height of two feet above its usual level, and continued at this height for a few hours. The waters of the lake of Zurich were also greatly agitated.

The commotion of the waters in Holland was still more remarkable. In the afternoon of the 1st of November, the waters of the Rhine at Alphen, between Leyden and Woerden, were so violently agitated, that the buoys were broken from their chains, large vessels parted from their cables, and smaller ones were thrown upon the dry land. At 11 in the forenoon at Amsterdam, when the air was perfectly calm, the waters in the canals were thrown into great commotion, so that boats broke loose from their moorings, chandeliers were observed to vibrate in the churches, although it is said no motion of the earth was perceptible. In the forenoon, at Haarlem, not only the water in the river, canals, &c. but it is asserted, smaller quantities of fluids contained in vessels, were greatly agitated, and sometimes dashed over the sides of the vessels. This continued for about four minutes. Between 10 and 11 in the forenoon, in some of the canals at Leyden, the waters rose suddenly, and produced very perceptible undulations.

The effects of this earthquake extended as far north as Norway and Sweden: many of the rivers and lakes in Norway were greatly agitated; shocks were felt in several of the provinces in Sweden, and commotions of the waters, with the rivers and lakes, especially in Dalecarlia, were observed. The river Dala suddenly overflowed its banks, and as suddenly retired; and at the same time, a lake which is a league distant from it, bubbled up with great violence. Several smart shocks were felt at Falun, a town in Dalecarlia.

In many places of Great Britain and Ireland, the agitation of the waters was very perceptible. At Eaton bridge in Kent, near a pond of an acre in extent, some persons heard a sudden noise, which they supposed was occasioned by something falling into the pond, for it was then a dead calm, and ran to the spot, where they saw the pond open in the middle, while the water was dashed over a perpendicular bank two feet high. This motion was repeated several times, and still accompanied with a great noise.

At Cobham in Surry, between 10 and 11 o'clock A. M. a person was watering a horse at a pond, the waters of which were derived from springs. At the moment the animal was drinking, the water retired from his mouth, and left the bottom of the pond dry. It then returned with great violence, and when it retired, its progress was towards the south. About the same time at Bushbridge, in the same county, while the weather was remarkably calm, the waters of a canal 700 feet long and 58 broad, were greatly agitated, and this was accompanied with an unusual noise. The waters rose between two and three feet above the usual level, in the form of a heap or ridge, extending 30 yards in length. This ridge then heeled towards the north side, and flowed with great impetuosity over the grass walk; it then returned to the canal, again heaped up in the middle, and then heeled to the south side with
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On the afternoon of the 31st of October, the water of a fountain at Colares was observed to be greatly diminished. On the morning of the 1st of November, the day on which the earthquake happened, it became thick and muddy, but afterwards recovered its usual quantity and limpidity. In some places springs appeared where there had been formerly no water, and continued afterwards to flow. At Varge, on the river Macaos, many springs of water burst forth at the time of the earthquake, and some threw up their waters mixed with sand of various colours, to the height of 18 or 20 feet. In Barbary, a stream of water, which was as red as blood, burst forth from a mountain, which was split in two. At Tangier all the fountains were dried up during the whole of the day on which the earthquake happened. The mineral waters of Töplitz, a village in Bohemia, which have been celebrated since the year 1672, experienced a very remarkable change. The principal hot spring had continued to flow from the time it was discovered, of the same temperature and the same in quantity. On the morning of the earthquake, between 17 and 12 o'clock, the waters of the spring increased so much in quantity, that all the banks over the place were overflown with water. Before the water increased, it flowed from the spring thick and muddy; and then having entirely stopped for about a minute, it burst out with great violence, carrying before it a great quantity of reddish sand. It afterwards became limpid, and flowed as formerly, but in larger quantity, and of a higher temperature. At Angouleme in France the earth opened in one place, and discharged a great body of water, which was mixed with reddish sand. Most of the springs in the neighbourhood sunk so low, that for some time it was supposed they had become quite dry.

Such were the extraordinary effects of this terrible earthquake, which extended over a space not less than four millions of square miles. Other earthquakes, although of more limited extent, have produced effects not less destructive, and particularly some of the earthquakes which have visited Italy and Sicily in modern times; accounts of which have been drawn up with accuracy and attention. Some of these we shall now detail.

One of the most calamitous earthquakes was that which befell Calabria in the year 1783. Of this earthquake Sir William Hamilton, who, soon after the earthquake happened, visited the scenes of desolation which it left behind, has drawn up a particular account. He observes, that "if on a map of Italy, and with your compass on the scale of Italian miles, you were to measure off 22, and then fixing the central point on the city of Oppido, which seemed to be the spot where the earthquake had exerted its greatest force, form a circle, the radius of which will be 23 miles, you will then include all the towns, villages, &c. that have been utterly ruined, and the spots where the greatest mortality happened, and where there have been the most visible alterations on the face of the earth. Then extend your compass in the same scale to 75 miles, preserving the same centre, and form another circle, you will include the whole country that has any mark of having been affected by the earthquake. A gradation was plainly observed in the damage done to the
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Approaching the plain, it was observed, according to the general remark made above, that the towns and villages were more or less desolated in proportion to their vicinity to the plain. Of the town of Mileto, which stood on a hill overlooking the town, but he could see nothing excepting a thick white cloud of dust. So completely was this town destroyed, that no vestige of house or street remained; all lay in the same confused heap of ruins. Other towns had suffered in the same manner, and now exhibited the same scene of desolation.

Terra Nuova suffered severely from the same earthquake. It is situated between two rivers which had formed deep and wide ravines in their course; one of these was not less than 500 feet deep, and three quarters of a mile broad. In consequence of the great depth of this ravine, and the violent motion of the earth, two large masses of the soil on which a great part of the town, consisting of some hundred houses, had been thrown into the ravine at the distance of half a mile from the place where they formerly stood. Many of the inhabitants who had been carried away with their houses, were dug out of the ruins alive, and even some of them escaped unburied. Of 1600 inhabitants, 400 only remained alive. In other places in the same neighbourhood, great tracts of land had been removed and carried to a considerable distance, with all their plantations and crops, which continued to grow and thrive in their new situation as well as formerly. The river here disappeared at the moment of the earthquake, but soon after returned, and covered the bottom of the ravine to the depth of three feet. This water was observed to be salt like that of the sea.

The whole town of Molochi di Sotto had been thrown into the ravine, and a vineyard of many acres lay near it in an inclined situation, but had not suffered any other injury. In several parts of the plain, the soil, with all its trees and crops of corn, to the extent of many acres, had sunk eight and ten feet below the level of the plain; and in other places it had risen the same height. The soil of this plain, it is to be observed, is composed of clay mixed with sand, which readily assumes any form.

Sir William next proceeded to Oppido, which, it will be recollected, was considered as the central point on which the greatest force of the earthquake was exerted. This city stands on a mountain of gritstone of a reddish colour. It is surrounded by two rivers, which run in a deep ravine. It had been reported, that the mountain on which the city stands, had been split in two, and stopped up the course of the rivers; but it appeared on examination, that huge masses of the plain on the edge of the ravine, had been detached into it, and had so far filled it up, as to stop the course of the rivers, the waters of which were collecting, and forming lakes to a great extent. Part of the rock, it was found, on which the city stood, was separated, and with several houses upon it, was thrown into the ravine. Great tracts of land, with plantations of vines and olives, were transported from one side of the ravine to the other, to a distance exceeding half a mile.

Having walked, (says Sir William), over the ruins of Oppido, I descended into the ravine, and examined carefully the whole of it. Here I saw, indeed, the wonderful force of the earthquake, which has produced exactly the same effects as those described in the ravine at Terra Nuova, but on a scale infinitely greater. The enormous masses of the plain detached from each side of
Earthquakes and Volcanoes than by the ardour of the sun, were struck with terror by the horrible sound which they heard, and the heat which they experienced. Pineda, that valuable member of society, whose premature death is still deplored by the friends of science, foretold that a terrible eruption was preparing in the mountain of Tunguragua; and his conjectures were confirmed by the event. On the 4th of February 1797, at three quarters past seven in the morning, the summit of the volcano was more free from vapours than usual; the interior part of the mountain was agitated by frequent shocks, and the adjacent chains burst in such a manner, that in the space of four minutes an immense tract of country was convulsed by an undulating movement. Never did history relate the effects of an earthquake so extraordinary, and never did any phenomenon of nature produce more misfortunes, or destroy a greater number of human beings. A number of towns and villages were destroyed in a moment: some of them, such as Riobamba, Quero, Pelileo, Patate, Pillaro, were buried under the ruins of the neighbouring mountains; and others in the jurisdictions of Harnata, Latacunga, Guaranda, Riobamba, and Alausi, were entirely overthrown. Some sustained prodigious loss by the gulfs which were formed, and by the reflux of rivers intercepted in their course by meetings earth, and others, though in part preserved, were in such a shattered state as to threaten their total ruin. The number of persons who perished during the first and succeeding shocks is estimated at 16,000. At ten o'clock in the morning, and four in the afternoon, the same day, (February 4.) after a dreadful noise, the earth was again agitated with great violence, and it did not cease to shake, though faintly, for the whole months of February and March; but, at three quarters past two in the morning of the 3rd of April, the villages already ruined were again exposed to such violent shocks as would have been sufficient to destroy them. This extraordinary phenomenon was felt throughout the extent of 140 leagues from east to west, from the sea as far as the river Napo; and without doubt farther, for we are little acquainted with these districts which are inhabited by the savages. The distance north-east and south-west between Popayan and Piura, is reckoned to be 170 leagues; but in the centre of that district, in 12 degree 16.6 from these places, is situated the part totally destroyed, and which comprehended 40 leagues from north to south between Guaranda and Machache, and twenty leagues from east to west. But, as if an earthquake alone had not been sufficient to ruin this fertile and populous country, another misfortune, hitherto unknown, was added. The earth opened, and formed immense gulfs; the summits of the mountains tumbled down into the valleys, and from the fissures in their sides there issued an immense quantity of fetid matter, which in a little time filled up valleys a thousand feet in depth and six hundred in breadth. It covered the villages, buildings, and inhabitants; choked up the sources of the purest springs, and being condensed by desiccation, in the course of a few days into an earthy and hard paste, it intercepted the course of rivers, made them flow backwards for the space of 87 days, and converted whole districts of dry land into lakes. Very extraordinary phenomena, which will doubtless be one day mentioned in history, occurred during these earthquakes; I shall, however, content myself with mentioning only two of them. At the same moment that the earth shook, the lake of Quilotoa, near the village of Insinoci, in the jurisdiction of Latacunga, took fire, and the vapour which rose from it suffocated the cattle and flocks that were feeding in the neighbourhood. Near the village of Pelileo, a large mountain named Moya, which was overturned in an instant, threw out a prodigious stream of the before-mentioned thick fetid matter, which destroyed and covered the miserable remains of that city. Naturalists will one day find, in these ravaged countries, objects worthy of their researches. Fragments of the minerals and earths of Tunguragua are about to be transported to Spain: but it is not in such fragments that we ought to search for the cause of these surprising phenomena; we must visit the country itself, where this conflict of the elements took place, and where the ruins it occasioned are still to be seen."

To the history of earthquakes now given, we shall only add the following account of the earthquakes which have taken place at Comrie in Perthshire, in Scotland, which was communicated to the Royal Society of Edinburgh, by Dr Finlayson, in a letter from Mr Taylor.

"The earthquakes which have lately (January 1790) taken place at Comrie (H) and its neighbourhood, are certainly very deserving of attention. I shall therefore cheerfully comply with your request, and give you as particular a description as I can of such of them as have been most remarkable. To give a particular account of all the noises or concussions which, during the last half year, have been heard or felt at Comrie, and within a short distance to the north, east, and west of that village, is beyond my power, and would indeed be of little use. With regard to these small concussions, it will be sufficient to say, that many of them have sometimes been observed to succeed one another in the space of a few hours; that they take place in all kinds of weather; that they are thought by some people to proceed from north-west to south-east, and by others, from north-east to south-west; that they have not been observed to affect the barometer; that they do not extend in any direction above three or four miles from Comrie; and that towards the south they are bounded by the Earn, which is in the immediate vicinity of the village. The same person, though bestowing the minutest attention, is often uncertain whether they proceed from the earth

(g) The volcano of Tunguragua occasioned an earthquake in 1557.

(h) Comrie is a village about 22 miles west of Perth, situated in the valley of Strathearn, and on the north side of the river Earn, about four miles below the place where it issues from the lake. The remains of a Roman camp on the opposite side of the river, have made the name of this village very well known to Scottish antiquaries."
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The tract within which the concussions described in this letter appear to have been confined, is a space of a rectangular form, which extends from east to west along the north side of the Earn about 22 miles in length, by a little more than five in breadth; reckoning the utmost length from about Monzie to the head of Loch Tay, and the breadth from a little south of the Earn northward to the ridge which separates the branches of that river from those of the Almond. The whole of this tract is mountainous, except toward the eastern extremity, where it joins the low country, and on the banks of the river Earn on the south. It is intersected by narrow glens or valleys, the most considerable of which is Glen Leondach, where the centre of the concussions seems to be placed. The minerals of this part of the country has not hitherto been accurately examined; but it is known in general, that the stone is the primary schistus, and in some places granite; that no mineral veins, nor any hot springs, have been found in it, and that no volcanic appearances have been observed. In the valleys, among the mountains, iron ore, of the kind that is called bog ore, is said to abound. Dr Hutton has remarked, that the line which terminates this tract on the south-east, seems to be nearly the same with that where the primary strata sink under the surface, and are covered by the secondary or horizontal strata. *Note by Mr Playfair*.

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From the consideration of all these circumstances, Dr. Stukeley is of opinion, that the phenomena of earthquakes can only be satisfactorily explained on electrical principles. He was particularly led to this opinion by directing his attention to the phenomena which accompanied the earthquakes which took place in England in 1749 and 1750. For five or six months previous to this time, the weather had been unusually warm; the wind was from the south and south-west; there had been no rain, so that the earth was particularly prepared to receive an electrical shock. The flat country of Lincolnshire had suffered greatly from extreme drought, and hence, as dry weather is favourable to electricity, earthquakes and other similar phenomena are more frequent in southern regions of the world. Before the earthquake at London, all vegetables had been unusually premature, and it is well known how much electricity quickens vegetation. About the same time the aurora borealis had been very frequent. A very short time before the earthquake, it had exhibited unusual colours, and its motions were to the south, contrary to the ordinary direction. From these circumstances an earthquake was predicted by Italians and others who had been accustomed to the appearances which precede them. During this year, too, meteors of different kinds, as fire-balls, lightnings, and coruscations, had been common; and particularly it was observed in the night preceding the earthquake, and early in the morning on the day on which it happened, that coruscations were very frequent. In these circumstances nothing was wanting to produce an earthquake, according to this hypothesis, but the touch of a non-electric body. This body must be derived from the air or atmosphere; hence it is inferred, that if a non-electric could discharge its contents upon any part of the earth, in this prepared and highly electrical state, a violent commotion or earthquake must be produced; and as the discharge from an excited tube produces a shock on the human body, so the discharge of electric matter from an extent of many miles of solid earth, must produce an earthquake. The rattling, uncouth noise which attends it, is to be ascribed to the snap which is occasioned by the contact.

Before the earthquake alluded to came on, a black cloud suddenly covered the atmosphere to a great extent; the discharge of a shower, according to this hypothesis, probably occasioned the shock; and as the electrical snap precedes the shock, a sound was observed to roll from the Thames towards Temple-bar, before the motion of the houses ceased. This noise, which is generally the forerunner of earthquakes, it is supposed can only be accounted for on the principles of electricity. The contrary to this would take place, were these phenomena owing to subterraneous eruptions. The flames and sulphureous smells which accompany earthquakes, might, it is thought, be more easily accounted for on the same principles, than by eruptions from the bowels of the earth. The sudden concussion, too, seems to be produced by a motion which could only be excited by electricity, not proceeding from any concussion in the interior parts of the earth, but from a uniform vibration along its surface, like that of a musical string, or like the vibratory motion of a glass, when the edge is rubbed with the finger. From the circumstances, it appears that earthquakes are chiefly fatal to places near the sea coasts, along the course of rivers, and elevated situations, a farther proof is derived, that they depend on the operation of electricity. The course or direction which the earthquake above alluded to took, affords an illustration of this point. Another argument in favour of the electrical hypothesis is drawn from the effects of the earthquake, or the state of the weather at the time, on persons of weak or nervous constitutions. To some of these disorders proved at that time fatal; and its effects, in general, were similar to those of artificial electricity.

A similar hypothesis was proposed by Beccaria, to account for the phenomena of earthquakes. He supposes that the electric matter to which these phenomena are owing, is lodged deep in the earth, and that it is this matter discharged from the earth, to restore the equilibrium or deficiency which the clouds in the atmosphere have sustained during thunder storms, by giving out their electrical matter to another part of the earth. Thus, he supposes, is confirmed by the noise resembling thunder, and the flashes of lightning which are perceived during earthquakes.

Dr. Priestley proposes to construct, on the principles of Stukeley and Beccaria, an hypothesis which he thinks will explain the phenomena in a more satisfactory manner. For this purpose he supposes the electric matter to be some way or other accumulated on one part of the surface of the earth, and on account of the dryness of the season, not easily to diffuse itself. It may, as Beccaria supposes, force its way into the higher regions of the air, forming clouds in its passage out of the vapours which float in the atmosphere, and occasion a sudden shower, which may further promote the passage of the fluid. The whole surface thus unloaded will receive a concussion like any other conducting substance, on parting with or receiving a quantity of the electric fluid. The rushing noise will likewise sweep over the whole extent of the country; and upon this supposition also, the fluid, in its discharge from the country, will naturally follow the course of the rivers, and also take the advantage of any eminences, to facilitate its ascent into the higher regions of the air. In making some experiments on the passage of the electrical fluid over water, he observed that it produced a tumultuous motion, and therefore he concludes that it must receive a concussion resembling that which is given to the waves of the sea by an earthquake. To try this, he immersed his hands in water, while an electrical flash passed over its surface, and he felt a sudden concussion, like that which is supposed to affect ships at sea during an earthquake. The impulse, which was felt in different parts of the water, was strongest near the place where the explosion was made.

Pleased with this resemblance of the earthquake, he observes, I endeavoured to imitate that great natural phenomenon in other respects; and it being frosty weather, I took a plate of ice, and placed two sticks about three inches high on their ends, so that they would just stand with ease; and upon another part of the ice I placed a bottle, from the cork of which was suspended a brass ball with a fine thread. Then making the electrical flash pass over the surface of the ice, which it
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did with a very loud report, the nearer pillar fell down, while the more remote stood, and the ball which had hung nearly still, immediately began to make vibrations, about an inch in length, and nearly in a right line from the place of the flash.

"I afterwards diversified this apparatus, erecting more pillars, and suspending more pendulums, sometimes upon bladders stretched on the mouth of open vessels, and at other times on wet boards swimming in a vessel of water. This last method seemed to answer the best of any; for the board representing the earth, and the water the sea, the phenomena of them both during an earthquake may be imitated at the same time; pillars, &c. being erected on the board, and the electric flash being made to pass, either over the board, over the water, or over them both *.*"

The ingenious Dolomieu proposes to account for these phenomena on different principles. On this subject he makes the following observations with regard to the earthquakes which desolated Calabria in 1783, and the causes by which they were produced. "The sea, says he, during the earthquakes of 1783, had little share in the shocks on the main land. The mass of water experienced no general movement, or fluctuation, or oscillation; the waves did not rise above their ordinary limits. Those which on the night of the 5th February beat against the coast of Sicily, and which afterwards covered the point of the Faro of Messina, were only the effects of a particular cause. The fall of a mountain into the sea raised the waters, which received an undulating motion, as happens always in similar cases. The undulation reached from the point of Sicily beyond the cape of Rosacolmo, extending in length along the coast which runs to the south; but always with a decrease in elevation as it was more remote from Sicily. Whatever inquiries the author has made, he has not been able to discover, in all the details which have been given him, any proofs of the existence of electrical phenomena; no spark, no disengagement of the electrical fluid, which the Neapolitan naturalists wish to assign as the cause of earthquakes.

"The state of the atmosphere was not the same in the whole range of earthquakes. While the tempests and the rain seemed to have conspired with them for the destruction of Messina, the interior part of Calabria enjoyed very fine weather. A little rain fell in the plain in the morning of the 5th of February, but the sky was clear during the rest of the day. This month and that of March were not only very serene, but likewise warm. There were some storms and rain; but they were the natural attendant of the season.

"The moving force seems to have resided under Calabria itself, since the sea which surrounds it had no share in the oscillations or vibrations of the continent. This force seems also to have advanced along the ridge of the Apennines in ascending from the south to the north. But what power in nature is capable of producing such effects? I exclude electricity, which cannot accumulate continually during the course of a year, in a country surrounded with water, where every thing conspires to place this fluid in equilibrio. Fire remains to be considered. The element, by acting directly upon the solids, can only dilate them; then their expansion is progressive, and cannot produce violent and instantaneous movements. When fire acts upon fluids, such as air and water, it gives them an astonishing expansion; and we know that then their elastic force is capable of overcoming the greatest resistances. These appear the only means which nature could employ to operate the effects we speak of: but in all Calabria there is no vestige of a volcano; nothing to point out in the interior combustion; no fire concealed in the centre of mountains, or under their base; a fire which could not exist without some external signs. The vapours diluted, the air rarified by a heat constantly active, must have escaped through some of the crevices or clefts formed in the soil; they must have formed currents. Both flame and smoke must have issued by some one or other of these passages. These once opened, the pressure would have ceased; the force not meeting with any more resistance, would have lost its effect; and the earthquake could have no longer continued. None of these phenomena took place: we must then renounce the supposition of a combustion acting directly under Calabria. Let us see whether, having recourse to a fire at some distance from this province, and acting upon it only as an occasional cause, we shall be able to explain all the phenomena which have accompanied these shocks.

Let us take for example Etna in Sicily, and suppose large cavities under the mountains of Calabria; a supposition which cannot be refused. It is certain that immense subterraneous cavities do exist, since Etna, in elevating itself by the accumulation of its explosions, must leave in the heart of the earth cavities proportioned to the greatness of the mass.

"The autumn of 1782 and the winter of 1783 were very rainy. The interior waters, augmented by those of the surface, may have run into those caverns which form the focus of Etna: there they must have been converted into vapour capable of the highest degree of expansion, and must have pressed forcibly against every thing which opposed their dilatation. If they found canals to conduct them into the cavities of Calabria, they could not fail to occasion there all the calamities of which I have given the description.

"If the first cavity is separated from the second by a wall (so to speak) or some slight division, and this separation is broken down by the force of the elastic vapour, the whole force will act against the bottom and sides of the second. The focus of the shocks will appear to have changed place, and become weaker in the space which was agitated most violently by the first earthquake.

"The plain, which was undoubtedly the most slender part of the vault, yielded most easily. The city of Messina, placed upon low ground, experienced a shock which the buildings on higher grounds did not. The moving force ceased at once as suddenly as it acted violently. When, at the periods of the 7th of February and the 28th of March, the focus appeared changed, the plain scarce suffered any thing. The subterraneous noise, which preceded and accompanied the shocks, appeared always to come from the south-west, in the direction of Messina. It seemed like thunder under ground, which resounded beneath vaults.

If Etna, then, has been the occasional cause of the earthquakes, it has also prepared, for some time, the misfortunes of Calabria, by gradually opening a passage along the coast of Sicily to the foot of the Neptu-
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Yet during the earthquakes of 1780, which disturbed Messina the whole summer, they felt, for the whole length of that coast, from Taranto even to the Faro, considerable shocks; but near the villages of Alli and Fiume de Nisi, which are situated about the middle of that line, shocks so violent were experienced, that they dreaded lest the mouth of a volcano should open. Each shock resembled the effort of a mine that had not strength to make an explosion. It appears, that then the volcano opened a free passage for the expansion of its vapours, and that they have since circulated without restraint; since in the year 1783 the earthquake was almost nothing upon that part of Sicily, at the time that Messina buried under its ruins the half of its inhabitants.

By others the phenomena of earthquakes have been ascribed to the force of steam, which, without a doubt, is an agent sufficiently powerful, if it is confined so, that its prodigious elastic force may be exerted; but it is denied by those who oppose this hypothesis, that earthquakes, though very frequent in regions where subterranean fires are really known to exist, as in volcanic countries, always happen in such places, and therefore water cannot be converted into steam. But, besides, it is well known, that this vapour, even admitting the possibility of its production in subterranean cavities, would be re-converted into water, the moment it came in contact with a cold body, which would deprive it of the principle of heat, in combination with which water assumes the form of vapour.

Many objections might have been made to the hypotheses which have been proposed to account for earthquakes. Many of these will probably occur to the attentive reader, who is a little acquainted with the nature and properties of the agents by which they are supposed to be produced; but whatever may be the cause of these extraordinary phenomena, it appears that it is very far from being clearly ascertained. Perhaps all the agents which have been stated as the cause of earthquakes, may have some influence in contributing to the effect, and many operate at different times, and in different circumstances.

Sect. II. Of Volcanoes.

Volcanoes exist in almost every part of the world, from the north to the south pole. Hecla in Iceland, and a volcano which has been observed in Terra del Fuego, at the termination of the southern continent of America, nearly comprehend the extremities of the globe; and having mentioned these boundaries, it is unnecessary to observe, that they exist in all climates.

The number of volcanoes at present known is not less than 100. The volcanoes of Europe are well known: these are Vesuvius in Italy, Elba in Sicily, and Hecla in Iceland. To these may be added the volcanoes in the Eolian Islands, of which Stromboli is remarkable for having thrown out flames, without the eruption of other volcanic matter, for more than 2500 years. In Asia there is a volcano on Mount Taurus; five in Kamtschatka; 10 in the islands of Japan; one in the peak of Adam in the island of Ceylon; four which have been observed in Sumatra; and some others in different parts of the Asiatic continent or islands. There are also some volcanoes on the African continent, as well as in some of the islands. Volcanoes exist also in the American continent, and in many of the islands which have been discovered in the South seas.

Almost all volcanoes are in the immediate vicinity of the sea. Mount Taurus, in the interior of Asia, and some of the volcanoes in the Andes, are the only exceptions to this.

Another general remark which may be made with regard to volcanoes is, that they always occupy the tops of mountains. No volcano was ever found bursting out in plains. The existence of volcanoes at the bottom of the ocean seems to be an exception; but it is to be observed, that these are also in the peaks of mountains, which have been raised up from great depths at the bottom of the ocean.

The first symptom of an approaching eruption is an increase of the smoke, if smoke has been emitted, in fair weather. This smoke is of a whitish colour, but, after some time, black smoke is observed to shoot up in the midst of the column of white smoke. These appearances are usually accompanied with explosions. The black smoke is then followed, at a shorter or longer distance of time, by a reddish-coloured flame. Showers of stones are afterwards thrown out, and some of them are projected to great heights in the air, which shews that the force by which they are impelled is very great. Along with these, ashes are likewise ejected. These phenomena, which daily increase in frequency and violence, are also usually preceded and accompanied by earthquakes, and hollow noises from the bowels of the earth, something like those that precede earthquakes unaccompanied with volcanic eruptions. The smoke, flame, and the quantity of stones and ashes, increase, and the stones are at last thrown out red hot.

The smoke which issues from the crater has been observed to be sometimes in a highly electrified state. The ashes are strongly attracted, and carried up along with the smoke to great heights in the atmosphere, forming a dense black column of vast height and size. Flashes of lightning are seen darting in a zig-zag direction, through the column of smoke and ashes; and this lightning is sometimes attended with thunder. But from some observations which have been made, this thunder and lightning are seemingly less intense than atmospheric electricity. When these terrible appearances have continued for four or five months, or for a longer or shorter time, according to the nature of the eruption, the lava begins to flow. This is a current of melted matter, which sometimes boils over the top, and sometimes, when the mountain is high, as is the case with Mount Etna, bursts out at the side, and makes a passage for itself. The period of the duration of the eruption is very different. Sometimes it continues to flow, at intervals, for the space of several weeks.

The matters ejected from volcanoes are lavas, which are either more or less consolidated; ashes, slag, and different kinds, and stones which have undergone little or no fusion. For an account of the nature and properties of volcanic productions, see Mineralogy. Stones have been projected into the air from Mount Etna, to the height of 7000 feet. A stone which was ejected from Vesuvius, measured 12 feet long, and 45 feet in circumference; and even larger masses have been thrown out from Etna.

Water has been frequently ejected from volcanoes.
Earthquakes and Volcanoes.

Similar submarine volcanoes have been observed near the island of St Michael, one of the Azores or Western islands in the Atlantic ocean. In the year 1639, near the island of St Michael, where the sea was known to be 20 feet deep, there arose, after an agitation of several weeks, an island about six miles round. It was again swallowed up in about the same space of time that had elapsed during its formation. In the year 1691, this volcano was in great agitation for a month. It convulsed the whole island of St Michael, and by the heat and violent commotion of the sea, as well as by the eruption of flames, ashes, and pumice, occasioned great damage; but in this case no island appeared. Similar eruptions were known in 1720, and in 1757. During the latter eruption, some of the islands were shaken to their foundations.

After this account of submarine volcanoes, of their effects, and of the islands formed by them, it would be unnecessary to enter into any detail of the submarine volcano which threw up an island off the coast of Iceland, in the year 1783. This island, the existence of which seemed to be fully ascertained, was again swallowed up in the ocean, and was seen no more.

Volcanoes of a very different kind have been described. The volcanoes to which we allude, have received the name of mud volcanoes, from ejecting a great quantity of mud. These, however, are similar to those which have been already described, in having volcanic motions and convulsive eruptions. The first volcano of this kind which was discovered is in the island of Sicily, near a place called Maccaluba, between Arragona and Girgenti. It is in a hill of a conical shape, truncated at the top, and 150 feet high. The summit is a plain, half a mile round, and the whole surface is covered with thick mud. The depth of the mud, which is supposed to be immense, is unknown. There is not the slightest appearance of vegetation upon it. In the rainy season the mud is much softened; the surface is even, and there is a general ebullition over it, which is accompanied with a very sensible rumbling noise. In the dry season, the mud acquires greater consistency, but without ceasing its motion. The plain assumes a form somewhat convex; a number of little cones are thrown up, which rarely rise to the height of two feet. Each of them has a crater, where a black mud is seen in constant agitation, and incessantly emitting babbles of air. With these the latter insensibly rises, and as soon as the crater is full of it, it disgorges. The residue sinks, and the cone has a free crater until a new emission.

This hill is sometimes subject to alarming convulsions. Earthquakes are felt at the distance of two or three miles, accompanied with internal noises, resembling thunder. These increase for several days, and terminate in an eruption of a prodigious spout of mud, earth, and stones, which rises two or three hundred feet into the air. This explosion is repeated twice or thrice in the course of 24 hours. Some years pass over without any eruption, but it generally happens that the eruptions continue yearly for five years successively. An eruption from this mud volcano took place in 1777.

Phenomena somewhat similar have been described by Pallas, which he observed partly in the peninsula of the Kercha, the boundary of Europe to the south-east of Little Tartary, now Taurida, and partly in the island of Taman, which is separated from Kercha only by a strait one of the mouths of the river Cuban. The island of Taman is situated in Asia. There, he observes, are in flat countries where there are few hills, and those very little raised above the level of the sea. The whole is covered with beds of slime, mixed with sand, with some beds of marl and sea-shells. From this he concludes that no real volcanic pit can exist here. Copious springs of petroleum are found in several places, and also pools or syphons of various dimensions, through most of which a briny mud is disgorged in bubbles. Pallas observed several of these pools, both in the peninsula and in Taman. The last eruption which took place, he observes, was in 1794. This was the greatest and most copious that had been known. It proceeded from the top of a hill at the north point of Taman. The place where the new gulf opened was a pool, where the snow and rain water usually remained for a long time. The explosion came on with a noise like that of thunder, and with the appearance of a mass of fire in the form of a sheaf. This lasted only for about half an hour, and it was accompanied with a thick smoke; but the ebullition which threw up part of the liquid mud, continued till the next day, after which the mud ran slowly in streams down the hill. The mud discharged was of a soft clay, of a bluish ash colour, very much the same nature, and mixed with brilliant sparks of mica, with a small quantity of marl, calcareous and sandy fragments of schistus, which seemed to have been torn from their beds.

Pallas supposes that a very deep coal mine had been for ages on fire, under Kercha and Taman, and that the sea having accidentally broken into the burning cavities of the mine, the expansion produced by the water converted into steam, and the struggle of the different aeriform substances to get free, forced the upper beds, broke them in pieces, and formed a passage to themselves. The vapours, as they escaped, carried the mud along with them. But others have supposed that these phenomena are not produced by fire; that the appearance of the sheaf of fire must have been extraneous, or, that it was only a quantity of inflammable air, which exploded when it came to the surface; or, perhaps it was altogether an illusion, from the appearances of the vapours which were emitted.

An account is given of a singular phenomenon, somewhat similar to the above, which was observed in 1717, at Bosley, near Wenlock, in Shropshire. After a great hurricane, the inhabitants were awakened in the middle of the night by commotions of the earth, which were accompanied with noise. Some persons went to an eminence from which the noise proceeded, and they saw water oozing through the turf, while at the same time inflammable air was emitted. The water was not hot. This continued for some time, but at last it ceased to throw out any inflammable air for some years, previous to the year 1746, when a second eruption took place, attended with similar circumstances.

We shall not dwell longer on the history of volcanoes. For a particular account of the most remarkable eruptions of the principal volcanoes in the world, the reader is referred to the history given under ETNA, ECLIPSE, and VESUVIUS. We shall now proceed to state some of the opinions and conjectures of philosophers,
the sides of the mountain in a dreadful and destructive torrent."

Others have attempted to account for the existence of volcanic fire, on the supposition that it is derived from central fires, and to these it is supposed that volcanoes act the part of chimneys; while others are of opinion that they are owing to the chemical decomposition of different substances, by which inflammable matters are evolved, with a great deal of heat, and by means of the latter the combustible materials are kindled, and exhibit the phenomena which are thus supposed to be accounted for.

M. Patrin is one of the latest naturalists who, with the assistance of modern chemistry, has attempted to account for the phenomena of volcanoes on the principles of this science. For a full view of his theory, or rather of his fanciful conjectures on this subject, we must refer the reader to the work itself. But the following is a recapitulation of the principles on which he gives this explanation. All volcanoes, he observes, in a state of activity, are in the vicinity of the sea, and are never found but in those places where sea salt is abundant. The volcanoes of the Mediterranean abstract the salt which the waters of the ocean hold in solution, and are constantly pouring in by the straits of Gibraltar. The strata of primitive schistus are the great laboratories in which volcanic matters are prepared, by a constant circulation of different fluids; but, according to this theory, these strata contribute no part of their own substance. They suffer no waste in the process.

The sphere of the activity of volcanoes may be far extended in these strata, but they have no other outlet beside spiracles, by which the gaseous substances escape, of which one part is dissipated in the atmosphere, and the other becomes concrete by its combination with oxygen. The concretion of these fluids is supposed to be analogous to the concretion of the primitive matters of the globe, according to the theory of Laplace; and the elective attractions determine, in the same way, the formation of stony crystals.

Volcanic eruptions are proportioned, in regard to their violence and duration, to the extent of the strata of schistus in which the volcanic fluids are accumulated. These fluids are,

1. Muratian acid, which carries off the oxygen from the metallic oxides of the schistus.
2. The oxygen of the atmosphere, which constantly replaces in the metals which was carried off by the muriatic acid.
3. Carbonic acid gas, which the water absorbs from the atmosphere, and conveys to the schistus, which always abounds in carbon.
4. Hydrogen, which proceeds from the decomposition of water. A part of this hydrogen is inflamed by electric explosions; the other united to carbonic acid forms oil, which becomes petroleum by its combination with sulphuric acid; and it is to this petroleum that the bitterness of sea water is owing.
5. The electric fluid, which is attracted from the atmosphere by the metals contained in the schistus. Sulphur seems to be the most homogeneous portion of this fluid, which has become concrete. Phosphorus is a modification of it, and it contributes to the fixation of oxygen. The sulphur formed in the schistus by means of the electric fluid, combines with the oxygen, and forms sulphuric acid, which decomposes the sea salt.
6. The metaliferous fluid. This forms the iron in lavas. It is the origin of metallic veins, and the colouring principle of organized bodies. This substance in its undecomposed state affords iron, but by decomposition it produces other metals. It is conjectured to be one of the principles of marastic acid, and it contributes, along with phosphorus, to fix oxygen under an earthy form.
7. The last of the volcanic fluids is exsotic gas. To this gas is owing the formation of the masses of carbonate of lime which are ejected by Vesuvius, and of the calcareous earth contained in lavas.

Such are the materials with which the author proposes to form the different substances which are produced in volcanoes, and by the operation of which he proposes to explain the phenomena of volcanic eruptions. Our readers will probably agree with us in thinking, that the present state of chemical science, even with the assistance of such hypothetical substances as the metaliferous fluids, is yet inadequate to give any degree of support to such opinions, even in the form of conjecture. We shall therefore dismiss it without further remark.

We shall now conclude this subject with some interesting observations by M. de Luc, on the nature of the strata in which volcanic fires exist.

"Volcanoes, he observes, have been more numerous on the surface of our continents, when they were under the waters of the ancient sea; and as this class of mountains, raised by subterranean fires, manifest themselves still on the shores of the present sea, and in the middle of its waters, it is of importance to geology and the philosophy of the earth to obtain as just ideas of them as possible."

"I have attended a great deal to this subject from my own observations; and I have shown, at different times, the errors into which several geologists and naturalists, in treating of it, have fallen."

"This class of mountains, in particular, requires that we should see them, that we should behold them during their erupptions, that we should have traced the progress of their lava, and have observed closely their explosions; that we should have made a numerous collection of the matters which they throw up under their different circumstances, that we might afterwards be able to study them in the cabinet, and to judge of their composition according to the phenomena which have been observed on the spot."

"This study is highly necessary when we apply it to geology and the philosophy of the earth, in order that we may avoid falling into those mistakes which make us ascribe to subterranean fires what does not belong to them, or which leads us to refuse them what really belongs to them."

"We read in the Journal de Physique for January 1824, under the title, On the Cause of Volcanoes, the following assertions:

1. What is the nature of the matters which maintain these subterranean fires? We have seen that Chimborazo, all these enormous volcanoes of Peru, and the Peak of Teneriffe, are composed of porphyry.
2. The Puy-de-Dôme is also composed of porphyry, as well as the Mont d'Or and the Cantal."
GEOLOGY.

Ætna, Solfataras, and Vesuvius, are also of the porphyry kind.

These facts prove that the most considerable volcanoes with which we are acquainted are of porphyry.

This opinion, that the fires of volcanoes have their centres in such or such a rock, and that their lavas are produced from these rocks, has always appeared to me not to be founded on any certain data. Opinions also on this subject have varied; some having placed the origin of lava in horn rock, others in granite or schist, and at present it is assigned to porphyry.

I have always been of opinion that nothing certain could be determined in regard to this point. It ever remains uncertain whether the seat of the matters of which lava is formed be in compact rocks, or in strata in the state of softness, pulvlerulent, and muddy.

Those who see lava issue from a volcano in its state of fusion and incandescence, and in its cooling, are convinced that the nature of everything is changed, that it exhibits a paste in which nothing can be known, except the substances which the volcanic fires have not reduced to fusion.

But these substances contained in the paste of lava, and those which are the most numerous, show us, that the strata from which they proceed cannot be similar to those exposed to the view, nor even to the most profound strata to which we can penetrate.

Admitting the hypothesis, that the strata from which the lavas proceed are in a pulvlerulent and muddy state, containing elements of all these small crystals, one may conceive how they are formed there, insulated, grouped, or solitary, and are found then in the lava in that state of insolubility.

The fragments of natural rocks thrown up by Vesuvius are not of the same kind as the matters of which the lava is composed. Most of these fragments are micaceous rocks with laminae of greater or less size, and of a kind of granite called syenite. I have found some composed of white quartzy rock; it is found sometimes of calcareous rock.

The most probable idea that can be formed in regard to the origin of these fragments is, that they have been carried from the borders of the strata through which the lava, that comes from great depths, has opened for itself a passage. These fragments are carried to the surface of the lava as far as the bottom of the chimney of the crater, whence they have been thrown out by explosions, mixed with fragments separated, or rather torn, from the lava; for it is not by the lava that they have been brought forth to view, but by explosions.

Some of these fragments of natural rocks have not been attacked by the fire; others have more or less; which depends, no doubt, on the place which they occupied in the volcano, and on the time which they remained in it. The most of the latter have retained at their surface a crust of lava, and this crust contains substances which are not the same as that of the fragment it covers.

On Vesuvius the strata pierced by eruptions are lower than the surface of the soil; in Auvergne and several places of Germany they are above; for this reason there are seen there in their place schists or granites.

Which the eruptions have broken to form for themselves a passage.

No volcano rests on natural strata: they sometimes show themselves on the exterior; but they have been opened by eruptions, and their edges have remained in their place.

The focus of no volcano exists or has existed in the cone which appears above the surface of the ground. They have been raised by eruptions, which, proceeding from great depths, have thrown them up through the upper strata. When it is said, therefore, that the volcanic mountains of Auvergne rest on granite, this is a mistake, and an incorrect expression has been used by those who have not formed a just idea of the phenomena. Lava may have flowed upon granite or any other rock, and rested upon it; but this is never the case with the volcano itself: its bases are below all the rocks visible.

It is from the bosom even of the lava, when in a state of fusion in the interior of the volcano, that all the explosions proceed. In that state of fusion they contain all the matters which produce fermentations, and the disengagement of expansible fluids.

I have been enabled to ascertain this on Vesuvius as far as was possible. The continual noise which was heard through the two interior mouths of the crater which I had before my eyes, was that of an ebullition, accompanied with inflammable vapours, and the gerbes of burning matters which they threw up at intervals were separated pieces of the lava in its state of fusion. I saw several of them in the air change their form, and sometimes become flat on the bodies which they struck or embraced in falling. And among the most apparent of these fragments there are always a multitude of small ones of the size of peas and nuts, and still smaller ones, which show at their surface, by their asperities, all the characters of laceration.

The name of scoriz has been given to these fragments, to distinguish them from compact lava, though their composition be the same as that of the hardest lava; and it is for want of reflecting properly on this point that it has been said that it is the compact part only that we must observe, in order to judge of their nature. The pieces which I took from the flowing lava with an iron hook, have at their surface the same lacerations and the same asperities as the fragments thrown up by explosions, and both contain the same substances.

This separation, by tearing off the parcels of the lava, effected by fermentations and explosions which proceed from their bosom, serves to explain those columns, sometimes prodigious, of volcanic sand, which rise from the principal crater. When seen with a magnifying glass, this sand exhibits nothing but lava reduced very small, the particles of which, rough with inequalities, have the bright black colour and the varnish of recent lava.

Parcels of substances which exist in our strata, such as fragments of quartz, scales of mica, and crystals of feldspar, are found sometimes in lava. Similar matters must no doubt be disseminated in the composition of our globe, without there being reason to conclude that the strata from which they proceed are the same as the exterior strata. It is neither in the granites, the porphyry,
ries, nor the horn rock, and still less in the schists and
quartz and calcareous rocks, that the schools of volcanoes, the leuc-
cites, and perhaps olivine, will be found. These small
crystals are brought to view by the lava, otherwise they
would be unknown to us.

"These lavas contain a great deal of iron, which
they acquire neither from the granite nor porphryres.
Might not one see in the ferruginous sand which is
found in abundance on the borders of the sea near
Naples, and in the environs of Rome, specimens of
that kind of pulverulent strata from which lava pro-
ceeds?"

"I have here offered enough to prove that it cannot
be determined that lava proceeds from strata similar to
those with which we are acquainted. The operations
of volcanoes, those vast laboratories of nature, will
always remain unknown to us, and on this subject our
conjectures will always be very uncertain.

"What is the nature of that mixture which gives
birth to these eruptions, that produce lava and throw
up mountains? What we observe as certain is, that
the introduction of the water of the sea is necessary to
excite these fermentations, as containing marine acid,
and salts are brought to united to the sulphuric acid, the
bases of which are contained in abundance in the sub-
terranean strata, determine these fermentations, which
produce the disengagement of fire and other fluids, and
all the grand effects that are the consequence.

Several naturalists have believed, and still believe,
that fresh or rain water is sufficient for this purpose;
but they are mistaken: this opinion is contradicted by
every fact known. To be convinced of this, nothing
is necessary but to take a short view of them. I have
done it several times, as it is necessary to consider them
often. I shall here enumerate the principal ones:—

No burning mountain exists in the interior part of
the earth; and all those which still burn are, without ex-
ception, in the neighbourhood of the sea, or surround-
ed by its waters. Among the deliquescent salts de-
posited by the smoke of volcanoes, we distinguish chiefly
the marine salt, united to different bases. Several of
the volcanoes of Iceland, and Hecla itself, sometimes
throw up eruptions of water, which deposit marine salt
in abundance. No extent of fresh water, however vast,
gives birth to a volcano. These facts are sufficient to
prove that the concurrence of sea-water is absolutely
necessary to excite those fermentations which produce
volcanoes.

"I shall here repeat the distinction I have already
made between burnt-out volcanoes and the ancient vol-
canoes, that I may range them in two separate classes.

"When we simply give the name of burnt-out or ex-
tinguished volcanoes to volcanic mountains which are in
the middle of the continents, it is to represent them as
having burnt while the land was dry, and inhabited as quites and
it is at present; which is not a just idea. These vol-
canoes have burnt when the land on which they are
raised was under the waters of the ancient sea, and none
of them have burnt since our continents became dry. It is
even very apparent that most of them were extinct before
the retreat of the sea, as we find by numerous
examples in the present seas.

"Those which I denominate extinct volcanoes are
such as no longer burn, though surrounded by the sea,
or placed on the borders of it. They would still burn,
were not the inflammable matters by which they were
raised really exhausted and consumed. Of this kind
is the volcano of Agde, in Languedoc. Of this kind
also are many of the volcanic islands which have not
thrown up fire since time immemorial.

M. Humboldt, in his letters written from Peru,
speaks of the volcanoes which he visited, but what he
says is not sufficiently precise to enable us to form a just
idea of them. He represents Chimborazo as being
composed of porphry from its bottom to its summit,
and adds, that the pophry is 1900 toises in thickness;
and after, he remarks, that it is almost impracticable
that Chimborazo, as well as Pichincha and Antisana,
should be of a volcanic nature: 'The place by which
we ascended, (says he), is composed of burnt and scor-
ified rock, mixed with pumice; which resembles all
the currents of lava in this country.'

"Here are two characters very different. If Chimb-
borazo be porphyry from the top to the bottom, it is
not composed of burnt and scorified rocks, mixed with
pumice; and if it is composed of burnt rocks, it
cannot be porphyry. This expression, burnt and scor-
ified rocks, is not even exact, because it excites the idea
of natural rocks, altered in their place by fire, and
they are certainly lava which has been thrown up by
the volcano. But the truth must be, that Chimborazo,
and all the other volcanoes of Peru, are composed of
volcanic matters, from their base at the level of the sea
to the summit.

I have just read in the Annales du Museum d'Histoire
Naturelle*, a letter of the same traveller, written from
Mexico, on his return from Peru, where, speaking
of the volcanoes of Popayan, Pasto, Quite, and the
other parts of the Andes, he says, 'Great masses of
this fossil (obsidian) have issued from the craters; and
the sides of these gulfs, which we closely examined,
consist of porphyry, the base of which holds a mean be-
tween obsidian and pitchstone (pechstein). M. Hum-
boldt therefore considers obsidian, or black compact
glass, as a natural fossil or rock, and not a volcanic
glass.'

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**Geomancy**

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the European and Oriental languages. Euclid is likewise known to have written other works on geometry: of these we have his *Data*, which may be regarded as a continuation of his elements; and an account of a work of his on *porisms* (see PORISMS) preserved in the writings of Pappus, but which has suffered so much from time as to be almost unintelligible.

After Euclid, lived Archimedes, who cultivated and improved all the branches of the mathematics known at that period, and in a particular manner geometry. He was the first that found nearly the ratio of the diameter of a circle to its circumference, and he squared the parabola. He likewise wrote treatises on the Sphere and Cylinder, on Spirals, on Conoids and Spheroids, besides others on mixt Mathematics. He also extended and improved the Geometrical Analysis, the principles of which had been established in the school of Plato. Many of the writings of Archimedes have been lost; but such as remain prove him to have been one of the greatest geometers that ever lived, and indeed the founder of modern geometry.

Apollonius of Perga was nearly contemporary with Archimedes, that is, he flourished about the end of the second century before the Christian era. He studied geometry in the Alexandrian school under the successors of Euclid, and he greatly extended the theory of the conic sections (see introduction to CONIC SECTIONS). He also composed treatises on different parts of Geometrical Analysis, but of these only one has come down to us entire; it is entitled *de sectione rationis*, and was discovered in the Arabic tongue, from which it has been translated into Latin by Dr Halley. Such accounts however are preserved in the *mathematical collections* of Pappus of his other treatises, that several of them have been restored by modern mathematicians. We may mention in particular his treatises *de Locis Planis*, *de Sectione Spatii*, *de Sectione Determinata*, *de Tactionibus*, each of which is divided into two books.

Having mentioned Archimedes and Apollonius, by far the most illustrious mathematicians of the period in which they lived, we shall pass over several others who contributed well to the improvement of the science, and therefore are but little known to us. We shall however briefly notice Theodorus, who lived about 30 years A. C. and who is the author of a work on Spherics, which is considered as one of the most valuable of the books on the ancient geometry. Pappus and Theon of Alexandria deserve to be mentioned as among the most celebrated of the commentators and annotators on the ancient geometry. We are particularly indebted to Pappus (who lived about the middle of the fourth century) for our knowledge of various discoveries and treatises of the ancient geometers, which, but for the account he has given of them in his *mathematical collections*, would have been for ever lost to mathematicians of modern times.

Proclus, the head of the Platonic school at Athens, cultivated mathematics about the middle of the fifth century; and although it does not appear that he made any discoveries in the science, yet he rendered it some service by his example and instruction. He wrote a commentary on the first book of Euclid, which contains many curious observations respecting the history and metaphysics of mathematics.

We have now briefly noticed the principal epochs in the history of geometry, and the most celebrated men who have contributed to its improvement from the earliest periods of history to the end of the fifth century; but long before this time the era of discovery seems to have been past, and the science on the decline. Still however the Alexandrian school existed, and it was possible that a Euclid or an Apollonius might again arise in that seminary. But the taking of Alexandria by the Arabs in the year 641 gave a death-blow to the sciences, not only in that capital, but throughout the whole Greek empire. The library, a treasure of infinite value, was burnt, and the stores of learning which had been accumulating for ages were annihilated for ever.

Although by this unfortunate event the sciences suffered an irreparable loss, it must be attributed to the fanaticism of the new religion which the conquerors had adopted, rather than to national ignorance or barbarity; for before that period, the sciences, when on the decline in Greece, had found an asylum among them, and about 120 years after the death of Mohammed they again took them under their protection.

The Arabs translated the greater part of the works of the Greek geometers, and chiefly those introductory to astronomy. They even began to study the more sublime geometry of the ancients; for Apollonius’s Conic Sections became familiar to them, and some of the books of that work have only reached us in an Arabic version. They gave to Trigonometry its present simple and commodious form, and greatly simplified its operations by the introduction of sine instead of the chords of double arcs, which had been formerly used.

After geometry, as well as its kindred mathematical sciences, had remained for several centuries under the protection of the Arabs, it was again received into Spain, Italy, and the rest of Europe, about the year 1400. Among the earliest writers on the subject after this period, were Leonardo Pisano, and Luca Pacioli or de Burgo.

The limits within which we must necessarily confine this sketch of the history of the science will not, however, allow us to enumerate all the improvements which it has received since the restoration of letters in Europe; for a list of the names of those who have contributed more or less to its extension, would include almost every mathematician of note from the time of Leonardo Pisano to the present day.

The writings of the ancient geometers have been assiduously sought after, and held in great repute; for it appears that as far as they carried some of their theories, they left but little room for improvement, and of this remark we think the writings of Euclid, of Archimedes, and of Apollonius, afford remarkable instances. Euclid’s elements of geometry have been considered, at least in this country, as one of the best books that could be put into the hands of the mathematical student, particularly that edition of its first six and eleventh and twelfth books which was given to the world by the late Dr Simson. An excellent system of geometry, comprehending the first six books of the illustrious ancient, together with three supplementary books, has of late years been published by Mr Professor Playfair, of the University of Edinburgh. We believe no modern system has excelled that of Euclid
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(as restored to its original purity by Dr Simson) in respect of logical accuracy and systematic arrangement. There is one, however, which we must particularly mention on account of its great excellence, and the use we have made of it in the system we are now to present to our readers. It is that of Mr Legendre, which we consider as the most complete and extensive that has yet appeared.

SECT. I. THE FIRST PRINCIPLES.

DEFINITIONS.

I. GEOMETRY is a science which treats of the properties and relations of quantities having extension, and which are called magnitudes. Extension is distinguished into length, breadth, and thickness.

II. A Point is that which has position, but not magnitude.

III. A Line is that which has only length. Hence the extremities of a line are points, and the intersections of one line with another are also points.

IV. A Straight or Right Line is the shortest way from one point to another.

V. Every line which is neither straight, nor composed of straight lines, is a Curve Line. Thus AB is a straight line, ACDB is a line made up of straight lines, and AEB is a curve line.

VI. A Superficies, or Surface, is that which has only length and breadth. Hence the extremities of a superficies are lines, and the intersections of one superficies with another are also lines.

VII. A Plane Superficies is that in which any two points being taken, the straight line between them lies wholly in that superficies.

VIII. Every superficies which is neither plane nor composed of plane superficies, is a Curve Superficies.

IX. A Solid is that which has length, breadth, and thickness. Hence the boundaries of a solid are superficies; and the boundary which is common to two solids, which are contiguous, is a superficies.

X. A Plane Rectilinear Angle is the inclination of two straight lines to one another, which meet together, but are not in the same straight line. The point in which the lines meet one another is called the Vertex of the angle.

Fig. 1.

When there is only one angle at a point, it may be expressed by the letter placed at that point; thus the angle contained by the lines EF and EG may be called the angle E: if, however, there be several angles, as at B, then each is expressed by three letters, one of which is the letter that stands at the vertex of the angle, and the others are the letters that stand somewhere upon the lines containing the angle, the letter at the vertex being placed between the other two. Thus the angle contained by the lines BA and BD is called the angle ABD or DAB.

Fig. 2.

Angles in common with other quantities admit of addition, subtraction, multiplication, and division. Thus the sum of the angles ABC and BDC is the angle ABC; the difference of the angles ABC and ABD is the angle DBC.

XI. When a straight line standing on another straight line makes the adjacent angles equal to one another, each of them is called a Right Angle, and the straight line which stands upon the other is called a Perpendicular to it. Thus, if DC meet AB, and make the angles ACD, DCB equal to one another; each of them is a right angle, and DC is a perpendicular to AB.

XII. An Obtuse Angle is that which is greater than a right angle, and an Acute Angle is that which is less than a right angle. Thus ABC being supposed a right angle, DBC is an obtuse angle, and EBC an acute angle.

XIII. Parallel Straight Lines are such as are in the same plane, and which being produced ever so far both ways, do not meet.

XIV. A Plane Figure is a plane terminated everywhere by lines.

If the lines be straight, the space which they enclose is called a Rectilineal figure, or a Polygon, and the lines themselves constitute the Perimeter of the polygon.

XV. When a polygon has three sides (which is the smallest number it can have) it is called a Triangle; when it has four, it is called a Quadrilateral; when it has five, a Pentagon; when six, a Hexagon, &c.

XVI. An Equilateral triangle is that which has three equal sides (fig. 7); an Isosceles triangle is that which has only two equal sides (fig. 8); and a Scalene triangle is that which has all its sides unequal (fig. 9).

XVII. A Right-angled triangle is that which has a right angle; the side opposite to the right angle is called the Hypotenuse. Thus in the triangle ABC, having the angle at B a right angle, the side AC is the hypotenuse.

XVIII. An Obtuse-angled triangle is that which has an obtuse angle, (fig. 9) and an acute-angled triangle is that which has three acute angles (fig. 11).

XIX. Of quadrilateral figures, a Square is that which has all its sides equal, and all its angles right angles (fig. 12). A Rectangle is that which has all its angles right angles, but not all its sides equal, (fig. 13). A Rhombus is that which has all its sides equal, but its angles are not right angles, (fig. 14). A Parallelogram, or Rhomboid, is that which has its opposite sides parallel (fig. 15). A Trapezium is that which has only two of its opposite sides parallel, (fig. 16).

XX. A Diagonal is a straight line which joins the vertices of two angles, which are not adjacent to each other; such is AC.

XXI. An Equilateral Polygon is that which has all its sides equal; and an Equiangular Polygon is that which has all its angles equal. If a polygon be both equilateral and equiangular, it is called a Regular Polygon.

XXII. Two polygons are equilateral between themselves, when the sides of the one are equal to the sides of the other, each to each, and in the same order; that is, when in going about each of the figures in the same direction, the first side of the one is equal to the first side of the other; the second side of the one is equal to the second side of the other.
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The expression $A^2$ means the square of the quantity $A$, and $A^3$ means the cube of $A$; also $PQ^2$, and $PQ^3$ mean, the one the square, and the other the cube, of a line whose extremities are the points $P$ and $Q$.

On the other hand the sign $\sqrt{ }$ indicates a root to be extracted; thus $\sqrt{A \times B}$ means the square root of the product of $A$ and $B$.

**Axioms.**

1. Two quantities, each of which is equal to a third, are equal to one another.
2. The whole is greater than its part.
3. The whole is equal to the sum of all its parts.
4. Only one straight line can be drawn between two points.
5. Two magnitudes, whether they be lines, surfaces, or solids, are equal, when, being applied one to the other, they coincide with one another entirely, that is, when they exactly fill the same space.
6. All right angles are equal to one another.

**Note.**—The references are to be understood thus: (7.) refers to the 7th proposition of the section in which it occurs; (4. 2.) means the 4th proposition of the 2nd section; (2. cor. 28. 4.) means the 2d corollary to the 28th proposition of the 4th section.

**Theorem I.**

A straight line $CD$, which meets with another $AB$, makes with it two adjacent angles, which, taken together, are equal to two right angles.

At the point $C$ let $CE$ be perpendicular to $AB$. The angle $ACD$ is the sum of the angles $ACE$, $ECD$; therefore, $ACD + BCD$ is the sum of the three angles $ACE$, $ECD$, $BCD$. The first of these is a right angle, and the two others are together equal to a right angle; therefore, the sum of the two angles $ACD$, $BCD$, is equal to two right angles.

Cor. 1. If one of the angles is a right angle, the other is also a right angle.

Cor. 2. All the angles $ACE$, $ECD$, $DCF$, $FCE$, at the same point $C$, on the same side of the line $AB$, are taken together, equal to two right angles. For their sum is equal to the two angles $ACD$, $DCB$.

**Theorem II.**

Two straight lines which coincide with each other in two points, also coincide in all their extent, and form but one and the same straight line.

Let the points which are common to the two lines be $A$ and $B$; in the first place it is evident that they must coincide entirely between $A$ and $B$; otherwise, two straight lines could be drawn from $A$ to $B$, which is impossible (axiom 4.). Now let us suppose, if possible, that the lines when produced separate from each other at a point $C$, the one becoming $ACD$, and the other $ACE$. At the point $C$ let $CF$ be drawn, so as to make the angle $ACF$ a right angle; then, $ACE$ being a straight line, the angle $FCE$ is a right angle (1. cor. 1.); and because $ACD$ is a straight line, the angle
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First Principles.

Angle FCD is also a right angle, therefore the angle FCE is equal to FCD, a part to the whole, which is impossible; therefore the straight lines which have the common points A, B cannot separate when produced, therefore they must form one and the same straight line.

Theorem III.

If two adjacent angles ACD, DCB make together two right angles, the two exterior lines AC, CB, which form these angles, are in the same straight line.

For if CB is not the line AC produced, let CE be that line produced, then, ACE being a straight line, the angles ACD, DCE are together equal to two right angles (1); but, by hypothesis, the angles ACD, DCB are together equal to two right angles, therefore ACD + DCE = ACD + DCE. From these equals take away the common angle ACD, and the remaining angles DCB, DCE are equal, that is, a part equal to the whole, which is impossible, therefore CB is the line AC produced.

Theorem IV.

If two straight lines AB, DE cut each other, the vertical or opposite angles are equal.

For since DE is a straight line, the sum of the angles ACD, ACE is equal to two right angles (1), and since AB is a straight line, the sum of the angles ACE, BCA is equal to two right angles, therefore the sum ACD + ACE is equal to the sum ACE + BCE; from each of these take away the same angle ACE, and there remains the angle ACD equal to its opposite angle BCE.

In like manner, it may be demonstrated, that the angle ACE is equal to its opposite angle BCD.

Cor. 1. From this it appears, that if two straight lines cut one another, the angles they make at the point of their intersection are, together, equal to four right angles.

Cor. 2. And hence all the angles made by any number of lines meeting in one point are, together, equal to four right angles.

Theorem V.

Two triangles are equal, when they have an angle, and the two sides containing it of the one equal to an angle, and the two sides containing it of the other, each to each.

Let the triangles ABC, DEF have the angle A equal to the angle D, the side AB equal to DE, and the side AC equal to DF; the triangles shall be equal. For if the triangle ABC be applied to the triangle DEF, so that the point A may be on D, and the line AB upon DE, then the point B shall coincide with E, because AB = DE; and the line AC shall coincide with DF, because the angle ABC is equal to EDF; and the point C shall coincide with F, because AC = DF; and since B coincides with E, and C with F, the line BC shall coincide with EF, and the two triangles shall coincide exactly, the one with the other; therefore they are equal (ax. 5).

Cor. Hence it follows, that the bases, or third sides BC, EF of the triangles are equal, and the remaining angles B, C of the one are equal to the remaining angles E, F of the other, each to each, namely, those to which the equal sides are opposite.

Theorem VI.

Two triangles are equal, when they have a side, and the two adjacent angles of the one equal to a side, and the two adjacent angles of the other, each to each.

Let the side BC be equal to the side EF, the angle B to the angle E, and the angle C to the angle F, the triangle ABC shall be equal to the triangle DEF. For if the triangle ABC be applied to the triangle DEF, so that the equal sides BC, EF may coincide; then because the angle B is equal to E, the side BA shall coincide with ED, and therefore the point A shall be somewhere in ED; and because the angle C is equal to F, the side CA shall coincide with FD, and therefore the point A shall be somewhere in FD; now the point A being somewhere in the lines ED, and FD, it can only be at D their intersection; therefore the two triangles ABC, DEF must entirely coincide, and be equal to one another.

Cor. Hence it appears that the remaining angles A, D of the triangles are equal, and the remaining sides AB, AC of the one are equal to the remaining sides DE, DF of the other, each to each, viz. those to which the equal angles are opposite.

Theorem VII.

Any two sides of a triangle are together greater than the third.

For the side BC, for example, being the shortest way between the points B, C (def. 4.) must be less than BA + AC.

Theorem VIII.

If from a point O, within a triangle ABC, there be drawn straight lines OB, OC to the extremities of BC one of its sides, the sum of these lines shall be less than that of AB, AC the two other sides.

Let BO be produced to meet CA in D; because the straight line OC is less than OD + DC, to each of these add BO, and BO + OC < BO + OD + DC; that is BO + OC < BD + DC.

Again, since BD < BA + AD, to each of these add DC and we have BD + DC < BA + AC, but it has been shewn that BO + OC < BD + DC, much more then is BO + OC < BA + AC.

Theorem IX.

If two sides AB, AC of a triangle ABC are equal to two sides DE, DF of another triangle DEF, each to each; but if the angle BAC contained

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by
produce one of them $AB$, so that $BF=AB$, and join $CF$. The triangle $BCF$ is equal to the triangle $ABC$, for the angle $CBF$ is a right angle, as well as $CBA$, and the side $BF=BA$; therefore the triangles are equal, (5) and hence the angle $BCF=BCA$; but the angle $BAC$ is by hypothesis a right angle; therefore the angle $BCF$ is also a right angle; hence $AC$ and $CF$ are equal, (2) and consequently two straight lines $AC$, $CF$ may be drawn between two points, $A$, $F$, which is impossible, (ax. 4) therefore it is equally impossible that two perpendiculars can be drawn from the same point to the same straight line.

Theorem XV.

If from a point $A$, without a straight line, $DE$, a perpendicular $AB$ be drawn upon that line, and also different oblique lines $AE$, $AC$, $AD$, &c. to different points of the same line.

First, The perpendicular $AB$ shall be shorter than any one of the oblique lines.

Secondly, The two oblique lines $AC$, $AE$, which meet the line $DE$ on opposite sides of the perpendicular, and at equal distances $BC$, $BE$ from it, are equal to one another.

Lastly, Of any two oblique lines $AC$, $AD$, or $AE$, $AD$, that which is more remote from the perpendicular is the greater.

Produce the perpendicular $AB$, so that $BF=BA$, and join $FC$, $FD$.

1. The triangle $BCF$ is equal to the triangle $BAC$; for the right angle $CBF=ACB$, the side $CF=BA$, therefore the third side $BF=AC$, (5) but $AF<AC+CF$, (7) that is $2\ AB<2\ AC$; therefore $AB<AC$, that is, the perpendicular is shorter than any one of the oblique lines.

2. If $BE=BC$, then, as $AB$ is common to the two triangles $ABE$, $ABC$, and the right angle $ABE=ABC$, the triangles $ABE$, $ABC$ shall be equal, (5) and $AE=AC$.

3. In the triangle $DFA$, the sum of the lines $AD$, $DF$ is greater than the sum of $AC$, $CF$, (8) that is, $2\ AD>2\ AC$; therefore $AD>AC$, that is, the oblique line, which is more remote from the perpendicular, is greater than that which is nearer.

Cor. 1. The perpendicular measures the distance of any point from a straight line.

Cor. 2. From the same point, three equal straight lines cannot be drawn to terminate in a given straight line; for if they could be drawn, then, two of them would be on the same side of the perpendicular, and equal to each other, which is impossible.

Theorem XVI.

If from $C$, the middle of a straight line $AB$, a perpendicular $CD$ be drawn to that line. First, Every point in the perpendicular is equally distant from the extremities of the line $AB$.

Secondly, Every point without the perpendicular is at unequal distances from the same extremities, $A$, $B$.

1. Let $D$ be any point in $CD$, then, because the two oblique lines $DA$, $DB$ are equally distant from the perpendicular, they are equal to one another (15), therefore every point in $CD$ is equally distant from the extremities of $AB$.

2. Let $E$ be a point out of the perpendicular; join $EA$, $EB$, one of these lines must cut the perpendicular in $F$; join $BF$, then $AF=BF$, and $AE=EF$; but $BF+FE=BE$, (7) therefore $AE=BE$, that is, $E$ any point out of the perpendicular is at unequal distances from the extremities of $AB$.

Theorem XVII.

Two right-angled triangles are equal, when the hypotenuse and a side of the one are equal to the hypotenuse and a side of the other, each to each.

Let the hypotenuse $AC=DF$, and the side $AB=DE$; the triangle $ABC$ shall be equal to $DEF$. The proposition will evidently be true (10) if the remaining sides $BC$, $EF$ are equal. Now, if it be possible to suppose that they are unequal, let $BC$ be the greater, take $BG=EF$, and join $AG$; then the triangles $ABG$, $DEF$, having the side $AB=DE$, $BG=EF$, and the angle $B=\angle E$, will be equal to one another (5), and will have the remaining side $AG=DF$; but by hypothesis $DF=AC$; therefore $AG=AC$; but $AG$ cannot be equal to $AC$ (15), therefore it is impossible that $BC$ can be unequal to $EF$, and therefore the triangles $ABC$, $DEF$ are equal to one another.

Theorem XVIII.

Two straight lines $AC$, $ED$, which are perpendicular to a third straight line $AE$, are parallel to each other.

For if they could meet at a point $O$, then two perpendiculars $OA$, $OE$, might be drawn from the same point $O$, to the straight line $AE$, which is impossible (14).

In the next theorem, it is necessary to assume another axiom, in addition to those already laid down in the beginning of this section.

Axiom.

7. If two points $E$, $G$ in a straight line $AB$ are situated at unequal distances $EF$, $GH$ from another straight line $CD$ in the same plane, these two lines, when indefinitely produced, on the side of the least distance $GH$, will meet each other.

Theorem XIX.

If two straight lines $AB$, $CD$ be parallel, the perpendiculars $EF$, $GH$ to one of the lines, which are terminated by the other line, are equal, and are perpendicular to both the parallels.

For if $EF$ and $GH$, which are perpendicular to $CD$, were unequal, the lines $AB$, $CD$ would meet each other (by the above axiom) which is contrary to the supposition that they are parallel. And if $EF$, $GH$ be
not perpendicular to AB, let EK be perpendicular to EF, meeting GH in K; then because EK and FH are perpendicular to EF, they are parallel \((18)\), and therefore, by what has been just shewn, the perpendiculars EF, KH, must be equal; but by hypothesis \(EF = GH\), therefore \(KH = GH\), which is impossible; therefore EF is perpendicular to AB; and in the same way it may be shewn that GH is perpendicular to AB.

Cor. Hence it appears, that through the same point E, no more than one parallel can be drawn to the same straight line CD.

**Theorem XX.**

Fig. 36. Straight lines \(AB, EF\), which are parallel to the same straight line \(CD\), are parallel to each other.

For let HKG be perpendicular to \(CD\), it will also be perpendicular to both \(AB\) and \(EF\) \((19)\), therefore these last lines are parallel to each other.

**Theorem XXI.**

Fig. 37. If a straight line \(EF\) meet two parallel straight lines \(AB, CD\), it makes the alternate angles \(AEF, EFD\) equal.

Let \(EH\) and \(GF\) be perpendicular to \(CD\), then these lines will be parallel \((18)\), and also at right angles to \(AB\) \((19)\), and therefore \(FH\) and \(GE\) are equal to one another \((19)\), therefore the triangles \(FGE, FH\), having the side \(FG = HE\), and \(GE = FH\), and \(FF\) common to both, will be equal; and hence the angle \(FEG\) will be equal to \(EFH\), that is, \(FEA\) will be equal to \(EFD\).

Cor. 1. Hence if a straight line \(KL\) intersect two parallel straight lines \(AB, CD\), it makes the exterior angle \(KEB\) equal to the interior opposite angle \(EFD\) on the same side of the line. For the angle \(AEF = KEB\), and it has been shewn that \(AEF = EFD\); therefore \(KEB = EFD\).

Cor. 2. Hence also, if a straight line \(EF\) meet two parallel straight lines \(AB, CD\), it makes the two interior angles \(BEF, EFD\) on the same side together, equal to two right angles. For the angle \(AEF\) has been shewn to be equal to \(EFD\), therefore, adding the angle \(FEB\) to both, \(AEF + FEB = EFD + FEB\); but \(AEF + FEB\) is equal to two right angles, therefore the sum \(EFD + FEB\) is also equal to two right angles.

**Theorem XXII.**

Fig. 38. If a straight line \(EF\), meeting two other straight lines \(AB, CD\), makes the alternate angles \(AEF, EFD\) equal, those lines shall be parallel.

For if \(AE\) is not parallel to \(CD\), suppose, if possible, that some other line \(KE\) can be drawn through \(E\), parallel to \(CD\); then the angle \(KEF\) must be equal to \(EFD\) \((21)\), that is, (by hypothesis), to \(AEF\), which is impossible; therefore, neither \(KE\), nor any other line drawn through \(E\), except \(AB\), can be parallel to \(CD\).

---

**Theorem XXIII.**

If a side \(AC\) of a triangle \(ABC\) be produced to \(D\), the exterior angle \(BCD\) is equal to both the interior and opposite angles \(BAC\), \(ABC\).

Let \(CE\) be parallel to \(AB\), then the angle \(B = BCE\), \((21)\) and the angle \(A = ECD\), \((1)\) cor. \((2)\) therefore \(B + A = BCE + ECD = BCD\).

Cor. The exterior angle of a triangle is greater than either of the interior opposite angles.

**Theorem XXIV.**

The three interior angles of a triangle \(ABC\) taken together are equal to two right angles.

For if \(AC\) be produced to \(D\), then \(A + B + BCD\), \((23)\); to each of these equal quantities add \(ACB\), then shall \(A + B + ACB = BCD + BCA\); but \(BCD + BCA = \text{two right angles}\), \((1)\), therefore \(A + B + ACB = \text{two right angles}\).

Cor. 1. If two angles of one triangle be equal to two angles of another triangle, each to each; the third angle of the one shall be equal to the third angle of the other, and the triangles shall be equiangular.

Cor. 2. If two angles of a triangle, or their sum, be given, the third angle may be found, by subtracting their sum from two right angles.

Cor. 3. In a right-angled triangle, the sum of the two acute angles is equal to a right angle.

Cor. 4. In an equilateral triangle, each of the angles is equal to the third part of two right angles, or to two thirds of one right angle.

---

**Theorem XXV.**

The sum of all the interior angles of a polygon is equal to twice as many right angles wanting four as the figure has sides.

Let \(ABCDE\) be a polygon; from a point \(F\) within it draw straight lines to all its angles, then the polygon shall be divided into as many triangles as it has sides; but the sum of the angles of each triangle is equal to two right angles, \((24)\) therefore the sum of all the angles of the triangles is equal to twice as many right angles as there are triangles, that is, as the figure has sides; but the sum of all the angles of the triangles is equal.
GEOMETRY.

Sect. II.

Theorem II.

Every chord is less than the diameter.

**LET** the radii CA, CD be drawn from the centre to the extremities of the chord AD; then the straight line AD is less than AC+CD, that is AD<AB.

Theorem III.

A straight line cannot meet the circumference of a circle in more than two points.

If it could meet it in three, these three points would be equally distant from the centre, and therefore three equal straight lines might be drawn from the same point to the same straight line, which is impossible (2 cor. 15. 1).

Theorem IV.

**Fig. 45.** In the same circle, or in equal circles, equal arches are subtended by equal chords, and, conversely, equal chords subtend equal arches.

If the radius AC be equal to the radius EO, and the arch AMD equal to the arch ENG; the chord AD shall be equal to the chord EG.

For the diameter AB being equal to the diameter EF, the semicircle AMDB may be applied exactly upon the semicircle, ENG, and then the curve line AMD shall coincide entirely with the curve line ENG, but the arch AMD being supposed equal to ENG, the point D must fall upon G, therefore the chord AD is equal to the chord EG.

Conversely, if the chord AD=EG, the arch AMD is equal to the arch ENG.

If for the radii CD, OG be drawn, the two triangles ACD, EOG have three sides of the one equal to three sides of the other, each to each, viz. AC=EO, CD=OG and AD=EG, therefore these triangles are equal, (10. 1.) and hence the angle ACD=EOG. Now if the semicircle ADB be placed upon EFG, because the angle ACD=EOG, it is evident that the radius CD will fall upon the radius OG, and the point D upon G, therefore the arch AMD is equal to the arch ENG.

Theorem V.

**Fig. 45.** In the same circle, or in equal circles, the greater arch is subtended by the greater chord, and, conversely, (if the arch be less than half the circumference) the greater chord subtends the greater arch.

For let the arch AH be greater than AD, and let the chords AD, AH, and the radii CD, CH be drawn. The two sides AC, CH, of the triangle ACH, are equal to the two sides AC, CD, of the triangle ACD; and the angle ACH is greater than ACD; therefore the third side AH is greater than the third side AD, (9. 1.) therefore the chord which subtends the greater arch is the greater. Conversely, if the chord AH be greater than AD, it may be inferred (cor. 9. 1.) from the same triangles that the angle ACH is greater than

ACD, and that thus the arch AH is greater than AD.

**Note.** Each of the arches is here supposed less than half the circumference; if they were greater, the contrary property would have place, the arch increasing as the chord diminishes.

Theorem VI.

The radius CG, perpendicular to a chord AB, bisects the chord (or divides it into two equal parts), it also bisects the arch AGB subtended by the chord.

**Draw** the radii CA, CB; these radii are two equal oblique lines in respect of the perpendicular CD, therefore they are equally distant from the perpendicular (15. 1.) that is AD=DB.

In the next place, because CG is perpendicular to the middle of AB, every point in CG is at equal distances from A and B (16. 1.) therefore, if GA, GB be drawn, these lines are equal, and as they are the chords of the arches AG, BG, the arches are equal. (4.)

Scholium.

Since the centre C, the middle D of the chord AB, and the middle G of the arch subtended by that chord, are three points situated in the same straight line perpendicular to that chord and that two points in a straight line are sufficient to determine its position; it follows, that a straight line which passes through any two of these points must necessarily pass through the third and must be perpendicular to the chord. It also follows, that a perpendicular to the middle of a chord passes through the centre, and the middle of the arch subtended by that chord.

Theorem VII.

If three points A, B, C be taken in the circumference of a circle, no other circumference which does not coincide with the former, can be made to pass through the same three points.

**Let** the chords AB, BC be drawn, and let OD, OF be drawn from the centre, perpendicular to, and consequently bisecting those chords. The centre of every circle passing through A and B must necessarily be somewhere in the perpendicular DO, (last theor.) and in like manner the centre of every circle passing through B and C, must be somewhere in the perpendicular OF, therefore the centre of a circle passing through A, B, and C, must be in the intersection of the perpendiculars DO, FO; and consequently can only be at one and the same point O; therefore, only one circle can be made to pass through the same three points A, B, C.

**Cor.** One circumference of a circle cannot intersect another in more than two points, for if they could have three common points they would have the same centre, and consequently would coincide with each other.

Theorem VIII.

Two equal chords are equally distant from the centre;
centre; and of unequal chords, that which is nearer the centre is greater than that which is more remote.

Let the chord \( AB = DE \), suppose the chords bisected by the perpendiculares \( CF, CG \) from the centre, and draw the radii \( CA, CD \). The right-angled triangles \( CAF, CDG \) have equal hypothesis \( CA, CD \); the side \( AF = AB \) of the one is also equal to the side \( DG = DE \) of the other, therefore, their remaining sides \( CF, CG \) (which are the distances of the chords from the centre) are equal (17. 1).

Next let the chord \( AH \) be greater than \( DE \); the arch \( AKH \) shall be greater than \( DME \). Upon the arch \( AKH \) take \( ANB \) equal to \( DME \); draw the chord \( AB \), and suppose \( COF \) drawn from the centre perpendicular to \( AB \), and \( CI \) perpendicular to \( AH \). It is evident that \( CF = CO \), and (15. 1) \( CO = CI \); much more then is \( CF = CI \); but \( CF = CG \), because the chords \( AB, DE \) are equal; therefore \( CG = CI \); that is, the chord nearer the centre is greater than that which is farther from it.

**Theorem IX.**

Fig. 49.
The perpendicular \( BD \), drawn at the extremity of a radius \( CA \), is a tangent to the circle.

For any oblique line \( CE \) is greater than the perpendicular \( CA \), (15. 1) therefore the point \( E \) is without the circle; therefore the line \( BD \) has but one point \( A \) common with the circumference, and consequently it is a tangent to the circle. (Def. 8).

**Scholium.**

Through the same point \( A \), only one tangent, \( AD \), can be drawn to the circle. For if it be possible to draw another, let \( AG \) be that other tangent; draw \( CF \) perpendicular to \( AG \); then \( CF \) shall be less than \( CA \), (15. 1) therefore \( F \) must be within the circle; and consequently \( AF \) when produced must necessarily meet the circle in another point besides \( A \); therefore it cannot be a tangent.

**Theorem X.**

Fig. 50.
If \( BC \), the distance of the centres of two circles, be less than the sum of their radii; and also the greater radius less than the sum of the distance of their centres and the lesser radius; the two circles intersect each other.

For that the circles may intersect each other in a point \( A \), it is necessary that the triangle \( ABC \) be possible; therefore, not only must \( CB \) be less than \( CA + AB \), but also the greater radius \( AB \) must be less than \( AC + CB \); (7. 1) and it is evident, that as often as the triangle \( ABC \) can be constructed, the circumferences described on the centres \( B, C \) shall intersect each other in two points \( A, D \).

**Theorem XI.**

If the distance \( CB \) of the centres of two circles be equal to the sum of the radii \( CA, BA \), the circles shall touch each other externally.

It is evident that they have a common point \( A \); but they cannot have more; for if they had two, then the distance of the centres must necessarily be less than the sum of the radii.

**Theorem XII.**

If the distance \( CB \) of the centres of two circles Fig. 53 be equal to the difference of the radii, the two circles shall touch each other internally.

In the first place, it is evident that the point \( A \) is common to them both; they cannot, however, have another; for that this may happen, it is necessary that the greater radius \( AB \) be smaller than the sum of the radius \( AC \) and the distance \( CB \) of the centre, (10.) which is not the case.

Cor. Therefore, if two circles touch each other, either internally or externally, their centres and the point of contact are in the same straight line.

**Theorem XIII.**

In the same circle, or in equal circles, equal angles \( ACB, DCE \), at the centres, intercept upon the circumference equal arches \( AB, DE \). And, conversely, if the arches \( AB, DE \) are equal, the angles \( ACB, DCE \) are equal.

First, if the angle \( ACB \) be equal to \( DCE \), the one angle may be applied upon the other; and as the lines containing them are equal, it is manifest that the point \( A \) will fall upon \( D \), and the point \( B \) upon \( E \); thus the arch \( AB \) will coincide with, and be equal to the arch \( DE \).

Next, if the arch \( AB \) be equal to \( DE \), the angle \( ACB \) is equal to \( DCE \); for if the angles are not equal; let \( ACB \) be the greater; and let \( ACI \) be taken equal to \( DCE \); then, by what has been already demonstrated, the arch \( AI = DE \); but by hypothesis \( AB = DE \); therefore, \( AI = AB \) which is impossible; therefore the angle \( ACB = DCE \).

**Theorem XIV.**

The angle \( BCD \) at the centre of a circle is double\( \frac{1}{2} \) the angle \( BAD \) at the circumference, when \( Fig. 56 \) both stand on the same arch \( BD \).

First let the centre of the circle be within the angle \( BAD \); draw the diameter \( AE \). The exterior angle \( BCE \) of the triangle \( BCA \) is equal to both the inward and opposite angles \( BAC, CBA \); (23. 1) but the triangle \( BCA \) being isosceles, the angle \( BAC = CBA \); therefore the angle \( BCE \) is double of the angle \( BAC \).

For the same reason, the angle \( DCE \) is double of the angle \( DAE \), therefore the whole angle \( BCD \) is double of the whole angle \( BAD \).

Suppose in the next place that the centre is without the angle \( BAD \); then, drawing the diameter \( AE \), it may be demonstrated, as in the first case, that the angle \( ECD \) is double of the angle \( EAD \), and that the...
Of Proportion.

GEOMETRY.

Theorem XV.

In a circle, the angle BAD in a semicircle is a right angle, but the angle ABD in a segment greater than a semicircle is less than a right angle; and the angle AED in a segment less than a semicircle is greater than a right angle.

Theorem XVIII.

SECT. III. OF PROPORTION.

VI. When two ratios are equal, their terms are called proportionals.

To denote that the ratio of A to B is equal to the ratio of C to D, they are usually written thus, A : B :: C : D, or thus, A : B = C : D, which is read thus; A is to B as C to D; such an expression is called an analogy or a proportion.

Theorem XVII.

Of Proportion.

Theorem XVIII.

VII. Three quantities A, B, C, are said to be proportionals, when the ratio of the first A to the second B is equal to the ratio of the second B to the third C.

VIII. Of three proportional quantities, the middle term is said to be a mean proportional between the other two, and the last a third proportional to the first and second.

IX. Quantities are said to be continual proportionals, when the first is to the second, as the second to the third, and as the third to the fourth, and so on.

X. When there is any number of magnitudes A, B, C, D, of the same kind, the ratio of the first A to the last D is said to be compounded of the ratio of A to B, B to C, C to D.
GEOMETRY.

Sect. III.

If four quantities be proportional, they are also proportional by composition, and by division.

Let \( A : B :: C : D \), then will
\[
A + B : A + B :: \frac{A + B}{B} : \frac{A + B}{A}.
\]
also
\[
A - B : A - B :: \frac{A - B}{B} : \frac{A - B}{A}.
\]

Let us suppose, as in the two preceding theorems, that the ratios of \( A \) to \( B \), and of \( C \) to \( D \), are each equal to the ratio of the number \( p \) to the number \( q \), so that \( A \) contains \( p \) such equal parts as \( B \) contains \( q \), and \( C \) contains \( p \) such equal parts as \( D \) contains \( q \); and let \( x \) and \( y \) each of the equal parts contained in \( A \) and \( B \), and \( C \) and \( D \), respectively.

\[
A = px, \quad B = qx, \quad C = py, \quad D = qy,
\]
therefore
\[
A + B = px + qx = (p + q)x, \quad C + D = py + qy = (p + q)y.
\]

Now as \( A + B \) contains \( p + q \) times, and \( A \) contains the same quantity \( p \) times, \( B \) contains it \( q \) times, (by the 4th axiom),
\[
A + B : A :: p + q : p, \quad A + B : B :: p + q : q,
\]
and as \( C + D \) contains \( p + q \) times, and \( C \) contains it \( p \) times, \( D \) contains it \( q \) times,
\[
C + D : C :: p + q : p, \quad C + D : D :: p + q : q.
\]

Thus it appears that the ratios of \( A + B \) to \( A \), and of \( C + D \) to \( C \), are equal to the same ratio, namely, that of \( p + q \) to \( p \); therefore (Ax. 3.) \( A + B : A :: C + D : C \). It also appears that the ratios of \( A + B \) to \( B \), and \( C + D \) to \( D \), are each equal to the ratio of \( p + q \) to \( q \); therefore (Ax. 3.) \( A + B : B :: C + D : D \).

In the same manner the second part of the theorem may be proved, namely, that
\[
A - B : A :: C - D : C \quad \text{and} \quad A - B : B :: C - D : D.
\]

THEOREM V.

If four quantities be proportional, and there be taken any equimultiples of the antecedents, and also any equimultiples of the consequents; the resulting quantities will still be proportional.

Let \( A : B :: C : D \), and \( m \) \( A \), \( m \) \( C \) be any equimultiples of the antecedents, and \( n \) \( B \), \( n \) \( D \) any equimultiples of the consequents; then \( m \) \( A \) : \( n \) \( B :: m \) \( C \) : \( n \) \( D \).

The quantities \( p, q, x \) and \( y \) being supposed to express the same things as in the foregoing theorems; because
\[
A = px, \quad B = qx, \quad C = py, \quad D = qy,
\]
therefore, multiplying the antecedents by the number \( m \), and the consequents by \( n \),
GEOMETRY.

Cor. 2. All triangles having equal bases, and equal altitudes, are equivalent.

Theorem III.

Two rectangles of the same altitude are to each other as their bases.

Let ABCD, AEFD be two rectangles, which have a common altitude AD; the rectangle ABCD shall have to the rectangle AEFD the same ratio that the base AB has to the base AE.

Let the base AB have to the base AE the ratio of the number p (which we shall suppose 7) to the number q (which may be 4) that is, let AB contain p such equal parts as AE contains q (4), then, if perpendiculars be drawn to AB and AE at the points of division, the rectangles ABCD and AEFD will be divided, the former into p, and the latter into q rectangles, which will be all equal (1) for they have equal bases, and the same altitude; thus the rectangle ABCD will also contain p such equal parts as the rectangle AEFD contains q; therefore the rectangle ABCD is to AEFD as the number p to the number q (Ax. 4. 3.), that is, as the base AB to AE.

Theorem IV.

Any two rectangles are to each other as the products of any numbers proportional to their sides.

Let the numbers m, n, p, q have among themselves the same ratios that the sides of the rectangles ABCD, AEFG have to each other; that is, let AB contain m such equal parts, whereof AD contains n, and AE contains p, and AF contains q; then shall ABCD: AEFG :: m : n : p : q.

Let the rectangles be so placed that the sides AB, AE may be in a straight line, then AD and AG will also lie in a straight line (3. 1.). Now (3)

ABCD : AEHD :: AB : AE :: m : p,
but m : p :: nm : np, (1. 3.)
therefore ABCD : AEHD :: nm : np.

Again, AEHD : AEFG :: AD : AG :: n : q,
but n : q :: pn : pq;
therefore, AEHD : AEFG :: pn : pq;
and it was shown that

ABCD : AEHD :: nm : np or p n,
therefore, (6. 3.) ABCD : AEFG :: mn : pq.

Scholium.

Hence it appears, that the product of the base by the altitude of a rectangle may be taken for its measure, observing that by such product is meant that of the number of linear units in the base by the number of linear units in the altitude. This measure is however not absolute, but relative, for it must be supposed, that in comparing one rectangle with another, the sides of both are measured by the same linear unit. For example, if the base of a rectangle A be three units, and its altitude 10, the rectangle is represented by $3 \times 10$ or 30; this number considered by itself has no meaning.
G E O M E T R Y.

If four straight lines AB, AC, AD, AE, be proportionals; the rectangle ABFE, contained by the two extremes, is equivalent to the rectangle ACGD contained by the means. And conversely, if the rectangle contained by AB, AE, the extremes, be equivalent to the rectangle contained by AC, AD the means, the four lines are proportionals.

Let the rectangles be so placed as to have the common angle A, and let BF, DG intersect each other in H. Because the rectangles ABHD, ACGD have the same altitude AD,

\[ \text{ABHD} : \text{ACGD} :: \text{AB} : \text{AC} \]

and because the rectangles ABHD, ABFF have the same altitude AB, for the same reason

\[ \text{ABHD} : \text{ABFE} :: \text{AD} : \text{AE} \]

but by hypothesis \( \text{AB} : \text{AC} :: \text{AD} : \text{AE} \), therefore (Ax. 3.3) \( \text{ABHD} : \text{ACGD} :: \text{ABHD} : \text{ABFE} \), therefore (Ax. 2.3) the rectangle ACGD = ABFE.

Next suppose that the rectangle ACGD = ABFE, then \( \text{ABHD} : \text{ACGD} :: \text{ABFE} \), (Ax. 1.3) but \( \text{ABHD} : \text{ACGD} :: \text{AB} : \text{AC} \), (3) and \( \text{ABHD} : \text{ABFE} :: \text{AD} : \text{AE} \), therefore \( \text{AB} : \text{AC} :: \text{AD} : \text{AE} \).

If three straight lines be proportionals, the rectangle contained by the extremes is equal to the square of the mean; and if the rectangle contained by the extremes be equal to the square of the mean, the three straight lines are proportionals.

If four straight lines be proportionals, and also the four, the rectangles contained by the corresponding terms shall be proportionals; that is, if \( \text{AB} : \text{BC} :: \text{CD} : \text{DE} \), and \( \text{BF} : \text{BG} :: \text{DH} : \text{DI} \), then shall rectangle \( \text{AF} : \text{rect. BM} :: \text{rect. CH} : \text{rect. DQ} \).

For in \( \text{BG} \) and \( \text{DI} \), produced if necessary, take \( \text{BF} = \text{BF} \), and \( \text{DH} = \text{DH} \), and let \( \text{FP} \) be parallel to \( \text{BC} \), and \( \text{HN} \) to \( \text{DE} \); then (3)

\[ \text{rect. AF} : \text{rect. BP} :: \text{AB} : \text{BC} \]

and \( \text{rect. CH} : \text{rect. DN} :: \text{CD} : \text{DE} \);

but \( \text{AB} : \text{BC} :: \text{CD} : \text{DE} \), (by hypothesis) therefore,

\[ \text{rect. AF} : \text{rect. BP} :: \text{rect. CH} : \text{rect. DN} \]

now (3) \( \text{rect. BP} : \text{rect. BM} :: \text{BF} : \text{BG} \), and \( \text{rect. DN} : \text{rect. DQ} :: \text{DH} : \text{DI} \); but \( \text{BF} : \text{BG} :: \text{DH} : \text{DI} \), (by hypothesis) therefore,

\[ \text{rect. BP} : \text{rect. BM} :: \text{rect. DN} : \text{rect. DQ} \]
GEOMETRY.

Sect. IV.

for $BH = DE$, and $BK = FE$; therefore, $AKLE = \text{Proportional ABHE - EDFG}$; but these two parts constitute the excess of the square $ABIF$ above the square $BHIG$, the former of which is the square upon $AB$, and the latter the square upon $BC$, therefore $(AB + BC) \times (AB - BC) = AB \times BC$.

THEOREM XIII.

The square upon the hypothenuse of a right-angled triangle is equal to the sum of the squares upon the two other sides.

Let $ABC$ be a right-angled triangle; having formed the squares upon its three sides, draw a perpendicular $AD$ from the right angle upon the hypothenuse, and produce it to $E$, and draw the diagonals $AF, CH$. The angle $ABF$ is evidently the sum of $ABC$ and a right angle, and the angle $HBC$ is also the sum of $ABC$ and a right angle; therefore the angle $ABF = HBC$; now $AB = BH$, for they are sides of the same square, and $BC = BF$ for, in the same manner, therefore the triangles $ABF, HBC$ have two sides, and the included angle of the one equal to two sides and the included angle of the other, each to each, therefore the triangles are equal (5. 1.) but the triangle $ABF$ is the half of the rectangle $BDEF$ (which for brevity's sake we shall call $BE$) because it has the same base $BF$, and the same altitude $BD$, (2.) and the triangle $HBC$ is in like manner half of the square $AH$, for the angles $BAE, BAL$ being both right angles, $CA$ and $AL$ constitute a straight line parallel to $EH, (3. 1.)$ and thus the triangle $HBC$, and the square $AH$ have the same base $HB$, and the same altitude $AB$; from which it follows that the triangle is half of the square (2). It has been proved that the triangle $ABF$ is equal to the triangle $HBC$; and that the rectangle $BE$ is double of the former, and the square $AB$ double of the latter; therefore the rectangle $BE$ is equal to the square $AH$. It may be demonstrated in like manner that the rectangle $CDEF$, or $CE$, is equal to the square $AI$; but the rectangles $BE, CE$ make up the square $BGF$, therefore the square $BGF$ upon the hypothenuse is equal to the squares $ALHB, AKIC$ upon the other sides.

THEOREM XIV.

In a triangle $ABC$, if the angle $C$ is acute, the square of the opposite side $AB$ is less than the squares of the sides which contain the angle $C$; and if $AD$ a perpendicular be drawn to $BC$ from the opposite angle, the difference shall be equal to twice the rectangle $BC \times CD$; that is, $AB^2 = AC^2 + BC^2 - 2BC \times CD$.

First. Suppose $AD$ to fall within the triangle, then $BD = BC - CD$, and consequently (11.) $BD + BC - CD = 2BC \times CD$; to each of these equals add $AD$; then, observing that $BD^2 + DA^2 = BA^2$, and $CD^2 + DA^2 = CA^2$,

$AB^2 = BC^2 + CA^2 - 2BC \times CD$.

Next, suppose $AD$ to fall without the triangle, so that $BD = CD - BC$, and therefore $BD^2 + CD^2 + BC^2 - 2BC \times CD$, (11.) to each of these add $AD^2$ below,
G E O M E T R Y.

Therefore, because of the common ratio in the two propor-
tions, we have (Ax. 3).

\[ AD : DB :: AE : EC. \]

Cor. Hence by composition \( AB : AD :: AC : AE \) ;
and \( AB : BD :: AC : CE \).

Theorem XVIII.

Conversely, if two of the sides \( AB, AC \) of a tri-
angle are divided proportionally by the straight
line \( DE \), so that \( AD : DB :: AE : EC \), then
shall the line \( DE \) be parallel to the remaining
side \( BC \).

For if \( DE \) is not parallel to \( BC \), suppose some
other line \( DO \) to be parallel to \( BC \); then, \( AB : BD :: AC : CO \) (17.) and since by hypothesis \( AD : DB :: AE : EC \),
and consequently, by composition, \( AE : BD :: AC : CE \),
therefore, \( AC : CO :: AC : CE \); therefore, \( CO = CE \) (2 Ax. 3) which is impossible;
therefore \( DO \) is not parallel to \( BC \).

Cor. If it be supposed that \( BA : AD :: CA : AE \),
still \( DE \) will be parallel to \( BC \); for by division
\( BD : AD :: CE : AE \), this proportion being the
same as in the Theorem, the conclusion must be
the same.

Theorem XIX.

A straight line \( AD \), which bisects the angle \( BAC \);
of a triangle, divides the base \( BC \) into two seg-
ments proportional to the adjacent sides \( BA, AC \);
that is, \( BD : DC :: BA : AC \).

Through the point \( C \) draw \( CE \) parallel to \( AD \),
as to meet \( BA \) produced. In the triangle \( BCE \),
the line \( AD \) is parallel to one of its sides \( CE \),
therefore \( BD : DC :: BA : AE \); now the triangle \( CAE \) is
isosceles, for, because of the parallels \( AD, CE \), the
angle \( ACE = DAC \), and the angle \( AEC = BAC \) (21. 1.)
but by hypothesis \( DAC = DAE \); therefore
\( ACE = AEC \) and consequently \( AE = EC \) (12. 4.)
therefore, substituting \( AC \) instead of \( AE \) in the above
proportion, it becomes \( BD : DC :: BA : AC \).

Theorem XX.

If two triangles are equiangular, their homologous sides are proportional, and the triangles are similar.

Let \( ABC, CDE \) be two equiangular triangles,
which have the angle \( BAC = CDE, ABC = DCE \),
and \( ACB = DEC \); the homologous sides, or the sides adjacent to the equal angles, shall be proportional; that is, \( BC : CE :: AB : CD :: AC : DE \).

Place the homologous sides \( BC, CE \) in the same
direction, and produce the sides \( BA, ED \), till they
meet in \( F \). Because \( BCE \) is a straight line, and
the angle \( BCA \) is equal to \( CED \), the lines \( CA, EF \) are
parallel, (22. 1.) and in like manner, because the angle
\( ABC = DOE \), the lines \( BF, CD \) are parallel; therefore
the figure \( ACDF \) is a parallelogram, and hence
\( AP = CD \) and \( CA = DF \) (26. 4.). In the triangle
\( BPE \), the line \( PE \) is parallel to the side \( FE \), therefore
\( BC \).
It is manifest, that the homologous sides are opposite to the equal angles.

**Theorem XXII.**

If two triangles have their homologous sides proportional, they are equiangular and similar.

**Fig. 5.**

If two triangles have their homologous sides proportional, they are equiangular and similar.

**Theorem XXIII.**

In a right-angled triangle, if a perpendicular AD be drawn from the right angle upon the hypothenuse, then,

1. The triangles ABD, CAD on each side of the perpendicular are similar to the whole triangle ABC, and to one another.
2. Each side AB or AC is a mean proportional between the hypothenuse BC, and the adjacent segment BD or DC.

**Scholium.**

What has been proved of triangles is also true of parallelograms, they being the doubles of such triangles.

**Theorem XXV.**

Two similar triangles are to each other as the squares of their homologous sides.
Theorem XXXI.

In the same circle, or in equal circles, any angles $\angle ACB, \angle DEF$ are to each other as the arches $AB, DF$ of the circles intercepted between the lines which contain the angles.

Problem I.

To bisect a given straight line $AB$; that is, to divide it into two equal parts.

From the points $A$ and $C$ as centres, with any radius greater than the half of $AB$, describe arches, cutting each other in $D$ and $E$ on each side of the line $AB$. Draw a straight line through the points $D$, $E$, cutting $AB$ in $C$; the line $AB$ is bisected in $C$.

For the points $D$, $E$, being equally distant from the extremities of the line $AB$, are each in a straight line perpendicular to the middle of $AB$, (16. 1.), therefore the line $DCE$ is that perpendicular, and consequently $C$ is the middle of $AB$.

Problem II.

To draw a perpendicular to a given straight line $BC$, from a given point $A$ in that line.

Take the points $B$ and $C$ at equal distances from $A$; and on $B$ and $C$ as centres, with any radius greater than $BA$, describe arches, cutting each other in $D$; draw a straight line from $A$ through $D$, which will be the perpendicular required. For the point $D$, being at equal distances from the extremities of the line $BC$, must be in a perpendicular to the middle of $BC$ (16. 1.), therefore $AD$ is the perpendicular required.

Problem III.

To draw a perpendicular to a given line $BD$, from a given point $A$ without that line.

On $A$ as a centre, with a radius sufficiently great, describe an arch, cutting the given line in two points $B$, $D$; and on $B$ and $D$ as centres, with a radius greater than the half of $BD$, describe two arches, cutting each other in $E$; draw a straight line through the points $A$, $E$, meeting $BD$ in $C$; the line $AC$ is the perpendicular required.

For the two points $A$ and $E$ are each at equal distances from $B$ and $D$; therefore, a line passing through $A$ and $E$ is perpendicular to the middle of $BD$ (16. 1.).

Problem IV.

At a given point $A$, in a given line $AB$, to make an angle equal to a given angle $K$.

On $K$ as a centre, with any radius, describe an arch to meet the lines containing the angle $K$, in $L$ and $I$; and on $A$ as a centre, with the same radius, describe an indefinite arch $BO$; on $B$ as a centre, with a radius equal to the chord $LI$, describe an arch, cutting the arch $BO$ in $D$; draw $AD$, and the angle $BAD$ shall be equal to $K$.

For the arches $BD$, $LI$, having equal radii and equal chords, the arches themselves are equal (4. 2.), therefore the angles $A$ and $K$ are also equal (13. 2.).

Problem V.

To bisect a given arch $AB$, or a given angle $C$.

First. To bisect the arch $AB$, on $A$ and $B$ as centres, with one and the same radius, describe arches to intersect in $D$; join $CD$, cutting the arch in $E$, and the arch $AE$ shall be equal to $EB$.

For, since the points $C$ and $D$ are at equal distances from $A$, and also from $B$, the line which joins them is perpendicular to the middle of the chord $AB$ (16. 1.), therefore, the arch $AB$ is bisected in $E$, (6. 2.).

Secondly. To bisect the angle $C$, on $C$ as a centre, with any distance, describe an arch, meeting the lines containing the angle in $A$ and $B$; then find the point $D$. 

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Sect. V. G E O M E T R Y .

Problems D as before, and the line CD will manifestly bisect the angle C, as required.

Scholium.

By the same construction we may bisect each of the arches AE, EB; and again we may bisect each of the halves of these arches, and so on; thus by successive subdivisions, an arch may be divided into four, eight, sixteen parts, &c.

Problem VI.

Fig. 98. Through a given point A, to draw a straight line parallel to a given straight line BC.

On A as a centre, with a radius sufficiently large, describe the indefinite arch EO; on E for a centre, with the same radius, describe the arch AF; in EO take ED equal to AF, draw a line from A through D, and AD will be parallel to BC.

For if AE be joined, the angle EAD is equal to AEB (13. 2), and they are alternate angles, therefore AD is parallel to BC, (22. 1).

Problem VII.

Fig. 99. To construct a triangle, the sides of which may be equal to three given lines A, B, C.

Take a straight line, DE, equal to one of the given lines A; on D as a centre, with a radius equal to another of the lines B, describe an arch; on E as a centre, with a radius equal to the remaining line C, describe another arch, cutting the former in F; join DF and EF, and DEF will be the triangle required, as is sufficiently evident.

Scholium.

It is necessary that the sum of any two of the lines be greater than the third line (7. 1).

Problem VIII.

Fig. 100. To construct a parallelogram, the adjacent sides of which may be equal to two given lines A, B, and the angle they contain equal to a given angle C.

Draw the straight line DE = A; make the angle GDE = C, and take DG = B; describe two arches, one on G as a centre, with a radius GF = DE, and the other on E, with a radius EF = DG, then DEFG shall be the parallelogram required.

For by construction the opposite sides are equal, therefore, the figure is a parallelogram, (27. 1) and it is so constructed, that the adjacent sides and the angle they contain have the magnitudes given in the problem.

Cor. If the given angle be a right angle, the figure will be a rectangle; and if the adjacent sides be also equal, the figure will be a square.

Problem IX.

To find the centre of a given circle, or of a circle of which an arch is given.

Take any three points A, B, D, in the circumference of the circle, or in the given arch, and having drawn the straight lines AB, BD, bisect them by the perpendiculars EG, FH; the point C where the perpendiculars intersect each other is the centre of the circle, as is evident from Theorem VI. sect. 2.

Scholium.

By the very same construction a circle may be found that shall pass through three given points A, B, C; or that shall be described about a given triangle ABC.

Problem X.

To draw a tangent to a given circle through a given point A.

If the given point A be in the circumference (Fig. 102), draw the radius AC; and through A, draw AD perpendicular to AC, and AD will be a tangent to the circle, (9. 2). But if the given point A be without the circle, (Fig. 103) draw AC to the centre, and bisect AC in O, and on O as a centre, with OA or OC as a radius, describe a circle which will cut the given circle in two points D and D'; join AD and AD', and each of the lines AD, AD', will be a tangent to the circle.

For, draw the radii CD, CD', then each of the angles ADC, AD'C is a right angle, (17. 2); therefore AD and AD' are both tangents to the circle, (9. 2).

Cor. The tangents AD, AD' are equal to one another, (17. 1).

Problem XI.

To inscribe a circle in a given triangle ABC. Fig. 104.

Bisect A and B any two angles of the triangle by the straight lines AO, BO, which meet each other in O; from O draw OD, OE, OF, perpendiculars to its sides; these lines shall be equal to one another.

For in the triangles ODB, OEB, the angles ODB = OEB, and the angle OBD = OBE; therefore the remaining angles BOD, BOE, are equal; and as the side DB is common to both triangles, they are equal to one another, (6. 1); therefore the side OD OE; in the same manner it may be demonstrated, that OD = OF; therefore the lines OD, OE, OF, are equal to one another, and consequently a circle described on O as a centre, with OD as a radius, will pass through E and F; and as the sides of the triangle are tangents to the circle, (9. 2) it will be inscribed in the triangle.

Problem XII.

Upon a given straight line AB, to describe a seg-

Fig. 105.

ment
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Problem XIII.

To divide a straight line, AB, into any proposed number of equal parts; or into parts having to each other the same ratios that given lines have.

First, Let it be proposed to divide the line AB, (fig. 106.) into five equal parts. Through the extremity A draw an indefinite line AC, take AC of any magnitude, and take CD, DE, EF, and FG, each equal to AC, that is, take AG equal to five times AC; join GB, and draw CI parallel to GB, the line AI shall be one-fifth of AB, and AI being taken five times in AB, the line AB shall be divided into five equal parts.

For since CI is parallel to GB, the sides AG and AB are cut proportionally in C and I; but AC is the fifth part of AG; therefore AI is the fifth part of AB.

Next, let it be proposed to divide AB (fig. 107.) into parts, having to each other the ratios that the lines P, Q, R have. Through A draw AG, and in AG take AC>P, CD=Q, DE=R; join EB, and draw CI and DK parallel to EB; the line AB shall be divided as required.

For, because the parallels CI, DK, EB, the parts AI, IK, KB, have to each other the same ratios that the parts AC, CD, DE have, (17. 4.) which parts are by construction equal to the given lines P, Q, R.

Problem XIV.

To find a fourth proportional to three given lines, A, B, C.

Draw two straight lines DE, DF, containing any angle; on DE take DA=A, and DB=B, and on DF take DC=C; join AC, and draw BX parallel to AC; then, BX shall be the fourth proportional required.

For, because BX is parallel to AC, DA:DB::DC:DX (17. 4.) that is, A:B::C:DX, therefore BX is a fourth proportional to A, B, and C.

Cor. The same construction serves to find a third proportional to two lines A and B; for it is the same as a fourth proportional to the lines A, B, and C.

Problem XV.

To find a mean proportional between two straight lines, A, B.

Given any straight line DF take DE=A, and EF =B; and on DF as a diameter describe a semicircle. Draw DG, draw EG perpendicular to DF, meeting the circle in G; the line EG shall be the mean proportional required.

For, if DG, FG, be joined, the angle DGF is a right angle, (17. 2.) therefore, in the right-angled triangle DGF, GF is a mean proportional between DE and EF, (23. 4.)

Problem XVI.

To divide a given straight line AB into two parts, so that the greater may be a mean proportional between the whole line and the other part.

At B, one of the extremities of the line, draw BC perpendicular to AB, and equal to the half of AB; on C as a centre, with CB as a radius, describe a circle; join AC, meeting the circle in D; make AF=AD, and AB shall be divided at F in the manner required.

For since AB is perpendicular to the radius, it is a tangent to the circle (9. 2.) and if AC be produced to meet the circle in E, AB: AF::AE:AB, (32. 4.) and by division, AB—AF::AE—AB::AB; but AB—AF=BF, and since DE=2BC=AB, therefore AE—AB=AD=AF, therefore BF:AF::AB.

Scholium.

When a line is divided in this manner it is said to be divided in extreme and mean ratio.

Problem XVII.

To make a square equivalent to a given parallelogram or to a given triangle.

First, Let ABCD be a given parallelogram, (fig. 112.) the base of which is AB, and altitude DE; find XY a mean proportional between AB and DE, (by problem 15.) and XY shall be the side of the square required.

For since by construction AB:XY::XY:DE, therefore, XY^2=AB*DE (8. 4.) parallelogram ABCD (5. 4.)

Next, let ABC be a given triangle (fig. 113.) BE its base, and AD its altitude; find XY a mean proportional between half the base and the altitude, and XY shall be the side of the square required.

For since BC:XY::XY:AD; therefore (8. 4.)
XY^2=BC*AD=triangle ABC (6. 4.)

Problem XVIII.

Upon a given line EF, to construct a rectangle EFGX equivalent to a given rectangle ABCD.

Find a fourth proportional to the three lines EF, AB and AD; (by problem 14.) draw EX, perpendicular to EF, and equal to that fourth proportional, and complete the rectangle EFGX, which will have the magnitude required.

For since EF:AB::AD:EX, therefore (8. 4.)
EF*EX=AB*AD, that is, the rectangle EFGX is equal to the rectangle ABCD.

Problem
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Sect. VI.

Of the Quadrature of the Circle.

Problem XXIV.

Having given ABCD, &c. a regular polygon inscribed in a circle, to describe a regular polygon of the same number of sides about the circle.

Draw GH a tangent to the circle at T the middle of the arch AB; do the same at the middle of each of the other arches BC, CD, &c. These tangents shall form a regular polygon GHIK, &c. described about the circle.

Join OG, OH, &c. also OT and ON. In the triangles OTH, ONH, the side OT is ON, and OH is common to both, and OTH, ONH, are right angles; therefore the triangles are equal (17. 1.) and the angles TOH = NOH; now B is the middle of the arch TN, therefore OH passes through B; and in the same manner it appears that I is in the line OC produced, &c. Now because OT bisects the arch AB it is perpendicular to the chord AB (6. 2.), therefore GH is parallel to AB (9. 2. and 18. 1.), and HI to BC, therefore the angle GHO = ABQ, and IHO = CBQ, and hence GHI = ABC; and in like manner it appears, that HIK = BCD, &c., therefore the angles of the circumscribed polygon are equal to those of the inscribed polygon. And because of the parallels, GH: AB:: OH: OB, and HI: BC:: OH: OB, therefore, GH: AB:: HI: BC; but AB = BC; therefore GH = HI. For the same reason HI = IK, &c.; therefore, the polygon is regular, and similar to the inscribed polygon.

Sect. VI. OF THE QUADRATURE OF THE CIRCLE.

Axiom.

Fig. 180. IF ABC be an arch of a circle, and AD, CD be two tangents at its extremities, intersecting each other in D; the sum of the tangents AD, DC is greater than the arch ABC.

Fig. 183. Cor. Hence the perimeter of any polygon described about a circle, is greater than the circumference of the circle.

Proposition I. Theorem.

Fig. 189. Equilateral polygons, ABCDEF, GHIKLM, of the same number of sides inscribed in circles are similar, and are to one another as the squares of the radii of the circles.

As each of the polygons is by hypothesis equilateral, it will also be equiangular (Sohv. 22. 5.). Let us suppose, for example, that the polygons are hexagons; then, as the sum of the angles is the same in both, viz. eight right angles (25. 1.), the angle A will be one-sixth part of eight right angles, and the angle G will be the same; therefore A = G; in like manner B = H, C = K, &c. and as the figures are equilateral, AB: GH: BC: HI:: CD: IK, &c. therefore (2. def. 4.) the figures are similar. Draw AO, BO, GP, HP to the centres of the circles; then, because the angle AOB is the same part of four right angles that the arch AB is of the whole circumference; and the angle GHP the same part of four right angles that GH is of the whole circumference (13. 2.) the angles AOB, GPH are each the same part of four right angles; therefore they are equal; the isosceles triangles AOB, GPH are therefore similar (22. 4.) and consequently AB: GH:: AO: GP, therefore (p. 9. and 27. 4.) polygon ABCDEF:: polygon GHIKLM:: AO: GP.

Prop. II. Theorem.

Fig. 111. A circle being given, two similar polygons may be found, the one inscribed in the circle, and the other described about it, which shall differ from each other by a space less than any given space.

Let AG be the side of a square equal to the given space; and let ABG be such an arch of the given circle, that AG is its chord. Bisect the fourth part of the circumference, (5. 5.) then bisect one of its halves, and proceed in this manner, till, by repeated bisections, there will at length be found an arch AB less than AG. As the arch thus found will be contained in the circumference a certain number of times exactly, its chord AB is the side of a regular figure inscribed in the circle; apply lines in the circle, each equal to AB, thus forming the regular figure ABC, &c. and describe a regular figure DEF, &c. of the same number of sides about the circle. Then, the excess of the circumscribed figure above the inscribed figure shall be less than the square upon AG. For draw lines from D and E to O the centre; these lines will pass through A and B (24. 5.); also, a line drawn from O, to H the point of contact of the line DE, will bisect AB, and be perpendicular to it; and AB will be parallel to DE. Draw the diameter AL, and join BL, which will be parallel to HO (18. 4.). Put P for the circumscribed polygon, and p for the inscribed polygon; then, because the triangles ODH, OAK are evidently like parts of P and p, P:: P:: ODH:: OAK (1. 5.); but the triangles ODH, OAK being similar, ODH:: OAH:: OK (25. 4.); and on account of the similar triangles OAK, LAB, OA, OH:: OK:: LB (20. and 9. 4.); therefore, P:: P:: LB, and by division and inversion, P:: P:: LB:: LB, and by division and inversion, P:: P:: LB:: LB, &c. of which proportion, the first term P is less than the third LA, therefore (2. 3.) the second P is less than the fourth AB, but AB < AG; therefore P < AG.

Cor. 1. Because the polygons P and p differ from one another more than either of them differs from the circle, the difference between each of them, and the circle, is less than the given space, viz. the square of AG. And therefore, however small any space may be,
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Cor. 2. A circle described with the hypothenuse of a right-angled triangle as a radius, is equal to two circles described with the other two sides as radii. Let the sides of the triangle be \( a, b \) and the hypothenuse \( h \), and let the circles described with these lines as radii be \( A, B \) and \( H \).

because \( A : H :: a^2 : h^2 \)
and \( B : H :: b^2 : h^2 \),
therefore \( A + B : H :: a^2 + b^2 : h^2 \) \((8. 3.)\)
but \( a^2 + b^2 = h^2 \) \((13. 4.)\), therefore \( A + B = H \).

Prop. V. Problem.

Having given the area of a regular polygon inscribed in a circle, and also the area of a similar polygon described about it; to find the areas of regular inscribed and circumscribed polygons, each of double the number of sides.

Let \( AB \) be the side of the given inscribed polygon, and \( EF \) parallel to \( AB \) that of the similarly circumscribed polygon, and \( C \) the centre of the circle; if the chord \( AM \), and the tangents \( AP, BQ \) be drawn, the chord \( AM \) shall be the side of the triangle inscribed of double the number of sides; and \( PQ \) or \( 2 \) \( PM \) that of the similar circumscribed polygon. Put \( A \) for the area of the polygon, of which \( AB \) is a side, and \( B \) for the area of the circumscribed polygon; also \( a \) for the area of the polygon of which \( AM \) is a side, and \( b \) for the area of the similar circumscribed polygon; then \( A \) and \( B \) are by hypothesis known, and it is required to find \( a \) and \( b \).

I. The triangles \( ACD, ACM \), which have a common vertex \( A \), are to one another as their bases \( CD \), \( CM \); besides, these triangles are to one another as the polygons, of which they form like parts, therefore \( A : a :: CD : CM \). The triangles, \( CAM, CME \), which have a common vertex \( M \), are to each other as their bases \( CA \), \( CE \); they are also to one another as the polygons \( a \) and \( B \), of which they are like parts; therefore, \( a : B :: CA : CE \); but because of the parallels \( DA, ME, CD, CM :: CA : CE \); therefore, \( A : a :: B : b \); therefore the polygon \( a \), which is one of the two required, is a mean proportional between the two known polygons \( A \) and \( B \), so that \( a = \sqrt[2]{AB} \).

II. The triangles \( CPM, CPE \), having the same altitude \( CM \), are to one another as \( PM \) to \( PE \). But as \( CP \) bisects the angle \( MCE, PM : PE :: CM : CE \) \((19. 4.) :: CD : CA :: A : a \); therefore, \( CPM :: CPE :: A : a \); and consequently \( CPM + CPE \), or \( CME \) : \( CPM : A + a :: A, \) and \( CME \) : \( 2 \) \( CPM :: A + a : 2 \) \( A \); but \( CME \) and \( 2 \) \( CPM \), or \( CMPA \), are to one another as the polygons \( B \) and \( b \), of which they are like parts; therefore, \( A + a : 2 \) \( A :: B : b \). Now the polygon \( a \) has been already found, therefore by this last proportion the polygon \( b \) is determined; that is, \( b = \frac{2A + B}{a + a} \).

Prop. VI. Problem.

To find nearly the ratio of the circumference of a circle to its diameter.

Let the radius of the circle \( = 1 \), then, the sides of the inscribed square being the hypothenuse of a right-angled triangle of which the radii are the sides, (see...
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Fig. 115. The area of the inscribed square will be 2; (13. 4.) and the circumscribed square, being the square of the diameter, will be 4. Now, retaining the notation of last problem, if we make \( A = 2 \) and \( B = 4 \), the formula

\[
a = \sqrt{A \times B}, \quad b = \frac{A \times B}{A + a}
\]

gives us \( a = 2.8284271 \), &c.

the area of the inscribed octagon, and \( b = 3.14137086 \), &c. the area of the circumscribed octagon. By substituting these numbers in the formula, instead of \( A \) and \( B \), we shall obtain the areas of the inscribed and circumscribing polygons of 16 sides; and hence we may find those of 32 sides, and so on as in the following table:

<table>
<thead>
<tr>
<th>No of sides</th>
<th>Ins. Polygons</th>
<th>Circ. Polygons</th>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>2.0000000</td>
<td>4.0000000</td>
</tr>
<tr>
<td>8</td>
<td>2.8284271</td>
<td>3.1415926</td>
</tr>
<tr>
<td>16</td>
<td>3.0614674</td>
<td>3.1415926</td>
</tr>
<tr>
<td>32</td>
<td>3.1214453</td>
<td>3.1415926</td>
</tr>
<tr>
<td>64</td>
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</tr>
<tr>
<td>128</td>
<td>3.1403215</td>
<td>3.1415926</td>
</tr>
<tr>
<td>256</td>
<td>3.141371782</td>
<td>3.1415926</td>
</tr>
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</tr>
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</tr>
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</tr>
<tr>
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</tr>
<tr>
<td>32768</td>
<td>3.141592659</td>
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</tr>
</tbody>
</table>

Hence it appears that the areas of a regular polygon of 32768 sides inscribed in the circle, and of a similar polygon described about it, differ so little from each other, that the numbers which express them are the same as far as the eighth decimal place. And as the circle is greater than the one polygon, and less than the other, its area will be nearly 3.1415926. But the area is the product of the radius and the half of the circumference; therefore, the radius being unity, half the circumference is nearly 3.1415926 nearly; and the radius is to half the circumference, or the diameter is to the circumference, nearly as 1 to 3.1415926.

SCHOLIUM.

In this way the ratio of the diameter to the circumference may be found to any degree of accuracy; but neither by this, nor any other method yet known, can the ratio be exactly determined.

ARCHIMEDES, by means of inscribed and circumscribed polygons of 96 sides, found that the diameter is to the circumference as 7 to 22, nearly, which ratio is nearer to the truth than can be expressed by any smaller numbers; and METHOD found it to be more nearly as 113 to 355. Both of these expressions are convenient on account of the smallness of the numbers, but later mathematicians have carried the approximation to a much greater degree of accuracy. Thus, it has been found that the diameter being 1, the circumference is greater than 3.1415926535897932, but less than the same number having its last figure increased by unity; and some have even had the patience to carry the approximation as far as the 250th place of decimals.

SECT. VII.

DEFINITIONS.

I. A straight line is perpendicular, or at right angles, to a plane, when it is perpendicular to every straight line meeting it in that plane. The plane is also perpendicular to the line.

II. A line is parallel to a plane, when they cannot meet each other, although both can be produced. The plane is also parallel to the line.

III. Parallel planes are such as cannot meet each other, though produced.

IV. It will be demonstrated (Theor. 3.) that the common section of two planes is a straight line; this being premised, the inclination of two planes is the angle contained by two straight lines drawn perpendicular to the line, which is their common section, from any point in it, the one perpendicular being drawn in the one plane, and the other in the other plane.

This angle may be either acute or obtuse.

V. If it be a right angle the two planes are perpendicular to each other.

VI. A solid angle is that which is made by the meeting of more than two plane angles, which are not in the same plane, in one point. Thus the solid angle S is formed by the plane angles ASB, BSC, CSD, DSA.

THEOREM I.

One part of a straight line cannot be in a plane and another part above it.

THEOREM II.

Two straight lines which cut each other in a plane determine its position; that is, the plane can coincide with these lines only in one position.

Let the straight lines AB, AC cut each other in A; conceive a plane to pass through AB, and to be turned about that line, till it pass through the point C; and this it can manifestly do only in one position; then, as the points A and C are in the plane, the whole line AC must be in the plane; therefore there is only one position in which the plane can coincide with the same two lines AB, AC.

Cor. Therefore a triangle ABC, or three points A, B, C not in a straight line, determine the position of a plane.

THEOREM III.

If two planes AB, CD intersect each other, their intersection is a straight line.

Let E and F be two points in the line of common section, and let a straight line EF be drawn between them; then the line EF must be in the plane AB,
meet the parallel planes in EF and GH; then EF and GH are parallel (7.) as well as EG and FH; therefore, EGHF, a parallelogram, is EF=GH.

Cor. Hence two parallel planes are everywhere at the same distance from each other. For, if EF and GH are perpendicular to the two planes, they are parallel, (i. cor. 5.) therefore they are equal.

Theorem X.

If two straight lines CA, EA, meeting one another, be parallel to two other lines DB, FB, that meet one another, though not in the same plane with the first two; the first two and the other two shall contain equal angles, and the plane passing through the first two shall be parallel to the plane passing through the other two.

Take AC=BD, AE=BF, and join CE, DF, AB, CD, EF. Because AC is equal and parallel to BD, the figure ABDC is a parallelogram; therefore, CD is equal and parallel to AB. For a similar reason EF is equal and parallel to AB; therefore also CE is equal and parallel to DF (2 cor. 5. and 28 i.) therefore the triangles CAE, DBF are equal, (10 i.) hence the angle CAE=DFB.

In the second place, the plane ACE is parallel to the plane BDF: For suppose that the plane parallel to BDE, passing through the point A, meets the lines CD, EF in any other points than C and E, (for example in G and H), then (9.) the three lines AB, CD, FH are equal; but the three lines AB, CD, EF have been shown to be equal; therefore, CD=GD, and FH=EF, which is absurd, therefore the plane ACE is parallel to BDF.

Theorem XI.

If a straight line AP be perpendicular to a plane MN, any plane APB, passing through AP, shall be perpendicular to the plane MN.

Let BC be the intersection of the planes AB, MN; if in the plane MN the line DE be drawn perpendicular to BP, the line AP, being perpendicular to the plane MN, shall be perpendicular to each of the straight lines BC, DE; therefore the angle APD is a right angle; now PA and PD are drawn in the planes AB, MN perpendicular to their common section, therefore (5. Def.) the planes AB, MN are perpendicular to each other.

Scholium.

When three straight lines, such as AP, BP, DP, are perpendicular to each other, each is perpendicular to the plane of the two other lines.

Theorem XII.

If the plane AB is perpendicular to the plane MN; and in the plane AB a straight line PA be drawn perpendicular to BP, the common intersection of the planes, then shall PA be perpendicular to the plane MN.

For, if in the plane MN, a line PD be drawn perpendicular to PB, the angle APD shall be a right angle, because the planes are perpendicular to each other, therefore, the line AP is perpendicular to the two lines PB, PD, therefore it is perpendicular to their plane MN.

Cor. If the plane AB be perpendicular to the plane MN, and from any point P, in their common intersection, a perpendicular be drawn to the plane MN; this perpendicular shall be in the plane AB; for if it is not, a perpendicular AP may be drawn in the plane AB to the common intersection BP, which will be at the same time perpendicular to the plane MN; therefore, at the same point P, there may be two perpendiculars to a plane NM, which is impossible (4.).

Theorem XIII.

If two planes AB, AD are perpendicular to a third, their common intersection AP is perpendicular to the third plane.

For, if through the point P, a perpendicular be drawn to the plane MN, this perpendicular shall be in the plane AB, and also in the plane AD, (cor. 12) therefore it is at their common intersection AP.

Theorem XIV.

If two straight lines be cut by parallel planes, they shall be cut in the same ratio.

Let the line AB meet the planes MN, PQ, RS in A, E, B; and let CD meet them in C, F, D, then shall AE:EB::CF:FD. For draw AD meeting the plane PQ in G, and join AC, EG, GF, BD; the lines EG, BD, being the common sections of the plane of the triangle ABD and the parallel planes PQ, RS, are parallel (7.), and in like manner it appears, that AC, GF are parallel; therefore AE:EB::AG:GD::CF:FD.

Theorem XV.

If a solid angle be contained by three plane angles, the sum of any two of these is greater than the third.

It is evidently only necessary to demonstrate the theorem, when the plane angle which is compared with the sum of the other two is greater than either of them; for, if it were equal to or less than one of them, the theorem would be manifest: therefore let 5 be a solid angle formed by three plane angles ASB, ASC, BSC, of which ASB is the greatest. In the plane ASB make the angle BSD=ASC; draw any straight line ADB, and having taken SC=SD, join AC, BC; the triangles BSC, BSD having two sides, and the included angle of the one equal to two sides, and the included angle of the other, each to each, are equal (5. i.), therefore BS=BC; now AB<AC+BC; therefore, taking BD from the first of these unequal quantities, and BC from the second, we get AD<AC, and as the triangles ASD, ASC have SD=SC, and SA common to both, and AD<AC, therefore (9 i.) the angle ASD<ASC; and, adding DSB to the one, and CSB to the other, ASD<ASC+SCB.

Theorem XVI.

If each of two solid angles be contained by three planes, the sum of the angles contained by the same planes is equal to the sum of the angles contained by the other planes.
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Theorem II.

In any parallelopiped the opposite planes are equal and parallel.

From the nature of the solid (4. def.) the bases ABCD, EFGH are equal parallelograms, and their sides are parallel, therefore the planes AC, EG are parallel; and because AD is equal and parallel to BC, and AE is equal and parallel to BF, the angle DAE = CBF, and the plane DAE is parallel to the plane CBF, (10. 7.) therefore also the parallelogram DAHE is equal to the parallelogram CBFG. It may in like manner be demonstrated, that the opposite parallelograms ABFE, DCGH are equal and parallel.

Cor. Hence, in a parallelopiped, any one of the six planes which contain it may be taken for its base.

Theorem III.

The plane BDHF, which passes through two parallel opposite edges BF, DH, of a parallelopiped AG, divides it into two triangular prisms ABDHEF, GHFBCD, equal to one another.

For the triangles ABD, EFH, having their sides equal and parallel, are equal, and the lateral faces ABFE, ADHE, BDHF are parallelograms; therefore the solid ABDHEF is a prism; for like reasons the solid GHFBCD is a prism. Again, because the plane angles which contain the solid angle at G are equal to those which contain the solid angle at A, viz. the angle FGH = DAB, FGC = DAE, and HGC = BAE, the planes in which these angles are have the same inclination to one another, (16. 7.) as, however, these angles are not disposed in the same order, but in a contrary order, the solid angles cannot be made to coincide with one another, and consequently the prisms cannot be proved equal by superposition, as in Theorem I. Their equality may however be established by reasoning thus.

The inclination of each of any two adjacent faces of a prism to the base, and the length of an edge being given, the prism is evidently restricted to one determinate magnitude; and it will evidently have the same magnitude whatsoever of the two sides of the base it may stand upon; that is, whether it be constructed above or below the base. Now if the upper base FGH of the one prism be applied to the lower base DAB of the other, so that the sides FG, GH may be upon the sides DA, AB, DB equal to them, then the prism GHFBCD will have the position ABDHEF; and the two faces ABFE of ADHE of the prism below the base will have each the same inclination to it, as the equivalent faces ABFE, ADHE of the prism above the base; and the edge AE of is equal to the edge AE; therefore the conditions which determine the magnitude of both prisms are identical, and consequently the prisms are equal.

Theorem IV.

If two parallelopipeds AG, AL have a common base ABCD, and have their upper bases in the same plane, and between the same parallel straight lines EK, HL, the two parallelopipeds are equivalent to each other.

Because AE is parallel to BF, and HE to GF, the angle AEU = BFK, HEU = GFK, and HEU = GFB; of these six angles the three first form the solid angle E, and the three others form the solid angle F; therefore since the plane angles are equal each to each, and similarly situated, the solid angles E and F are equal. Now if the prism AEIDHM be applied to the prism BFKCGAL, so that their bases AEI, BFK, which are equal, may coincide with each other, then, because the solid angle E is equal to the solid angle F, the side EH shall fall upon FG, and this is all that is necessary to prove that the two prisms coincide entirely, for the base AEI and the edge EH determine the prism AEI, and the base BFK and the edge FG determine the prism BFL; therefore the prisms are equal. But if from the solid AEI, the prism AEM be taken away, there will remain the parallelopiped AIL; and if from the same solid AEL, the prism BFL be taken away, there will remain the parallelopiped AEG; therefore the parallelopipeds AIL, AEG are equivalent to each other.

Theorem V.

Parallelopipeds upon the same base, and having the same altitude, are equivalent to one another.

Let ABCD be the common base of the two parallelopipeds AG, AL, which, because they have the same altitude, will have their upper bases in the same plane; then, because EF and AB are equal and parallel, as also IK and AB; EF is parallel to IK, (cor. 2. 5. 7.) for a similar reason GF is parallel to IL. Let the sides EF, IG, as also the sides IK, IM, be produced, so as to form by their intersections the parallelogram NOPQ; it is manifest that this parallelogram is equal to each of the bases EFCH, IMKL. Now, if we suppose a third parallelopiped, which, with the same lower base ABCD, has for its upper base NOPQ, this third parallelopiped will be equivalent to the parallelopiped AG, (4.) for the same reason the third parallelopiped will be equivalent to the parallelopiped AL; therefore the two parallelopipeds AG, AL, which have the same base and the same altitude, are equivalent to one another.

Theorem VI.

Any parallelopiped AG is equivalent to a rectangular angular parallelopiped, having the same altitude, and an equivalent base.

At the points A, B, C, D, let AI, BK, CL, DM, be drawn perpendicular to the plane ABCD, and terminating in the plane of the upper base; then, IK, KL,
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Theorem XII.

Similar prisms are to one another as the cubes of their homologous sides.

Let \( \text{AG}, \text{IP} \) be two similar prisms, of which \( \text{AB}, \text{IK} \) are two homologous sides, the prism \( \text{AG} \) is to the prism \( \text{IP} \) as the cube of \( \text{AB} \) to the cube of \( \text{IK} \). Let \( E \) and \( N \) be two homologous angles of the prisms, and \( ES, \text{NV} \) perpendiculars to the planes of their bases; join \( IV \); take \( IR=AE \), and in the plane \( \text{INV} \) draw \( RT \) perpendicular to \( IV \); then \( BT \) shall be perpendicular to the plane \( IL \) (11. and 12. of 7.), also \( RT \) shall be equal to \( ES \); for if the solid angles \( A \) and \( I \) were applied one to the other, the planes which contain them would coincide (schol. 16. 7.), and the point \( E \) would fall upon the point \( R \), and therefore the perpendicular \( ES \) would coincide with the perpendicular \( RT \) (2. cor. 4. 7.). Now the content of a prism being the product of its base by its altitude (11.), it follows that \( \text{prism AG} : \text{prism IP} :: ES \times \text{base AC} \times NV \times \text{base IL} 

\times \text{base AC} \times \text{base AC} : \text{NV} \times \text{base IL} ; \text{but} \text{base AC} : \text{base IL} :: AB^3 : IK^3 \) (27. 4.) and therefore considering the lines expressed by numbers, \( ES \times \text{base AC} \times \text{RT} \times \text{base AC} \times \text{NV} \times \text{base IL} :: \text{RT} \times \text{AB}^3 \times \text{NV} \times \text{IK}^3 \) (5. 3.) therefore \( \text{prism AG} : \text{prism IP} :: \text{RT} \times \text{AB}^3 \times \text{NV} \times \text{IK}^3 \); therefore \( \text{prism AG} : \text{prism IP} :: AB^3 : IK^3 \).

Cor. Similar prisms are to one another in the triplicate ratio of the homologous sides. For let \( Y \) and \( Z \) be two such lines that \( AB : IK :: Y : Z \), then the ratio of \( AB \) to \( Z \) is triplicate the ratio of \( AB \) to \( IK \) (22. def. 3.). Now, since \( AB : IK :: Y \), therefore \( AB^3 : IK^3 :: Y^3 \) (9. 4.), and multiplying the antecedents by \( AB \), and consequents by \( IK, AB^4 : IK^4 :: AB \times IK : IK \times Y^3 :: AB \times IK : Y^3 \), but \( Y^3 = IK \times Z \) (8. 4.), therefore \( AB^4 : IK^4 :: AB \times IK : IK \times Z :: AB : Z \), but \( \text{prism AG} : \text{prism IP} :: AB^4 : IK^4 \); therefore \( \text{prism AG} : \text{prism IP} :: AB : Z \), which last ratio is triplicate the ratio of \( AB \) to \( IK \).

Theorem XIII.

If a triangular pyramid \( \text{ABCD} \) be cut by a plane \( \perp \) \( bcd \) parallel to its base, the section \( bcd \) is similar to the base \( BCD \).

For because the planes \( bcd \), \( BCD \) are parallel, their intersections \( b, c, \) \( BC \) with a third plane \( \text{BAC} \) are parallel (7. 7.) and, for a like reason, \( c, d \) is parallel to \( CD \), and \( b \) to \( DB \); therefore the angle \( b \times d = \text{BCD}, c \times b = \text{CDB}, \) and \( d \times c = \text{DBC} \) (10. 7.) hence the triangles \( bcd \) \( BCD \) are equiangular, and consequently similar.

Cor. 1. If two triangular pyramids \( \text{ABCD}, \text{EFGH} \), which have equal bases, and equal altitudes, be cut by planes \( bcd, fgh \) that are parallel to the bases, and at equal distances from them, the sections are equal. For conceive the bases of the pyramids to be in the same plane, then their vertices will be in a plane parallel to their bases, and the sections, \( bcd, fgh \) will also be a plane parallel to their bases, therefore, \( AB : \text{AA} :: EF 

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EF : E'F' (14. 7), but because the triangles ABC, A' B'C' are similar, AB : A'B', BC : B'C; and, in like manner EF : E'F' = FG : f g, therefore, BC : b c::

FG : f g and B'C' = b'c' = FG' : f g' (9. 4.); but B'C' = b'c' = triangle BCD : trian. b c d, and FG' : f g' = trian. FGH : trian. f g h (25. 4.); therefore, trian. BCD : trian. b c d = trian. FGH : trian. f g h, but trian. BCD = trian. FGH (by hyp.) therefore trian. b c d = trian. f g h.

Scholiwm.

It is easy to see that what is here demonstrated of triangular pyramids, is equally true of polygonal pyramids having equal bases and altitudes.

Theorem XIV.

A series of prisms of the same altitude may be circumscribed about any pyramid ABCD, such that the sum of the prisms shall exceed the pyramid by a solid less than any given solid Z.

Let Z be equal to a prism standing on the same base with the pyramid, viz. the triangle BCD, and having for its altitude the perpendicular drawn from a certain point E in the line BCD. It is evident that CE multiplied by a certain number m will be greater than AC; divide CA into as many equal parts as there are units in m, and let these be CF, FG, GH, HA, each of which will be less than CE. Through each of the points F, G, H, let planes be made to pass parallel to the plane BCD, making with the sides of the pyramid the sections FQ, GR, HT, which will be all similar to one another, and to the base BCD (13.). From the point B draw in the plane of the triangle ABC the straight line BK parallel to CF, meeting FP produced in K. In like manner, from D draw DL parallel to CF, meeting FQ in L; join KL, and it is plain that the solid KBCDLF is a prism. By the same construction let the prisms PM, RO, TV be described. Also let the straight line IP, which is in the plane of the triangle ABC be produced till it meet BC in i; and let the line MQ be produced till it meet D C in q. Join Hg, then AGH is a prism, and is equal to the prism PM (cor. 11.). In the same manner is described the prism MS equal to the prism RO, and the prism Q U equal to the prism TV. The sum, therefore, of all the inscribed prisms h Q, m S and q U is equal to the sum of the prisms PM, RO, TV, that is, to the sum of all the circumscribed prisms except the prism BL; wherefore, BL is the excess of the prisms circumscribed about the pyramid above the prisms inscribed within it. But the prism BL is less than the prism which has the triangle BCD for its base, and for its altitude the perpendicular from E upon the plane BCD, which prism is, by hypothesis, equal to the given solid Z; therefore the excess of the circumscribed above the inscribed prisms is less than the solid Z. But the excess of the circumscribed prisms above the inscribed is greater than their excess above the pyramid ABCD, because ABCD is greater than the sum of the inscribed prisms; much more therefore is the excess of the circumscribed prisms above the pyramid less than the solid Z. A series of prisms of the same altitude has therefore been circumscribed about the pyramid ABCD exceeding it by a solid less than the given solid Z.

Theorem XV.

Pyramids that have equal bases and altitudes are Fig. 146. equal to one another.

Let ABCD, EFGH be two pyramids that have equal bases BCD, FGH, and also equal altitudes; the pyramid ABCD is equal to the pyramid EFGH.

If they are unequal, let the pyramid EFGH exceed the pyramid ABCD by the solid Z. Let a series of prisms of the same altitude be circumscribed about the pyramid ABCD that shall exceed it by a solid less than Z, (14.) and let another series equal in number to the former, and having all the same altitude, be described about the pyramid EFGH; then, because the pyramids have equal altitudes, the altitude of each of the prisms described about the one pyramid is equal to the altitude of each of the prisms described about the other pyramid; therefore the sections of the pyramids which are the bases of the corresponding prisms will be at equal distances from the bases of the pyramids, and hence these sections will be equal; (1. cor. 13.) and because the prisms have all the same altitude, the corresponding prisms will be equal, and the sum of the prisms described about the pyramid ABCD will be equal to the sum of the prisms described about the pyramid EFGH. Let the pyramid EFGH be denoted by P, and the pyramid ABCD by p, and put Q for the sum of the prisms described about P, and q for the prisms described about p: Then by hypothesis Z = P - p, and by construction Z = q - p, therefore P - p > q - p, and consequently P > q; but it has been shown that q = Q, therefore P > Q, that is, the pyramid EFGH is greater than the sum of the prism described about it, which is impossible, therefore the pyramids ABCD, EFGH are not unequal, that is, they are equal.

Theorem XVI.

Every prism having a triangular base may be divided into three pyramids that have triangular bases, and that are equal to one another.

Let ABC, DEF be the opposite bases of a triangular prism. Join AE, FC, CD; and because ABC is a parallelogram, of which AE is the diameter, the triangle ADE is equal to the triangle ABE; therefore the pyramid of which the base is the triangle ADE and vertex the point C, is equal to the pyramid of which the base is the triangle ABE, and vertex the point C. But the pyramid of which the base is the triangle ABE and vertex the point C, that is the pyramid ABCE, is equal to the pyramid DEF, (15.) for they have equal bases, viz. the triangles ABC, DFE, and the same altitude, viz. the altitude of the prism ABCDEF. Therefore, the three pyramids ADEC, ABEC, DFEC are equal to one another; but these pyramids make up the whole prism ABCDEF; therefore, the prism ABCDEF is divided into three equal pyramids.

Cor. 1. From this it is manifest that every pyramid
mid is the third part of a prism which has the same base and the same altitude with it; for if the base of the prism be any other figure than a triangle, it may be divided into prisms having triangular bases.

SECT. IX. OF CYLINDERS, CONES, AND THE SPHERE.

DEFINITIONS.
I. A Cylinder is a solid figure described by the revolution of a right-angled parallelogram about one of its sides, which remains fixed.

The Axis of the cylinder is the fixed straight line about which the parallelogram revolves.

The Bases of the cylinder are the circles described by the two revolving opposite sides of the parallelogram.

II. A Cone is a solid figure described by the revolution of a right-angled triangle about one of the sides containing the right angle, which side remains fixed.

The Axis of the cone is the fixed line about which the triangle revolves.

The Base of the cone is the circle described by that side containing the right angle which revolves.

III. A Sphere is a solid figure described by the revolution of a semicircle about a diameter.

The Axis of a sphere is the fixed line about which the semicircle revolves.

The Centre of a sphere is the same with that of the semicircle.

The Diameter of a sphere is any straight line which passes through the centre, and is terminated both ways by the superficies of the sphere.

IV. Similar cones and cylinders are those which have their axes and diameters of their bases proportional.

THEOREM I.

Fig. 148. If from any point E in the circumference of the base of a cylinder ABCD, a perpendicular EF be drawn to the plane of the base AEB, the straight line EF is wholly in the cylindrical superficies.

Let HG be the axis, and AGHD the rectangle, which by its revolution describes the cylinder. Because HG is perpendicular to AG in every position of the revolving rectangle, it is perpendicular to the plane of the circle described by AG; and because AD, the line which describes the cylindrical superficies, is parallel to GH, it is also perpendicular to the plane of that circle. (5. 7.) Now when by the revolution of the rectangle AGHD the point A coincides with the point E, the line EF will coincide with AD, and thus will be wholly in the cylindrical superficies; for otherwise two perpendiculars might be drawn to the same plane, from the same point, which is impossible (2 cor. 4. 7.).

THEOREM II.

Fig. 149. A cylinder and a parallelopiped having equivalent bases and the same altitude are equal to one another.

Let ABCD be a cylinder, and EF a parallelopiped having equivalent bases, viz. the circle AGB and the parallelogram EH, and having also equal altitudes; the cylinder ABCD is equal to the parallelopiped EF. If not, let them be unequal; and first let the cylinder be less than the parallelopiped EF; and from the parallelopiped EF let there be cut off a part EQ by a plane PQ parallel to NF, equal to the cylinder ABCD. In the circle AGB inscribe the polygon AGKBLM that shall differ from the circle by a space less than the parallelogram PH, (1 cor. 2. 6.) and cut off from the parallelogram EH a part OR equal to the polygon AGKBLM, then it is manifest that the parallelogram OR is greater than the parallelogram OP, therefore the point R will fall between P and N. On the polygon AGKBLM let an upright prism be constituted of the same altitude with the cylinder, which will therefore be less than the cylinder, because it is within it; (1.) and if through the point R a plane RS parallel to NF be made to pass, it will cut off the parallelopiped ES equal to the prism AGB, because its base is equal to that of the prism, and its altitude is the same. But the prism AGB is less than the cylinder ABCD, and the cylinder ABCD is equal to the parallelopiped EQ, by hypothesis; therefore, ES is less than EQ, and it is also greater, which is impossible. The cylinder ABCD therefore is not less than the parallelopiped EF; and in the same manner it may be shown not to be greater than EF, therefore they are equal.

THEOREM III.

If a cone and cylinder have the same base and the same altitude, the cone is the third part of the cylinder.

Let the cone ABCD, and the cylinder BFKG have the same base, viz. the circle BCD, and the same altitude, viz. the perpendicular from the point A upon the plane BCD; the cone ABCD is the third part of the cylinder BFKG. If not, let the cone ABCD be the third part of another cylinder LMNO having the same altitude with the cylinder BFKG; but let the bases BCD, LIM be unequal, and first let BCD be greater than LIM. Then, because the circle BCD is greater than the circle LIM, a polygon may be inscribed in BCD that shall differ from it less than LIM does, (1 cor. 2. 6.) and which therefore will be greater than LIM. Let this be the polygon BECDF; and upon BECDF let there be constituted the pyramid ABECFD, and the prism BCFKHG. Because the polygon BECDF is greater than the circle LIM, the prism BCFKHG is greater than the cylinder LMNO, for they have the same altitude, but the prism has the greater base. But the pyramid ABECFD is the third part of the prism BCFHG (16. 8.) therefore it is greater.
greater than the third part of the cylinder LMNO.
Now the cone $ABECD$ is by hypothesis the third part of the cylinder $LMNO$, therefore, the pyramid $ABECD$ is greater than the cone $ABCD$, and it is also less, because it is inscribed in the cone, which is impossible. Therefore the cone $ABCD$ is not less than the third part of the cylinder $BFKG$. And in the same manner, by circumscribing a polygon about the circle $BCD$, it may be shown that the cone $ABCD$ is not greater than the third part of the cylinder $BFKG$; therefore, it is equal to the third part of the cylinder.

**Theorem IV.**

If a hemisphere and cone have equal bases and altitudes, a series of cylinders may be inscribed in the hemisphere, and another series may be circumscribed about the cone, having all the same altitudes with one another, and such that their sum shall differ from the sum of the hemispheres and the cone by a solid, less than any given solid.

Let $ADB$ be a semicircle, of which the centre is $C$, and let $CD$ be at right angles to $AB$; let $DB$ and $DA$ be squares described on $DC$, draw $CE$, and let the figure thus constructed revolve about $DC$: then the quadrant $BCD$ will describe a hemisphere having $C$ for its centre, and the triangle $CDE$ will describe a cone having its vertex at $C$, and having for its base the circle described by $DE$, equal to that described by $BC$, which is the base of the hemisphere. Let $W$ be a given solid, a series of cylinders may be described in the hemisphere $ADB$, and another described about the cone $ECL$, so that their sum shall differ from the sum of the hemisphere and cone, by a solid less than the solid $W$.

Upon the base of the hemisphere let a cylinder be constituted equal to $W$, and let its altitude be $CX$. Divide $CD$ into such a number of equal parts that each of them shall be less than $CX$; let these be $CH$, $HG$, $GF$, and $FD$. Draw $FN$, $GO$, $HP$ parallel to $CB$, meeting the circle in $K$, $L$, and $M$, and the straight line $BE$ part of $Q$, $R$, and $S$. Draw $Kf$, $Lq$, $Mh$, perpendicular to $GO$, $HP$, and $CB$; and draw $Qq$, $Br$, $Sr$, perpendicular to the same lines. It is evident that the figure being thus constructed, if the whole revolve about $CD$, the rectangles $Ff$, $Gq$, $Hh$, will describe cylinders that will be circumscribed by the hemisphere $BDA$; and that the rectangles $DN$, $Fq$, $Gr$, $Hs$ will also describe cylinders that will circumscribe the cone $ICE$. Now it may be demonstrated, as was done of the prisms inscribed in a pyramid (14. 8.), that the hemisphere exceeds the sum of all the cylinders described within it, by a solid less than the cylinder generated by the rectangle $HB$, that is, by a solid less than $W$. In the same manner it may be demonstrated, that the sum of the cylinders circumscribing the cone $ICE$ is greater than the cone by a solid less than the cylinder generated by the rectangle $DN$, that is, by a solid less than $W$. Therefore, since the sum of the cylinders inscribed in the hemisphere together with a solid less than $W$, is equal to the hemisphere; and

**Theorem V.**

The same thing being supposed as in last theorem, Fig. 131, the sum of all the cylinders inscribed in the hemisphere, and described about the cone, is equal to a cylinder having the same base and altitude with the hemisphere.

For, the same construction being supposed as in last theorem, let $L$ be the point in which $GO$ meets the circle $ADB$, then because $CGL$ is a right angle, if $CL$ be joined, the circles described with the radii $CG$ and $GL$ are equal to the circle described with the radius $CL$ or $GO$. Now $CG = GR$, because $CD = DE$, therefore, the circles described by the revolution of the radii $GR$ and $GL$ about the point $G$ are together equal to the circle described by the revolution of the radius $GO$ about the point $G$; therefore also the cylinders that stand upon the two first of these circles having the common altitude $GH$ are equal to the cylinder which stands upon the remaining circle, and which has the same altitude $GH$. The cylinders described by the revolution of the rectangles $Gq$ and $Gr$ are therefore equal to the cylinder described by the rectangle $GP$. And as the same may be shown all the rest, the cylinders described by the rectangles $Hh$, $Gg$, $Ff$, and by the rectangles $Hs$, $Gr$, $Fq$, $Dn$, are together equal to the cylinder described by $DB$, that is, to the cylinder having the same base and altitude with the hemisphere.

**Theorem VI.**

Every sphere is two-thirds of the circumscribing cylinder.

Let the figure be constructed as in the two last theorems, and if the hemisphere described by the quadrant $BDC$ be not equal to two-thirds of the cylinder described by the rectangle $BD$, let it be greater by the solid $W$. Then as the cone described by $CDE$ is one-third of the cylinder described by $BD$, the cone and the hemisphere together will exceed the cylinder by $W$. But that cylinder is equal to the sum of all the cylinders described by the rectangle $HH$, $Gg$, $Ff$, $Hs$, $Gr$, $Fq$, $Dn$; therefore, the hemisphere and the cone added together exceed the sum of all these cylinders by the solid $W$, which is absurd; for it has been shown (4.) that the hemisphere and the cone together differ from the sum of these cylinders by a solid less than $W$. The hemisphere is therefore equal to two-thirds of the cylinder described.
the island itself appears to have been the favourite residence of an Indian prince. It lies to the south of Lake Champlain, and its waters lie at 100 feet higher. It abounds with fisheries of a superior quality, such as the Oswego bass, and speckled trouts of considerable magnitude. The French at one time called it Lake Sacrament, as they were at the trouble to bring from it their water for sacramental purposes, to the churches they had planted in Canada.

GEORGETOWN, the name of several towns in America, such, for instance, as Georgetown in Maryland, about 63 miles S. W. of Philadelphia; Georgetown in the county of Lincoln, and district of Maine, lying on both sides of Kennebec river, 148 miles S. W. of Philadelphia, where the Roman Catholics have a very flourishing college: it is the name of a village in Fayette county, Pennsylvania, where a number of boats are annually built; and of a port town in the district of the same name, where the Episcopalians, Baptists, and Methodists, have each a place of worship. It is also the name of a port of entry in South Carolina, situated on the Sampit river, 12 miles from the sea. It has a flourishing academy, where orphans and poor children are educated gratis.

GEORGIA, a country of Asia, bounded by Circassia, on the north by Daghestan and Shirvan, on the south by Armenia, and on the west by the Caspian and Black seas; comprehending the greatest part of the ancient Colchis, Iberia, and Albania. About the etymology of the name of this country, authors are not agreed. The most probable opinion is, that it is a corruption by softening of Kurgio, from the river Kur; whence it is supposed that the inhabitants are called by the Persians indifferently Gurgi and Kurgi; and the country Kurgistan and Gurgistan. It is divided by a ridge of mountains into eastern and western; the former of which is again subdivided into the kingdoms of Caket, Carduel or Carthuel, and Goguetia; and the latter into the province of Abassia, Mireta or Imretia, and Gurial. Another division is into Georgia Proper, Abassia, and Mingrelia. A third division will be afterwards mentioned.

"Georgia, (says Sir George Chardin) is as fertile a country as can be seen; the bread is as good here as in any part of the world; the fruit of an exquisite flavour and of different sorts: no place in Europe yields better pears and apples, and no place in Asia better pomegranates. The country abounds with cattle, venison, and wild fowl of all sorts: the river Kur is well stocked with fish; and the wine is so rich, that the king of Persia has always some of it for his own table. The inhabitants are robust, valiant, and of a jovial temper; great lovers of wine, and esteemed very trusting and faithful; endowed with good natural parts, but, for want of education, very vicious. The women are generally so fair and comely, that the wives and concubines of the king of Persia and his court are for the most part Georgian women. Nature has adorned them with graces nowhere else to be met with: it is impossible to see them without loving them; they are of a good size, clean limbed, and well shaped. Another traveller, however, of no mean character, thus expresses himself with respect to the women: "As to the Georgian women, they did not at all surprise us; for we expected to find them perfect beauties. They are, indeed no way disagreeable; and may be counted beauties, if compared with the Curdes. They have an air of health that is pleasing enough; but, after all, they are neither so handsome nor so well shaped as is reported. Those who live in the towns have nothing extraordinary more than the others; so that I may think, venture to contradict the accounts that have been given of them by most travellers."

This country formerly abounded with great cities, as appears not only from its history, but from the ruins of many of them still visible, which show that they must have been very large, opulent, and magnificently built. These were all destroyed by the inundations of northern barbarians from Mount Caucasus, as the Alans, Huns, Suevi, and some others, so much noted in history for their strength, courage, and conquests.

The latest division of this country is into nine provinces; five of which were subject to the famous prince Heraclius, forming what is commonly called the kingdom of Georgia; and four were under the dominion of David, composing the kingdom or principality of Imeretia. See Imeretia.

This whole country is so extremely beautiful, that some fanciful travellers have imagined they had here found the situation of the original garden of Eden. The hills are covered with forests of oak, ash, beech, chestnuts, walnuts, and elms, encircled with vines, growing perfectly wild, but producing vast quantities of grapes. From these is annually made as much wine as is necessary for the yearly consumption; the remainder is left to rot on the vines. Cotton grows spontaneously, as well as the finest European fruit trees. Rice, wheat, millet, hemp, and flax, are raised on the plains, almost without culture. The valleys afford the finest pastureage in the world; the rivers are full of fish; the mountains abound in minerals, and the climate is delicious; so that nature appears to have lavished on this favourite country every production that can contribute to the happiness of its inhabitants.

On the other hand, the rivers of Georgia being fed by mountain torrents, are at all seasons either too rapid or too shallow for the purposes of navigation: the Black sea, by which commerce and civilization might be introduced from Europe, has been till very lately in the exclusive possession of the Turks: the trade of Georgia by land is greatly obstructed by the high mountains of Caucasus; and this obstacle is still increased by the swarms of predatory nations, by which those mountains are inhabited.

It is said, that in the 15th century, a king of Georgia divided among his five sons the provinces of Carduel and Caket, Imeretia, Mingrelia, Gurial, and Abassia. These petty princes were too jealous to unite for their common defence, and too weak singly to resist a foreign enemy, or even to check the encroachments of their great vassals, who soon became independent. By forming a party among these nobles, the Turks gradually gained possession of all the western provinces, while the Persians occupied the governments of Carduel and Caket. Since that period the many unsuccessful attempts of the Georgians to recover their liberty have repeatedly produced the devastation of their country. Abbas the Great is said to have carried off in one expedition from the provinces of
The subjects of Heraclius were estimated at about 80,000 families; but this, notwithstanding the present desolate state of the country, is probably an under valuation. The peasants belonging to the queen, and those of the patriarch, pay no tax to the prince, and therefore do not appear on the books of the revenue officers. Many similar exemptions have likewise been granted by the prince to his sons-in-law, and his favourites. Besides, as the import of his customs is lost by a prohibition of the export of foreign goods, but a tax on the inhabitants of a village, on the approach of the collectors, frequently carry the furniture of several huts into one, and destroy the remainder, which are afterwards very easily replaced. It is probable, therefore, that the population of Georgia does not fall short of 350,000 souls. The revenues may be estimated at about 150,000 rubles, or 26,250 l. They consist of, 1. The customs, farmed at 1750 l.—2. Rent paid by the farmers of the mist, at Telifs, 1750 l.—3. The tribute paid by the khans of Erivan and Guasha, 7000 l.—and, 4. The beard money levied on the peasants, amounting to 15,750 l. The common coins here are the abasas, of about 18 l. value, and a small copper coin, stamped at the mint at Telifs. Besides these, a large quantity of gold and silver money is brought into the country from Persia and Turkey, in exchange for honey, butter, cattle, and blue linens.

The government of Georgia was despotic; and though now subject to Russia, it is still in a great measure governed by its own laws. The punishments in criminal cases are shockingly cruel; fortunately they are not frequent, because it is seldom difficult to escape into some of the neighbouring countries, and become the prince is more enriched by confiscating the property of the criminal, than by putting him to torture. Judicial combats are considered as the privilege of nobility, and take place when the cause is extremely intricate, or when the power and interest of two claimants are equal, that neither can force a decision of the court in his favour. This mode of trial is called an appeal to the judgment of God.

The dress of the Georgians nearly resembles that of the Cossacks; but men of rank frequently wear the habit of Persia. They usually dye their hair, beard, and nails with red. The Georgian women employ the same colour to stain the palms of their hands. On their heads they wear a cap or fillet, under which their black hair falls on their forehead; behind it is braided into several tresses. Their eyebrows are painted with black, in such a manner as to form one entire line, and their faces are perfectly painted with white and red. Their robe is open to the girdle, so that they are reduced to conceal their breasts with their hands. Their air and manner are extremely voluptuous. Being generally educated in convents, they can all read and write; a qualification which is very unusual among the men, even of the highest rank. Girls are betrothed as soon as possible, often at three or four years of age. In the streets the women of rank are always veiled, and then it is indecent in any man to accost them. It is likewise uncivil in conversation to inquire after the wives of any of the company. These, however, are not regarded as customs, but are a consequence of the violence committed by the Persians, under Shah Nadir.
Travellers accuse the Georgians of drunkenness, superstition, cruelty, sloth, avarice, and cowardice; vices which are everywhere common to slaves and tyrants, and are by no means peculiar to the natives of this country. The descendants of the colonists, carried off by Shah Abbas, and settled at Peria, near Ispahan, and in Mafteran, have changed their character with their government; and the Georgian troops, employed in Persia against the Afghans, were advantageously distinguished by their docility, their discipline, and their courage.

The other inhabitants of Georgia are Tartars, Osis, and Armenians, called in the Georgian language Samaki. These last are found all over Georgia, sometimes mixed with the natives, and sometimes in villages of their own. They speak among themselves their own language, but all understand and can talk the Georgian. Their religion is partly the Armenian, and partly the Roman Catholic. They are the most oppressed of the inhabitants, but are still distinguished by that instinctive industry which everywhere characterizes the nation.

Besides these, there are in Georgia considerable numbers of Jews, called, in the language of the country, Oria. Some have villages of their own; and others are mixed with the Georgian, Armenian, and Tartar inhabitants, but never with the Osis. They pay a small tribute above that of the natives.

Georgia, one of the United States of America, lying between South Carolina and Florida. It is about 350 miles long from north to south, 250 broad, and its area is about 52,000 square miles. It is bounded by Florida on the south, the Atlantic on the east, Alabama on the west, and South Carolina on the north. The whole coast is bordered by islands; the principal of which are Skidaway, Wassaw, Sapelo, Frederica, Jekyll, Cumberland, and Amelias. The settlement of a colony between the rivers Savannah and Alatamaha was made in England in 1732, for the accommodation of poor people in Great Britain and Ireland, and for the further security of Carolina. Private compassion and public spirit conspired to promote the benevolent scheme. Humane and opulent men suggested a plan of transporting a number of indigent families to this part of America free of expense. For this purpose they applied to the king, George II. and obtained from him letters patent, bearing date June 9, 1732, for legally carrying into execution what they had generously projected. They called the new province Georgia, in honour of the king, who encouraged the plan. A corporation, consisting of 21 persons, was constituted by the name of, The Trustees for settling and establishing the colony of Georgia.

In November 1732, 116 settlers embarked for Georgia to be conveyed thither free of expense, furnished with every thing requisite for building and for cultivating the soil. Mr James Ogilthorpe, one of the trustees, and an active promoter of the settlement, embarked as the head and director of these settlers. They arrived at Charleston early in the next year. Mr Ogilthorpe, accompanied by William Bull, shortly after his arrival, visited Georgia, and after surveying the country, marked the spot on which Savannah now stands, as the fittest to begin their settlement. Here they accordingly began and built a small fort, and a number of small huts for their defence and accommodation. Such of the settlers as were able to bear arms were embodied, and well appointed with officers, arms, and ammunition. A treaty of friendship was concluded between the settlers and their neighbours the Creek Indians, and every thing were the aspect of peace and future prosperity. But the fundamental regulations established by the trustees of Georgia were ill adapted to the circumstances and situation of the poor settlers, and of pernicious consequences to the prosperity of the province. Yet although the trustees were greatly mistaken with respect to their plan of settlement, it must be acknowledged their views were generous. Like other distant legislators, who framed their regulations upon principles of speculation, they were liable to many errors and mistakes; and however good their design, their rules were found improper and impracticable. These injudicious regulations and restrictions, the wars in which they were involved with the Spaniards and Indians, and the frequent insurrections among themselves, threw the colony into a state of confusion and wretchedness too great for human nature long to endure. Their oppressed situation was represented to the trustees by repeated complaints; till at length finding that the province languished under their care, and weary with the complaints of the people, they in the year 1772 surrendered their charter to the king, and it was made a royal government.

In the year 1740, the Rev. George Whitefield founded an orphan house academy in Georgia about 12 miles from Savannah. Mr Whitefield died at Newburyport, in New England, in October 1770, in the 56th year of his age, and was buried under the Presbytery church in that place. From the time Georgia became a royal government in 1772 till the year of Paris in 1763, she struggled under many difficulties, arising from the want of credit and friends, and the frequent molestation of enemies. The good effects of the peace were sensibly felt in the province of Georgia. From this time it began to flourish under the fatherly care of Governor Wright. To form a judgment of the rapid growth of the colony, we need only attend to its exports. In the year 1763, they consisted of 7,500 barrels of rice, 9632 pounds of indigo, 1250 bales of Indian corn, which, together with deer and beaver skins, naval stores, provisions, timber, &c. amounted to no more than 27,021. sterling. Ten years afterwards, in 1773, they amounted to 121,677. sterling. The chief articles of export from this state are, rice, tobacco, indigo, saffo, lumber of various kinds, naval stores, leather, deer skins, snake-root, myrtle, bees wax, corn, live stock, &c.

During the American war, Georgia was overrun by the British troops, and the inhabitants were obliged to flee to the neighbouring states for safety. Since the peace the progress of the population of this state is said to have been astonishingly rapid; but it was for a time a good deal checked by the hostile irruptions of the Creek Indians, who continually harassed the frontiers of the state. This evil is now little known, and the recent
The principal river in the middle and western parts of this state is the Apalachicola, which is formed by the Catahouchee and Flint rivers. It forms the western boundary of the state for 120 miles, and after a long southern course falls into the gulf of Mexico.

No general character will apply to the inhabitants at large. Collected from different parts of the world, in interest, necessity, or inclination led them, their character and manners must of course partake of all the varieties which distinguish the several states and kingdoms from whence they came. There is so little uniformity, that it is difficult to trace any governing principles among them. An aversion to labour is too predominant, owing in part to the relaxing heat of the climate, and partly to the want of necessity to excite industry. An open and friendly hospitality, particularly to strangers, is an ornamental characteristic of a great part of this people.

In regard to religion, politics, and literature, this state is yet in its infancy. In Savannah is an Episcopal church, a Presbyterian church, a synagogue, and a German Lutheran church, supplied occasionally by a German minister from Ebenezer, where there is a large convenient steeple church, and a settlement of sober and industrious Germans of the Lutheran religion. In Augusta they have an Episcopal church. In Midway is a society of Christians established on the congregational plan. Their ancestors emigrated in a colony from Dorchester, near Boston, about the year 1700, and settled at a place named Dorchester, about 20 miles south-west of Charlestown, South Carolina. In 1752, for the sake of a better climate and more land, almost the whole society removed and settled at Midway. They, as a people, retain in a great measure that simplicity of manners, that unaffected piety and brotherly love, which characterized their ancestors, the first settlers of New England. The upper counties are supplied pretty generally by Baptist and Methodist ministers; but the greater part of the state is without ministers of any denomination.

The numerous defects in the late constitution of this state, induced the citizens to petition unanimously for a revision of it. It was accordingly revised, or rather a new one was formed, in the course of the year 1789, nearly upon the plan of the constitution of the United States, which has lately been adopted by the state.

The charter containing the present system of education in this state was passed in the year 1785. A college, with ample and liberal endowments, is instituted in Louisville, a high and healthy part of the country, near the centre of the state. There is also provision made for the institution of an academy in each county in the state, to be supported from the same funds, and considered as parts and members of the same institution, under the general superintendence and direction of a president and board of trustees, appointed for their literary accomplishments from the different parts of the state, and invested with the customary powers of corporations. The institution thus composed is denominated the University of Georgia. The funds for the support of this institution are principally in lands, amounting in the whole to about 50,000 acres, a great part of which is of the best quality.
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GERMANY, a very extensive empire of Europe, but which, in different ages of the world, has had very different limits. Its name, according to the most probable conjecture, is derived from the Celtic words Ghar man, signifying a warlike man, to which their other name, Alman, or Aleman, likewise alludes.

The ancient history of the Germans is altogether wrapped up in obscurity. The first time we find them mentioned by the Roman historians, is about the year 211 B.C., at which time Marcellus subdued Insurbia and Liguria, and defeated the Gesates, a German nation situated on the banks of the Rhine. From this time history is silent with regard to any of these northern nations till the irrigation of the Cimbri and Teutones, who inhabited the most northerly parts of Germany. It is very difficult to fix the limits of the country called Germany by the Romans. The southern Germans were intermixed with the Gauls, and the northern ones with the Scythians; and thus the ancient history of the Germans includes that of the Dacians, Huns, Goths, &c., till the destruction of the western Roman empire by them. Ancient Germany, therefore, we may reckon to have included the northern part of France, the Netherlands, Holland, Germany so called at present, Denmark, Prussia, Poland, Hungary, part of Turkey in Europe, and Muscovy.

The Romans divided Germany into two regions; Belgic or Lower Germany, which lay to the southward of the Rhine, and Germany Proper, or High Germany. The first lay between the rivers Seine and the Rhine; and in this we find a number of different nations, the most remarkable of which were the following.

1. The Ubii, whose territory lay between the Rhine and the Mosel or Maas, and whose capital was the city of Cologne. 2. Next to them were the Tungri, supposed to be the same whom Caesar calls Eburones and Condroni; and whose metropolis, then called Attuatius, has since been named Tongres. 3. Higher up from them, and on the other side of the Moselle, were the Treviri, whose capital was Augusta Treverorum, now Trier. 4. Next to them were the Triboci, Nemetes, and Vangiones. The former dwelt in Alsace, and had Argentoratum, now Strasbourg, for their capital; the others inhabited the cities of Worms, Speyer, and Mann. 5. The Mediomatrii were situated along the Moselle, about the city of Metz in Lorraine; and above them were situated another German nation, named Raurici, Rauraci, or Rorvici, and who inhabited that part of Helvetia, or Switzerland, about Basel. To the westward and southward of these were the Nervii, Sueviones, Silvanectes, Sueci, Rhemi, Lingones, &c., who inhabited Belgic Gaul.

Between the heads of the Rhine and Danube was seated the ancient kingdom of Vindelicia, whose capital was called Augusta Vindelicorum, now Augsburg. Below it on the banks of the Danube were the kingdoms of Noricum and Pannonia. The first of these was divided into Noricum Ripense and Mediterraneum. It contained a great part of the provinces of Austria, Stiria, Carinthia, Tyrol, Bavaria, and some others of less note. The latter contained the kingdom of Hungary, divided into Upper and Lower; and extended from Illyricum to the Danube, and the mountains Casti in the neighbourhood of Vienna, now Vienna.

Upper or High Germany lay beyond the Rhine and Elbe, between the Rhine and the Elbe, being the following nations. 1. The Chauci, Upper and Lower, who were divided from each other by the river Visurgis, now the Weser. Their country contained what is now called Bremen, Luneburg, Frisland, and Groningen. The Upper Chauci had the Cherusci, and the lower the Chamavi on the south-east, and the German ocean on the north-west. 2. The Frisii, Upper and Lower, were divided from the Lower Chauci by the river Amisia, now the Ems; and from one another by an arm of the Rhine. Their country still retains the name of Frisia, and is divided into east and west; but the latter is now dismembered from Germany, and becomes one of the Seven United Provinces. 3. Beyond the Isel, now the Ise, which bounded the country of the Frisii, were situated the Bructeri, who inhabited the tract now called Brocromeriand; and the Marsi, about the river Loppe. On the other side of the river were the Usipi or Usipi, but these were famed for often changing their territories, and therefore found in other places. 4. Next to these were the Joes, or inhabitants of Juliers, between the Mese and the Rhine. 5. The Catti, another ancient and warlike nation, inhabited Hesse and Thuringia, from the Hanzi mountains to the Rhine and Weser, among whom were comprehended the Mattiaci, whose capital is by some thought to be Morpur, by others Baden. 6. Next to these were the Suedus dawn upon Susia; the Norisci, or the ancient inhabitants of Northgow, whose capital was Nuremberg; and the Marcomanni, whose country was during the time of the Danube, and to the Neckar. The Marcomanni afterwards went and settled in Bohemia and Moravia, under their general or king Maroboduus; and some of them in Gaul, whence they drove the Boii, who had settled themselves there. 7. On the other side the Danube, and between the Rhine and it, were the Hermunduri, who possessed the country now called Austria in Upper Saxony, though some make their territories to have extended much farther, and to have reached quite to, or even beyond, the kingdom of Bohemia, once the seat of the Boii, whence its name. 8. Beyond them, on the north of the Danube, was another seat of the Marcomanni along the river Albis, or Elbe. 9. Next to Bohemia were situated the Quei, whose territories extended from the Danube to Moravia, and the northern part of Austria. These are comprehended under the ancient name of Suevi; part of whom at length forced their way into Spain, and settled a kingdom there. 10. Eastward of the Quadi were situated the Bastarnae, and part from them by the Gramma, now Gran; a river that falls into the Danube, and by the Carpathian mountains, from them called Alpes Bastarnae. The country of the Bastarnae indeed
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Indeed made part of the European Sarmatia, and so was without the limits of Germany properly so called; but we find these people so often in league with the German nations, and joining them for the destruction of the Romans, that we cannot but account them as one people.

Between those nations already taken notice of, seated also on the other side of the Danube and the Hercynian forest, were several others whose exact situation is uncertain, viz. the Martingi, Burii, Borades, Lygi or Legiones, and some others, who are placed by our geographers along the forest above mentioned, between the Danube and the Vistula.

On this side the Hercynian forest, were the famed Rheni, now Rheni, seated among the Alps. Their country, which was also called Western Illyricum, was divided into Rhenia Prima or Propria and Secunda; and was then of much larger extent, spreading itself towards Suabia, Bavaria, and Austria.

On the other side of the Hercynian forest were: 1. The Suevi, who spread themselves from the Vistula to the river Elbe. 2. The Longobardi, so called according to some on account of their wearing long beards, but, according to others, on account of their consisting of two nations, viz. the Bardi and Lingones. These dwelt along the river Elbe, and bordered southward on the Chauci above mentioned. 3. The Burgundi, of whose original seat we are uncertain. 4. The Semnoes; who, about the time of Tiberius, were seated on the river Elbe. 5. The Angles, Saxons, and Goths, were probably the descendants of the Circii; and inhabited the countries of Denmark, along the Baltic sea, and the peninsula of Scandinavia, containing Norwia, Denmark, and Finnmark. 6. The Vandals were a Gothic nation, who, proceeding from Scandinavia, settled in the countries now called Mecklenburgh and Brandenburgh. 7. Of the same race were the Dacians, who settled themselves in the neighbourhood of the Palus Mmesiae, and extended their territories along the banks of the Danube.

These were the names of the German nations who performed the most remarkable exploits in their wars with the Romans. Besides these, however, we find mention made of the Scordisci, a Thracian nation, who, afterwards settled on the banks of the Danube. About the year 113 B.C. they ravaged Macedon, and cut off a whole Roman army sent against them; the general, M. Porcius Cato, grandson to Cato the censor, being the only person who had the good fortune to make his escape. After this, they ravaged all Thessaly; and advanced to the coasts of the Adriatic, into which, because it stopped their further progress, they discharged their arrows of death. By another Roman name, however, they were driven back into their own country with great slaughter; and soon after, Metellus so weakened them by repeated defeats, that they were incapable, for some time, of making any more attempts on the Roman provinces. At last, in the consulsiphip of M. Livius Drusus and L. Calpurnius Piso, the former prevailed on them to pass the Danube, which thenceforth became the boundary between the Romans and them. Notwithstanding this, in the time of the Jugurthine war, the Scordisci repassed the Danube on the ice every winter, and being joined by the Triballi a people of Lower Messen, and the Daci of Upper Messia, penetrated as far as Macedon, committing everywhere dreadful ravages. So early did these northern nations begin to be formidable to the Romans, and when they were most renowned for warlike exploits.

Till the time of Julius Caesar, however, we hear nothing more concerning the Germans. About 55 B.C. he undertook his expedition into Gaul; during which, his assistance was implored by the Aedui, against Ariovistus, a German prince who oppressed them. Caesar, pleased with this opportunity of increasing his power, invited Ariovistus to an interview; but this being declined, he next sent deputies, desiring him to restore the hostages he had taken from the Aedui, and to bring no more troops over the Rhine into Gaul. To this a haughty answer was returned; and a battle soon after ensued, in which Ariovistus was entirely defeated, and with great difficulty made his escape.

In 55 B.C. Caesar having subdued the Sessiones, Bellavaci, Ambiani, Nerii, and other nations of Belgia Gaul, hastened to oppose the Usipetes and Tenchtheri. These nations having been driven out of their own country by the Suevi, had crossed the Rhine with a design to settle in Gaul. As soon as he appeared, the Germans sent him a deputation, offering to join him, provided he would assign them lands. Caesar replied, that there was no room in Gaul for them; but he would desire the Ubii to give them leave to settle among them. Upon this, they desired him to retreat with the Ubii; but in the mean time fell upon some Roman squadrons: which so provoked Caesar, that he immediately marched against them, and coming unexpectedly upon them, defeated them with great slaughter. They fled in the utmost confusion to the conflux of the Rhine and the Maese, where the slaughter was renewed with such fury, that almost 400,000 of the Germans perished. After this, Caesar being resolved to spread the terror of the Roman name through Germany, built a bridge over the Rhine, and entered that country. In this expedition, however, which was his last in Germany, he performed no remarkable exploit. A little before his death, indeed, he had projected the conquest of that, as well as of a great many other countries; but his assassination prevented the execution of his designs. Nor is there any thing recorded of the Germans till about 17 B.C. when the Tenchtheri made an irruption into Gaul, and defeated M. Lollius, proconsul of that province. At last, however, they were repulsed, and forced to retire with great loss beyond the Rhine.

Soon after this the Rheni invaded Italy, where they Rheni in committed the greatest devastations, putting all the victors Italy males they met to the sword, without distinction of age: nay, we are told, that when they happened to take women with child, they consulted their authors to know whether the child was a male or female; and if they pronounced it a male, the mother was immediately massacred. Against these barbarians was sent Drusus, the second son of Livia, a youth of extraordinary valour and great accomplishments. He found means to bring them to a battle; in which the Romans proved victorious, and cut in pieces great numbers of their enemies, with very little loss on their
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They are subdued, together with the Vindelici and Norici.

The following year (9 B.c.) Augustus, bent on subduing the whole of Germany, advanced to the banks of the Rhine, attended by his two sons-in-law Tiberius and Drusus. The former he sent against the Daci, who lived up to the south of the Danube; and the latter to complete the conquest he had so successfully begun in the western parts of Germany. The former easily overcame the Daci, and transported 40,000 of them into Gaul. The latter, having passed the Rhine, subdued all the nations from that river to the Elbe; but having attempted in vain to cross the last, he set out for Rome: an end, however, was put to his conquests and his life by a violent fever, with which he was seized on his return.

After the death of Drusus, Tiberius again overran all those countries in which Drusus had spent the preceding summer; and struck some of the northern nations with such terror, that they sent deputies to sue for peace. This, however, they could not obtain upon any terms; the emperor declaring that he would not conclude a peace with one, unless they all desired it. But the Catti, or according to some the Scambri, could not by any means be prevailed upon to submit; so that the war was still carried on, though in a languid manner, for about 18 years. During this period, some of the German nations hadQuit their forests, and begun to live in a civilized manner under the protection of the Romans; but one Quintilius Varus being sent to command the Roman forces in that country, so provoked the inhabitants by his extortions, that not only those who still held out refused to submit, but even the nations that had submitted were seized with an eager desire of throwing off the yoke. Among them was a young nobleman of extraordinary parts and valour, named Arminius. He was the son of Sigimer, one of the most powerful lords among the Chatti, had served with great reputation in the Roman armies, and been honoured by Augustus with the privileges of a Roman citizen and the title of knight. But the love of his country prevailing over his gratitude, he resolved to improve the general discontent which reigned among his countrymen, to deliver them from the bondage of a foreign dominion. With this view he engaged, underhand, the leading men of all the nations between the Rhine and the Elbe, in a conspiracy against the Romans. In order to put Varus of
Germany, off his guard, he at the same time advised him to show himself to the inhabitants of the more distant provinces, administer justice among them, and acclaim them, by his example, to live after the Roman manner, which he said would more effectually subdue them than the Roman sword. As Varus was a man of a peaceable temper, and averse from military toils, he readily consented to this insidious proposal, and, leaving the neighbourhood of the Rhine, marched into the country of the Cherusci. Having there spent some time in hearing causes and deciding civil controversies, Arminius persuaded him to weaken his army, by sending out detachments to clear the country of robbers. When this was done, some distant nations of Germany rose up in arms by Arminius's directions; while those through which Varus was to pass in marching against them, pretended to be in a state of profound tranquillity, and ready to join the Romans against their enemies.

On the first news of the revolt, Varus marched against the enemy with three legions and six cohorts; but being attacked by the Germans as he passed through a wood, his army was almost totally cut off, while he himself and most of his officers fell by their own hands. Such a terrible overthrow, though it raised a general consternation in Rome, did not, however, dishearten Augustus, or cause him to abandon his enterprise. About two years after (A. D. 12.), Tiberius and Germanicus were appointed to command in Germany. The death of Augustus, however, which happened soon after, prevented Tiberius from going on his expedition; and Germanicus was for some time hindered from proceeding in his, by a revolt of the legions, first in Pannonia, and then in Germany. About the year 15, Germanicus having brought over the soldiers to their duty, laid a bridge across the Rhine, over which he marched 12,000 legionaries, 26 cohorts of the allies, and eight alae (squadrons of 300 each) of horse. With these he first traversed the Ceven forest (part of the Hercynian, and thought to lie partly in the duchy of Cleves, and partly in Westphalia), and some other woods. On his march he was informed that the Marsi were celebrating a festival with great mirth and jollity. Upon this he advanced with such expedition, that he surprised them in the midst of their debauch, and giving his army full liberty to make what havoc they pleased, a terrible massacre ensued, and the country was destroyed with fire and sword for 30 miles round, without the loss of a single man on the part of the Romans. — This general massacre roused the Bructeri, the Tubantes, and the Usipetes; who, besetting the passes through which the Roman army was to return, fell upon their rear, and put them into some disorder; but the Romans soon recovered themselves, and defeated the Germans with considerable loss.

The following year (A. D. 16), Germanicus taking advantage of some intestine broils which happened among the Catti, entered their country, where he put great numbers to the sword. Most of their youth, however, escaped by swimming over the Adrana, now the Oder, and attempted to prevent the Romans from laying a bridge over that river: but being disappointed in this, some of them submitted to Germanicus, while the greater part, abandoning their villages, took refuge in the woods; so that the Romans, without opposition, set fire to all their villages, towns, &c. and having laid their capital in ashes, began their march back to the Rhine.

Germanicus had scarce reached his camp, when he received a message from Segestes, a German prince, in the interest of the Romans, acquainting him that he was besieged in his camp by Arminius. On this advice, he instantly marched against the besiegers; entirely defeated them; and took a great number of prisoners, among whom was Thuanseldis, the wife of Arminius, and daughter of Segestes, whom the former had carried off, and married against her father's will. Arminius then, more enraged than ever, for the loss of his wife, whom he tenderly loved, stirred up all the neighbouring nations against the Romans. Germanicus, however, without being dismayed by such a formidable confederacy, prepared himself to oppose the enemy with vigour: but, that he might not be obliged to engage such numbers at once, detached his lieutenant Cecina, at the head of 40 cohorts, into the territories of the Bructeri; while his cavalry, under the command of Pedo, entered the country of the Frisii. As for Germanicus himself, he embarked the remainder of his army, consisting of four legions, on a neighbouring lake; and transported them by rivers and canals to the place appointed on the river Ems, where the three bodies met. In their march they found the sad remains of the legions conducted by Varus, which they buried with all the ceremony their circumstances could admit. After this they advanced against Arminius, who retired and posted himself advantageously close to a wood. The Roman general followed him; and coming up with him, ordered his cavalry to advance and attack the enemy; Arminius, at their first approach, pretended to fly but suddenly wheeled about, and giving the signal to a body of troops, whom he had concealed in the wood, to rush out, obliged the cavalry to give ground. The cohorts then advanced to their relief; but they too were put into disorder, and would have been pushed into a morass, had not Germanicus himself advanced with the rest of the cavalry to their relief. Arminius did not think it prudent to engage these fresh troops, but retired in good order; upon which Germanicus also retired towards the Ems. Here he embarked with four legions, ordered Cecina to reconduct the other four by land, and sent the cavalry to the sea side, with orders to march along the shore to the Rhine. Though Cecina was to return by roads well known, yet Germanicus advised him to pass, with all possible speed, a causeway, called the long bridges, which led across vast marshes, surrounded on all sides with woods and hills that gently rose from the plain.

Arminius, however, having got notice of Cecina's march, arrived at the long bridges before Cecina, and filled the woods with his men, who, on the approach of the Romans, rushed out, and attacked them with great fury. The legions, not able to manage their arms in the deep waters and slippery ground, were obliged to yield; and would in all probability have been entirely defeated, had not night put an end to the combat. The Germans, encouraged by their successes, instead of refreshing themselves with sleep, spent the whole night in diverting the courses of the springs which...
Germ any.

They are subdued by Trajan.

Marcomanni and Quadri formidable to the empire.

Roman empire destroyed by the Heruli.

History of Germany since the time of Charlemagne.

They ordered two castles to be built; one on this side the Danube, and the other on the opposite side; and all this was accomplished in the space of one summer. Trajan, however, as the season was now far advanced, did not think it advisable to enter Dacia this year, but contented himself with making the necessary preparations.

In the year 106, early in the spring, Trajan set out for Dacia; and having passed the Danube on the bridge he had built, reduced the whole country, and would have taken Decebalus himself, had he not put an end to his own life, in order to avoid falling into the hands of his enemies. After his death the kingdom of Dacia was reduced to a Roman province; and several castles were built in it, and garrisons placed in them, to keep the country in awe.

After the death of Trajan, the Roman empire began to decline, and the northern nations to be daily more and more formidable. The province of Dacia indeed was held by the Romans till the reign of Galienus, when, on the death of Galienus, the arches of the bridge over the Danube to be broken down, lest the barbarians should make themselves masters of it, and invade the Roman territories. In the time of Marcus Aurelius, the Marcomanni and Quadi invaded the empire, and gave the emperor a terrible overthrow. He continued the war, however, with better success afterwards, and invaded their country in his turn. It was during the course of this war that the Roman army is said to have been saved from destruction by that miraculous event related under the article Christians, p. 70. col. 2.

In the end, the Marcomanni and Quadi were, by repeated defeats, brought to the verge of destruction, insomuch that their country would probably have been reduced to a Roman province, had not Marcus Aurelius been diverted from pursuing his conquests by the revolt of one of his generals. After the death of Marcus Aurelius, the Germanic nations became every day more and more formidable to the Romans. Far from being able to invade and attempt the conquest of these northern countries, the Romans had the greatest difficulty to repress the incursions of their inhabitants. But for a particular account of their various invasions of the Roman empire, and its total destruction by them at last, see the article Rome.

The immediate destroyers of the Roman empire were the Heruli; who, under their leader Odoscar, deposed Augustinus the last Roman emperor, and proclaimed Odoscar king of Italy. The Heruli were soon expelled by the Ostrogoths; and these in their turn were subdued by Justinian, who annexed Italy to the eastern empire. But the popes found means to obtain the temporal as well as spiritual jurisdiction over a considerable part of the country, while the Lombards subdued the rest. These last proved very troublesome to the popes, and at length besieged Adrian I in his capital. In this distress he applied to Charles the Great, king of France; who conquered both Italy and Germany, and was crowned emperor of the west in 800.

The posterity of Charlemagne inherited the empire of Germany until the year 882; at which time the different princes assumed their original independence, rejected the Carolingian line, and placed Arnulf king of Bohemia on the throne. Since this time Germany has ever been considered as an elective monarchy. Princes of different families, according to the prevalence of their interest and arms, have mounted the throne. Of these the most considerable, until the Austrian line acquired the imperial power were the houses of Saxony, Franconia, and Swabia. The reigns of these emperors contain nothing more remarkable than the contests between them and the popes; for an account of which see the article Italy. From hence, in the beginning of the 13th century, arose the fashions of the Guelfs and Ghibellines, of which the former was attached to the popes, and the latter to the emperor; and both, by their violence and iniquity, tended to disquiet the empire for several ages. The emperors too were often at war with the infidels; and sometimes, as happens in all elective kingdoms, with one another, about the succession.

But what more deserves our attention is the progress of government in Germany, which, in some measure, opposite to that of the other kingdoms of Europe. When the empire raised by Charlemagne fell asunder, all the different independent princes assumed the right of election; and those now distinguished by the name of electors had no peculiar or legal influence in appointing a successor to the imperial throne; they were only the officers of the king's household, his secretary, his steward, chaplain, marshal, or master of his horse, &c. By degrees, however, as they lived near the king's person, and had, like all other princes, independent territories belonging to them, they increased their influence and authority; and in the reign of Otto III. 984, acquired the sole right of electing the emperor. Thus, while in the other kingdoms of Europe, the dignity of the great lords, who were all originally alodial or independent barons, was diminished by the power of the king, as in France, and by the influence of the people as in Great Britain, in Germany, on the other hand, the power of the electors was raised upon the ruins of the emperor's supremacy; and so far as the people's jurisdiction. In 1440, Frederic III. duke of Austria was elected emperor, and the imperial dignity continued in the male line of that family for 300 years. His successor Maximilian married the heiress of Charles duke of Burgundy; whereby Burgundy and the 17 provinces of the Netherlands were annexed to the house of Austria. Charles V. grandson of Maximilian, and heir to the kingdom of Spain, was elected emperor in the year 1519. Under him Mexico and Peru were conquered by the Spaniards; and in his reign happened the Reformation in several parts of Germany; which, however, was not confirmed by public authority till the year 1628, by the treaty of Westphalia, and in the reign of Ferdinand III. The reign of Charles V. was continually disturbed by his wars with the German princes and the French king Francis I. Though successful in the beginning of his reign, his good fortune towards the conclusion of it began to forsake him; which, with other reasons, occasioned his abdication of the crown. See Charles V.

His brother Ferdinand I. who in 1558 succeeded to the throne, proved a moderate prince with regard to religion. He had the address to get his son Maximilian declared king of the Romans in his own lifetime,
very fortunate prince. He had two great powers to contend with, France on the one side, and the Turks on the other; and was a loser in his war with both. Louis XIV., at that time king of France, was happy in having the two celebrated generals Condé and Turenne in his service. The latter had already distinguished himself by great exploits against the Spaniards; and, on the accession of Leopold, the court of France had taken the opportunity of confirming the treaty of Munster, and attaching to her interest several of the independent princes of Germany. The tranquility which now took place, however, was not established upon any permanent basis. War with Spain was resumed in the year 1668; and the great successes of Turenne in the Netherlands stimulated the ambition of the prince of Condé, to attempt the conquest of Franche Comté, at that time under the protection of the house of Austria. This was accomplished in three weeks: but the rapid success of Louis had awakened the jealousy of his neighbours to such a degree, that a league was formed against him by England, Holland, Sweden; and the French monarch, dreading to enter the lists with such formidable enemies, consented to the treaty of Aix-la-Chapelle, by which, among other articles, Franche Comté was restored. The flames of war, however, were renewed by the insatiable ambition of the French monarch; who, having entered into an alliance with Charles II. of England, aimed at nothing less than the total overthrow of the Dutch republic. The events of that war are related under the article United Provinces; here it is sufficient to observe, that the misfortunes of the Dutch excited the compassion of the emperor and court of Spain, who now openly declared themselves their allies. Turenne was opposed by the prince of Orange in conjunction with the celebrated Imperial general Moutecoupull, whose artful conduct eluded even the penetration of Turenne, and he sat down suddenly before the city of Bonne. Here he was joined by the prince of Orange, who, had likewise means to elude the vigilance of the French generals. Bonne surrendered in a short time, and several other places in Cologne fell into the hands of the allies, who likewise cut off the communication betwixt France and the United Provinces; so that Louis was soon obliged to recall his armies, and abandon all his conquests with greater rapidity than they had been made. In 1674 he was abandoned by his ally Charles II. of England, and the bishop of Munster and elector of Cologne were compelled to renounce their allegiance to him; but notwithstanding these misfortunes, he continued everywhere to make head against his enemies, and even meditated new conquests. With a powerful army he again invaded Franche Comté in person, and in six weeks reduced the whole province to his obedience. In Alsace, Turenne defeated the Imperial general at Sintzheim, and ravaged the palatinate. Seventy thousand Germans were surprised; a considerable detachment was cut in pieces at Mulhausen; the elector of Brandenburg, who had been intrusted with the chief command, was round by Turenne near Colmar; a third body met with a similar fate at Turkheim; and the whole German forces were obliged at last to evacuate the province and repass the Rhine.
In consequence of these disasters, the imperial general Montecuculi was recalled to act against Turenne. The military skill of the two commanders seemed to be nearly equal; but before the superiority could be adjudged to either, Turenne was killed by a cannon ball as he was reconnoitring a situation for erecting a battery. By his death the Imperialists obtained a decided superiority. Montecuculi penetrated into Alsace; and the French, under De Lorges nephew to the deceased general, were happy in being able to escape a defeat.

Part of the German army now sat down before Treves; where they were opposed by Mareschal Crequi; but the negligence of that general exposed him to a dreadful defeat, that he was obliged to fly into the city with only four attendants. Here he endeavored in vain to animate the people to a vigorous defence. The garrison mutinied against his authority; and, when he refused to sign the capitulation they made, delivered him up prisoner to the enemy. Louis in the mean time had taken the field in person against the prince of Orange; but the disastrous state of affairs in Germany induced him to recall the prince of Condé to make head against Montecuculi. In this campaign the prince seemed to have the advantage. He compelled the Germans to raise the sieges of Hagenau and Séverne; and at last to repass the Rhine without having been able to force him to a battle.

This was the last campaign made by these celebrated commanders: both of them now, contented with the fame they had acquired, retiring from the field to spend the remainder of their days in peace. The excellence of discipline in France, which the two great French generals had introduced into their armies, still continued to make them very formidable, though it did not always ensure them of victory. In Germany, the duke of Lorraine, who had recovered Philippsburg, was repeatedly defeated by Mareschel Crequi, who had been ransomed from his captivity, and become more prudent by his defeat. In Flanders, the prince of Orange was overmatched by the duke of Orleans and Marshal Luxembourg. A peace was at length concluded at Nimeguen in 1679, by which the king of France secured himself Franche Comté with a great many cities in the Netherlands; while the king of Sweden was reinstated in those places of which he had been stripped by the Danes and Germans. This tranquility, however, was of no long duration. Louis employed every moment in preparations for new conquests; possessed himself of the imperial city of Strasbourg by treachery; and dispossessed the elector Palatine and the elector of Treves of the lordships of Palatine, Germanstein, and Valdanz. On the most frivolous pretences he had demanded Alost from the Spaniards; and on their refusal, seized upon Luxembourg. His conduct, in short, was so intolerable, that the prince of Orange, his inveterate enemy, found means to unite the whole empire in a league against him. Spain and Holland became parties in the same cause; and Sweden and Denmark seemed also inclined to accede to the general confederacy. Notwithstanding this formidable combination, however, Louis seemed still to have the advantage. He made himself master of the cities of Philippsburg, Manheim, Frankendal, Spire, Worms, and Oppenheim: the fruitful country of the Palatinate was ravaged in a dreadful manner; the towns were reduced to ashes; and the people, driven from their habitations, were everywhere left to perish through the inclemency of the weather and want of provisions. By this cruelty his enemies were rather exasperated than vanquished: the Imperialists, under the conduct of the duke of Lorraine, resumed their courage, and put a stop to the French conquests. At length all parties, weary of a destructive war, consented to the treaty of Ryswick in 1697. By this treaty Louis gave up to the empire, Fribourg, Bâle, Neuchâtel, and Philaptorsburg; he confirmed also to the Elector Palatine the fortifications of Strasbourg. Fort Louis and Traverbach, the works of which had exhausted the skill of the great Vauban, with Lorraine, Treves, and the Palatinate, were resigned to their respective princes; insomuch that the terms to which the French monarch now consented, after so many victories, were such as could scarce have been expected under the pressure of the greatest misfortunes. The views of Louis, however, in consenting to this apparently humiliating treaty, were beyond the views of ordinary politicians. The health of the king of Spain was in such a declining way, that his death appeared to be at hand; and Louis now resolved to renew his pretensions to that kingdom, which he had formerly by treaty solemnly renounced. His designs in this respect could not be concealed from the vigilance of William III. of Britain; of which Louis being sensible, and knowing that the emperor had claims of the same nature on Spain, he thought proper to enter into a very extraordinary treaty with William. This was no less than the partition of the whole Spanish dominions, which were now to be distributed in the following manner. To the young prince of Bavaria were to be assigned Spain and the East Indies; the duchy, son to Louis, was to have Naples, Sicily, and the province of Guiptesca; while the archduke Charles, son to the emperor Leopold, was to have only the duchy of Milan. By this scandalous treaty the indignation of Charles was roused, so that he bequeathed the whole of his dominions to the prince of Bavaria. This scheme, however, was disconcerted by the sudden death of the prince; upon which a new treaty of partition was concluded between Louis and William. By this the kingdom of Spain, together with the East India territories, were to be bestowed on the archduke Charles, and the duchy of Milan upon the duke of Lorraine. The last moments of the Spanish monarch were disturbed by the intrigues of the rival houses of Austria and Bourbon; but the haughtiness of the Austrian ministers so disgusted those of Spain, that they prevailed upon their dying monarch to make a new will. By this the whole of his dominions were bequeathed to Philip duke of Anjou, grandson to the king of France; and Louis, prompted by his natural ambition, accepted the kingdom bequeathed to his grandson, excusing himself to his allies in the best manner he could for departing from his engagements with them. For this, however, he was made to pay dear. His inustiable ambition and his former successes had alarmed all Europe. The emperor, the Dutch, and the king of England, entered into a new confederacy against him; and a bloody war ensued, which threatened
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The war (of which an account is given under the article BRITAIN) was carried on with such success, the emperor Leopold died in the year 1705.

He was succeeded by his son Joseph, who put the electors of Cologne and Bavaria to the ban of the empire; but being ill served by Prince Louis of Baden, general of the empire, the French partly recovered their affairs, notwithstanding their repeated defeats. The duke of Marlborough had not all the success he expected or deserved. Joseph himself was suspected of a design to subvert the German liberties; and it was plain by his conduct, that he expected England should take the labouring oar in the war, which was to be entirely carried on for his benefit. The English were disgusted at his slowness and selfishness: but he died in 1711, before he had reduced the Hungarians; and leaving no male issue, he was succeeded in the empire by his brother Charles VI. whom the allies were endeavouring to place on the throne of Spain, in opposition to Philip duke of Anjou, grandson to Louis XIV.

When the peace of Utrecht took place in 1713, Charles at first made a show as if he would continue the war; but found himself unequal, now that he was forsaken by the English. He therefore was obliged to conclude a peace with France at Baden in 1714, that he might attend the progress of the Turks in Hungary; where they received a total defeat from Prince Eugene at the battle of Peterwaradin. They received another of equal importance from the same general in 1717, at Belgrade, which fell into the hands of the Imperialists; and next year the peace of Passarowitz, between them and the Turks, was concluded. Charles employed every minute of his leisure in making arrangements for increasing and preserving his hereditary dominions in Italy and the Mediterranean. Happily for him, the crown of Britain devolved to the house of Hanover; an event which gave him a very decisive weight in Europe, by the connexions between George I. and II. and the empire. Charles was sensible of this; and carried matters with so high a hand, that, about the years 1724 and 1725, a breach ensued between him and George I. and so uneasy was the system of affairs all over Europe at that time, that the capital powers often changed their old alliances, and concluded new ones contradictory to their interest. Without entering into particulars, it is sufficient to observe, that the safety of Hanover, and its aggrandizement, was the main object of the British court; as that of the emperor was the establishment of the pragmatic sanction in favour of his daughter (the late empress queen), he having no male issue. Mutual concessions upon those great points restored a good understanding between George II. and the emperor Charles; and the elector of Saxony, flattered with the view of gaining the throne of Poland, relinquished the great claims he had upon the Austrian succession.

The emperor, after this, had very bad success in a war he entered into with the Turks, which he had undertaken chiefly to indemnify himself for the great sacrifices he had made in Italy to the princes of the house of Bourbon. Prince Eugene was then dead, and he had no general to supply his place. The system of France, however, under Cardinal Fleury, happened at that time to be passive; and she obtained for him, from the Turks, a better peace than he had reason to expect. Charles, to keep the German and other powers easy, had, before his death, given his eldest daughter, the late empress queen, in marriage to the duke of Lorraine, a prince who could bring no accession of power to the Austrian family.

Charles died in 1740; and was no sooner in the grave, than all he had so long laboured for must have been overthrown, had it not been for the firmness of George II. The young king of Prussia entered and conquered Silesia, which he said had been wrongfully dismembered from his family. The king of Spain and the elector of Bavaria set up claims directly incompatible with the pragmatic sanction, and in this they were joined by France; though all those powers had solemnly guaranteed it. The imperial throne, after a considerable vacancy, was filled up by the elector of Bavaria, who took the title of Charles VII, in January 1742. The French poured their armies into Bohemia, where they took Prague; and the queen of Hungary, to take off the weight of Prussia, was forced to cede to that prince the most valuable part of the duchy of Silesia by a formal treaty.

Her youth, her beauty, and sufferings, and the noble fortitude with which she bore them, touched the hearts of the Hungarians, into whose arms she threw herself and her little son; and though they had been always remarkable for their disaffection to the house of Austria, they declared unanimously in her favour. Her generals drove the French out of Bohemia; and George II. at the head of an English and Hanoverian army, gained the battle of Dettingen, in 1743. Charles VII. was at this time miserable on the imperial throne, and would have given the queen of Hungary almost her own terms; but she haughtily and impolitically rejected all accommodation, though advised to it by his Britannic majesty, her best and indeed only friend. This obstinacy gave a colour for the king of Prussia to invade Bohemia, under pretence of supporting the imperial dignity; but though he took Prague, and subdued the greatest part of the kingdom, he was not supported by the French; upon which he abandoned all his conquests, and retired into Silesia. This event confirmed the obstinacy of the queen of Hungary: who came to an accommodation with the emperor, that she might recover Silesia. Soon after, his Imperial majesty, in the beginning of the year 1755, died; and the duke of Lorraine, then grand duke of Tuscany, consort to the queen of Hungary, after surmounting some difficulties, was chosen emperor.

The bad success of the allies against the French and Bavarians in the Low Countries, and the loss of the battle of Fontenay, retarded the operations of the empress queen against his Prussian majesty. The latter beat the emperor's brother, Prince Charles of Lorraine, who had before driven the Prussians out of Bohemia; and the conduct of the empress queen was such, that his Britannic majesty thought proper to guarantee to him the possession of Silesia, as ceded by treaty. Soon after, his Prussian majesty pretended that he had discovered a secret convention which had been entered into between the empress queen, the empress of Russia, and the king of Poland as elector of Saxony, to strip him of his dominions, and to divide them
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This prince showed an active and restless disposition, much inclined to extend his territories by conquest, and to make reformatory in the internal policy of his dominions, yet without taking any proper methods for accomplishing his purposes. Hence he was almost always disappointed; insomuch that he wrote for himself the following epitaph: "Here lies Joseph, unfortunate in all his undertakings." In the year 1758, a war commenced between him and the king of Prussia; in which, notwithstanding the impetuous valor of that monarch, Joseph acted with such caution that his adversary could gain no advantage over him; and an accommodation took place without any remarkable exploit on either side. In 1781 he took the opportunity of the quarrel between Britain and the United Provinces, to deprive the latter of the barrier towns which had been secured to them by the treaty of Utrecht. These indeed had frequently been of great use to the house of Austria in its state of weakness; but Joseph, conscious of his own strength, looked upon it as derogatory to his honor to allow so many of his cities to remain in the hands of foreigners, and to be garrisoned at his expense. As at that time the Dutch were unable to resist, the imperial order for the occupation of the barrier towns was instantly complied with; nor did the court of France, though then in friendship with Holland, make any offer to interpose. Encouraged by this success, Joseph next demanded the free navigation of the Scheldt; but as this would evidently have been very detrimental to the commercial interests of Holland, a flat refusal was given to his requisitions. In this the emperor was much disappointed; having flattered himself that the Hollanders, intimidated by his power, would yield the navigation of the river as easily as they had done the barrier. Great preparations were made by the emperor, which the Dutch, on their part, seemed determined to resist. But while the emperor appeared so much set upon this acquisition, he suddenly abandoned the project entirely, and entered into a new scheme of exchanging the Netherlands for the duchy of Bavaria. This was opposed by the king of Prussia; and by the interference of the court of France, the emperor found himself at last obliged also to abandon his other scheme of obtaining the navigation of the Scheldt. A treaty of peace was concluded, under the guarantee of his most Christian majesty. The principal articles were, that the states acknowledged the emperor's sovereignty over the Scheldt from Antwerp to the limits of Sestingen; they agreed to demolish certain forts, and to pay a considerable sum of money in lieu of some claims which the emperor had on Maestricht, and by way of indemnification for laying part of his territories under water.

The treaty with the Dutch was no sooner concluded than a quarrel with the Turks took place, which terminated in an open war. It does not appear that the emperor had at this time any real provocations, but seems to have acted merely in consequence of his engagements with Russia to reduce the dominions of the Grand Signior. All these foreign engagements, however, did not in the least retard the progress of reformation which the emperor carried on throughout his dominions with a rapidity scarcely to be matched, and which at last produced the revolt of the Austrian Netherlands. In the course of his labors in this way, a
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Germany. A complete code of laws was compiled. These were at first greatly commended for their humanity, as excluding almost entirely every species of capital punishment; yet, when narrowly considered, the computations found to be so exceedingly severe, that the most cruel death would, comparatively speaking, have been an act of mercy. Even for smaller crimes the punishments were severe beyond measure; but the greatest fault of all was, that the modes of trial were very defective, and the punishments so arbitrary, that the most perfect and innocent character lay at the mercy of a tyrannical judge. The innovations in ecclesiastical matters were, however, most offensive to his subjects in the Netherlands. Among the many changes introduced into this department, the following were some of the most remarkable. 1. An abridgment of divine service. 2. A total suppression of vocal performers in choirs. 3. The introduction of the vernacular language instead of the Latin in administering the sacraments. 4. The prohibition of chanting hymns in private houses. 5. The suppression of a great number of religious houses, and the reduction of the number of the clergy. 6. The total abolition of the papal supremacy throughout the imperial dominions. The same spirit of innovation displayed itself even in the most minute matters. Many favours were bestowed upon the Jews; and in 1786 the emperor wrote with his own hand to the different handicraft and trading corporations in Vienna, requesting that their youths might be received as apprentices in that city. Severe laws against gaming were enacted and put in execution with equal rigour. Heavy restrictions were also laid on all the societies of free masons in Germany, while those in the Netherlands were totally suppressed.

The great number of innovations in religious matters were highly resented by the inhabitants of the Netherlands, who have always been remarkable for their attachment to the Romish religion in its most superstitious form. Indeed the alterations in the civil constitution were so great, that even those who were least bi- gotted in this respect began to fear that their liberties were in danger, and an universal dissatisfaction was excited. The emperor behaved at first in a very haughty manner, and refused to yield the smallest point to the solicitations of his subjects. Finding, however, that a general revolt was about to take place, and being unable at that time, on account of the Turkish war, to spare such a force as would be necessary to reduce the provinces to obedience, he thought proper, in the autumn of 1787, to promise a restoration of their ancient constitution and privileges. His promises, however, were found to be so delusive, and his conduct was so arbitrary and capricious, that in the end of the year 1788 the states of all the provinces in the Austrian Netherlands came to a resolution of entirely throwing off the yoke. Articles of a federal union were drawn up, and a general public was adopted under the title of the Belgic Provinces. The situation of the emperor's affairs at that time did not allow him to take the measures necessary for preventing this revolt; to which perhaps his ill state of health also contributed. About the beginning of February 1790 his distemper increased to such a degree as to be thought dangerous; and continuing daily to grow worse, he sunk under it on the 20th of the same month, in the 40th year of his age, and 26th of his reign.

The leaders of the revolution, however, soon became so disagreeable to their countrymen, that they were obliged to fly. Joseph's successor, Leopold, adopted a more conciliatory policy, and the troubles in the Netherlands were at length calmed.

The Netherlands, which the French had overthrown in 1794, were annexed to France by the treaty of Campo Formio in 1797. This was the amputation of a limb from the Germanic body; but the further changes which this measure introduced were not completed till 1801, when the three ecclesiastical electorates, Mentz, Triers, and Cologne, were abolished, and in their room were created four new electorates, Baden, Wirtemberg, Hesse Cassel, and Saltzburg. Many bishoprics and abbeys were at the same time secularized, and a number of free towns disfranchised, to afford indemnities to the princes who were deprived of their possessions on the left bank of the Rhine. In 1806, after the battle of Austerlitz, further changes were made, which entirely abolished the ancient Germanic constitution. The emperor Francis renounced the title of emperor of Germany, and assumed that of emperor of Austria. The princes of Bavaria, Wirtemberg, and Saxony assumed the title of king; and these, with nearly all the other small states, were united into a body, named the Confederation of the Rhine, of which the emperor Napoleon was head. This body was dissolved in 1813, when the French were driven within the Rhine; but its constitution served as the model for the new Germanic confederation, which was established in 1814 by the congress of Vienna.

Monarchy was first established in Germany by Clo. Constitutionovitz: after him Charlemagne extended his power, and his dominions; and so great had the empire become, that during his reign, and that of his son, government was administered in the provinces by persons vested with power for that purpose under the title of Dukes. In the districts of these provinces, justice was distributed by a comes or count, which officer was in Germany called Graf. But from their courts lay an appeal to that of the emperor, before a president styled Comes Palatinus, that is, "Count Palatine, or of the palace," in German denominated Paetzgraf. The frontiers or marches were governed by a marquis, styled by the Germans Markgraf, similar to our lord warden. Generally the centre of the empire was ruled by an officer who possessed a similar power, but a greater extent of dominion, than the Grave, under the title of Landgraf. Towns and castles, which were occasionally honoured with the residence of the emperor, were governed by a Burggraf. It may be remarked, that the signification of the above-mentioned titles, and the extent of power which they conferred upon the persons honoured with them, differ according to the successive ages and the gradual development of the German constitution.

By reason of family broils in the imperial house, and civil wars in their dominions, the dignity of the sovereignty was depressed, and a new form in the government raised up. The dukes exalted themselves above the power of the emperor, and secured for their sons a succession to their greatness; while the interest of
the sovereign, in order to strengthen the bond of personal attachment, ratified to others and their descendants that sway which had been formerly delegated and dependant on his will. Hence arose the modern constitution of distinct principalities, acknowledging one head in the person of an emperor. But shortly after the election of Conrad duke of Franconia to the throne, this new-gained authority of the princes became doubtful. However, after most violent disturbances and confusions, the regulations yielded to by Albert II. and his successors, particularly by Frederick III. laid the foundation of the German constitution; but the power and form of which were afterwards improved by Maximilian. Before Charles V. mounted the throne, on the death of Maximilian, the electors formed a bulwark against the Imperial power, by an instrument called the capitulation; to which articles of government he and all emperors elected since have sworn, previous to their investiture with the Imperial dignity.

When the German monarchy received an elective form, the right of election was not limited to the great officers of state, for other princes participated of this privilege. But the empire being governed by four dukes, the princes under their authority, in order to court their favour, gave to them the disposal of their votes, and of those of their vassals. The three archbishops also, who were necessarily present at the coronation, obtained the electoral dignity. However, beside this origin of the modern electors, the high-statutes about court procuring their presence by influence over other members, and their general residence there gave them a solid advantage in their constant and early presence at the diet of election. For in times of turbulence several emperors were elected, when the princes had not an opportunity to attend. And hence sprung up a sanction to that right, which the high officers of the household had assumed, of electing without any consultation of the other members of the empire. Pope Gregory X. too, either conceiving that they did possess, or willing that they should acquire, this right, exorted them in a bull to terminate the troubles of Germany by electing an emperor. And since that period they have been held as the sole electors. But the possession of this high power was strengthened by a league amongst themselves, called the electoral union, which received additional confirmation from the emperor Louis of Bavaria, and was formally and fully ratified by that famous constitution of Charles IV. termed the golden bull; according to which, the territories and the high officers by which the electoral dignity is conveyed, must descend according to the right of primogeniture, and are indivisible.

The golden bull declares the following number and titles of the electors: The archbishop of Mentz as great chancellor of the German empire; the elector of Cologne as great chancellor of the empire in Italy; the elector of Trier as great chancellor of the empire in Gaul and Arles; the king of Bohemia as cup-bearer; the count Palatine as high steward; the duke of Saxony as grand marshal; the margrave of Brandenburg as grand chamberlain. The number originally was seven, but the emperor Leopold created the duke of Lunenburg, ancestor to our present British sovereignty, an elector; to whom the post of arch-treasurer was afterwards given; and thus Hanover forms the eighth electorate. But this number cannot be increased by the emperor without a previous election by the electors themselves; who, thus capable of electing and of being elected, may style themselves Coemperators; and they exercise part of the imperial authority, if a vacancy of the throne happen. But when or before the coronation of the emperor, elections are generally held on some fixed day within the space of three months from the date of the summons. The electors generally send their ambassadors to the place of election, which is held at Frankfort on the Main; but saving the right of the city of Frankfurt, it may be held elsewhere.

When the diet of electors is assembled, they proceed to compose the capitulation, to which the emperor when elected is to swear. The capitulation being adjusted, the elector of Mentz appoints a day for the election. When this day arrives, the gates of the city are shut, and the keys delivered to the elector of Mentz. The electors or their ambassadors, Protestants excepted, repair in great pomp to mass; and after its celebration they take a solemn oath to choose, unbiased and uninfluenced, the person that appears most proper for the imperial dignity. After this they repair to the sacristy, where the elector of Mentz first asks, if there be any impediment known against their proceedings at present to an election; and next he obtains a promise, that the person elected by the majority shall be received as emperor. The declarations of the electoral ambassadors, in respect to those two points, are recorded by two notaries of the empire. Then all witnesses withdraw; and the elector of Mentz collecting the suffrages, which are visus voce, and giving his own last, the witnesses are recalled, and he declares the person whom the electors have chosen. But the election is not complete, nor is the new emperor proclaimed, until the capitulation be sworn to either by himself or by his ambassadors if he be absent. From this time he is styled king of the Romans until the coronation takes place; which ceremony confers the title of emperor. According to the golden bull, it should be celebrated at Aix-la-Chapelle, out of respect to Charlemagne, who resided there; but saving the right to Aix-la-Chapelle, it may take place elsewhere. The coronation is performed by the archbishop of Mentz or elector of Cologne. And when he is seated on his throne, the duke of Saxony delivers into his hand the sword of Charles the Great, with which he makes some knights of the holy Roman empire, and is also obliged to confer that honour upon such others as are nominated by the respective electors. When he proceeds to dinner in the great hall, he is seated at a table elevated two steps higher than that of the electors, and is served by counts of the empire. The electors, each of whom has also his table, are attended by the gentlemen of their respective courts. These electors, who assist personally at the ceremony,
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remoncy, sit and eat at their own tables; but those who
are represented by ambassadors have only their tables
covered out of form with plates, at which the ambassa-
dors do not sit.

For the benefit of the empire during the reign of
an emperor, his presumptive successor may be elected
king of the Romans. But this election confers at first
a mere title; for by an express article in his capitula-
tion, the king of the Romans swears not to interfere
with the government during the life of the emperor;
but on his decease the coronation confirms him
emperor without a second election.

Should there not be a king of the Romans, and the
throne become vacant, the government is administered
by vicars of the empire, who are the electors Palatine
and of Saxony, as count palatine and arch-marshal of
the empire. Each has his district and tribunal of the
vicariate; and by the golden bull it is established, that
all acts of the vicars are valid; but they are all fully
confirmed by the emperor; which confirmation, by an
article of his capitulation, he is bound to give.

There are also vicars of the emperor. These officers
are constituted by a delegation of the imperial power
from the emperor to any prince of the empire, when he
is unable to execute his authority himself. But these
vicars stand accountable to the emperor; their acts
may be annulled and their offices revoked, all depend-
ent on the will of the emperor, and determinable at
his pleasure.

When the race of Charlemagne ceased to govern in
Germany, the princes and states associated to continue
the empire; and that its majesty might be visible, and
its laws enforced, they agreed to choose an emperor.
From this emperor all electors and princes except those
before 1582 receive investiture of their dominions;
counts and free cities from the Aulic council. But
this investiture is no more than a sign of submission to
the majesty of the empire, which is deposited in the
emperor. For as the constituted members of the empire
are dependent on that collective union from which they
derive protection, they therefore show this dependence
on the emperor, because he represents the majesty of
that union or of that empire; but in all other respects
they are independent and free.

These princes or sovereigns may even wage war
with the prince wearing the imperial crown, as pos-
essed of other titles and dominions unconnected with
his imperial station. Nor can the sovereignty of any
member be affected so long as he remains loyal to the
empire; which loyalty constitutes his duty, and secures
him its protection. But should he be guilty of any
violation against the emperor, as head of the empire,
such a crime would commit him to the punishment of
its laws, and he would be put under the ban. For
this crime would be against that collective body of so-
vereigns whose union constitutes the empire; and there-
fore any violation of that union is justly punished with
deprivation of these territories which render such so-
vereigns members of the empire. Nor can this pu-
nishment of the ban derogate from the dignity of those
princes who derive their sovereignty from this constitu-
tion, and whose subjection is an act of their own
consent. However, no member of the empire can at
present be put under the ban without being first heard,
and without the concurrence of the electors, princes,
and states, being previously obtained.

The emperor is endowed with many privileges, and
his power partly appears in the exercise of his reserved
rights, or the peculiar prerogatives annexed to the im-
perial dignity. He grants to princes the investiture of
their dominions; but to this he is bound as the laws
direct. He confers titles, but promises that they
shall be bestowed only on such persons as will maintain
their dignity, and can support their rank. Besides, he
can give merely the title; for the power or privilege
of prince or count can be obtained only from the re-
spective bodies. But in some instances, even titles are
of high importance. For the descendants of a prince
are incapable of succession, if their mother be of in-
ferior rank to their father; but the conferring of a title
enobles her and removes the bar, if the collateral line
consents.

The emperor can also make cities, found universi-
ties, grant the privilege of fairs, &c. He can also
dispose with the tedious terms of minority, and em-
power princes to assume at an earlier age the govern-
ment of their own dominions. He decides all rank and
precedency, and has a power of primate preses, that is,
of granting for once in every chapter of the empire a
vacant seat. But he is not above the law; for electors
have not only chosen but deposed emperors. However,
the influence of the capitulation is to prevent such rigo-
rous proceedings: but should the capitulation be vi-
olated, the college of electors might proceed to remon-
strance; and if these remonstrances should be without
effect, in conjunction with the diet, they might resort
to more forcible remedies.

The diet is that assembly of the states in which the Diet of
the legislative power of the empire resides; and is comPosed of the electors, princes, prelates, counts, and free
cities of the empire. It has sat since 1663, and is
held usually at Ratisbon. The emperor, when pre-
ent, presides in person; when absent, by his commis-
sary, whose communication of proposals from the em-
peror to the assembly is called the commissorial de-
cree. The elector of Mentz, as chancellor of the
empire, is director of the diet; and to his chancery
are all things addressed that are to be submitted to
the empire; the reading of which by his secretary to
the secretaries of the other ministers at the diet is de-
nominated per dictatum, and constitutes the form of
transmitting papers or memorials to the dictateure of
the empire. The diet is composed of three distinct
colleges, each of which has its particular director. The
first college is that of electors; of which the arch-
bishop of Mentz is director as first elector. The se-
cond college is that of princes. It consists of princes,
archbishops, and bishops; and of prelates, abbots, and
counts, who are not considered as princes. Each prince
spiritual and temporal has a vote, but prelates and
counts vote by benches. The prelates are divided in-
to two benches, the counts into four; and each bench
has only one vote. The archduke of Austria and the
archbishop of Saltzburg are alternately directors of
the college of princes. The third college is that of
the free cities of the empire; the director of which
is the minister of the city in which the diet happens
to sit.
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In the origin of the empire, justice was administered in the districts of the provinces by counts, and appeals lay from their courts to that of the emperor before the count palatine. But as civil broils shook the power of the emperor, they interrupted also the course of justice. The consequent inconveniences caused several solicitations to be preferred from the states to different emperors, if any point be proposed, it must meet not only the unanimous concurrence of the proposing body, but must have the majority of the other to establish it. This distinction arose from a conjunction called the evangelical body; which was formed by the Protestant states and princes to guard the Protestant interest in Germany, by watching over the laws for the security of their religion, and, in case of violation, by obtaining redress from the imperial throne. For in any part of the empire, as in the palatinate, where the count is a Papist and the subjects are Protestants, should oppressions arise, application would be made to the evangelical body through the director. The elector of Saxony is director of the evangelical body, though he is a Papist: but therefore his representations in favour of the Protestants have more force; and beside, should he abuse an office which invests him with considerable weight and influence, he could be instantly deprived of it.

The first two colleges are styled superior, and in effect constitute the diet; for all points that come before the diet are generally first deliberated in the college of electors, and pass from that to the college of princes; in which, if any objection arises, a free conference takes place between the directors of each college. And should they, in consequence of this free conference, concur, they invite the third college to accord to their joint opinion; which invitation is generally complied with: but should this college return a refusal, the opinion of the other two colleges is in some few cases engrossed in the chancery, and delivered to the emperor's commissary as the opinion of the empire. The opinion of the third college is merely mentioned at the close. However, though the superior colleges do in effect constitute the diet; yet the received maxim is, that no two colleges constitute a majority, that is, the majority of voices at the diet; nor can the emperor confirm the opinion of two colleges as an opinion of the diet. By the peace of Westphalia, a decisive vote was recognized as a right of the imperial cities, which the two superior colleges should not infringe upon; their vote being, by the fundamental law, of equal weight with that of the electors and princes.

After a measure is approved of by the colleges, it is submitted to his Imperial majesty to receive his negative or confirmation. Should he approve the point, it is published in his name as the resolution of the empire, which states are exorted to obey, and tribunals desired to consider as such.

The diet not only makes and explains laws, but decides ambiguous cases. It must also be consulted before war is made; appoints the field marshal who is to command the army, and assigns him his council of war. The diet also enters into and makes alliances, but usually empowers the emperor to negotiate them; and foreign states have their ambassadors at the diet, but the diet sends no ministers to foreign courts.
cancy of the throne under the authority of the vicars of the empire; whereas the Aulic council does not exist until appointed by the succeeding emperor.

The Aulic council consists of a president, vice president, and 17 assessors, of whom six are Protestants. The vice chancellor of the empire is also entitled to a seat; and all decrees issuing from the council pass through his hands to those who are to execute them. This tribunal obtains for the emperor, through the appeals from the courts of other princes, a new authority beside that which he possesses from his reserved rights; but electors and some princes, as those of Hanover, Austria, Brunswick, Swedish Pomerania, Hesse, are free from this dependence on the emperor, to whose Aulic council their subjects cannot appeal; nor can it take cognizance of ecclesiastical or criminal causes, both of which appertain to territorial justice; which we shall presently consider when we have surveyed the executive instrument of Imperial justice.

The division of the empire into circles is a regulation coeval with the establishment of the Imperial chamber by Maximilian, in order to strengthen the arm of justice with vigour to enforce its decrees. The original division was into six circles, which are called the ancient circles; and are, Bavaria, Franconia, Suabia, Lower Saxony, the Upper Rhine, and Westphalia; but the powerful princes, who at first declined bringing their dominions under the form of circles, were led by a political finesse of the emperor to adopt the regulation, and increase the number to ten, by forming the four new circles of Austria, Burgundy, the Electorate Circle, and Upper Saxony.

Over these circles preside directors, to whom the tribunals of justice commit the execution of their decrees. The six old circles have two directors each, the four new have one each. The office of director is permanent and hereditary, as it belongs always to the first prince in the circle, upon whom it confers high authority; for all the decrees of the Imperial chamber and Aulic council are of no avail unless the director will execute them. The directors of the circles are not only instruments of war but of peace; for in case of an Imperial war, they are to collect the troops of the circle; and if any state or prince of their respective circles suffers violation from others, they are to yield protection and enforce the peace; or should there be any tumultuous uprisings of the people, the suppression of such belongs to them.

The emperor is the executive instrument of the whole empire; the directors are such of the constitutive parts called circles. The prosperity and security of which being at stake, the directors, as presidents, must hold frequent diets in their respective circles, in order to consult on and adopt salutary measures for their safety and welfare: but as the interests of those near to us are generally so intimately blended with our own, that the good of either cannot be pursued with-
With regard to the character of the ancient Germans, they are described to us by the Greek and Roman writers as resembling the Gauls; and differing from other nations by the largeness of their stature, ruddy complexion, blue eyes, and yellow bushy hair, haughty and threatening looks, strong constitutions, and being proof against hunger, cold, and all kinds of hardship.

Their native disposition displayed itself chiefly in the martial genius, and in their singular fidelity.
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The modern Germans in their persons are tall and strong built. The ladies have generally fine complexions; and some of them, especially in Saxony, have all the delicacy of features and shape that are so bewitching in a certain island of Europe.

Both men and women affect rich dresses, which in fashion are the same as in France and England, but the better sort of men are excessively fond of gold and silver lace, especially if they are in the army. The ladies at the principal courts differ not much in their dress from the French and English, only they are not so excessively fond of paint as the former. At some courts they appear in rich furs; and all of them are loaded with jewels, if they can obtain them. The female part of the burghers families, in many German towns, dress in a very different manner, and some of them inconceivably fantastic, as may be seen in many prints published in books of travels; but in this respect they are gradually reforming, and many of them make quite a different appearance in their dress from what they did 30 or 40 years ago. As to the peasantry and labourers, they dress as in other parts of Europe, according to their employments, convenience, and opulence. In Westphalia, and most other parts of Germany, they sleep between two feather beds, or rather the upper one of down, with sheets stretched to them, which by use becomes a very comfortable practice. The most unhappy part of the Germans are the tenants of little needy princes, who squeeze them to keep up their own grandeur; but, in general, the circumstances of the common people are far preferable to those of the French.

The Germans are naturally a frank, honest, hospitable people, free from artifice and disguise. The higher orders are ridiculously proud of titles, ancestry, and show. The Germans, in general, are thought to want animation, as their persons promise more vigour and activity than they commonly exert even in the field of battle. But when commanded by able generals, especially the Italian ones such as Montecuculi and Prince Eugene, they have done great things, both against the Turks and the French. The Imperial army has seldom made any remarkable figure against either of those two nations, or against the Swedes or Spaniards, when commanded by German generals. This possibly might be owing to the arbitrary obstinacy of the court of Vienna; for in many wars the Austrians have exhibited prodigies of military valour and genius.

Industry, application, and perseverance, are the greatest characteristics of the German nation, especially the mechanical part of it. Their works of art would be incredible were they not visible, especially in watch and clockmaking, jewellery, turnery, sculpture, drawing, painting, and certain kinds of architecture. The Germans have been charged with intemperance in eating and drinking; and perhaps not unjustly, owing to the vast plenty of their country in wine and provisions of every kind. But those practices seem now to be wearing out. At the greatest tables, though the guests drink pretty freely during dinner, yet the repast is commonly finished by coffee, after three or four public toasts have been drank. But no people have more feasting at marriages, funerals, and birthdays.

The German nobility are generally men of so much honour, that a sharper in other countries, especially in England, meets with more credit if he pretends to be a German, than of any other nation.

The merchants and tradesmen are very civil and obliging. All the sons of noblemen inherit their father's titles, which greatly perplexes the heralds and genealogists of that country. This perhaps is one of the reasons why the German husbands are not quite so complaisant as they ought otherwise to be to their ladies, who are not entitled to any pre-eminence at the table; nor indeed do they seem to affect it, being far from either ambition or loquacity, though they are said to be somewhat too fond of gaming. From what has been premised, it may easily be conceived, that many of the German nobility, having no other hereditary estate than a high sounding title, easily enter into their armies, and those of other sovereigns. Their fondness for title is attended with many other inconveniences. Their princes think that the cultivation of their lands, though it may trouble their revenue, is below their attention; and that, as they are a species of beings superior to labourers of every kind, they would demean themselves in being concerned in the improvement of their grounds.

The domestic diversions of the Germans are the same as in England; billiards, cards, dice, fencing, dancing, and the like. In summer, people of fashion repair to places of public resort, and drink the waters.

As to their field diversions, besides their favourite sport of hunting, they have, bull and bear baiting, and the like. The inhabitants of Vienna live luxuriously, a great part of their time being spent in feasting and carousing; and in winter, when the several branches of the Danube are frozen over, and the ground covered with snow, the ladies take their recreation in sledges of different shapes, such as griffins, tygers, snakes, scallop-shells, &c. Here the lady sits, dressed in velvets, lined with rich furs, and adorned with lace and jewels, having up her head a velvet cap; and the sledge is drawn by one horse, stags, or other creatures, set off with plumes of feathers, ribbons, and bells. As this diversion is taken chiefly in the night-time, servants ride before the sledge with torches, and a gentleman sitting on the sledge behind guides the horse.

The Reformation first spread in Germany to most advantage; and since the religious peace of 1555, there have been established the Roman Catholic, prevailing mostly in the south; the Lutheran in the north; and the Calvinist, called also the Reformed, near the Rhine. Civil wars considerably deranged this settlement: it was, however, established by the celebrated peace of Westphalia, that the religion of the Seven States should remain as it was in 1554. The Roman superior clergy consist of 8 archbishops, 40 bishops, and many abbots. The Protestant clergy are governed by consistories under the sovereign of each state. The Corpus Catholicon is under the direction of the archbishop, elector of Mentz; and the Corpus Evangelorum, or Protestants, under the elector of Saxony; who have the care of the public concerns of their respective bodies.

Literature
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Germany, with about 850 professors; besides a number of literary societies and academic institutions; and education in general is particularly attended to even in the very lowest ranks.

A detailed account of the present statistical and political condition of Germany will be found in the articleGERMANY, SUPPLEMENT.

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GERMEN, the seed bud; defined by Linnaeus to be the base of the pistillum, which contains the rudiments of the seed; and, in progress of vegetation, swells and becomes the seed vessel.

In assimilating the vegetable and animal kingdoms, Linnaeus denominates the seed bud the ovarium or uterus of plants; and affirms its existence to be chiefly at the time of the dispersion of the male dust by the anther drop. After its impregnation, it becomes a seed vessel. See BOTANY.

GERMEN, by Pliny and the ancient botanists, is used to signify a bud containing the rudiments of the leaves. See GERM.

GERMINATION, among botanists, comprehends the precise time which the seeds take to rise after they have been committed to the soil.—The different species of seeds are longer or shorter in rising according to the degree of heat which is proper to each. Millet, wheat, and several of the grasses, rise in one day; but rice, hazel, beans, mustard, kidney beans, turnips, and rocket, in three days; and lettuce and dill, in four; cucumber, gourd, melon, and cress, in five; radish and beet, in six; barley, in seven; orach, in eight; purslane, in nine; cabbage, in ten; hyssop, in thirty; parsley, in forty or fifty days; peach, almond, walnut, chestnut, peony, horned poppy, hypericum, and ranunculus falcatus, in one year; rose bush, orange tree, hawthorn, medlar, and various fruits, in two. The seeds of some species of orchis, and of some liliaceous plants, never rise at all. Of seeds, some require to be sown almost as soon as they are ripe, otherwise they will not sprout or germinate. Of this kind are the seeds of coffee and fraxinella. Others, particularly those of the pea-bloom flowers, preserve their germinating faculty for a series of years. Mr. Adanson asserts, that the sensitive plant retains that virtue for 30 or 40 years.

Air and water are the agents of germination. The humidity of the air alone makes several seeds to rise, but that are exposed to it. Seeds too are observed to rise in water, without the intervention of earth; but water without air is insufficient. Mr. Homburg's experiments on this head are decisive. He put several seeds under the exhausted receiver of an air pump, with a view to establish something certain on the causes of germination. Some of them did not rise at all, and the greatest part of those which did, made very weak and feeble productions. Thus it is for want of air that seeds which are buried at a very great depth in the earth, either thrive but indifferently, or do not rise at all. They frequently preserve, however, their germinating virtue for many years within the bowels of the earth; and it is not unusual, upon a piece of ground being newly dug to a considerable depth, to observe it soon after covered with several plants, which had not been seen there in the memory of man. Were this precaution frequently repeated, it would doubtless be the means of recovering certain species of plants which are regarded as lost, or which perhaps, never coming to the knowledge of botanists, might hence appear the result of a new creation.

GERONTEUS, in antiquity, a kind of judges, or magistrates, in ancient Sparta, answering to what the Areopagites were at Athens. See AREOPAGUS.

The word is formed of the Greek geron, which signifies "old man." Whence also the words gerontic, something belonging to an old man; and Geronicon, a famous book among the modern Greeks, containing the lives of the ancient monks. The senate of gerontes was called gerusia, that is, assembly or council of old men.

The gerontes were originally instituted by Lycurgus: their number, according to some, was 28; and, according to others, 32. They governed in conjunction with the king, whose authority they were intended to balance, and to watch over the interests of the people. Polybius defines their office in few words, when he says, per ipsos, et cum ipsis, omnia administrari. None were to be admitted into this office under 60 years of age, and they held it for life. They were succeeded by the epori.

GEROPOGON, a genus of plants belonging to the syncentria class, and in the natural method ranking under the 40th order, Composite. See BOTANY INDEX.

GERBETZ. See Rembrandt.

GEBS, a department in the south-west of France. Its surface is in general hilly but fertile, and abounds more in pasture soil than in arable land. In 1815 it contained 286,500 inhabitants, on an area of 2620 square miles. Auch is the chief town.

GERVAISE, or GERVASE, of Tilbury, a famous English writer of the 13th century; thus named from his being born at Tilbury on the Thames. He was nephew to Henry II. of England; and was in great credit with Otho IV. emperor of Germany, to whom he dedicated a Description of the World, and a Chronicle. He also composed a History of England, that of the Holy Land, and other works.

GERUND, in Grammar, a verbal noun of the neuter gender, partaking of the nature of a participle, declinable only in the singular number, through all the cases except the vocative; as nom. amandum, gen. amans, dat. amando, accus. amandum, abl. amando. The word is formed of the Latin gerundus, and that from the verb gerere, "to bear."

The gerund expresses not only the time, but also the manner of an action; as, "he fell in running post."—It differs from the participle, in that it expresses the time, which,
GETHIN, lady Grace, an English lady of uncommon parts, was the daughter of Sir George Norton of Abbot Leigh in Somersetshire, and born in the year 1676. She had all the advantages of a liberal education; and became the wife of Sir Richard Gethin, of Gethin Grott in Ireland. She was mistress of great accomplishments, natural and acquired, but did not live long enough to display them to the world; for she died in the 21st year of her age. She was buried in Westminster abbey, where a beautiful monument with an inscription is erected over her; and, for perpetuating her memory, provision was made for a sermon to be preached in Westminster abbey yearly, on Ash Wednesday for ever. She wrote, and left behind her, in loose papers, a work, which, soon after her death, was methodized, and published under the title of "Reliquiae Gethiniani; or, Some remains of the most ingenious and excellent lady, Grace, lady Gethin, lately deceased. Being a collection of choice discourses, pleasant apothegms, and witty sentences. Written by her, for the most part, by way of essay, and at spare hours." Lond. 1700, 4to; with her picture before it.

GETHSEMÄNE, in Ancient Geography, a village in the mount of Olives, whither Jesus Christ sometimes retreated in the night time. It was in a garden belonging to this village that he suffered the agony in which he sweated drops of blood; and here he was arrested by Judas and the rest who were conducted by this traitor. The place is by Maundrel described as an even plot of ground, not above 57 yards square, lying between the foot of Mount Olivet and the brook Cedron.

GETHYLLIS, a genus of plants belonging to the dodecathea class, and in the natural method ranking under the ninth order, Gethyacea. See Botany Index.

GEUM, AVENS, or Herb Bennett, a genus of plants belonging to the icosandra class, and in the natural method ranking under the 35th order, Gentianacea. See Botany Index.

GHENT, a city of the Austrian Netherlands, capital of the province of Flanders. It is seated on four navigable rivers, the Scheldt, the Lys, the Lieve, and the Moere, which run through it, and divide it into canals. These form 26 little isles, over which there are 300 bridges: among which there is one remarkable for a statue of brass of a young man, who was obliged to cut off his father's head; but as he was going to strike, the blade flew into the air, and the hilt remained in his hand, upon which they were both pardoned. There is a picture of the whole transaction in the townhouse. Ghent is surrounded with walls and other fortifications, and is tolerably strong for a place of its circumference. But all the ground within the walls is not built upon. The streets are large and well paved, the market places spacious, and the houses built with brick. In the Friday's market there is the largest, and is remarkable for the statue of Charles V. which stands upon a pedestal in the imperial habit. That of Cortere is remarkable for a fine walk under several rows of trees. In 1737 a fine opera house was built here, and a guard house for the garrison. Near the town is a very high tower, with a handsome clock and chimes. The great bell weighs 11,000 pounds.

This town is famous for the pacification signed here in 1556, for settling the tranquillity of the Seventeen Provinces, which was afterwards confirmed by the king of Spain. It was taken by Louis XIV. in 1678,
who afterwards restored it. The French took possession of it again after the death of Charles II. of Spain. In 1706, it was taken by the duke of Marlborough; and by the French in 1708; but it was retaken the same year. Last of all, the French took it by surprise after the battle of Fontenoy; but at the peace of Aix-la-Chapelle, it was rendered back. It was also taken by the French in 1794; and was restored to the Netherlands in 1814. This is the birth-place of John of Gaunt. It is very well seated for trade, on account of its rivers and canals. It has linen, woollen, and silk manufactures. The number of inhabitants is about 61,000. E. Long. 3° 50'. N. Lat. 51° 14'.

GHOST, an apparition, or spirit of a person deceased.

The ancients supposed every man to be possessed of three different ghosts, which after the dissolution of the human body were differently disposed of. These three ghosts were distinguished by the names of Mnes, Spiritus, Umbra. The mnes, they fancied, went down into the inferior region; the spiritus ascended to the skies; and the umbra hovered over the tomb, as being unwilling to quit its old connexions. Thus Dido (Virg. Æn. iv. 384.) threatens Æneas after death that she will haunt him with her unquiet shade, and direct him to his torments below. This idea of a threefold soul is very clearly expressed in these lines, which have been attributed to Ovid.:

Bis duo sunt homini: Mnes, Caro, Spiritus, Umbra: Quatuor ista loci bis duo suscipiunt. Terra tegit Carnem, tumulum circumvolat Umbra, Orcus habeat Mnes, Spiritus astra petit.

The most striking outlines of the popular superstitions respecting ghosts among us, are thus humorously collected by Captain Grose in his Provincial Glossary: "A ghost is supposed to be the spirit of a person deceased, who is either commissioned to return for some special errand, such as the discovery of a murder, to procure restitution of lands or money unjustly withheld from an orphan or widow—or, having committed some injustice whilst living, cannot rest till that which is redressed. Sometimes the occasion of spirits revisiting this world, is to inform their heir in what secret place, or private drawer, in an old trunk, they had hidden the title deeds of the estate; or where, in troublesome times, they buried their money or plate. Some ghosts of murdered persons, whose bodies have been secretly buried, cannot be at ease till their bones have been taken up, and deposited in consecrated ground with all the rites of Christian burial.

"Sometimes ghosts appear in consequence of an agreement made, whilst living, with some particular friend, that he who first died should appear to the survivor."

"Glanvil tells us of the ghost of a person who had lived but a disorderly kind of life, for which it was condemned to wander up and down the earth, in the company of evil spirits, till the day of judgment."

"In most of the relations of ghosts, they are supposed to be mere aerial beings, without substance, and that they can pass through walls and other solid bodies as pleasurable. A particular instance of this is given, in relation the 29th, in Glanvil's collection, where one David Hunter, near-bred to the bishop of Down and Derry, was a"
David Hunter's relation above quoted; but in that case they usually show signs of terror, by whining and creeping to their master for protection; and it is generally supposed that they often see things of this nature when their owner cannot; there being some persons, particularly those born on a Christmas eve, who cannot see spirits.

"The coming of a spirit is announced some time before its appearance, by a variety of loud and dreadful noises; sometimes rattling in the old hall like a coach and six, and rumbling up and down the staircase like the trumplings of bowls or cannon balls. At length the door flies open, and the spectre stalks slowly up to the bed's foot, and opening the curtains, looks steadfastly at the person in bed by whom it is seen; a ghost being very rarely visible to more than one person, although there are several in company. It is here necessary to observe, that it has been universally found by experience, as well as affirmed by diverse apparitions themselves, that a ghost has not the power to speak till it has been first spoken to; so that, notwithstanding the urgency of the business on which it may come, every thing must stand still till the person visited can find sufficient courage to speak to it: an event that sometimes does not take place for many years. It has not been found that female ghosts are more loquacious than those of the male sex, both being equally restrained by this law.

"The mode of addressing a ghost is by commanding it, in the name of the Three Persons of the Trinity, to tell you who it is, and what is its business; this it may be necessary to repeat three times; after which it will, in a low and hollow voice, declare its satisfaction at being spoken to, and desire the party addressing it not to be afraid, for it will do him no harm. This being premised, it commonly enters into its narrative; which being completed, and its request or commands given, with injunctions that they be immediately executed, it vanishes away, frequently in a flash of light; in which case, some ghosts have been so considerate as to desire the party to whom they appeared to shut their eyes: sometimes its departure is attended with delightful music. During the narration of its business, a ghost must by no means be interrupted by questions of any kind; so doing is extremely dangerous; if any doubts arise, they must be stated after the spirit has done its tale. Questions respecting its state, or the state of any of its former acquaintance, are offensive, and not often answered; spirits perhaps being restrained from divulging the secrets of their prison house. Occasionally spirits will even condescend to talk on common occurrences, as is instanced by Glanvil in the apparition of Major George Sydenham to Captain William Dyke, relation 30th, wherein the major reproved the captain for suffering a sword he had given him to grow rusty: saying, 'Captain, captain, this sword did not use to be kept after this manner when it was mine.' This attention to the state of arms, was a remnant of the major's professional duty when living.

"It is somewhat remarkable that ghosts do not go about their business like the persons of this world. In cases of murder, a ghost, instead of going to the next justice of the peace, and laying its information, or to the nearest relation of the person murdered, appears to some poor labourer who knows none of the parties, draws the curtains of some decrepit nurse or alms woman, or hovers about the place where his body is deposited. The same circumspect mode is pursued with respect to redressing injured orphans or widows; when it seems as if the shortest and most certain way would be, to go to the person guilty of the injustice, and haunt him continually till he be terrified into a restitution. Nor is the pointing out lost writings generally managed in a more summary way; the ghost commonly applying to a third person ignorant of the whole affair, and a stranger to all concerned. But it is presumptuous to scrutinize too far into these matters: ghosts have undoubtedly forms and customs peculiar to themselves.

"If after the first appearance, the persons employed neglect, or are prevented from, performing the message or business committed to their management, the ghost appears continually to them, at first with a discontented, next an angry, and at length with a furious countenance, threatening to tear them in pieces if the matter is not forthwith executed; sometimes terrifying them, as in Glasneil's relation 26th, by appearing in many formidable shapes, and sometimes even striking them with a violent blow. Of blows given by ghosts there are many instances, and some wherein they have been followed with an incurable lameness.

"It should have been observed, that ghosts, in delivering their commissions, in order to ensure belief, communicate to the persons employed some secret, known only to the parties concerned and themselves, the relation of which always produces the effect intended. The business being completed, ghosts appear with a cheerful countenance, saying they shall now be at rest, and will never more disturb any one; and thanking their agents, by way of reward communique to them something relative to themselves, which they will never reveal.

"Sometimes ghosts appear, and disturb a house, without designing to give any reason for so doing: with these, the shortest and only way is to exorcise, and eject them; or, as the vulgar term is, lay them. For this purpose there must be two or three clergymen, and the ceremony must be performed in Latin; a language that strikes the most audacious ghost with terror. A ghost may be laid for any term less than 100 years, and in any place or body, full or empty; as, a solid oak — the pommel of a sword — a barrel of beer, if a yeoman or simple gentleman — or a pipe of wine, if an esquire or a justice. But of all places the most common, and what a ghost least likes, is the Red sea; it being related, in many instances, that ghosts have most earnestly besought the exorcists not to confine them in that place. It is nevertheless considered as an indubitable fact, that there are an infinite number laid there, perhaps from its being a safer prison than any other nearer at hand; though neither history nor tradition gives us any instance of ghosts escaping or returning from this kind of transportation before their time.

"Another species of human apparition may be here noticed, though it does not come under the strict description of a ghost. These are the exact figures and resemblances of persons then living, often seen not only by their friends at a distance, but many times by themselves.
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selves; of which there are several instances in Aubery's Miscellanies; one of Sir Richard Napier, a physician of London, who, being on the road from Bedfordshire to visit a friend in Berkshire, saw at an inn his own apparition lying on his bed as a dead corpse; he nevertheless went forward, and died in a short time: another of Lady Diana Rich, daughter of the earl of Holland, who met her own apparition walking in a garden at Kensington, and died a month after of the smallpox. These apparitions are called fetches; in Cumberland, wraiths; and in Scotland, wraiths; they most commonly appear to distant friends and relations, at the very instant preceding the death of the person whose figure they put on. Sometimes, as in the instances above mentioned, there is a greater interval between the appearance and death. For a philosophical inquiry into the subject of apparitions in general, see the article SPECTRE.

GIACH, in Chronology, a cycle of 12 years; in use among the Turks and Cathayans.

Each year of a giach bears the name of some animal: the first that of a mouse; the second that of a bullock; the third of a lynx or leopard; the fourth of a hare; the fifth of a crocodile; the sixth of a serpent; the seventh of a horse; the eighth of a sheep; the ninth of a monkey; the tenth of a hen; the eleventh of a dog; and the twelfth of a hog.

They also divide the day into 12 parts, which they call giachs, and distinguish them by the names of some animals. Each giach contains two of our hours, and is divided into eight kehs, as many as there are quarters in our hours.

GIALLOLINO, in Natural History, a fine yellow pigment, much used under the name of Naples Yellow.

GIANT, a person of extraordinary bulk and stature.

The romances of all ages have furnished us with so many extravagant accounts of giants of incredible bulk and strength, that the existence of such people is now generally disbelieved. It is commonly thought, that the stature of men hath been the same in all ages; and some have even pretended to demonstrate the impossibility of the existence of giants mathematically. Of these our countryman MéLaurin hath been the most explicit. "In general (says he) it will easily appear, that the efforts tending to destroy the cohesion of beams arising from their own gravity only, increase in the quadruplicate ratio of their lengths: but that the opposite efforts tending to preserve their cohesion, increase only in the triplicate proportion of the same lengths. From which it follows, that the greater beams must be in greater danger of breaking than the lesser similar ones; and that though a lesser beam may be firm and secure, yet a greater similar one may be made so long, that it will necessarily break by its own weight. Hence Galileo justly concludes, that what appears very firm, and succeeds very well in models, may be very weak and inimf, or even fail to pieces by its own weight, when it comes to be executed in large dimensions according to the model. From the same principle he argues, that there are necessary limits in the operations of nature and art, which they cannot surpass in magnitude. Were trees of a very enormous size, their branches would fail by their own weight. Large animals have not strength in proportion to their size; and if there were any land animals much larger than those we know, they could hardly move, and would be perpetually subject to the most dangerous accidents. As to the animals of the sea, indeed: the case is different; for the gravity of the water in a great manner sustains those animals; and in fact these are known sometimes to be vastly larger than the greatest land animals. Nor does it avail against this doctrine to tell us, that bones have sometimes been found which were supposed to have belonged to giants of immense size; such as the skeletons mentioned by Strabo and Pliny, the former of which was 60 cubits high, and the latter 46: for naturalists have concluded on just grounds, that in some cases these bones had belonged to elephants; and that the larger ones were bones of whales, which had been brought to the places where they were found by the revolutions of nature that have happened in past times. Though it must be owned, that there appears no reason why there may not have been men who have exceeded by some feet in height the tallest we have seen."

It will easily be seen, that arguments of this kind can never be conclusive; because, along with an increase of stature in any animal, we must always suppose a proportional increase in the cohesion of the parts of its body. Large works sometimes fail when constructed on the plan of models, because the cohesion of the materials whereof the model is made, and of the large work, are the same; but a difference in this respect will produce a very remarkable difference in the ultimate result. Thus, suppose a model is made of fir-wood, the model may be strong and firm enough; but a large work made also of fir, when executed according to the plan of the model, may be so weak that it will fall to pieces by its own weight. If, however, we make use of iron for the large work instead of fir, the whole will be sufficiently strong, even though made exactly according to the plan of the model. The like may be said with regard to large and small animals. If we could find an animal whose bones exceeded in hardness and strength the bones of other animals as much as iron exceeds fir, such an animal might be of a monstrous size, and yet be exceedingly strong. In like manner, if we suppose the flesh and bones of a giant to be greatly superior in hardness and strength to the bones of other men, the great size of his body will be no objection at all to his strength. The whole of the matter therefore concerning the existence of giants must rest on the credibility of the accounts we have from those who pretend to have seen them, and not on any arguments drawn a priori.

In the Scripture we are told of giants, who were produced from the marriages of the sons of God with the daughters of men. This passage indeed has been differently interpreted, so as to render it doubtful whether the word translated giants does there imply any extraordinary stature. In other parts of Scripture, however, giants, with their dimensions, are mentioned in such a manner that we cannot possibly doubt; as in the case of Og king of Bashan, and Goliath. In a memoir read before the Academy of Sciences at Rouen, M. Le Cat gives the following account of giants that are said to have existed in different ages.

"Profane historians have given seven feet of height
to Hercules their first hero; and in our days we have seen men eight feet high. The giant who was shown in Rome in 1555, measured eight feet some inches. The emperor Maximian was of that size; Shenkius and Platerus, physicians of the last century, saw several of that stature; and Garopius saw a girl who was ten feet high. — The body of Orestes, according to the Greeks, was eleven feet and a half; the giant Galbaro, brought from Arabia to Rome under Claudius Caesar, was near ten feet; and the bones of Secondila and Fusio, keepers of the gardens of Sallust, were but six inches shorter. Funnan, a Scotsman, who lived in the time of Eugene II. king of Scotland, measured eleven feet and a half; and Jacob le Maire, in his voyage to the Straits of Magellan, reports, that on the 17th of December 1615, they found at Fort Daire several graves covered with stones; and having the curiosity to remove the stones, they discovered human skeletons of ten and eleven feet long. The chevalier Scory, in his voyage to the peak of Tenerife, says, that they found in one of the sepulchral caverns of that mountain the remains of a skeleton which had 80 teeth, and that the body was not less than 15 feet long. The giant Ferragus, slain by Orlando nephew of Charlemagne, was 18 feet high. Rioland, a celebrated anatomist, who wrote in 1614, says, that some years before there was to be seen in the suburbs of St. Germain the tomb of the giant Isoret, who was 20 feet high. In Rouen, in 1590, in digging in the ditches near the Dominicans, they found a stone tomb containing a skeleton whose skull held a bushel of corn, and whose shin bone reached up to the girdle of the tallest man there, being about four feet long, and consequently the body must have been 17 or 18 feet high. Upon the tomb was a plate of copper, whereon was engraved, "In this tomb lies the noble and puissant lord the chevalier Ricon de Vallemont, and his bones." Platerus, a famous physician, declares, that he saw at Lucerne the true human bones of a subject which must have been at least 19 feet high. Valence in Dauphiné boasts of possessing the bones of the giant Buc熟知, tyrant of the Pyrenees, who was slain with an arrow by a shepherd, the count de Cabillon his vassal. The Dominicans had a part of the shin bone, with the articulation of the knee, and his figure painted in fresco, with an inscription, showing that this giant was 22 feet and a half high, and that his bones were found in 1705, near the banks of the Morderi, a little river at the foot of the mountain of Crussol, upon which (tradition says) the giant dwelt.

"January 11, 1613, some masons digging near the ruins of a castle in Dauphiné, in a field, which (by tradition) had long been called the giant's field, at the depth of 18 feet discovered a brick tomb 30 feet long, 12 feet wide, and 8 feet high; on which was a gray stone, with the words Theutobucus Rex cut thereon. When the tomb was opened, they found a human skeleton entire, 25 feet and a half long, 10 feet wide across the shoulders, and five feet deep from the breast bone to the back. His teeth were about the size each of an ox's foot, and his shin bone measured four feet. — Near Mazzaro, in Sicily; in 1566, was found a giant 30 feet high; his head was the size of an hogshead, and each of his teeth weighed five ounces. Near Palermo, in the valley of Mazzaro, in Sicily, a skeleton of a giant 30 feet long was found, in the year 1548; and another of 33 feet high, in 1555; and many curious persons have preserved several of these gigantic bones.

"The Athenians found near their city two famous skeletons, one of 34 and the other of 36 feet high.

"At Tott, in Bohemia, in 1738, was found a skeleton, the head of which could scarce be encompassed by the arms of two men together, and whose legs, which they still keep in the castle of that city, were 26 feet long. The skull of the giant found in Macedonia, September 1651, held 210 pounds of corn.

"The celebrated Sir Hans Sloane, who treated this matter very learnedly, does not doubt these facts; but thinks the bones were those of elephants, whales, or other enormous animals.

"Elephants bones may be shown for those of giants; but they can never impose on connoisseurs. Whales, which, by their immense bulk, are more proper to be substituted for the largest giants, have neither arms nor legs; and the head of that animal hath not the least resemblance to the giant's. There is, therefore, no doubt but that a great number of the gigantic bones which we have mentioned have been seen by anatomists, and by them have been reputed real human bones, the existence of giants is proved."

With regard to the credibility of all or any of these accounts, it is difficult to determine anything. If, in any castle of Bohemia, the bones of a man's leg 26 feet in length are preserved, we have indeed a decisive proof of the existence of a giant in comparison of whom most others would be but pignoises. Nor indeed could these bones be supposed to belong to an elephant: for an elephant itself would but be a dwarf in comparison of such an enormous monster. But if these bones were really kept in any part of Bohemia, it seems strange that they have not been frequently visited, and particular descriptions of them given by the learned who have travelled into that country. It is certain, however, that there have been nations of men considerably exceeding the common stature. Thus all the Roman historians inform us, that the Gauls and Germans exceeded the Italians in size; and it appears that the Italians in those days were of much the same stature with the people of the present age. Among these northern nations, it is also probable, that there would be as great differences in stature as there are among the present race of men. If that can be allowed, we may easily believe that some of the barbarians might be called giants, without any great inpropriety. Of this superiority of size, indeed, the historian Floris gives a notable instance in Teutobuchus, above mentioned, king of the Teutones: who being defeated and taken prisoner by Marius, was carried in triumph before him at Rome, when his head reached above the trophies that were carried in the same procession.

But whether these accounts are credited or not, we are very certain, that the stature of the human body is by no means absolutely fixed. We ourselves are a kind of giants in comparison of the Laplanders; nor are these the most diminutive people to be found upon the earth. The Abbé la Chappe, in his journey into Siberia in order to observe the last transit of Venus, passed through a village inhabited by people called..."
still farther very remarkable, likewise, that the articulations of those joints are frequently inverted; in some the concavity is upwards, in others the reverse. This occasions that variety and mixture of concavities and convexities on the tops of the columns, which is observable throughout the platform of this causeway, yet without any discoverable design or regularity with respect to the number of either. The length also of these particular stones, from joint to joint, is various: in general, they are from 18 to 24 inches long; and, for the most part, longer toward the bottom of the columns than nearer the top, and the articulation of the joints something deeper. The size or diameter likewise of the columns is as different as their length and figure; in general, they are from 15 to 20 inches in diameter. There are really no traces of uniformity or design discovered throughout the whole combination, except in the form of the joint, which is invariably by an articulation of the convex into the concave of the piece next above or below it; nor are there any traces of a finishing in any part, either in height, length, or breadth, of this curious causeway. If there is here and there a smooth top to any of the columns above water, there are others just by, of equal height, that are more or less convex or concave, which show them to have been joined to pieces that have been washed, or by other means taken off. And undoubtedly those parts that are always above water have, from time to time, been made as even as might be; and the remaining surfaces of the joints must naturally have been worn smoother by the constant friction of weather and walking, than where the sea, at every tide, is beating upon it and continually removing some of the upper stones and exposing fresh joints. And farther, as these columns preserve their diameters from top to bottom, in all the exterior ones, which have two or three sides exposed to view, the same may be inferred of the interior columns whose tops only are visible. Yet what is very extraordinary, and equally curious, in this phenomenon, is, that notwithstanding the universal dissimilitude of the columns, both as to their figure and diameter, and though perfectly distinct from top to bottom, yet is the whole arrangement so closely combined at all points, that hardly a knife can be introduced between them either on the sides or angles.

The cliffs at a great distance from the causeway, especially in the bay to the eastward, exhibit at many places the same kind of columns, figured and jointed in all respects like those of the grand causeway: some of them are seen near to the top of the cliff, which in general, in these bays to the east and west of the causeway, is near 300 feet in height; others again are seen about midway, and at different elevations from the strand. A very considerable space is seen in the very bottom of the bay to the eastward, near a hundred rods from the causeway, where the earth has evidently fallen away from them upon the strand, and exhibits a most curious arrangement of many of these pentagonal columns, in a perpendicular position, supporting, in appearance, a cliff of different strata of earth, clay, rock, &c. to the height of 130 feet or more, above. Some of these columns are between 38 and 40 feet high, from the top of the sloping bank below them; and, being longest in the middle of the arrangement, shortening on either hand in view, they have obtained the appellation of organs, from a rude likeness in this particular to the exterior or frontal tubes of that instrument; and as there are few broken pieces on the strand near it, it is probable that the outside range of columns that now appears is really the original exterior line, to the seaward, of this collection. But how far they extend internally into the bowels of the incumbing cliff, is unknown. The very substance, indeed, of that part of the cliff which projects to a point, between the two bays on the east and west of the causeway, seems composed of this kind of materials; for besides the many pieces that are seen on the sides of the cliff that circulate to the bottom of the bays, particularly the eastern side, there is at the very point of the cliff, and just above the narrow and highest part of the causeway, a long collection of them seen, whose heads or tops just appearing without the sloping bank, plainly show them to be in an oblique position, and about half way between the perpendicular and horizontal. The heads of these, likewise, are of mixed surfaces, convex and concave, and the columns evidently appear to have been removed from their original upright, to their present inclining or oblique position, by the sinking or falling of the cliff.

GIBBET, or GIBET, a machine in manner of a gallows, whereon notorious criminals, after execution, are hung in irons or chains, as spectacles in terror. See GALLOWS.—The word in French, gibel, properly denotes what we call gallows: it is supposed to come originally from the Arabic gibel, "mount or elevation of ground;" by reason gibeis are usually placed on hills or eminences.

GIBBON, EDWARD, a historian of distinguished eminence, was born at Putney in the year 1737. He was the son of a gentleman of fortune and family distinction, who sat as a member in two separate parliaments. Edward when a boy, was of such an extremely delicate constitution that his life was frequently despaired of. When at the school of Westminster, his progress was often retarded by repeated shocks of bad health. After being for a long time under the management of the best medical practitioners, his constitution was radically changed for the better, which induced his father to place him in Magdalen college as a gentleman commoner, that he might be pushed into many acquisitions. This was prior to the completing of his fifteenth year. Before this time his reading had been of such a nature as to store his mind with much valuable historical knowledge, although his grammatical and philosophical knowledge at this time was not so extensive as that of some others at the same period of life. He says of himself: I arrived at Oxford with a stock of erudition that might have puzzled a doctor, and a degree of ignorance of which I should have been ashamed. Under such circumstances he was not ill prepared to receive the benefits of an university education, and this was no doubt the reason why he was exclaimed so bitterly against the public and private instructions at Oxford.

He was fond of polemical divinity from his infancy, and during his leisure moments he turned his attention, when farther advanced, to the celebrated controversy between Papists and Protestants; and as he had not then acquired talents sufficient to enable him to combat error
error and defend the truth, he fell a victim to the sophistry of the church of Rome. His father, with a view to reclaim him from the love of what he considered as the most destructive of all errors, sent him to Lausanne in Switzerland, and put him under the care of Mr Pavilliard, a clergyman of the Calvinistic persuasion. This gentleman called his pupil Edward, "a little thin figure, with a large head, disputing, and urging with the greatest ability, all the best arguments that had ever been used in favour of Popery." The masterly exertions of Mr Pavilliard, who had to deal with a young man of solid reason and matured reflection, accomplished the recantation of Mr Gibbon, and he received the sacrament in the Protestant church on the 25th of December 1754. At Lausanne, too, he made great progress in many branches of knowledge which he had hitherto neglected, and acquired a regular habit of study. He became master of the French and Latin languages, and was a profound logician. He gave full scope to the exercise of reading excellent authors, which was his ruling passion. He did not appear fond of mathematics, and therefore soon relinquished the study of them. At Lausanne he fell in love with a young lady, the daughter of a village clergyman; but he was frustrated in his hopes, and the lady became afterwards the wife of the celebrated Necker.

On his return home in April 1758, his father received him with every mark of tenderness and affection, and his mother-in-law found means to conciliate his good opinion and confidence. It is a singular circumstance that he should have taken a captain's commission in the army, a profession, one would have imagined, for which he was very ill calculated. Indeed he soon evinced the truth of this, for his tent and quarters were frequently encumbered with the odd furniture of Greek and Latin authors. On the event of peace he resigned his commission, and paid a visit to Paris in the year 1763, where he resided a few months, and his obliging friends insured him the means for remaining about a year, in order to prepare for a journey into Italy, which he accomplished in 1765. He thus speaks on the occasion of his entering Rome: "After a sleepless night, I trod, with a lofty step, the ruins of the forum; each memorable spot, where Romulus stood, or Tully spoke, or Cæsar fell, was at once present to my eye; and several days of intoxication were lost or enjoyed before I could descend to a cool and minute investigation." On the 5th of October, he informs us, the idea of writing the decline and fall of Rome first came into his mind, when the bare-footed friars were singing vesper in the temple of Jupiter.

In the year 1770 Mr Gibbon lost his father, and succeeded to an estate which was very much involved; yet he considered his circumstances as very well adapted to the great and extensive work he had undertaken to accomplish, which in his own opinion he had probably never finished, if he had been either poorer or richer than he was. He had an extensive circle of acquaintance in London, but the time necessarily devoted to their company, he made up by early rising and intense application. In the year 1774 he was chosen member of parliament for the borough of Lisleard, by the influence of Lord Elliot, which threatened to give his studies a very serious interruption. He sat eight years in the house of commons without having the courage so much as once to open his mouth, notwithstanding he was such an elegant writer. When the first volume of his "Decline and Fall of the Roman Empire," made its appearance in 1776, it met with a greater degree of applause than he expected; but by no praise was he so highly gratified as by that which the two great historians of Scotland, Hume and Robertson, bestowed upon him. For his two chapters which relate to the spread of Christianity he met with many antagonists, to whom he made no reply but to a Mr Davis, which was considered as a masterpiece. There can be no doubt that Gibbon was a real enemy to revelation in the disguise of a believer, a conduct so not abominable as at first sight may appear, so long as penal laws exist against an open declaration of opinion.

Soon after the publication of the first volume of his history, he paid another visit to Paris, and did not appear to be in much haste to complete his extensive work. In 1781, however, the second and third volumes of his history were given to the world; and although in the estimation of many competent judges they were inferior to the first, they still were allowed to possess sufficient merit to support his reputation. Having lost his seat for Lisleard, the influence of ministry brought him in as representative for Lymington, and on the dissolution of Lord North's ministry, he lost his office as one of the lords of trade, which was a serious diminution of his income. He again determined to visit his favourite Lausanne, where he completed the remaining volumes of his history; but when the revolutionary mania began to rage on the continent, he quitted Lausanne, and sought for an asylum in England. He mortally hated innovations of every kind, whether necessary or not, as appears from the following exclamation: "I beg leave to subscribe my assent to Mr Burke's creed on the revolution of France. I admire his eloquence, I approve his politics, I adore his chivalry, and can almost excuse his reverence for church establishments."

During his consoling visit to Lord Sheffield, who had met with a trying domestic loss, his attention was called to the rapid progress of a distemper which had subsisted for about 30 years. A mortification at last ensued, which terminated his existence on the 16th of January 1794, in the 67th year of his age. Mr Gibbon gives himself a character which is perhaps pretty near the truth. "I am endowed with a cheerful temper, a moderate sensibility, and a natural disposition to repose rather than to activity: some mischievous appetites and habits have perhaps been corrected by philosophy or time. The love of study supplies each day, each hour, with a perpetual source of independent and rational pleasure." Mr Gibbon possessed the manners and sentiments of a gentleman in an eminent degree; he was easy in society, of which he was extremely fond, and beloved by all who had the pleasure of intimately knowing him.

GIBBOUS, a term in Medicine, denoting any protuberance or convexity of the body, as a person hunchbacked or hump-backed.

Infants are much more subject to gibbosity than adults, and it often proceeds from external than internal causes. A fall, blow, or the like, frequently thus distorts the tender bones of infants. When it proceeds from
from an internal cause, it is generally from a relaxation of the ligaments that sustain the spine, or a caries of its vertebrae; though the spine may be inflected forward, and the vertebrae thrown out by a too strong and repeated action of the abdominal muscles. This, if not timely redressed, grows up and fixes as the bones harden, till in adults it is totally irretrievable: but when the disorder is recent, and the person young, there are hopes of a cure. The common method is by a machine of pasteboard, wood, or steel, which is made to press principally on the gibbous part; and this by long wearing may set all right. The surgeons, however, have a different instrument, which they call a cross, much more efficacious, though not quite so convenient in the wearing. By the use of this, the parts are always prevented from growing any worse, and are often cured. During the application of these assistances, the parts should be at times rubbed with Hungary water, spirit of lavender, or the like, and defended with a strengthening plaster.

GIBBOUS, in Astronomy, a term used in reference to the enlightened parts of the moon, whilst she is moving from the first quarter to the full, and from the full to the last quarter; for all that time the dark part appears horned or falcated; and the light one hunched out, convex, or gibbous.

GIBEAH, a city in the tribe of Benjamin, lying north of Jerusalem about 20 or 30 furlongs, and built upon a hill, as its name imports. This city gave birth to Saul, the first king of Israel, for which reason it is frequently called Gibeah of Saul, or Gibeah the native country of Saul.

GIBELINS, or GIBELINS, a famous faction in Italy, opposite to another called the Guelphs.

These two factions ravaged and laid waste Italy for a long series of years; so that the history of that country, for the space of two centuries, is no more than a detail of their mutual violence and slaughters. The Gibelins stood for the emperor against the pope: but concerning their origin and the reason of their names we have but a very obscure account. According to the generality of authors, they rose about the year 1240, upon the emperor Frederick II.’s being excommunicated by Pope Gregory IX. Other writers maintain, that the two factions arose ten years before, though still under the same pope and emperor. But the most probable opinion is that of Maimbourg, who says, that the two factions of Guelphs and Gibelins arose from a quarrel between two ancient and illustrious houses on the confines of Germany, that of the Henries of Gibling, and that of the Gueuls of Adon.

GIBEON, a city seated on an eminence about 40 furlongs from Jerusalem northward, and not far from the city of Gibeah. See GEBEA.

This was the capital city of the Gibeonites, who took the advantage of Joshua’s oath, and of that which the elders of Israel likewise swore to them, upon an artificial representation which they made of their belonging to a very remote country, and their desire of making an alliance with the Hebrews. Joshua (ix. 3, 4, et seq.) and the elders inconsequently entered into a league with these people; but soon discovered their mistake. Upon this, sending for the Gibeonites, they reproached them with their fraud; and without revoking the promise which they had made to them, of giving them their lives, they condemned them to carry wood and water to the tabernacle of the Lord, as slaves and captives taken in war; in which state of servitude they remained till the ruin and entire dispersion of the Jewish nation.

The Gibeonites were descended from the Hivites, the old inhabitants of that country, and possessed four cities, whereof Gibeon was the capital. The cities were Chephirath, Beeroth, Kirjathjearim, and Gibeon, Josh. ix. 17. These cities were afterwards given to the tribe of Benjamin, except Kirjathjearim, which fell to the tribe of Judah. The Gibeonites continued ever after subject to those burdens which Joshua had imposed on them, and were very faithful to the Israelites.

GIBLETS, the offals or entrails of a goose; including the heart and liver, with the feet, gizzard, &c. The word is supposed to be formed of goblets, from the French gobet, “mouthful.”—Giblets make a considerable article in cookery: they boil giblets, stew giblets, make ragouts of giblets, giblet pies, &c.

GIBRALTAR, a famous promontory, or rather peninsula, of Spain, lying in N. Lat. 36° 6’ W. Long. 5° 17’. To the ancients it was known by the name of Colapse, and was also called one of the Pillars of Hercules; by the Arabs it is called Gebel Tarek, that is, “the mount of Tarek,” from Tarek, the name of the Saracen general who conquered Spain in the beginning of the eighth century. The whole is an immense rock, rising perpendicularly about 440 yards, measuring from north to south about two English miles, but not above one in breadth from east to west. The town lies along the side of the mountain on a declivity; by which, generally speaking, the rains pass through it, and keep it clean. The old town was considerably larger than the new. Many of the streets are narrow and irregular: the buildings are of different materials; some of natural stone out of the quarries, some of a factitious or artificial stone, and a few of brick. The people are supplied with fresh provisions chiefly from the coast of Barbary, with fruit, roots, and vegetables of all sorts from thence, or from their own gardens. Besides what is properly called the town, there are several spacious and commodious public edifices erected; such as barracks for the soldiers, with apartments for their officers, magazines of different kinds, storehouses for provisions, &c. The inhabitants, exclusive of the British subjects dependent on the garrison, or who reside there from other motives, consist of some Spaniards, a few Portuguese, a considerable number of Genoese, about as many Jews, and even some Moors; making in the whole a population of twelve thousand persons, the overtopping the garrison; though some make them much fewer. This town may be said to have two ports; the first lying to the north, and is proper only for small vessels; the other is very commodious for large vessels, and has a fine stone quay. The bay is very beautiful and capacious, being in breadth about five miles, and in length eight or nine, with several small rivers running into it. It is very advantageous to the place. There is no ground to be found in the middle of it at one hundred fathoms depth, so that a squadron may lie there in great safety; the breezes from it are very refreshing; and it contributes likewise
and supposing that the garrison would be off their guard and secure on account of the vicinity of their fleet, they formed the rash design of attempting to surprise the place, though the British admirals was still before it. In this mad attempt 500 volunteers associated, taking the sacrament never to return unless they accomplished their purpose. They were conducted by a goat-herd to the south side of the rock near the cave guard, at that time called the pass of lowest trees. This they mounted, and lodged themselves the first night in the cave of St Michael: the next they scaled Charles V.'s Wall; surprised and massacred the guard at Middle hill; where afterwards, by ropes and ladders, several hundreds of the party designed to support them were hauled up: but being discovered, they were attacked by a strong party of grenadiers, and all of them at last either killed or taken. These brave adventurers were to be supported by a body of French troops, and some men were proposed to the command of the assistance of the garrison; but, through the disagreement of the commanding officers, these proposals were not put in execution, and thus the volunteers were left to their fate.

Notwithstanding these misfortunes, the Spaniards still continued the siege, and fitted out a strong squadron from Cadiz, with a design to intercept the convey of provisions which might be sent to the garrison; flattering themselves at the same time, that, on the arrival of their fleet, Sir John would be obliged to retire, and the garrison of consequence to surrender to their united attacks. They continued their fire therefore with additional fury, dismounted many of the cannon, and did essential injury to the works in several different places. The prince of Hesse, however, was by no means deficient in his endeavours to disappoint their expectations. As it was probable that an attempt might be made to storm the citadel, a couvette was dug in the ditch, which was filled by the tide, and a double row of palisades were parallel to the works. The chambers of the mine under the glacis were loaded, and all means taken to defeat such an attempt; but on a sudden the Spaniards seemed to have altered their design, and threatened an attack on the line which the garrison had on the declivity of the hill to flank the glacis, and overlook their advanced works. While affairs remained in this situation, part of the succours they had long expected arrived in the bay, December 7, 1704, and in two days after, the remainder came in with near 2000 men, along with a proportionable quantity of ammunition and provisions. These had sailed from Cape Spartel under convoy of four frigates; but were in imminent danger of falling into the hands of the enemy, whose fleet they mistook for their own; however, they escaped by the fortunate circumstance of being becalmed, so that they could not get up to them.

Sir John Leake having thus powerfully reinforced the garrison, thought his presence in the bay no longer necessary, and therefore set sail for Lisbon, where he arrived about the end of the year. In the beginning of January 1705 the Spaniards were reinforced by a considerable body of infantry, and on the 11th of the month made an attack on the extremity of the King's Lines, but were repulsed. The attack was renewed next day with 600 grenadiers, French and Walloons, supported by 1000 Spaniards, under Lieutenant Colonel Joby. They disposed themselves in such a manner as showed an intention to storm a breach which had been made in the Round Tower at the extremity of the King's Lines, and another in the intrenchment on the hill. The retrenchment which covered the latter breach, with part of the intrenchment joining the precipice of the rock, was defended at night by a captain, three subalterns, and 90 men; but it was customary for the captain to withdraw, with two subalterns and 60 men at daybreak. The Round Tower was defended by 180 men, commanded by a lieutenant-colonel. The marquis, by deserters from the garrison, had obtained intelligence of the strength of these posts, and planned his attack accordingly. The detachment for the upper breach mounted the rock at midnight, and concealed themselves in the cliffs until the captain had withdrawn; after which, advancing to the point of the intrenchment, they threw grenades on the subalterns, and his party, so that they were obliged to leave the place. At the same time 300 men stormed the Round Tower, where Lieutenant Colonel Bar had made a vigorous defence, though the enemy, having passed the breach above, annoyed them on the flanks with great stones and grenades. Observing, however, the Spaniards marching down to cut off his retreat from the town, he retired; and, by getting over the parapet of the King's Lines, descended into the covered way, where the English guards were posted. Thus the garrison were alarmed; all the regiments were assembled at their proper posts; and Captain Fisher endeavoured to stop the progress of the enemy with 17 men, but they were repulsed, and himself taken prisoner. At the last, however, the Tower was retaken by Lieutenant-colonel Colonel Moncal at the head of 400 or 500 men, after it had been in the possession of the enemy upwards of an hour.

The garrison was now farther reinforced by six companies of Dutch troops and 300 English soldiers, together with some provisions and stores. The assailants, however, were still determined to go on. The marquis de Villadarias was superseded by Mariscal Tous, a Frenchman, with whom Admiral Ponce was desired to co-operate in blocking up the place. The mariscal therefore joined the army with four fresh battalions, besides eight companies which had been sent before; the ordinance, which had been greatly injured by constant use, was exchanged for others, and the works as they then stood, put into the best repair. On the part of the English, a reinforcement was ordered under the command of Sir Thomas Dilkies and Sir John Hardly, to join Admiral Leake at Lisbon; which junction being effected, the whole fleet, consisting of 20 English, 4 Dutch, and 5 Portuguese men of war, having on board two battalions of land forces, set sail from Lisbon. Happily for the besieged, however, the incessant rains and storms about this time had retarded the operations of the land forces, and greatly disturbed the fleet of the enemy. Eight ships of the latter were forced from their anchors by the strong westerly wind, and obliged to drive alee. At this critical period Sir John Leake, with the allied fleet, entered the straits. On his approach the few remaining French ships put out to sea; and the British admiral discovering five sail making out of the bay, and a gun fired at them from the garrison,
The siege turned into a blockade, and in June the French garrison, immediately gave chase. Three French men of war were taken, and the admiral's ship and another driven on shore, where they were burnt. The rest, on hearing the report of the guns, had made the best of their way to Toulon.

The garrison was now so well supplied, that Marshal Tasse withdrew his troops from the trenches, and raised a blockade, drawing an entrenchment across the isthmus to prevent the garrison from ravaging the country. The prince of Hesse remained for some time in the place, where he repaired the batteries, and made some additions to the fortifications; after which he joined the archduke Charles at Lisbon. As the latter, however, was resolved to try his fortune with the earl of Peterborough in Valencia and Catalonia, the prince was sent back to Gibraltar to prepare part of the garrison for embarkation, and soon after was followed by the whole fleet. Major General Ramos was now appointed governor of Gibraltar, in which only two new battalions were left, as nothing was to be feared from the enemy. The new governor, however, brought with him 400 men for the greater security of the place; but soon resigned his government to Colonel Roger Elliot, during whose time Gibraltar was made a free port by a special order from the queen.

Colonel Elliot was succeeded by Colonel Congreve before the year 1714, and he by Colonel Cotton a short time after. In 1720 the Spaniards seem to have threatened another attack. Ceuta, a Spanish fortress in Barbary, had been for many years besieged by the Moors; and a powerful armament, commanded by the marquis de Laga, was now assembled in Gibraltar bay, under pretence of relieving the African fortress, but with a secret design of first surprising Gibraltar; for which purpose they had provided scaling ladders, &c. The armament, however, had not been fitted out with such secrecy, but that the British ministry had intelligence of it. On this they sent orders to Colonel Kane, governor of Minorca, to embark with part of his garrison for Gibraltar under convoy of the fleet in the Mediterranean. On his arrival he found the place in a critical situation. The garrison consisted only of three weak battalions under Major Hetherington, besides whom there was only one other field officer, Major Batteroux, in the place, and no more than 14 days provisions remaining. The posture of affairs, however, was altered by the arrival of Colonel Kane with 500 men, with provisions and ammunition; which reinforcement, together with the spirited behavior of the British commodore, induced the Spanish commander to abandon his design, though he remained of opinion that the fortress might then have been carried by a general assault.

Notwithstanding this disappointment, the Spaniards continued to keep a watchful eye over Gibraltar; and, in the latter end of the year 1726, assembled an army in the neighborhood of Algeciras, encamping, on the 20th of January following, on the plain below St. Roch, and erecting a battery on the beach to protect their camp. Though Admiral Hopson was then at anchor in the bay of Gibraltar, yet, as he had received no intelligence of the actual commencement of hostilities between Britain and Spain, he was obliged to allow the boats of the latter to pass with provisions, arms, and ammunition, between Algeciras and the camp, at the same time that Colonel (afterwards Brigadier) Kane, who had been a second time sent from Minorca, lay under similar embarrassments. The operations of the Spaniards, however, seemed so evidently to tend towards an attack, that the governor thought proper to order such of that nation as were in the town to leave it, and to forbid their galleys to anchor under his guns (A).

The count de las Torres commanded the Spanish forces, amounting to near 20,000 men; and soon after forming his camp, he advanced within reach of the garrison. The brigadier then desired him to keep out of his reach, otherwise he should do his utmost to force him; but to this the Spanish commander replied, that, as the garrison could command no more than they had power to maintain, he should obey his Catholic majesty's orders, and encroach as far as possible. Hostilities, however, were not commenced until the 10th of February 1727, when the Spaniards, having brought materials for batteries to the old windmill on the neutral ground, it was determined in a council of war, that the Spanish general had commenced hostilities by encroaching so far on the liberties of the garrison. Still, however, the governor sent to the count to know the reason of breaking ground before the garrison; but received for answer, that "he was in his master's territories, and was not answerable to any other person for his conduct." On this the governor opened the batteries of the Old Mole and those of Willis upon the Spanish works: however, they persisted on carrying on their operations, and at night marched a party down to the Devil's Tower, where they immediately broke ground, and began a communication with their other works. The governor was now informed by some deserters, that the enemy were forming a mine in the wall under Willis's Battery, with a design to blow it up; but the plot being thus happily discovered, a party was immediately stationed to cut off the communication. On the 22d of February the Spaniards opened on the garrison with 17 pieces of cannon besides mortars; and the day following Brigadier Kane left Gibraltar to send a reinforcement from Minorca. On the 3d of March the enemy opened a new battery of 22 guns, on the Old Mole, and on the 8th another of 15 guns, bearing also upon the same mole, the guns of which had annoyed the western flank of their approaches.

All this time the garrison had kept up a constant and well directed fire from the batteries which bore upon the works of the enemy; but the ordnance in general being old, were frequently bursting; by which they suffered more than from the fire of the besiegers.

At this time the fortifications of Gibraltar were considerably different from what they had been in 1705. Several works were erected on the heights above the lines called Willis's Batteries; the Prince's Lines were extended to the extremity of the rock, and an inundation was formed out of the morass in front of the grand battery.
G I B

Gibraltar. The latter were also greatly distressed by the fleet under Admiral Hopson and Sir Charles Wager, who, since the beginning of the siege, had intercepted their homebound ships, and at the same time greatly benefited the garrison, by bringing the prizes into the bay. Finding the Spaniards, however, ostensibly bent on their enterprise, they formed a design, on the 2d of April, to bombard Algiers, from whence the besiegers were supplied with various articles of ammunition but the fleet happening to be becalmed, the design was afterwards unaccountably abandoned; and on the arrival of a reinforcement from Minorca, they sailed to the westward, leaving the garrison to defend themselves the best way they could.

The enemy continued to augment their batteries, and erect new ones, until they amounted at last to 60 cannon besides mortars; and, on the 3d of May, the governor received intelligence that a general assault was intended; to repel which he took every proper precaution. The enemy, however, still added to their approaches, and considerable reinforcements were received by both parties. Hostilities, however, ceased on the 12th, when news arrived that the preliminaries of a general peace were signed; from which time to the year 1779, no further attempts were made on Gibraltar. In the course of these sieges the loss of the Spaniards was very considerable; that of 1705 costing them not less than 10,000 men, including those who died of sickness; and in that of 1727 their loss was computed at near 3000, besides casualties, which could not be ascertained. That of the garrison amounted in 1705 to 400; and in 1727 to 300; a very small number, considering that during the siege 70 cannon and 30 mortars burst on the batteries.

The hostile manifesto presented by the Spanish ambassador to the court of London at the commencement of the American war, was soon followed by an interruption of communication betwixt Spain and the fortress of Gibraltar. No direct intention of attacking or distressing it, however, was manifested till the 16th of July, when the port was completely blockaded by a squadron of two 74 gun ships, several frigates, galleys, &c. Ten days after they began to form a camp on the plain below St Roch, three miles from the fortress. The garrison at this time consisted of 5382 men, including officers, with a company of engineers and artificers; but the greatest expectations were formed from the abilities and value of General Elliot the governor. As soon as the breaking off the communication with Spain indicated approaching hostilities, the governor took every precaution that could be suggested by military wisdom; but though informed of the rupture betwixt the two courts having actually taken place, and though he beheld the hostile operations of the enemy, no means were used to interrupt them till the 12th of September, when the batteries of Green's Lodge, Willis, and Queen Charlotte, were opened for a few hours, with a view to disturb the workmen.

From this time to the beginning of the year 1780 the enemy continued the blockade both by sea and land, but without doing any damage to the works or garrison, and it was not until the 12th of January that a single person was wounded. This happened to be a woman, who, passing near one of the houses, was slightly hurt by a shot from the enemy. In the mean time, however, the usual supplies of provisions being cut off, the garrison began to feel all the horrors of famine. All the necessaries of life were very scarce, and to be procured only at exorbitant prices. Venison, mutton, and beef, sold from half a crown to four shillings per pound; fresh pork from two to three shillings; salted beef and pork fifteenpence; forty eightpence shillings per couple; ducks a guinea; firewood, five shillings per hundredweight; a pint of milk and water fifteenpence; a small cabbag cost five shillings, and a small bunch of outer leaves fivepence; Irish butter half a crown per pound; candles as much; and eggs sixpence each. As the rock, however, is almost surrounded by the sea, it was natural to suppose, that in such a scarcity of other provisions great benefit would have been derived from the ocean; but the fishermen, being all foreigners, and under no regulation, took advantage of the present scarcity of provisions in the garrison to exact a most exorbitant price for the fish they supplied.

Had matters remained long in this state, it is plain that the fortress, however strong, must have fallen into the hands of the enemy. They were, however, effectually relieved in consequence of the victory gained by Admiral Rodney over the Spanish fleet commanded by Don Juan de Jangar. The former had been furnished with a strong squadron, in order to relieve this important fortress: with which having set sail, he in a few days fell in with a Spanish fleet of 16 transports bound from Bilboa to Cadiz, and laden with provisions and naval stores, conveyed by a man of war of 64 guns, four frigates, and two armed vessels. Of these only a single transport escaped, the rest being all captured on the 8th of January 1780; and the loss of them, at the same time that it promised to be very serviceable to the garrison, was equally detrimental to the enemy, who were now in great want both of provisions and materials for their shipping.

This advantage was soon after followed by a much greater. On the 16th of the same month a Spanish squadron of 11 sail of the line was discovered off Cape St Vincent; and the British admiral having taken the proper methods to come up with them as quickly as possible, an engagement took place about four in the afternoon. At this time the ships of the British line closed in with the nearest of the enemy, and in half an hour one of the Spaniards, mounting 70 guns, and having on board 600 men, blew up, and all on board perished. In two hours more another Spanish ship of the line was taken; notwithstanding which the fight continued with great vigour till two in the morning, when the headmost ship of the enemy struck to the Sandwich; after which the firing ceased. The weather throughout the night was so tempestuous that it was with the utmost difficulty the British could take possession of those ships which surrendered. These were six in number, but two of them drove ashore and were lost, only four being brought safe into Gibraltar. These were the admiral's ship of 80 guns and 700 men, with three others of 70 guns and 600 men. The engagement, however, happened so near the shore, and the British were so eager in securing the fee to prevent the enemy's escape, that Admiral Rodney's ship, together with some of the largest in the fleet, were in great danger of running on the shoals of St. Lucar;
The news of this important victory arrived at Gib-

eralter on the evening of the day after it was fought; and in two days more the garrison was completely re-

lieved by the arrival of the fleet and convoy, at the same time that they were farther reinforced by a regiment of Highlanders, consisting of 109 men, officers included. An opportunity was also taken of sending away with the fleet all the invalids and women in the garrison; with whom they set sail on the 10th of Feb-

uary, leaving in the bay only the Edgar and Panther ships of the line, with two frigates.

On the departure of the British fleet, the blockade was immediately resumed; and notwithstanding the ample supplies lately received, the garrison soon began to experience the inconvenience of want of fresh provisions. It had hitherto received these in abundance from the coast of Barbary; but an unaccountable alteration had now taken place, so that the friendship of the emperor of Morocco was transferred from Great Britain to Spain in a manner totally unprecedented. His partiality towards the latter was the more surpris-

ing, as Britain had given no provocation, and the en-

mity between Spain and Morocco seemed to be in a manner constitutional, and founded upon such causes as could never cease to operate. Thus, however, the garrison became daily more and more distressed, from being obliged to make constant use of their salt provi-

sions, and even with the strictest economy. The industry and resolution of the British seamen and offi-

cers, indeed, sometimes overcame all obstacles, so that they found means to procure the necessary refresh-

ments through the vessel and they were certainly exposed to the utmost danger from the enemy. At the same time the defence of the garrison was so vigorous, that while it continued to be supplied even in this scanty manner, the Spaniards began to lose all hope of reducing it; for which reason they formed a project of burning all the British shipping in the bay. The night appoint-

ed for putting this scheme in execution was the 6th of June 1780, when 10 fire-ships, favoured by an uncom-

mon darkness, stood over from the Spanish to the Brit-

ish side of the bay. Their design was to set fire to the storehouses nearest to the water side, as well as to the shipping there; but having been too precipitate in firing their ships, and being received also by a very heavy cannonade, the attempt was frustrated. On this occasion the skill and intrepidity of the British seamen were eminently displayed. Having manned their boats, they grappled the fire-ships already in flames; and, notwithstanding their dreadful appearance and the danger of their exploding, towed them clear of the vessels under the walls and extinguished them.

The failure of this project was a grievous disap-

pointment to Don Barcelo the Spanish admiral, who lay ready with his squadron to intercept the British vessels that might attempt to escape; at the same time that the batteries on their lines were in readiness to bombard the town, if the fire-ships had succeeded in causing any confusion on shore. The failure of the present attempt, however, was soon followed by other disasters. As soon as they had, with great labour, Spanish works de-

stroyed, the batteries were entirely destroyed by the besieged; and their mortification on these occasions was the greater, as it was usual for the governor to allow them to complete their works before he commenced his destructive operations. Thus the labour of many days was often lost in a few hours, and afterwards was to be resumed with as little prospect of success as before. The garrison was now considerably annoyed by the Spanish gun boats, to which indeed the shipping were equally exposed with themselves. These were vessels from 30 to 40 tons burden, constructed so that they lay low in the water, which rendered them difficult to be aimed at. They had 15 oars on a side, carried 40 or 50 men, with a 26 pounder on the prow; and from the facility of manag-

ing them, two were deemed, in calm weather, to be a match for a frigate of modern size. All their efforts, however, could still do no more than to reduce the garrison to great straits for want of provisions; and to this dreadful inconvenience the British submitted with the greatest cheerfulness. From the time of Admiral Rodney’s departure in the month of February 1780 to the month of October, almost the only provisions in the garrison were such as tended to produce the scurvy; which accordingly raged in such a manner, as to threaten the most fatal consequences. An antidote, however, was happily procured by the capture of a Danish dogger from Malaga laden with lemons and oranges, which the governor immediately purchased for the use of the garrison and distributed among them. “At this time,” says Captain Drinkwater, “the scurvy had made dreadful ravages in our hospitals, and more were daily confined: many however, unwilling to yield to its first attacks, persevered in their duty to the more advanced stages. It was therefore not uncommon, at this period, to see men, who, some months before, were hale, and capable of enduring any fatigue, sup-

porting themselves to their posts upon crutches, and even with that assistance scarcely able to move along. The most fatal consequences in short were to be appreh-

ended to the garrison from this terrible disorder, when this Dane was happily directed to our relief.”

According to Mr Cairnrooss, an eminent surgeon, who was present during this siege, “the scurvy which now raged in Gibraltar, differed in no respect from that disease usually contracted by sailors in long sea voyages; and of which the immediate cause seemed to be the subsisting for a length of time upon salted provi-

sions only, without a sufficient quantity of vegetables or other acceent foods. The circumstances related in the voyage of that celebrated circumnavigator Lord Anson of consolidated fractures disuniting, and the callousness of the bone being perfectly dissolved, occurred frequently in our hospitals, and old sores and wounds opened anew from the nature of the disorder. Various antiscorbutics were used without success, such as acid of vitriol, sour crout, extract of malt, essence of spruce, &c.; but the only specifics were fresh lemons and oranges given liberally; or, when they could not be
be procured, the preserved juice in such quantities, from one to four ounces per day, as the patient could bear. Whilst the lemons were sound, from one to three were administered each day as circumstances directed. The juice given to those in the most malignant state was sometimes diluted with sugar, wine, or spirits; but the convalescents took it without dilution. Women and children were equally affected; nor were the officers exempted from this dreadful disorder. It became almost general at the commencement of the winter season, owing to the cold and moisture, and in the beginning of spring when vegetables were scarce. The juice was preserved by adding to 60 gallons of expressed liquor about five or ten gallons of brandy, which kept it in so wholesome a state, that several casks were opened in good condition at the close of the siege. The old juice, however, was not so speedily efficacious as the fruit, though by persevering longer in its use it seldom failed.

Till this month the allowance of salt provisions had continued unremitted; but now it was judged necessary to reduce the allowance of bread and meat, and to make some other regulations in order to enforce the strictest economy with regard to food. Every thing of this kind that could be practised, however, seemed insufficient to preserve the garrison from absolute want. In the beginning of the year 1781, provisions became exceedingly scarce, by reason of the almost total expenditure of what was contained in the public stores, and the vigilance of the enemy’s cruisers. About the middle of February the town bakers left off work for want of flour; and many of the poorer sort wanted bread. The price of fresh provisions again rose to a most enormous height. Small pigs sold at two guineas, turkeys at three shillings, geese at 30 shillings; fowls and ducks at 10 shillings; damaged biscuit a shilling the pound; pease 1s. 6d.; and all other necessaries in proportion; at the same time the scarcity of fuel was such, that it was sometimes scarcely procurable in quantity sufficient to dress the meals.

The garrison had hitherto derived assistance occasionally from the gardens on the neutral ground, though the use of the enemy. Towards the end of the month of October 1780, however, the Spaniards determined to expel the British from the gardens entirely: and this they accomplished in spite of all that could be done to prevent them. From this time the resources with regard to vegetables depended entirely upon the attention paid to cultivation; which, happily for the garrison, was attended with such success, especially during the winter months, that the produce came at last to be nearly equal to the demand. At last, on the 12th of April 1781, supplies were brought by the British fleet under Admirals Darby, Digby, and Ross, though they could not be got in without great difficulty. The gun-boats already mentioned were now much increased in number and strength of construction; infesting the bay in such a manner as greatly to interrupt the disembarkation of the stores. As no vessels of the same kind had been prepared to oppose them, they could scarcely be prevented from effecting their purpose of burning the store-ships. With this view they had approached them every morning in hazy weather to the number of between 20 and 30, several of them carrying mortars; and as they used both sails and oars, they eluded all pursuit, by withdrawing on the rise of any breeze. To keep off these troublesome guests, several stony frigates were obliged to station themselves along the bay for the protection of the shipping; but even this did not prevent them from continuing their molestation; and notwithstanding the vigilance and activity of the British sailors, it was seldom that they could come near enough to do them any damage. In spite of all their endeavours, however, the garrison was effectually relieved: an exploit which so exceedingly irritated the court of Spain, that they determined to exert the utmost force of the kingdom rather than fail in the execution of their favourite project. The works before the town were therefore carried on with more vigour than ever, and the most tremendous preparations made to cause the obstinate garrison feel the resentment of an exasperated enemy. Their batteries were now mounted with the heaviest metal, and with mortar-pieces of the largest size; the number of the former augmented to near 200, and of the latter to upwards of 80. For three weeks this prodigious artillery continued to pour forth an almost incessant shower of shot and shells, insomuch that, in the time just mentioned, they had consumed 100,000 lb. of gunpowder, and thrown into the town four or five thousand shot or shells every 24 hours.

By such an immense bombardment the town was almost totally laid in ruins. The inhabitants, computed at more than 3000 in number, experienced every difficulty that could arise from the destruction of their habitation: several of them were killed, and all forced to leave the town, and take shelter under tents with what accommodation could be provided for them in such scenes of horror and confusion. Numbers took the opportunity of retiring with the fleet; while many that remained were now reduced from a state of opinion to the greatest distress. The conduct of Governor Elliot was very humane and compassionate to such as were inclined to depart; allowing them a free passage to England, and supplying them with provisions for the voyage.

During this bombardment, not only the greatest part of the effects belonging to the inhabitants were destroyed, but the fortifications were in many places greatly injured; and the worst was, that the remainder were destroyed by the soldiers, who had arrived at such a pitch of licentiousness, that they neither regarded nor would obey their officers. They were incited to this destructive scheme by the avarice of some of the inhabitants who had hoarded up and concealed a quantity of necessary articles, in order to procure an advanced price. They now, therefore, kept no bounds in dissipation, waste, and extravagance; a remarkable instance of which is given by Captain Drinkwater, in the roasting a pig by a fire made of cinnamon. To put a stop to these atrocious proceedings, rigorous measures were of necessity adopted; and it was intimated, that any soldier convicted of being drunk or absent from his post, or found marauding, should be immediately executed. The loss of human lives during this dreadful bombardment was less than could have been expected; but many remarkable circumstances are taken notice
notice of by Captain Drinkwater, some of which are related in the note (8). By the beginning of June 1781, the enemy had relaxed considerably in their firing, seldom exceeding 600 shot in a day; and continued gradually to diminish this number so remarkably, that towards the end of August, they seldom fired in the day, and only discharged six or seven, and sometimes not above three, shot in the night. The batteries at land, however, were succeeded by the gun-boats; which renewed their attacks every day, keeping the garrison in continual alarm, and never failing to do more or less execution. To restrain them, therefore, a battery of guns capable of throwing their shot to a great distance was erected as near as possible to the enemy; and as it reached their very camp, it was determined to open it upon them as often as the gun-boats made their attacks; which being soon perceived, they thought it prudent to desist in some measure from that mode of hostility. They continued still, however, to improve their works, and for this purpose employed the best engineers both of France and Spain; so that by the latter part of November 1781, they had brought them to such a state of perfection as filled both kingdoms with the most sanguine expectations of success. Governor Elliot, however, far from being dismayed at these formidable bulwarks, suffered them to proceed without molestation to the end of their scheme, that he might as in a moment destroy the labour of so many months, and thus render the disappointment the greater. In the night of the 27th of November, a chosen party of 200 men entirely detached, in order to destroy the enemy’s works and batteries; and their success was equal to their most sanguine expectations. They marched out in great order and silence about two o’clock in the morning, under the command of Brigadier General Ross; after which they proceeded with the same circumspection, but with the utmost celerity, to the enemy’s works, which they stormed and overthrew with astonishing rapidity. The Spaniards were instantly thrown into confusion, and fled on every side; the guns and mortars on the batteries were all spiked up, and

(9) Two boys belonging to the artillerie company were endowed with such wonderful strength of vision, that they could see the shot of the enemy in the air almost as soon as it came from the mouth of the gun; and were therefore constantly placed upon some part of the works to give notice to the soldiers of the approaching danger. During the time of the hottest fire, however, the men were so habituated to the fall of shells and shot around them, that they contracted an insensibility of danger, and almost required to be cautioned by their officers to avoid the explosion of a shell when living with the fusee burning at their feet. In consequence of this inattention, they frequently neglected the advice of the boys above mentioned, and their neglect could not but be productive of fatal effects. An instance of this happened on the Princess Amelia’s battery, where a shot thus disregarded came through one of the capped embrasures, carried off one leg from each of three soldiers, and wounded a fourth in both. In other cases, in which the person themselves have observed the shot or shells coming towards them, they have been fascinated by its appearance, and unable to move from the spot, as small birds are said to be by the rattlesnake. “This sudden arrest of the faculties (says our author) was nothing uncommon: several instances occurred to my own observation, where men, totally free, have had their senses so engaged by a shell in its descent, that though sensible of their danger, even so far as to cry for assistance, they have been imprudently fixed to the place. But what is more remarkable, these men have so instaneously recovered themselves on its fall to the ground, as to remove to a place of safety before the shell burst.”

In this manner Lieutenant Law of the 12th regiment was fascinated by a shot which he saw coming, but had not power to remove from the place before it fell upon him and took off his leg.

Where these shells burst they produced instant and certain destruction, mangling in the most dreadful manner. The following are some particulars: A matross had the misfortune of breaking his thigh by some accident; and being a man of great spirit, could scarce bear the confinement necessary for its reunion. In consequence of this he went abroad too soon, and thus unfortunately broke the bone a second time. Being now confined to bed, a shell happened to fall into the room where he was, and, rebounding, lodged itself directly upon him. The convulsions and sick instantly summoned all their strength, and crawled out of the room, while the poor matross lay below the shell, kept down by its weight, and utterly unable to stir. In a few seconds it burst, and took off both his legs, and scorched him in a dreadful manner. He survived the explosion, was sensible to the last moment, and died regretting that he had not been killed on the batteries. The case of a soldier of the 73rd regiment shows, that even in the most dangerous cases we should never despair of recovery while life remains. This unfortunate man had been knocked down by the wind of a shell, which, instantly bursting, killed his companion, and mangled himself in a shocking manner. His skull was dreadfully fractured, his left arm broken in two places, one of his legs shattered, the skin and muscles torn off from part of his right hand, the middle finger broken to pieces, and his whole body most severely bruised and marked with gunpowder. He presented so horrid an object to the surgeons, that they had not the least hopes of saving his life, and were at a loss what part to attend to first. He was that evening trepanned; a few days afterwards his leg was amputated, and other wounds and fractures were dressed. Being possessed of a most excellent constitution, nature performed wonders in his favour, and in 11 weeks his cure was completely effected. On the 18th of September a shell from the lines fell into a house where the town major, Captain Burke, with Majors Mercier and Vignoles of the 39th regiment were sitting. It took off Major Burke’s thigh; afterwards fell through the floor into the cellar; there it burst, and forced the flooring with the unfortunate major up to the ceiling. When assistance came, they found him almost buried in the ruins of the room. He was instantly conveyed to the hospital, where he died soon after the wounded part had been amputated. Majors Mercier and Vignoles.
Vignoles had time to escape before the shell burst; nevertheless they were slightly wounded by the splinters, as were a sergeant and his daughter who happened to be in the cellar when the shell entered. The following are recorded as instances of very extraordinary escapes from the destructive power of these engines, and which indeed it seems difficult to account for.—A corporal had the muzzle of his firelock closed, and the barrel twisted like a French horn, by a shell, without any injury to his person. A shell happened to fall into a tent where two soldiers were asleep, without awakening them by its fall. A sergeant in an adjacent tent heard it, and ran near 40 yards to a place of safety, when he recollected the situation of his comrades. Thinking the shell had fallen blind, he returned and awakened them; both immediately rose, but continued by the place, debating on the narrow escape they had had, when the shell exploded, and forced them with great violence against a garden wall, but “miraculously” did no further mischief than destroying everything in the tent. On the new year’s day of 1782, an officer of artillery observed a shell falling towards the place where he stood, and got behind a traverse for protection. This he had scarcely done, when the shell fell into the traverse, and instantly entangled him in the rubbish: one of the guards, named Martin, observing his distress, generously risked his own life in defence of his officer, and ran to extricate him: but finding his own efforts ineffectual, called for assistance; when another of the guard joining him, they relieved the officer from his situation; and almost at the same instant the shell burst, and levelled the traverse with the ground. Martin was afterwards promoted, and rewarded by the governor; who at the same time told him, that “he should equally have noticed him for attending to his comrade.” A shell happening to fall into the room where Ensign Mackenzie of the 75th regiment was sitting, carried away part of his chair, and fell into the room below, where it burst, lifting him and the chair from the floor without further injury.
the enemy made preparations for the ensuing day, Gibraltar, which was allotted for their grand and decisive attack.

Accordingly, on the morning of the 13th, the ten 44-floating batteries came forward, under the command of

Don Buenaventura de Moreno, a Spanish officer of great the 13th

gallantry, and who had signaled himself at the taking of September

of Minorca. Before ten o’clock they had all got into

their proper stations, anchoring in a line about a thousand yards distant from the shore. As soon as they were properly arranged, they began a heavy cannonade, and were seconded by all the cannon and mortars in the enemy’s lines and approaches, at the same time that the garrison opened all its batteries both with hot and cold shot from the guns, and shells from the howitzers and mortars. This terrible fire continued on both sides without intermixture until noon; when that of the Spaniards began to slacken, and the fire of the garrison to obtain a superiority. About two o’clock, the principal battering ship commanded by Don Moreno was observed to emit smoke as if on fire, and some men were seen upon the roof searching from whence it proceeded. The fire from the garrison was now kept up without the least discontinuance or diminution, while that from the floating batteries was perceived sensibly to decrease; so that about seven in the evening they fired but few guns, and that only at intervals. At midnight the admiral’s ship was plainly seen to burn, and in an hour after was completely in flames. Eight more of these batteries took fire successively; and on the signals of distress made by them, destruction of the multitude of feluccas, launches, and boats, with which they were surrounded, all came to their assistance, and began to take the men out of the burning vessels.

Captain Curtis, who lay ready with the gunboats to take advantage of any favourable circumstance, came upon them at two in the morning, and forming a line on the enemy’s flank, advanced upon them with such order and expedition as to throw them into immediate confusion. At this sudden and unexpected attack they were so astonished and disconcerted, that they fled precipitately with all their boats, totally abandoning the floating batteries to be burnt, and all who were in them to perish in the flames. This would undoubtedly have been their fate, had not Captain Curtis extricated them from the fire at the imminent danger of his own life and that of his men. In this work he was so eager, that while his boat was alongside of one of the largest batteries, it blew up, and the fragments of the wreck spreading all around to a vast distance, some heavy pieces of timber fell into his boat and pierced through its bottom, killing one man and wounding several others. He escaped with difficulty out of this boat, which was sunk, as well as another, by the same accident. The floating batteries were every one consumed; and the violence with which they exploded was such, that doors and windows at a great distance on shore were burst open. About 400 people were saved from them; many of whom were picked up floating on rafts and pieces of timber. Indeed the blowing up of

(c) This was suggested by Lieutenant Governor Boyd, and had been attended with remarkable success, September 8th, when the enemy’s advanced works were almost destroyed by it.
The batteries as the flames reached their powder rooms, and the discharge of the guns in succession as the metal became heated by the fire, rendered any attempt to save them very dangerous.

This terrible catastrophe took place in sight of the combined fleets of France and Spain. It had been proposed that they should co-operate upon this important occasion, by attacking the garrison at Europa Point, and such places as appeared most exposed to an attempt by sea. This, it was afterwards said, must have occasioned a material diversion of the garrison’s force, and, by dividing it, have weakened considerably the vigorous means of defence used in those parts which were actually attacked. The reason assigned for this inactivity was the want of wind.

Though this terrible repulse effectually convinced the Spaniards that Gibraltar could not be taken by force, some hope still remained, that, without any further exertions on their part, the garrison would be obliged to surrender from want of ammunition and provisions. When the news was brought to them, it was received with consternation; 20,000 men were marched to blockade it closely, and to cut off all communication, flattering themselves that Britain would not be able to collect a naval force sufficient to drive their fleet from the bay before the fortress was reduced to extremity; and they imagined must be the case in a few days. Such diligence, however, had been used on the part of the British, that a fleet was already assembled at Portsmouth, consisting of 35 sail of the line, in excellent condition, and filled with the best officers and sailors in Europe. The command was given to Lord Howe, who was accompanied in the expedition by Admirals Barrington, Milbank, Hood, Sir Richard Hughes, and Commodore Hotham, all of them men eminent in their profession. At the same time also it fortunately happened, that a large British fleet of merchantmen had just arrived in safety from the Baltic; and that a Dutch squadron which had been cruising on their own coasts, not being able to penetrate southwards in order to join the French, had retired into port, and given up the intention of effecting any junction for that season.

At this time the British nation was in the utmost anxiety about the fate of Gibraltar. The progress of the ships was delayed by contrary winds, and it was not until they had gained the southern coast of Portugal that they received information of the defeat of the enemy’s attempt on the 13th of September. On the 11th of October, Lord Howe entered the Straits, and several of the store ships destined for Gibraltar came safe to anchor under the cannon of the fort without any molestation from the enemy. The combined fleet in the mean time had been much damaged by a storm; two ships of the line were driven ashore near Algeciras; two more were driven out of the bay into the Mediterranean; others lost their masts, and most of them suffered considerably. One in particular, a ship of 70 guns, was carried by the storm across the bay, and ran aground under the works of Gibraltar, where she was taken by the garrison, with her whole complement of men, consisting of 700. Notwithstanding the endeavours of the enemy to destroy her, she was safely got off, and properly repaired. The combined fleet, however, put to sea on the 13th, with a view to prevent the remaining store ships that had overshot the bay to the east from making good their entrance into it; and at the same time to rejoin the two ships that bad been separated from the main body by the storm. Having the advantage of the wind, they bore down upon the British fleet, which drew up in order of battle to receive them; but notwithstanding their superiority, they declined coming to an engagement. On the wind becoming more favourable next day, Lord Howe took the opportunity to bring in the storeships that were in company; and the day following the remainder were conveyed to Gibraltar, the troops for the reinforcement of the garrison were landed, with a large supply of powder, and ample provision in every other respect. As they returned through the Straits they were threatened with an engagement by the combined fleets; but though the latter had a superiority of 12 ships of the line, they kept a wary distance. Some firing indeed took place, but it was attended with little effect on either side.

This last relief proved entirely decisive; for though the blockade continued till the arrival of the prelimina- 
saries of peace being signed, in the beginning of Fe-
bruary, 1783, no other attack was made. The news of the pacification was received with the utmost joy by the Spaniards. Mutual civilities passed between the commanders in chief, and the Duke de Crillon paid many handsome compliments to the governor and garrison for their noble defence; declaring that he had exerted himself to the utmost of his abilities, and though he had not proved successful, yet he was happy in having his sovereign’s approbation of his conduct.

The possession of Gibraltar is esteemed of very great importance to consequence to Britain. It not only gives us the com-
mand of the Straits, and their navigation; but afford refreshment and accommodation to our fleets in time of war, and to our merchantmen at all times; which, to a maritime power, is of very great advantage. From its situation, it divides both the kingdoms of France and Spain; that is, it hinders a ready communication by sea between the different parts of these kingdoms. This, of course, hinders the conjunction of their fleets and squadrons with each other, or at least renders it so difficult as to be a perpetual check upon these ambitious powers. It avails also the pratical states of Barbary, and in like manner the emperor of Morocco; insomuch, that our commerce is more safe than that of any other European power, which gives us great advantages in point of freight. It is otherwise highly favourable to our trade in the Mediterranean and Levant. It procures us the respect of the Italian and other powers; who, though far distant from Britain, must consider this as an instance of her power to hurt or assist them. It also saves us the expense of squadrons or convoys, upon any disputes or disturbances that may happen among these powers, and which would otherwise be necessary for the protection of our navigation.

The form of this mountain is (says Major Imrie) oblong; its summit a sharp craggy ridge; its direction is nearly from north to south; and its greatest length, in that direction, falls very little short of three miles. Its breadth varies with the indentations of the shore, but it nowhere exceeds three quarters of a mile. The line of its ridge is undulating, and the two extremes are somewhat higher than its centre.

The summit of the Sugar Loaf, which is the point
Gibraltar.

The greater elevation towards the south, is 1,439 feet; the Rock Mortar, which is the highest point to the north, is 1,350; and the Signal House, which is nearly the central point between these two, is 1,276 feet above the level of the sea. The western side of the mountain is a series of rugged slopes, interspersed with abrupt precipices. Its northern extremity is perfectly perpendicular, except towards the north-west, where what are called the Lines intervene, and a narrow passage of flat ground that leads to the isthmus, and is entirely covered with fortification. The eastern side of the mountain mostly consists of a range of precipices; but a bank of sand, rising from the Mediterranean in a rapid, covers a third of its perpendicular height. Its southern extremity falls, in a rapid slope from the summit of the Sugar Loaf, into a rocky flat of considerable extent, called Windmill hill.

"The principal mass of the mountain rock consists of a gray, dense (what is generally called primary) marble; the different beds of which are to be examined in a face of 1,350 feet of perpendicular height, which it presents to Spain in a conical form. These beds, or strata, are of various thickness, from 2 to upwards of 40 feet, dipping in a direction from east to west, nearly at an angle of 35 degrees. In some parts of the solid mass of this rock are found testaceous bodies entirely transmuted into the constituent matter of the rock, and their interior hollows filled up with calcareous spar; but these do not often occur in its composition, and its beds are not separated by any intermediate strata.

"The caves of Gibraltar are many, and some of them of great extent. That which most deserves attention and examination is called St Michael's Cave, which is situated upon the southern part of the mountain, almost equally distant from the Signal Tower, and the Sugar Loaf. Its entrance is 1,000 feet above the level of the sea: This entrance is formed by a rapid slope of earth, which has fallen into it at various periods, and which leads to a spacious hall, incrusted with spar, and apparently supported in the centre by a large massy stalactitical pillar. To this succeeds a long series of caves of difficult access. In these cavernous recesses, the formation and process of stalactities is to be traced, from the slimy quill-like cone, suspended from the roof, to the robust trunk of a pillar, three feet in diameter, which rises from the floor, and seems intended by Nature to support the roof from which it originated.

"The only inhabitants of these caves are bats, some of which are of a large size. The soil, in general, upon the mountain of Gibraltar is but thinly sown; and in many parts that thin covering has been washed off by the heavy autumnal rains, which have left the superficies of the rock, for a considerable extent, bare and open to inspection. In those situations, an observing eye may trace the effects of the slow, but constant, decomposition of the rock, caused by its exposure to the air, and the corrosion of sea-salts, which, in the heavy gales of easterly winds, are deposited with the spray on every part of the mountain. Those uncovered parts of the mountain rock also expose to the eye a phenomenon worthy of some attention, as it tends clearly to demonstrate, that, however high the surface of this rock may now be elevated above the level of the sea, it has once been the bed of agitated waters. This phenomenon is to be observed in many parts of the rock, and is constantly found in the beds of torrents. It consists of pot-like holes, of various sizes, hollowed out of the solid rock, and formed apparently by the attrition of gravel or pebbles, set in motion by the rapidity of rivers or currents in the sea.

"Upon the west side of the mountain, towards its base, some strata occur, which are heterogeneous to the mountain rock: the first, or highest, forms the segment of a circle; its convex side is towards the mountain, and its slopes also in that direction. This stratum consists of a number of thin beds; the outward one, being the thinnest, is in a state of decomposition, and is mouldering down into a blackish brown or ferruginous coloured earth. The beds, inferior to this, progressively increase in breadth to 17 inches, where the stratification rests upon a rock of an argillaceous nature.

"This last bed, which is 17 inches thick, consists of quartz of a blackish blue colour, in the septs or cracks of which are found fine quartz crystals, colourless, and perfectly transparent. These crystals are composed of 18 planes, disposed in hexagonal columns, terminated at both extremities by hexagonal pyramids. The largest of those that Major Imrie saw did not exceed one-fourth of an inch in length: They, in general, adhere to the rock by the sides of the column, but are detached without difficulty. Their great degree of transparency has obtained them the name of Gibraltar diamonds.

"In the perpendicular fissures of the rock, and in some bones of the caverns of the mountain (all of which afford evident proofs of their former communication with the surface), a calcareous concretion is found, of a reddish brown ferruginous colour, with an earthy fracture, and considerable induration, inclosing the bones of various animals, some of which have the appearance of being human. These bones are of various sizes, and lie in all directions, intermixed with shells of snails, fragments of the calcareous rock, and particles of spar; all of which materials are still to be seen in their natural uncombined states, partially scattered over the surface of the mountain. These have been swept, by heavy rains at different periods, from the surface into the situations above described, and having remained for a long series of years in those places of rest, exposed to the permeating action of water, have become enveloped, and cemented by, the calcareous matter which it deposited.

"The bones, in this composition, have not the smallest appearance of being petrified; and if they have undergone any change, it is more like that of calcification than that of petrifaction, as the most solid parts of them generally admit of being cut and scraped down with the same ease as chalk.

"Bones combined in such concretions are not peculiar to Gibraltar: they are found in such large quantities in the country of Dalmatia and upon its coasts, in the islands of Cherson and Osero, that some naturalists have been induced to go so far as to assert, that there has been a regular stratum of such matter in that country, and that its present broken and interrupted appearance has been caused by earthquakes, or other convulsions, experienced in that part of the globe. But, of late years, a traveller (Abbé Alberti Fortis) has given a minute description of the concretion in which the bones are found in that country: And by his account it appears, that with regard to situation, composition, and colour,
By his description, it also appears that the two mountain rocks of Gibraltar and Dalmatia consist of the same species of calcareous stone; from which it is to be presumed, that the concretions in both have been formed in the same manner and about the same periods.

"Perhaps if the fissures and caves of the rocks of Dalmatia were still more minutely examined, their former communications with the surface might yet be traced, as in those described above; and, in that case, there would be at least a strong probability, that the materials of the concretions of that country have been brought together by the same accidental cause which has probably collected those found in the caverns of Gibraltar. Major Imrie traced, in Gibraltar, this concretion, from the lowest part of a deep perpendicular fissure, up to the surface of the mountain. As it approached to the surface, the concretion became less firmly combined, and, when it had no covering of the calcareous rock, a small degree of adhesion only remained, which was evidently produced by the argillaceous earth, in its composition, having been moistened by rain and baked by the sun."

"The depth at which these materials had penetrated by that proportion of stalactitical matter, capable of giving to the concretion its greatest adhesion and solidity, be found to vary according to its situation, and to the quantity of matter to be combined. In fissures, narrow and contracted, he found the concretion possessing a great degree of hardness at six feet from the surface; but in other situations more extended, and where a larger quantity of the materials had been accumulated, he found it had not gained its greatest degree of adhesion at double that depth. In one of the caves, where the mass of concretion is of considerable size, he perceived it to be divided into different beds, each bed being covered with a crust of the stalactitical spar, from one inch to an inch and a half in thickness, which seems to indicate, that the materials have been carried in at various periods, and that those periods have been very remote from each other."

"At Rossia bay, upon the west side of Gibraltar, this concretion is found in what has evidently been a cavern, originally formed by huge unshapely masses of the rock which have tumbled in together. The fissure, or cavern, formed by the disruption and subsidence of those masses, has been entirely filled up with the concretion, and is now exposed to full view by the outward mass having dropped down in consequence of the encroachments of the sea. It is to this spot that strangers are generally led to examine the phenomenon; and the composition having here attained to its greatest degree of hardness and solidity, the hasty observer, seeing the bones inclosed in what has so little the appearance of having been a vacancy, examines no further, but immediately adopts the idea of their being incased in the solid rock.

"The communication from this former chasm, to the surface from which it has received the materials of the concretion, is still to be traced in the face of the rock, but its opening is at present covered by the base of the line wall of the garrison. Here bones are found that are apparently human; and those of them that appear to be of the legs, arms, and vertebrae of the back, are scattered among others of various kinds and sizes, even down to the smallest bones of small birds. Major Imrie found here the complete jaw-bone of a sheep; it contained its full complement of teeth, the enamel of which was perfect, and its whiteness and lustre in no degree impaired. In the hollow parts of some of the large bones was mantained a minute crystallization of a pure and colourless calcareous spar; but, in most, the interior part consisted of a spongy crust of a reddish colour, scarcely in any degree transparent."

"At the northern extremity of the mountain, the concretion is generally found in perpendicular fissures. The miners there employed upon the fortifications, is excavating one of those fissures, found at a great depth from the surface, two skulls, which were supposed to be human; but, to the Major, one of them, if not both, appeared to be too small for the human species. The bone of each was perfectly firm and solid; from which it is to be presumed, that they were in a state of maturity before they were included in the concretion. Had they appertained to very young children, perhaps the bone would have been more porous, and of a less firm texture. The probability is, that they belonged to a species of monkey, which still continues to inhabit, in considerable numbers, those parts of the rock which are to us inaccessible."

"This concretion varies, in its composition, according to the situation in which it is found. At the extremity of Prince's Line, high in the rock which looks towards Spain, it is found to consist only of a reddish calcareous earth, and the bones of small birds connected thereby. The rock around this spot is inhabited by a number of hawks, that, in the breeding season, nestle here and rear their young; the bones in this concretion are probably the remains of the food of those birds. At the base of the rock, below King's Lines, the concretion consists of pebbles of the prevailing calcareous rock. In this concretion, at a very considerable depth under the surface, was found the under parts of a glass bottle, uncommonly shaped, and of great thickness; the colour of the glass of a dark green."

"The subterranean galleries are very extensive, under the rock in several places, and in various directions, and at various degrees of elevation; all of them having a communication with each other, either by flights of steps cut in the rock, or by wooden stairs where the passages are required to be very perpendicular."

"The sentinel may now be relieved during a siege from one post to another in perfect safety; whereas, previously to the constructing of these galleries a vast number of men were killed by the Spaniards while marching to their several stations. The width of these galleries is about twelve feet, their height about fourteen. The rock is broken through in various places, both for the purpose of giving light and for placing the guns to bear on the enemy. In different parts there are spacious recesses, capable of accommodating a considerable number of men. To these recesses they give names, such as St Patrick's Chamber, St George's Hall, &c. The whole of these singular structures have been formed out of the solid rock by blasting with gunpowder."

"Through the politeness of an officer on duty, a place called Smart's Reservoir was opened for our inspection, which is a great curiosity, and not generally permitted to be shown. It is a spring at a considerable depth in the body of the rock, and is above 700 feet above the level of the sea; we descended into the cavern that contains
in Westmorland, in 1699. He applied himself early and vigorously to learning, and displayed his knowledge in several writings and translations, which recommended him to the patronage of Archbishop Tenison. He was appointed domestic chaplain to his Grace; and we soon after find him rector of Lambeth, and archdeacon of Surrey. Becoming thus a member of the convocation, he engaged in a controversy, which was carried on with great warmth by the members of both houses, and defended his patron's rights, as president, in eleven pamphlets; he then formed and completed his more comprehensive scheme of the legal duties and rights of the English clergy, which was at length published under the title of Codex Juris Ecclesiastici Anglicani, in folio. Archbishop Tenison dying in 1715, and Dr Wake bishop of Lincoln being made archbishop of Canterbury, Dr Gibson succeeded the latter in the see of Lincoln, and in 1720 was promoted to the bishopric of London. He saw not only governed his diocese with the most exact regularity, but by his great care promoted the spiritual affairs of the church of England colonies in the West Indies. He was extremely jealous of the least of the privileges belonging to the church; and therefore, though he approved of the toleration of the Protestant Dissenters, he continually guarded against all the attempts made to procure a repeal of the corporation and test acts; in particular, his opposition to those lickings assemblies called masquerades, gave great annoyance at court, and effectually excluded him from all further favours. He spent the latter part of his life in writing and printing pastoral letters, visitation-charges, occasional sermons, and tracts against the prevailing immoralities of the age. His pastoral letters are justly esteemed as the most masterly productions against indigence and enthusiasm. His most celebrated work, the Codex, has been already mentioned. His other publications are, 1. An edition of Drummond's Poleno Middlinia, and James V. of Scotland's Cantilen Rustica, with notes. 2. The Chronicon Saxonicum, with a Latin translation, and notes. 3. Religiae Spelmaniana, the posthumous works of Sir Henry Spelman, relating to the laws and antiquities of England. 4. An edition of Quintilian de Arte Oratoria, with notes. 5. An English translation of Camden's Britannia, with additions, two volumes folio: and, 6. A number of small pieces, that have been collected together and printed in three volumes folio.—His intense application to study impaired his health; notwithstanding which, he attained the age of 79. He expired in September 1748, after an episcopate of near 33 years. —With regard to Bishop Gibson's private life and character, he was in every respect a perfect economist. His abilities were so well adapted to discharge the duties of his sacred function, that during the incapacity of Archbishop Wake, the transaction of ecclesiastical affairs was committed to the bishop of London. He was a true friend to the established church and government, and as great an enemy to persecution. He was usually consulted by the most learned and exalted personages in church and state, and the greatest deference was paid to his judgment. He possessed the social virtues in an eminent degree; his beneficence was very extensive; and he had such genrosity,
rosity, that he freely gave two thousand five hundred pounds, left him by Dr Crow, who was once his chaplain, to Crow's own relations, who were very poor.

Gideon, the son of Ophrah, of the tribe of Manasseh. He dwelt in the city of Ophrah; and had a very extraordinary call to deliver the Israelites from the oppression of the Midianites, to which they had become subject after the death of Barak and Deborah. Having effected their deliverance by supernatural aid, he was chosen judge of Israel in the year of the world 2759, and died in 2768. (See Judges, chap. vi. vii. and viii.)

Gift, Donum, in Law, is a conveyance which passes either lands or goods; and is of a larger extent than a grant, being applied to things moveable and immoveable; yet as to things immoveable, when taken strictly, it is applicable only to lands and tenements given in tail; but gift and grant are too often confounded.

New Year's Gifts; presents made on new year's day, as a token of the giver's good will, as well as by way of presage of a happy year.

This practice is very ancient, the origin of it among the Romans being referred to Tatius of the Sabines, who reigned at Rome conjointly with Romulus, and who having considered a good omen a present of some sprigs of vervain gathered in a wood consecrated to Sternia, the goddess of strength, which he received on the first day of the new year, authorized this custom afterwards, and gave to these presents the name of Sterna. However this may be, the Romans on that day celebrated a festival in honour of Janus, and paid their respects at the same time to Juno; but they did not pass it in idleness, lest they should become indolent during the rest of the year. They sent presents to one another of figs, dates, honey, &c. to show their friends that they wished them a happy and agreeable life. Clients, that is to say, those who were under the protection of the great, carried presents of this kind to their patrons, adding to them a small piece of silver. Under Augustus, the senate, the knights, and the people, presented such gifts to him, and in his absence deposited them in the Capitol. Of the succeeding princes some adopted this custom, and others abolished it, but it always continued among the people. The early Christians condemned it, because it appeared to be a relic of Paganism, and a species of superstition; but when it began to have no other object than that of being a mark of veneration and esteem, the church ceased to disapprove of it.

Gigg, Giga, or Gia, in Music and Dancing, a gay, brisk, sprightly composition, and yet in full measure, as well as the allemand, which is more serious. Manage takes the word to arise from the Italian gigia, a musical instrument mentioned by Dante. Others suppose it to be derived from the Teutonic gigia, or ghighe, a fiddle. This is a favourite air in most nations of Europe: its characteristic is duple time, marked $\xi$, or $\psi$: it consists of two strains, without any determinate number of bars.

Gigglewick, a town in the west riding of Yorkshire, half a mile from Settle, stands on the river Ribble; where, at the foot of a mountain, is a spring, the most noted in England for ebbing and flowing sometimes thrice an hour, and the water subsides three quarters of a yard at the reflux, though the sea is 30 miles off. At this town is an eminent free grammar school; and in the neighbourhood are dog up flags, slate, and stone.

Gihon, in Ancient Geography, one of the rivers of Paradise; according to Wells, the eastern branch of the Euphrates, into which it divides after its conjunction with the Tigris.

Gilan, or Ghilan, a considerable province of Persia, on the side of the Caspian sea, to the southwest. It is supposed to be the Hyrcania of the ancients. It is very agreeably situated, having the sea on one side and high mountains on the other; and there is no entering in but through narrow passes, which may easily be defended. The sides of the mountains are covered with many sorts of fruit trees, and in the highest parts of them there are deer, bears, wolves, leopards, and tigers; which last the Persians have a method of taming, and but with them as we do with dogs. Gilan is one of the most fruitful provinces of Persia, and produces abundance of silk, oil, wine, &c. and tobacco, besides excellent fruits. The inhabitants are brave, and of a better complexion than the other Indians, and the women are accounted extremely handsome. Resht is the capital town.

Gilbert, or Gilbert, William, a physician, was born at Colchester in the year 1549, the eldest son of the recorder of that borough. Having spent some time in both universities, he went abroad; and at his return settled in London, where he practised with considerable reputation. He became a member of the College of Physicians, and physician in ordinary to Queen Elizabeth, who, we are told, gave him a pension to encourage him in his studies. From his epitaph it appears that he was also physician to King James I. He died in the year 1603, aged 63; and was buried in Trinity church in Colchester, where a handsome monument was erected to his memory. His books, globes, instruments, and fossils, he bequeathed to the College of Physicians, and his picture to the school gallery at Oxford. He wrote, 1. De Magnete, magnetico corporis, et de magni magneti tellure. physiologia nova; London 1600, folio. 2. De mundo nostro sublunari philosophia nova: Amsterdam 1637, 4to. He was also the inventor of two mathematical instruments for finding the latitude at sea without the help of sun, moon, or stars. A description of these instruments was afterwards published by Thomas Blondel in his Theoricae of the Planets.

Gilbert, Sir Humphrey, a brave officer and skilful navigator, was born about the year 1559, in Devonshire, of an ancient and honourable family. Though a second son, he inherited a considerable fortune from his father. He was educated at Eton, and afterwards at Oxford; where probably he did not continue long. It seems he was intended to finish his studies in the Temple; but being introduced at court by his aunt Mrs Catharine Ashley, then in the queen's service, he was diverted from the study of law, and commenced soldier. Having distinguished himself in several military expeditions, particularly that to Newhaven in 1563, he was sent over to Ireland to assist in suppressing a rebellion; where, for his signal services, he was made commander in chief and gover
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or of Munster, and knighted by the lord deputy, Sir Henry Sidney, on the first day of the year 1570. He returned soon after to England, where he married a rich heiress. Nevertheless, in 1572, he sailed with a squadron of nine ships to reinforce Colonel Morgan, who at that time mediated the recovery of Flushing. Probably on his return to England he resumed his cosmographical studies, to which he was naturally inclined; for, in the year 1576, he published his book on the north-west passage to the East Indies; and as Martin Frobisher sailed in the same year, probably it was in consequence of this treatise. In 1578, he obtained from the queen a very ample patent, empowering him to discover and possess in North America any lands then unsettled. He sailed to Newfoundland, but soon returned to England without success; nevertheless, in 1583, he embarked a second time with five ships, the largest of which put back an account of a contagious distemper on board. Our general landed on Newfoundland on the third of August, and on the fifth took possession of the harbour of St John's. By virtue of his patent he granted leases to several people; but though none of these remained there at that time, they settled afterwards in consequence of these leases; so that Sir Humphrey deserves to be remembered as the real founder of the vast American empire. On the 20th of August he put to sea again, on board a small sloop; which on the 23rd foundered in a hard gale of wind. Thus perished Sir Humphrey Gilbert; a man of quick parts, a brave soldier, a good mathematician, a skilful navigator, and of a very enterprising genius. We learn also, that he was remarkable for his eloquence, being much admired for his patriotic speeches both in the English and Irish parliaments. He wrote "A discourse to prove a passage by the north-west to Cathiaia and the East Indies, printed London 1576." This treatise, which is a masterly performance, is preserved in Hakluyt's Collection of Voyages, vol. iii. p. 11. The style is superior to most, if not to all, the writers of that age; and shows the author to have been a man of considerable reading. He mentions, at the close of this work, another treatise on navigation, which he intended to publish: it is probably lost.

GILBERTINES, an order of religious, thus called from St Gilbert of Sempringham, in the county of Lincoln, who founded the same about the year 1148: the monks of which observed the rule of St Augustine, and were accounted canons; and the nuns of that of St. Benedict.

The founder of this order erected a double monastery, or rather two different ones, contiguous to each other, the one for men, the other for women, but parted by a very high wall.

St Gilbert himself founded 13 monasteries of this order, viz. four for men alone, and nine for men and women together, which had in them 700 brethren and 1500 sisters. At the dissolution there were about 25 houses of this order in England and Wales.

GILBOA, in Ancient Geography, mountains of Samaria, stretching out from west to east, on the confines of the half tribe of Manasseh, and of the tribe of Issachar, and to the south part of the valley of Jezreel; beginning westward at the city of Jezreel, situated at the foot of these mountains, reaching almost quite to the Jordan, lying at the distance of six miles from Scythopolis. Famous for the death of Saul and his son Jonathan, and the defeat of the Israelites by the Philistines.

GILCHRIST, Dr Ebenezer, an eminent Scots physician, was born at Dumfries in 1707. He began the study of medicine at Edinburgh, which he afterwards prosecuted at London and Paris. He obtained the degree of doctor of medicine from the university of Rheims; and in the year 1732 he returned to the place of his nativity, where he afterwards constantly resided, and continued the practice of medicine till his death. It may with justice be said, that few physicians of the present century have exercised their profession in a manner more respectable or successful than Dr Gilchrist; and few have contributed more to the improvement of the healing art. Having engaged in business at an early period of life, his attention was wholly devoted to observation. Endowed by nature with a judgment acute and solid, and a genius active and inventive, he soon distinguished himself by departing, in various important particulars, from established but unsuccessful modes of practice. Several of the improvements which he introduced have procured him great and deserved reputation both at home and abroad. His practice, in ordinary cases, was always to be judicious, and placed him high in the confidence and esteem of the inhabitants of that part of the country where he lived. But his usefulness was not confined to his own neighbourhood. On many occasions he was consulted by letter from the most distant parts of the country. In different collections are to be found several of his performances, which prove that he had something new and useful to offer upon every subject to which he applied himself. But those writings which do him the greatest honour are two long dissertations on Nervous Fevers, in the Medical Essays and Observations published by a Society in Edinburgh; and a treatise on the use of Sea Voyages in Medicine, which first made its appearance in the year 1757, and was afterwards reprinted in 1771. By means of the former, the attention of physicians was first turned to a species of fever which is now found to prevail universally in this country; and the liberal use of wine, which he was the first among the moderns to recommend, has since been adopted in those fevers by the most judicious physicians of the present age, and has probably contributed not a little to the success of their practice. His treatise on Sea Voyages points out their utility in various distempers, and particularly in consumptions; but experience by no means confirms the observation, that there is now a prospect of our being able to employ a remedy in this unhurt disease much more efficacious than any hitherto in use. Dr Gilchrist died in 1774.

GILD, or GUILD. See GUILD.

GILDAS, surnamed the Wise, was born in Wales in the year 511. Where he was educated is uncertain; but it appears from his own writings that he was a monk. Some writers say that he went over to Ireland; others, that he visited France and Italy. They agree however in asserting, that after his return to England he became a celebrated and most assiduous preacher of the gospel. Dr Pinn says he founded a monastery at Veneta in Britain. Gildas is the only British author of the sixth century whose works are printed;
GILDING, the art of spreading or covering a thing with gold, either in leaf or liquid. The art of gilding was not unknown among the ancients, though it never arrived among them at the perfection to which the moderns have carried it. Pliny assures us, that the first gilding seen at Rome was after the destruction of Carthage, under the censorship of Lucius Mummius, when they began to gild the ceilings of their temples and palaces; the Capitol being the first place on which this enrichment was bestowed. But he adds, that luxury advanced on them so hastily, that in a little time you might see all, even private and poor persons, gild the very walls, vaults, &c. of their houses.

We need not doubt but they had the same method with us, of beating gold, and reducing it into leaves; though it should seem they did not carry it to the same height, if it be true which Pliny relates, that they only made 750 leaves of four fingers square out of a whole ounce. Indeed he adds, that they could make more; that the thickest were called bractae Prænestes, by reason of a statue of the goddess Fortune at Prænesta gilt with such leaves; and that the thinnest sort was called bractae questorarum.

The modern gilders do also use make of gold leaves of divers thicknesses; but there are some so fine, that a thousand do not weigh above four or five drachms. The thickest are used for gilding on iron and other metals; and the thinnest on wood. But we have another advantage over the ancients in the manner of using or applying the gold: the secret of painting in oil, discovered of late ages, furnishes us with means of gilding works that shall endure all the injuries of time and weather, which to the ancients was impracticable. They had no way to lay the gold on bodies that would not endure the fire but with whites of eggs or size, neither of which will endure the water; so that they could only gild such places as were sheltered from the moisture of the weather.

The Greek called the composition on which they applied their gilding on wood leucophorum or leucophorum; which is described as a sort of glutinous compound earth, serving in all probability to make the gold stick and bear polishing. But the particulars of this earth, its colour, ingredients, &c., the antiquaries and naturalists are not agreed upon.

The lustre and beauty of gold have occasioned several inquiries and discoveries concerning the different methods of applying it to different substances. Hence the art of gilding is very extensive, and contains many particular operations and various management.

A colour of gold is given by painting and by varnishes, without employing gold; but this is a false kind of gilding. Thus a very fine golden colour is given to brass and to silver, by applying upon these metals a gold-coloured varnish, which, being transparent, shows all the brilliancy of the metals beneath. Many ornaments of brass were varnished in this manner, which is called gold lacquering, to distinguish them from those which are really gilt. Silver leaves thus varnished are put upon leather, which is then called gilt leather. See Opaque Lacquer.

Amongst the false gilding may also be reckoned those which are made with thin leaves of copper or brass, called Dutch leaf. In this manner are made all the kinds of what is called gilt paper.

In the true gilding, gold is applied to the surface of bodies. The gold intended for this purpose ought in general to be beat into thin leaves, or otherwise divided into very fine parts.

As metals cannot adhere well merely by contact in any but to other metallic substances, when gold is to be applied to the surface of some unmetallic body, that surface must be previously covered with some gluey and tenacious substance by which the gold shall be made to adhere. These substances are in general called sizes. Some of these are made of vegetable and animal glues, and others of oily, gluey, and drying matters. Upon them the leaves of gold are applied, and pressed down with a little cotton or a hare's foot; and when the whole is dry, the work is to be finished and polished with a hard instrument, called a dog's tooth, to give lustre.

When the work is required to be capable of resisting rain or moisture, it must be previously covered with a composition of drying oil, yellow ochre, ground together; otherwise a water size may be used, which is prepared by boiling cuttings of parchment or white leather in water, and by mixing with this some chalk or whiting; several layers of this size must be laid upon the wood, and over these a layer of the same size mixed with yellow ochre. Lastly, another mixture, called gold size, is to be applied above these upon which the gold leaves are to be fixed. This gold size, the use of which is to make the gold leaf capable of being burnished, is composed of tobacco-pipe clay, ground with some ruddle or black-lead, and tempered with a little tallow or oil of olives. The edges of glasses may be gilt by applying first a very thin coat of varnish, upon which the gold leaf is to be fixed; and when the varnish is hardened, may be burnished. This varnish is prepared by boiling powdered amber with linseed oil in a brass vessel to which a valve is fitted, and by diluting the above solution with four or five times its quantity of oil of turpentine; and that it may dry sooner, it may be ground with some white lead.

The method of applying gold upon metals is entirely different. The surface of the metal to be gilt is first to be cleaned; and then leaves are to be applied to it, which, by means of rubbing with a polished bloodstone, and a certain degree of heat, are made to adhere perfectly well. In this manner silver leaf is fixed and burnished upon brass in the making of what is called French plate, and sometimes also gold leaf is burnished upon copper and upon iron.

Gold is applied to metals in several other ways. One of these is by previously forming the gold into a paste or amalgam with mercury. In order to obtain a small amalgam of gold and mercury, the gold is first to be reduced into thin plates or grains, which are heated red hot, and thrown into mercury previously heated, till it begins to smoke. Upon stirring the mercury with an iron rod, the gold totally disappears. The proportion of mercury to gold is generally as six or eight to one.
Gilding.

With this amalgam, the surface of the metal to be gilded is to be covered; then a sufficient heat is to be applied to evaporate the mercury and the gold is lastly to be burned with a blood-stone.

This method of gilding by amalgamation is chiefly used for gilding copper, or an alloy of copper, with a small portion of zinc, which more readily receives the amalgam and is also preferable for its colour, which more resembles that of gold than the colour of copper. When the metal to be gilt is wrought or chased, it ought to be previously covered with quicksilver before the amalgam is applied, that this may be easier spread; but when the surface of the metal is plain, the amalgam may be applied directly to it. The quicksilver or amalgam is made to adhere to the metal by means of a little aquafortis, which is rubbed upon the metallic surface at the same time, by which this surface is cleansed from any rust or tarnish which might prevent the union or adhesion of the metals. But the use of the nitrous acid in this operation is not, as is generally supposed, confined merely to cleanse the surface of the metal to be gilt from any rust or tarnish it may have acquired; but it also greatly facilitates the application of the amalgam to the surface of that metal, probably in the following manner: It first dissolves part of the mercury of the amalgam; and when this diffusion is applied to the copper, this latter metal having a stronger affinity for nitrous acid than the mercury has, precipitates the mercury upon its surface, in the same manner as a polished piece of iron precipitates copper upon its surface from a solution of blue vitriol. When the metal to be gilt is thus covered over with a thin precipitated coat of mercury, it readily receives the amalgam. In this solution and precipitation of mercury, the principal use of the nitrous acid in the process of gilding appears to consist. The amalgam being equally spread over the surface of the metal to be gilt by means of a brush, the mercury is then to be evaporated by a heat just sufficient for that purpose; for if it be too great, part of the gold may be expelled, and part of it will run together, and leave some of the surface of the metal bare; while the mercury is evaporating, the piece is to be from time to time taken from the fire, that it may be examined, that the amalgam may be spread more equally by means of a brush, and that defective parts of it may be again covered, and that the heat may not be suddenly applied to it: when the mercury is evaporated, which is known by the surface being entirely become of a dull yellow colour, the metal must then undergo other operations, by which the fine gold colour is given to it. First, the gilded piece of metal is rubbed with a scratch brush (which is a brush composed of brass wire) till its surface is made smooth; then it is covered over with a composition called gilding wax, and is again exposed to the fire till the wax be burnt off. This wax is composed of bees wax, sometimes mixed with some of the following substances: red ochre, verdigrise, copper scales, alum, vitriol, borax: but according to Dr Lewis, the saline substances alone are sufficient, without any wax. By this operation the colour of the gilding is heightened; and this effect seems to be produced by a perfect dissipation of some mercury remaining after the former operation. This dissipation is well effected by this equable application of heat. The gilt surface is then covered over with a saline composition, consisting of nitre, alum or other vitriolic salt, ground together, and mixed up into a paste with water or urine. The piece of metal thus covered is exposed to a certain degree of heat, and then quenched in water. By this method its colour is further improved, and brought nearer to that of gold. This effect seems to be produced by the acid of nitre (which is disengaged by the vitriolic acid of the alum, or other vitriolic salt, during the exposure to heat) acting upon any particles of copper which may happen to lie on the gilded surface. Lastly, some artists think that they give an additional lustre to their gilt work by dipping it in a liquor prepared by boiling some yellow materials, as sulphur, orpiment, or turmeric. The only advantage of this operation is, that a part of the yellow matter, as the sulphur or turmeric, remains in some of the hollows of the carved work, in which the gilding is apt to be more imperfect, and to which it gives a rich and solid appearance.

Iron cannot be gilt by amalgamation, unless, as it is said, it be previously coated with copper by dipping in a solution of blue vitriol. Iron may also receive a golden coat from a saturated solution of gold in aqua regia, mixed with spirit of wine, the iron having a great affinity with the acid, from which it therefore precipitates the gold. Whether any of these two methods be applicable to use, is uncertain: but the method commonly employed of fixing gold upon iron is that above mentioned, of burning off the gold leaf upon this metal when heated so as to become blue, and the operation will be more perfect if the surface has been previously scratched or grated.

Another method is mentioned by authors of gilding upon metals, and also upon earthen ware, and upon glass: which is to fuse gold with regulus of antimony, to pulverize the mass which is sufficiently brittle to admit that operation, to spread this powder upon the piece to be gilt, and expose it to such a fire that the regulus may be evaporated, while the gold remains fixed. The inconveniences of this method, according to Dr Lewis, are, that the powder does not adhere to the piece, and cannot be equally spread; that part of the gold is dissipated along with the regulus that glass is fusible with the heat necessary for the evaporation of regulus of antimony; and that copper is liable to be corroded by the regulus, and to have its surface rendered uneven.

On this subject of gilding by amalgamation Dr Lewis improves has the following remarks. There are two principal inconveniences in this business: One, that the workmen are exposed to the fumes of the mercury, and generally, sooner or later, have their health greatly impaired by them: the other, the loss of the mercury; for though part of it is said to be detained in cavities made in the chimney for that purpose, yet the greatest part of it is lost. From some trials I have made, it appeared that both these inconveniences, particularly the first and most considerable one, might in good measure be avoided, by means of a furnace of a due construction. If the communication of a furnace with its chimney, instead of being over the fire, is made under the grate, the ash-pit door, or other apertures beneath the grate, closed, and the mouth of the furnace left open; the current of air, which otherwise would have entered be...
Gilding.

The foregoing process is given entirely on the authority of the French writer. I have had no experience of it myself, but have seen very elegant figures of gold raised upon silver, on the same principle, by a different procedure. Some cinnaubar was ground, not with the distilled spirit, but with the expressed juice of garlic, a fluid remarkably tenacious. This mixture was spread all over the polished silver; and when the first layer is dry, a second, and after this a third, was applied. Over these were spread as many layers of another mixture, composed chiefly of asphaltum and linseed oil boiled down to a due consistence. The whole being dried with a gentle heat on a kind of wire grate, the figures were traced and cut down to the silver so as to make its surface rough: the incisions were filled with an amalgam of gold, raised to different heights in different parts according to the nature of the design; after which a gentle fire, at the same time that it evaporated the mercury, destroyed the tenacity of the gummy juice, so that the coating, which served to confine the amalgam, and as a guide in the application of it, was now easily got off. The gold was then pressed down and embossed as in the former method; and had this advantage, that the surface of the silver under it having been made rough, it adhered more firmly, so as not to be in danger of coming off, as M. du Fay says the gold applied in his way sometimes did.

The artist, however, found the process so troublesome, that though he purchased the receipt for a considerable sum, he has laid the practice aside.

Finally, some metals, particularly silver, may be gilt in the following manner:

Let gold be dissolved in aqua-regia. In this solution pieces of silver are to be dipped, and burnt to black ashes. These ashes being rubbed on the surface of the silver by means of a wet linen rag, apply the particles of gold which they contain, and which by this method adhere very well. The remaining part of the ashes is to be washed off; and the surface of the silver, which in this state does not seem to be gilt, is to be burnedished with a blood-stone, till it acquire a fine colour of gold. This method of gilding is very easy, and consumes a very small quantity of gold. Most gilt ornaments upon fans, snuff boxes, and other toys of such show and little value, are nothing but silver gilt in this manner.

Gold may also be applied to glass, porcelain, and other vitrified matters. As the surface of these matters of gilding is very smooth, and consequently is capable of a very perfect contact with gold leaves, these leaves adhere to them with some force, although they are not of metallic nature. This gilding is so much more perfect, as the gold is more exactly applied to the surface of the glass. The pieces are then to be exposed to a certain degree of heat, and burnished slightly to give them lustre.

A more substantial gilding is fixed upon glass, enamel, and porcelain, by applying to these substances powder of gold mixed with a solution of gum arabic, or with some essential oil, and a small quantity of borax; after which a sufficient heat is to be applied to soften the glass and the gold, which is then to be burnished. With this mixture any figures may be drawn. The powders for this purpose may be made, in grinding gold leaf with honey, which is afterwards
himself a complete master: in short, there was no branch of knowledge that could either enlarge or enrich Biblical learning, which, however difficult, was not attempted and attained: and it may be truly asserted, that in this line he had but few equals, and that the annals of literature do not exhibit a character by whom he was excelled.

In 1748, Mr. Gill published a commentary on the New Testament, in three volumes folio. The immense reading and learning discoverable in this arduous work, attracted the attention of the Marischal College and University of Aberdeen; and procured for him, without either his solicitation or his knowledge, a diploma, creating him doctor in divinity. This intelligence was communicated to the doctor in the most handsomely terms by the professors Osborn and Pollock; who declared, 'that on account of his knowledge of the Scriptures, of the Oriental languages, and of Jewish antiquities, of his learned defence of the Scriptures against Deists and Infidels, and the reputation gained by his other works; the university had, without his privity, unanimously agreed to confer on him the degree of doctor in divinity.'

Dr. Gill's sentiments, as a divine, were throughout Calvinistic: "And perhaps no man (says the Rev. Mr. Toplady, a minister in the church of England) since the days of Austin, has written so largely in defence of the system of grace; and certainly no man has treated that momentous subject in all its branches, more closely, judiciously, and successfully. What was said of Edward the Black Prince, that he never fought a battle which he did not win; what has been remarked of the great duke of Marlborough, that he never undertook a siege which he did not carry: may be justly accommodated to our great philosopher and divine; who, so far as the distinguishing doctrines of the gospel are concerned, never besieged an error which he did not force from its strong holds, nor ever encountered an adversary whom he did not baffle and subdue. His learning and labours, if exceedable, were exceedable only by the invincible sanctity of his life and conversation. From his childhood to his entrance on the ministry, and from his entrance on the ministry to the moment of his dissolution, not one of his most inveterate opposers was ever able to charge him with the least shadow of immorality. Himself, no less than his writings, demonstrated that the doctrine of grace does not lead to licentiousness. Those who had the honour and happiness of being admitted into the number of his friends, can go still farther in their testimony. They know that his moral demeanour was more than blameless: it was from first to last consistently exemplary. And indeed an undeviating consistency, both in his views of evangelical truths, and in his obedience as a servant of God, was one of those qualities by which his cast of character was eminently marked. He was in every respect a burning and a shining light: burning with love to God, to truth, and to souls; shining as an example to believers, in word, in faith, in purity; a pattern of good works, and a model of all holy conversation and godliness; and while true religion and sound learning have a single friend remaining in the British empire, the works and name of Gill will be precious and revered.'

He died at Camberwell, October 14, 1771, aged 73 years 10 months and 10 days. In 1718, the Doctor married Mrs. Elizabeth Negus; by whom he had many children, two of whom only survived him. Mrs. Gill died in 1764.


GILL, a measure of capacity, containing a quarter of an English pint.

GILLS or Branch of fishes. See Anatomy Index.

GILLINGHAM, a parish in Dorsetshire, on the river Stour, near the forest of its own name; where, anno 1016, King Edmund Ironside vanquished the Danes. It is one of the largest parishes in the county, being 41 miles in circuit, containing 64,000 acres. It lies on the borders of Wilts and Somerset, four miles north-west of Shaftesbury. It has a manufacture of linen, but the chief produce is grazing and the dairies. Near it are the traces of an ancient residence of Normans or Saxon kings, 320 feet long and 240 broad, surrounded by a rampart of earth. Henry I. resided here, and King John repaired it at the expense of the county. Edward I. spent his Christmas here in 1270; but the whole of the materials are removed, and the foundation of the house only can be traced, which was in the form of the letter L, in length 180 feet by 80 broad, and the foot of the letter 48 by 40; the area of the house containing 168,000 square feet. It stood half a mile from the church, on the road to Shafton, encompassed by a moat, now dry, in some places three feet deep and 20 broad. The rampart appears to have been 30 feet thick. Here is a free school, a large old building, and a workhouse, as well as two stone bridges. In 1694, it received damage of good stock. Near it is a Gillingham forest, four miles long and one mile broad. The church is a large ancient fabric.

GILLINGHAM, a parish of Kent, three miles below Chatham, and on the same side of the Medway. Part of Chatham dock is in this parish; and here is a castle well furnished with guns that commands the river, there being no less than 170 embrasures for cannon; which would stop the progress of any enemy that should happen to make way by Sheerness fort, before they could reach Chatham. Here are also copperas works. At this place 600 Norman gentlemen, who came over is the retinue of the two princes Alfred and Edward, were all barbarously murdered by Earl Godwin. It was in remote times the property of the archbishop of Canterbury, who had here an elegant palace, the old hall of which is now converted into a barn; it is built principally of flint, but the windows are filled up with brick. Near it are the remains of the chapel, &c., and a great part of the whole of its original outer walls may be traced.

GILOLO, a large island of the Pacific ocean, lying between 1° S. Lat. and 2° N. Lat. and between 125° and 128° E. Long. It belongs to the Dutch...
but does not produce any of the fine spices, though it lies in the neighbourhood of the spice islands. The natives are fierce and cruel savages.

GILPIN, BERNARD, rector of Houghton, distinguished by his extraordinary piety and hospitality, was descended from an ancient and honourable family in Westmoreland, and born in 1517. As he was bred in the Catholic religion, so he for some time defended it against the reformers, and at Oxford held a disputation with Hooper, afterward bishop of Worcester and a martyr for the Protestant faith; but was staggere in another disputation with Peter Martyr, and began seriously to examine the contested points by the best authorities. Thus, being presented to the vicarage of Norton in the diocese of Durham, he soon resigned it, and went abroad to consult eminent professors on both sides; and after three years absence returned a little before the death of Queen Mary, satisfied in the general doctrines of the reformation. He was kindly received by his uncle Dr Tonstall, bishop of Durham; who soon after gave him the archdeaconry of Durham, to which the rectory of Effington was annexed. When repairing to his parish, though the persecution was then at its height, he boldly preached against the vices, errors, and corruptions of the times, especially in the clergy, which a charge consisting of 12 articles was drawn up against him, and presented in form to the bishop. But Dr Tonstall found a method of dismissing the cause in such a manner as to protect his nephew, without endangering himself, and soon after presented him to the rich living of Houghton le Spring. He was a second time accused to the bishop, and again protected; when his enemies, enraged at this second defeat, laid their complaint before Dr Bonner, bishop of London; who immediately gave orders to apprehend him. Upon which Mr Gilpin bravely prepared for martyrdom; and ordering his house steward to provide him a long garment that he might make a decent appearance at the stake, set out for London. Luckily, however, he broke his leg on the journey; which protracted his arrival until the news of the queen’s death freed him from all further apprehensions. Being immediately set at liberty, he returned to Houghton, where he was received by his parishioners with the sincerest joy.

Upon the deprivation of the Popish bishops, he was offered the see of Carlisle, which he declined; and confining his attention to his rectory, discharged all the duties of his function in the most exemplary manner. To the greatest humanity and courtesy, he added an unwearied application to the instruction of those under his care. He was not satisfied with the advice he gave in public, but used to instruct in private; and brought his parishioners to come to him with their doubts and difficulties. He had a most engaging manner towards those whom he thought well disposed: nay, his very reproach was so conducted, that it seldom gave offence; the becoming gentleness with which it was urged made it always appear the effect of friendship. Thus, with unceasing assiduity, did he employ himself in admonishing the vicious, and engaging the well-intentioned; by which means, in a few years, he made a greater change in his neighbourhood than could well have been imagined. A remarkable instance, what reformation a single man may effect, when he hath it earnestly at heart!

But his hopes were not so much in the present generation, as in the succeeding. It was an easier task, he found, to prevent vice, than to correct it; to form the young to virtue, than to amend the bad habits of the old. He employed much of his time, therefore, in endeavouring to improve the minds of the younger part of his parish; suffering none to grow up in an ignorance of their duty; but pressing it as the wisest part to mix religion with their labour, and amidst the cares of this life to have a constant eye upon the next. He attended to every thing which might be of service to his parishioners. He was very assiduous in preventing all law suits among them. His ball is said to have been often threshed with people, who came to him about their differences. He was not indeed much acquainted with law; but he could decide equitably, and that satisfactorily: nor could his sovereign’s commission have given him more weight than his own character gave him.

His hospitable manner of living was the admiration of the whole country. He spent in his family every fortnight 40 bushels of corn, 24 bushels of malt, and whole ox; besides a proportionable quantity of other kinds of provision. Strangers and travellers found a cheerful reception. All were welcome that came; and even their beasts had so much care taken of them, that it was humorously said, “If a horse was turned loose in any part of the country, it would immediately make its way to the rector of Houghton’s.”

Every Sunday, from Michaelmas till Easter, was a sort of public day with him. During this season he expected to see all his parishioners and their families. For their reception, he had three tables well covered; the first was for gentlemen, the second for husbandmen and farmers, and the third for day labourers. This piece of hospitality he never omitted, even when losses, or a scarcity of provision, made its continuance rather difficult to him. He thought it his duty, and that was a deciding motive. Even when he was absent from home, no alteration was made in his family expenses; the poor were fed as usual, and his neighbours entertained.

But notwithstanding all his painful industry, and the large scope it had in so extended a parish, Mr Gilpin thought the sphere of his benevolence yet too confined. It grieved him extremely to see everywhere, in the parishes around him, so great a degree of ignorance and superstition, occasioned by the shameful neglect of the pastoral care in the clergy of those parts. These bad consequences induced him to supply, as far as he could, what was wanting in others. For this purpose, every year he used regularly to visit the most neglected parishes in Northumberland, Yorkshire, Cheshire, Westmoreland, and Cumberland; and that his own parish in the mean time might not suffer, he was at the expense of a constant assistant. In each place he stay’d two or three days; and his method was, to call the people about him, and lay before them, in as plain a way as possible, the danger of leading wicked or even careless lives; explaining to them the nature of true religion; instructing them in the duties they owed to God, their neighbour, and themselves; and showing them how greatly a moral and religious conduct would contribute to their present as well as future happiness.

As Mr Gilpin had all the warmth of an enthusiast, though
though under the direction of a very calm and sober judgment, he never wanted an audience, even in the wildest parts; where he roused many to a sense of religion, who had contracted the most inveterate habits of inattention to every thing of a serious nature. And wherever he came, he used to visit all the gaols and places of confinement; few in the kingdom having at that time any appointed minister. And by his labours, and affectionate manner of behaving, he is said to have reformed many very abandoned persons in those places. He would employ his interest likewise for such criminals whose cases he thought attended with any hard circumstances, and often procured pardons for them.

There is a tract of country upon the border of Northumberland, called Readsw-dale and Tine-dale, of all barbarous places in the north at that time the most barbarous. Before the Union, this place was called the debatable land, as subject by turns to England and Scotland, and the common theatre where the two nations were continually acting their bloody scenes. It was inhabited by a kind of desperate banditti, rendered fierce and active by constant alarms: they lived by theft, used to plunder on both sides of the barrier; and what they plundered on one, they exposed to sale on the other; by that means escaping justice. And in this dreadful country, where no man would even travel that could help it, Mr Gilpin never failed to spend some part of every year.

He generally chose the Christmas holidays for his journey, because he found the people at that season most disengaged, and most easily assembled. He had set places for preaching, which were as regularly attended as the assizes towns of a circuit. If he came where there was a church, he made use of it; if not, of barns, or any other large building; where great crowds of people were sure to attend him, some for his instructions, and others for his charity. This was a very difficult and laborious employment. The country was so poor, that what provision he could get, extreme hunger only could make palatable. The inclemency of the weather, and the badness of the roads through a mountainous country, and at that season covered with snow, exposed him likewise often to great hardships. Sometimes he was overtaken by the night, the country being in many places desolate for several miles together, and obliged to lodge out in the cold. At such times, we are told, he would make his servant ride about with his horses, whilst himself on foot used as much exercise at his age and the fatigues of the preceding day would permit. All this he cheerfully underwent; esteeming such services well compensated by the advantages which he hoped might accrue from them to his un instructed fellow creatures.

The disinterested pains he took among these barbarous people, and the good offices he was always ready to do them, drew from them the warmest and sincerest expressions of gratitude. Indeed he was little less than adored among them, and might have brought the whole country almost to what he pleased. One instance that is related, shows how greatly he was revered. By the carelessness of his servants, his horses were one day stolen. The news was quickly propagated, and every one expressed the highest indignation at the fact. The thief was rejoicing over his prize, when, by the report of the country, he found whose horses he had taken. Terrified at what he had done, he instantly came trembling back, confessed the fact, returned the horses, and declared he believed the devil would have seized him directly, had he carried them off knowing them to have been Mr Gilpin's.

We have already taken notice of Mr Gilpin's uncommonly generous and hospitable manner of living. The value of his rectory was about 400l. a year: an income, indeed, at that time very considerable, but yet in appearance very disproportionate to the generous things he did: indeed, he could not have done them, unless his frugality had been equal to his generosity. His friends, therefore, could not but wonder to find him, amidst his many great and continual expenses, entertain the design of building and endowing a grammar school; a design, however, which his exactness soon enabled him to accomplish, though the expense of it amounted to upwards of 500l. His school was no sooner opened, than it began to flourish; and there was so great a resort of young people to it, that in a little time the town was not able to accommodate them. He put himself, therefore, to the inconvenience of fitting up a part of his own house for that purpose, where he seldom had fewer than 20 or 30 children. Some of these were the sons of persons of distinction, whom he boarded at easy rates: but the greater part were poor children, whom he not only educated, but clothed and maintained: he was at the expense likewise of boarding in the town many other poor children. He used to bring several every year from the different parts where he preached, particularly Readsw-dale and Tine-dale; which places he was at great pains in civilizing, and contributed not a little towards rooting out that barbarism which every year prevailed list among them.

As to his school, he not only placed able masters in it, whom he procured from Oxford, but himself likewise constantly inspected it. And, that encouragement might quicken the application of his boys, he always took particular notice of the most forward: he would call them his own scholars, and would send for them often into his study, and there instruct them himself. One method used by him to fill his school was a little singular. Whenever he met a poor boy upon the road, he would make trial of his capacity by a few questions, and if he found it such as pleased him, he would provide for his education. And besides those whom he sent from his own school to the universities, and there wholly maintained, he would likewise give to others, who were in circumstances to do something for themselves, what farther assistance they needed. By which means he induced many parents to allow their children a liberal education, who would otherwise not have done it. And Mr Gilpin did not think it enough to afford the means only of an academical education to these young people, but endeavoured to make it as beneficial to them as he could. He still considered himself as their proper guardian; and seemed to think himself bound to the public for their being made useful members of it, as far as it lay in his power to make them so. With this view he held a punctual correspondence with their tutors; and made the youths themselves frequently write to him, and give him an account of their studies. So solicitous indeed was he about
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about them, knowing the many temptations to which their age and situation exposed them, that once every other year he generally made a journey to the universities to inspect their behaviour. And this uncommon care was not unrewarded; for many of his scholars became ornaments to the church, and exemplary instances of piety.

To the account that hath been already given of Mr. Gilpin's hospitality and benevolence, the following particulars may be added. Every Thursday throughout the year, a very large quantity of meat was dressed wholly for the poor, and every day they had what quantity of broth they wanted. Twenty-four of the poorest were his constant pensioners. Four times in the year a dinner was provided for them; when they received from his steward a certain quantity of corn, and a sum of money: and at Christmas they had always an ox divided among them.

Whenever he heard of any in distress, whether of his own parish or any other, he was sure to relieve them. In his walks abroad, he would frequently bring home with him poor people, and send them away clothed as well as fed. He took great pains to inform himself of the circumstances of his neighbours, that the modesty of the sufferer might prevent his relief. But the money best laid out was, in his opinion, that which encouraged industry. It was one of his greatest pleasures to make up the losses of his laborious neighbours, and prevent their sinking under them. If a poor man lost a beast, he would send him another in his room; or if any farmer had had a bad year, he would make him an abatement in his tythes. Thus, as far as he was able, he took the misfortunes of his parish upon himself; and, like a true shepherd, exposed himself for his flock. But of all kinds of industrious poor, he was most forward to assist those who had large families; such never failed to meet with his bounty, when they wanted to settle their children in the world.

In the distant parishes where he preached, as well as in his own neighbourhood, his generosity and benevolence were continually showing themselves; particularly in the desolate parts of Northumberland. "When he began his journey," says an old manuscript life of him, "he would have 10 pounds in his purse; and, at his coming home, he would be 20 nobles in debt, which he would always pay within a fortnight after." In the geols visited, he was not only careful to give the prisoners proper instructions, but used to purchase for them likewise what necessaries they wanted.

Even upon the public road, he never let slip an opportunity of doing good. He has often been known to take off his cloak, and give it to a half-naked traveller: and when he has had scarce money enough in his pocket to provide himself a dinner, yet would he give away part of that little, or the whole, if he found any who seemed in need of it. Of this benevolent temper, the following instance is preserved. One day returning home he saw in a field several people crowding together; and judging something more than ordinary had happened, he rode up, and found that one of the horses in a team had suddenly dropped down, which they were endeavouring to raise; but in vain, for the horse was dead. The owner of it seemed much dejected with his misfortune; and declaiming how grievous a loss it would be to him, Mr. Gilpin bade him not be disheartened: "I'll let you have (says he), honest man, that horse of mine," and pointed to his servant's. "Ah! master (replied the countryman), my pocket will not reach such a beast as that." "Come, come (said Mr. Gilpin), take him, take him; and when I demand my money, then thou shalt pay me."

This worthy and excellent divine, who merited and obtained the glorious titles of the Father of the Poor, and the Apostle of the North, died in 1853, in the 86th year of his age.

GILTHREAD. See Sparus. Ichthyology Index.

GIN. See Geneva.

GIN, in mechanics, a machine for driving piles, fitted with a windlass and winches at each end, where eight or nine men heave, and round which a rope is reeled that goes over the wheel at the top: one end of this rope is seized to an iron monkey, that hooks to a beetle, of different weights, according to the piles they are to drive, being from eight to thirteen hundred weight; and when have up to a cross piece, near the wheel, it unbooks the monkey, and lets the beetle fall on the upper end of the pile, and forces the same into the ground: then the monkey's own weight overhuals the windlass, in order for its being hooked again to the beetle.

GINGER, the root of a species of amomum. See Amomum. Botany Index.

GINGIDUM, a genus of plants, belonging to the pentandria class. See Botany Index.

GINGIRO, or Zinderu, a small territory of Africa, to the south of Abyssinia; being separated from it by the river Zeebe, by which it is also almost entirely surrounded. This river is extremely large, having more water than the Nile, and being much more rapid; so that, during the rainy season, it would altogether impassable, were it not for the great rocks which are in its channel. The extreme difficulty which occurs in passing this river, however, is the means of preserving the kingdom of Gingiro, which would otherwise be conquered in a single season by the Galla.

Of the most remarkable particular with regard to this kingdom is, that the sovereign is a professed votary of the devil. "This superstition (says Mr. Bruce) reaches down all the western side of the continent on the Atlantic ocean, in the countries of Congo, Angola, and Benin. In spite of the firmest foundation in true philosophy, a traveller, who decides from the information and investigation of facts, will find it very difficult to treat these appearances as absolute fictions, or as owing to the superiority of cunning of one man in overreaching another. For my own part, I confess, I am equally at a loss to assign reasons for disbelieving the fiction on which their pretensions to some preternatural information are founded, as to account for them by the operation of ordinary causes."

In this kingdom every thing is conducted, or pretended to be conducted, by magic; and all those slaves, which in other African countries are sold to Europeans, are here sacrificed to the devil, human blood being a necessary part in all their accursed solemnities. "How far (says Mr. Bruce) this reaches to the southward, I do not know; but I look upon this to be the geographical bounds of the reign of the devil.
With regard to this country, very little farther is known, than some of the customs of the people, transiently picked up by the Jesuit missionaries in Abyssinia. From them we learn, that the kingdom is hereditary in one family, though it does not regularly descend to the eldest son, the king being chosen by the nobles; in which they resemble their neighbours the Abyssinians. When the king is dead, his body is wrapped in a fine cloth, and a cow is killed. The body so wrapped is next enclosed in the cow’s skin; and all the princes of the royal family fly and hide themselves in the bushes, while those who are intrusted with the election enter the thickets, beating about everywhere as if for game. At last a bird of prey, called in their language liber, appears, and hovers over the person destined to be king; crying and making a great noise without quitting his station. By this means the person destined to be elected is found out, surrounded, as is reported, by lions, tigers, panthers, and other wild beasts; all which are supposed to be brought by the power of magic or of the devil.—After the king is found, he flies upon those who came in quest of him with great fury, killing and wounded as many as he can reach, until at last he is dragged to the throne whether he will or not. One particular family have the privilege of conducting him to the throne; and if they should not happen to find him at first, they have a right to take him out of the hands of those who did so; and thus another battle ensues before the vacant throne can be filled. Lastly, Before he enters his palace, two men must be killed; one at the foot of a tree by which the house is supported; and the other at the threshold of the door, which is besmeared with the blood of the victim. It is the particular privilege of one family to afford these victims; and so far are they from seeking to avoid this fate, that they glory in the occasion, and willingly offer themselves to meet it. This last particular, Mr Bruce says, he had in Abyssinia from people coming from Gingiro.

GINGIVÆ, the gums. See GUMS.

GINGLYMUS, in Anatomy, one of the species of articulation. It is that jointure of the bones where each bone mutually receives the other; so that each bone both receives and is received. See Anatomy Index.

GINKGO, the MAIDEN-HAIR Tree. See MAURITIA, BOTANY INDEX.

GINORA, a genus of plants belonging to the dog-decandria class, and in the natural method ranking with those of which the order is doubtful. See Botany Index.

GINSENG. See PANAX, BOTANY and MATERIA MEDICA INDEX.

GIOIA, FLAVIO, of Amalfi, in the kingdom of Naples, the celebrated mathematician; who, from his knowledge of the magnetic powers, invented the mariner’s compass, by which the navigation of the Europeans was extended to the most distant regions of the globe; before this invention, navigation was confined to coasting. The king of Naples being a younger branch of the royal family of France, he marked the north point with a fleur-de-lis, in compliment to that country. It is said the Chinese knew the compass long before; by this as it may, the Europeans are indebted to Gioia for this invaluable discovery. He flourished in A.D. 1500.

GIORDANA, LUCA. See JORDANO.

GIORGIONE, so called from his comely aspect, was an illustrious Venetian painter, born in 1478. He received his first instructions from Giovanni Bellini; but studying afterwards the works of Leonardo da Vinci, he soon surpassed them both, being the first among the Lombards who found out the admirable effects of strong lights and shadows. Titian became his rival in this art; and was so careful in copying the life, that he excelled Giorgione in discovering the delicacies of nature, by tempering the boldness of his colouring. The most valuable piece of Giorgione’s oil is that of Christ carrying his cross, now in the church of San Zeno in Venice; where it is held in great veneration. He died of the plague, young, in 1511.

GIRAFFE. See CERVUS, MAMMALIA INDEX.

GIRALD, BARRY, or Giralda Cambrensis. See BARRY.

GIRALDI, LILIO GREGORIO, an ingenious critic, and one of the most learned men that modern Italy has produced, was born at Ferrara in 1470. He was at Rome when it was plundered by the emperor Charles V.; and having thus lost all he had, and being tormented by the gout, he struggled through life with ill fortune and ill health. He wrote many performances, which were collected and published in Basil in 2 vols. folio in 1580, and at Leyden in 1596. Authors of the first rank have bestowed the highest eulogies on Giralda; particularly Casabon and Theanus.

GIRALDI, JOHN BAPTIST CINTO, an Italian poet of the same family with the foregoing Lilio, was born in 1504. He was secretary to the duke of Ferrara, and afterwards became professor of rhetoric at Paris. He died in 1573. His works, which consist chiefly of tragedies, were collected and published at Venice by his son Celso Giraldi, in 1583; and some scruple not to rank him among the best tragic writers Italy has produced.

GIRARDON, FRANCIS, a celebrated French architect and sculptor, born at Troyes in 1637. Louis XIV. being informed of his great talents, sent him to Rome with a pension of 1000 crowns. At his return into France, he laboured for the royal palaces and the gardens of Versailles and Trianon; where there are many of his works executed in bronze and in marble, from the designs of Charles le Brun. The mausoleum of Cardinal de Richelieu, in the Sorbonne, and the equestrian statue of Louis XIV. at the Place de Vendome, where the statue and horse are cast in one piece, pass for his most excellent performances. Girardon was professor, rector, and chancellor, of the Academy of Painting and Sculpture; and had the post of inspector general of all the works done in sculpture. He died in 1715.

GIRDERS, in Architecture, the largest pieces of timber in a floor. Their ends are usually fastened into the summers, or breast-summers; and the joists are framed at one end to the girders.

By the statute for rebuilding London, no girder is to
Gla

Pindar, who first farmed them, paid rents to the king 12,500 L. to the Earl Musgrave 1640. and to Sir William Penniman 600 L. and had moreover 800 men by sea and land in constant pay; yet he was a considerable gainer, because there was then scarce any other to be had, and the price was 25 L. a ton; but now there are several other alum works in this county, which have taken a great part of the trade from hence; so that the works here have for some years lain neglected. Population 1834 in 1814.

Gittith, a Hebrew word occurring frequently in the Psalms, and generally translated wine presses. The conjectures of interpreters are various concerning this word. Some think it signifies a sort of musical instrument; others, that the psalms with this title were sung after the vintage; lastly, others, that the hymns of this kind were invented in the city of Gath. Calmet is rather of opinion, that it was given to the class of young women or songstresses of Gath to be sung by them, Psal. viii. 1. Ixxi. 1. Ixxxiv. 1. Dr Hammond thinks that the psalms with this title were all set to the same tune, and made on Goliath the Gittite.

Giulia, a strong town of Upper Hungary, on the frontier of Transylvania. It was taken by the Turks in 1566, and retaken by the Imperialists in 1596. It is seated on the river Kereslau, in E. Long. 21° 1'. N. Lat. 46° 25'.

Giustandel, a large and strong town of Turkey in Europe, and in Macedonia, with a Greek archbishop's see. It is seated near the lake Ochrida, in E. Long. 20° 50'. N. Lat. 41° 10'.

Glaciers, a name given to some very extensive fields of the snow. Mr Coxe observes of these mountains in general, that they are composed of many parallel chains, the highest of which occupy the centre, and the others gradually diminish in proportion as we recede from thence. The central chain appears covered with pointed rocks; all parts of which, that are not absolutely perpendicular, lie hid under perpetual snow and ice even in summer. On each side of this ridge are fertile and cultivated valleys, interspersed with numerous villages, and watered by numerous streams. The elevated peaks of the central chain are covered with snow, but their declivities, excepting those that are extremely steep, have all a covering of ice as well as snow; the intermediate parts being filled with vast fields of ice, terminating in the cultivated valleys above mentioned. The same phenomena, though on a smaller scale, occur in those chains that are at a distance from the principal one: in those which are most remote, no ice, and scarcely any snow, is observed, unless upon some of the most elevated summits; and the mountains diminishing in height and ruggedness, appear covered with verdure, until at last they terminate in small hills and plains.

Thus the glaciers may be divided into two sorts; one occupying the deep valleys situated in the bosom of the Alps, and distinguished by the name of Ice valleys; the others are those which clothe the declivities and sides of the mountains. These two kinds of glaciers are distinguished by Mr Coxe into the upper and lower glaciers.

The lower glaciers are by far the most considerable; some of them extending several leagues in length. They do not communicate with each other, as has been generally supposed, few of them being parallel to the central chain; but, stretching mostly in a transverse direction, are bordered at the higher extremity by inaccessible rocks, and at the lower extending into the cultivated valleys. The thickness of the ice varies in different parts. In the glacier des Bois, which extends more than 15 miles in length, and upwards of three in breadth, M. Saussure found it generally from 80 to 100 feet; but he was credibly informed, that in some places it was not less than 600 feet, and even more. These vast masses of ice usually rest on an isolated plane, where, being pushed forward by their own weight, and but weakly supported by the rugged rocks beneath them, they are intersected by large crevices, and have an appearance of walls, pyramids, &c. according to the position of the eye in viewing them. In those parts, however, where they lie upon even ground, or such as only have a gentle inclination, the surface of the ice is nearly uniform, the crevices being few and narrow, and the glacier being crossed by travellers on foot without any difficulty. The surface of the ice is rough and granulated, so that people may walk upon it, excepting such places as have a steep descent. It is opaque, full of small bubbles about the size of peas, very porous, and greatly resembles a mixture of snow and water congealed. A vast quantity of stones and earth falls down from the mountains upon the glaciers, and are by them thrown off on each side according to the descent of the ice, as will be afterwards explained. The place on which these rest is more hard and earthed than the rest of the ice, and is very difficult to walk upon; the earth is likewise laid upon them in such heaps, that it appears to have been done by art. This collection of earths and stones is termed by the natives the Moraine.

Mr Coxe, who visited the glacier des Bois, informs us, that the appearance of it at a distance was so tremendous, that it seemed impracticable to cross it. Numerous and broad chasms intersected it in every direction; but entering upon it, the company found that courage and activity were only required to accomplish the task. They had large nails in their shoes, and spiked sticks, which on this occasion were found to be particularly serviceable. Having passed the moraine, and descended upon the glacier itself, they found the ice cleared by a warm wind which rendered it less slippery than usual. Having walked across it for about a quarter of an hour, they came again to the moraine, along which they continued their journey for half an hour, and then entered upon the great body of the glacier. Here (says Mr Coxe) it was curious to observe the numerous little rills produced by the collection of drops occasioned by the thawing of the snow on the upper part of the glacier; these little rills hollow out small channels, and, torrent-like, precipitate themselves into the chasms with a violent noise, increasing the body of waters formed by the melting of the interior surface, and finding an outlet under the immense arch of ice in the valley of Chamouni, from which the Arveron rushes.
Glaciers

(says he) we were astonished with a view more magnificent than imagination can conceive: hitherto the glaciers had scarcely answered my expectations, but now they far surpassed them. Nature had clad herself in all her terrors. Before us was a valley of ice 20 miles in extent, bounded by a circular glacier of pure unbroken snow, named Takuil, which leads directly to the foot of Mount Blanc, and is surrounded by large conical rocks, terminating in sharp points like the towers on an ancient fortification; to the right rose a range of magnificent peaks, the intervals filled with glaciers; and far above the rest, the magnificent summit of Mount Blanc, his highest point obscured with clouds. He appeared of such immense magnitude, that, at his presence, the surrounding mountains, however gigantic, seemed to shrink before him, and hide their dimines;

heads. In half an hour we arrived at the moraine, which forms a boundary of the valley, crossing it, and proceeded upon a body of ice about three quarters of a mile broad. Here the ice was more even and free from chasms than in the great valley. We then passed a second moraine, and beyond that another mass of ice to a third moraine; descending from thence we came upon the last ridge of ice, broader considerably than the two former, and full of large chasms: it separated from the rock only by a very narrow moraine. These moraines contain great quantities of crystal.

They continued to ascend the valley of ice, the scene constantly increasing in magnificence and horror; and having walked about five miles on the ice, they arrived at last at the foot of the eminence named Couvercle, where they were obliged to quit the ice. The doing this was extremely dangerous, and at one place very tremendous. It was a bulging smooth rock, with a precipice of considerable depth terminated by a vast crevice in the ice, which seemed to stop all further progress; a small hollow in the middle, however, afforded room for one foot; and having fixed this, they sprang over to the other side, being helped and directed by the guides who went over first. Having gained the top of the Couvercle, they had a view of three of the glaciers, viz. that of Telefre to the left, Pechau, in front, and Takuil on the right; all uniting in that great one called the Glacier de Bois. The Couvercle itself is a most extraordinary rock, having the appearance of a large irregular building with many sides; the substance of which is granite. Having reached the top, they were surprised with a thunder storm, from which they took shelter under an impending rock. The view was exceedingly magnificent; the glaciers appearing like a rugged expanse of frozen sea bordered by gigantic rocks, and terminated by Mount Blanc. A single rock appeared of a triangular figure covered with Alpine plants; and which by reason of its contrast with the rugged and snowy mountains in the neighbourhood, has obtained the name of the Couvercle; but farther up, among the Alpes, Mr. Coxe had occasion to observe that the colour of the sky was of a much deeper blue than in the lower regions.

The upper glaciers may be subdivided into those which cover the summits, and those which extend along the sides of the Alps. Those on the very summit, however, though they have the appearance of ice, are not so in reality, but consist entirely of snow hardened by the extreme cold. M. Saussure found that which covered the top of Mount Blanc to be penetrable, though with difficulty, by a stick; but below this hard crust was a soft snow without coherence. The sides are covered with a mixture of ice and snow; by reason of the superior power of the summer sun to dissolve the snow, which afterwards congeals into hard ice.

Several conjectures have been made concerning the formation of these extraordinary bodies of ice. Mr. Coxe agrees with M. Gruner in opinion, that they are produced by the continual dissolution of the snow in summer, and its congelation by the succeeding frosts. Hence, on the summits of the mountains where the sun has very little power, the glacier is soft, and contains no ice: as we descend the mountains the consistence becomes firmer, because there is a considerable mixture of snow water, the congelation of which augments the hardness; and in the valleys, the glacier is hardest of all, because the portion of water is there much superior to that of the snow. Hence it seems plain that the glaciers derive their origin from the melting of the snow on the upper parts of the mountains, and the congelation of the water as it advances: and to this cause M. Saussure adds the quantity of snow which often rolls down into the valleys, and congeals along with the water just mentioned.

Another question concerning the glaciers naturally occurs, namely, Whether they are to be considered as in a state of increase or diminution? Mr. Coxe is of opinion, that they occasionally increase and decrease; in proof of which he adds the following observation: "The borders of the glacier of Montaunvet are mostly skirted with trees: towards its base a vast arch of ice rises to near 100 feet in height; under which the river Arveron rushes with considerable force, and in a large body of water. As we approached the ice, we passed through a wood of trees; those trees would stand at a little distance from the arch are about 80 feet high and are undoubtedly of a very great age. Between these and the glacier the trees are of a later growth; as is evident from their texture and inferior size. Others, still smaller, have been overturned and enveloped in the ice: there seems to be a kind of regular gradation in the age of these several trees, from the largest which are standing to the smallest that lie prostrate."

Hence our author concludes, that the glacier once extended as far as the row of small trees; but that upon its gradual dissolution, a number of trees shot up on the spot it had occupied; since which time the ice has again advanced, and overturned the last grown trees before they had attained to any considerable height. This he thinks also confirmed by the following fact. "Large stones of granite are usually found at a small distance from the extremities of the glacier. These stones have certainly fallen from the mountains upon the ice; have been carried on in its progress; and have tumbled into it explain upon the dissolution of the ice, and supported them. These stones, which the natives call Moraines, form a kind of border towards the foot of the valley of ice, and have been pushed forward by the glacier in its advances: they extend even to the place occupied by the larger pines."
Glaciers. Grindelwald had diminished to such a degree, that the
spot which its extremity occupied in the former year,
was at least 400 paces from that occupied by it in the
latter. 2. In the year 1765 the Mornilles de Glace,
which in 1775 he had described as forming the border
of the glacier of Bosson no longer existed; and young
trees had shot up in the spots which were then covered
by the glacier of Montanvert. Still, however, it may
be urged, that these changes only take place in the
valleys where the power of the sun is considerable;
and that from thence we cannot form any adequate
idea of what passes in the more elevated regions,
where in all probability more snow falls than can be dissolved.
In support of this opinion, it is alleged, that the cold
produced by the mass of ice already formed ought to
augment it still more; and that within the memory
of the present generation, many places have been covered
with ice which were not so before. To these argu-
ments, however, Mr. Coxe replies, that the causes,
which diminish the ice in the upper regions, are no
less powerful than the cold which tends to augment it.
These are, 1. Rain or sleet; which falling upon
the lower glaciers, thaw the ice, increase the rills on
its surface, excavate channels, and in many ways tend
to diminish its quantity. 2. Evaporation, which takes
place even from the surface of the ice itself, acts still
more powerfully; and its action is not confined to any
particular season. The floating of the snow and
ice; both that which comes gradually from the
clouds; and that which descends from the mountains
in great masses, called by the natives avalanches. When
these last fall down into milder regions, though some-
times they may resist the influence of the sun and
form ice valleys, yet they generally dissolve. They
are most common in the upper glaciers, though some-
times they descend upon the lower, while the gradual
descent of snow from the clouds, which chiefly takes
place in the lower, contributes very much to lessen the
mass. 4. All the lower glaciers or valleys of ice rest
on an inclined plane, are hollow, and undermined by
torrents which are constantly flowing from the upper
glaciers, as well as from their own lowermost surface.
Their foundation being thus constantly diminishing,
the lower glaciers are carried imperceptibly forward in-
to the cultivated fields, where an end is necessarily put
to their progress by the heat of the sun. Hence we
may see the reason of that strange phenomenon taken
notice of by Mr. Coxe, that with one hand he could
touch ripe corn, and with the other solid ice. This
descent of the glacier is demonstrable from the trees
overturned by it, and the moraine always observed at
the bottom of the lower glaciers. 5. The heat of the
sun is an evident cause of the diminution of the
glaciers. To this Mr. Coxe adds another cause less gen-
erally known, viz. the warm winds which blow by night
as well as by day both in the upper and lower glaciers.
"These warm winds (says he) are during summer so
common in those parts, that I never crossed a glacier
without feeling in some particular positions a warmth
similar to the air of a hot bath." 6. Another cause
is the mean temperature of the earth itself; which,
where it is not exposed to the piercing cold of the
atmosphere, is found to have a temperature always above
the freezing point. As the vast thickness of the su-
perincumbent ice, therefore, is in the present case abun-
dantly sufficient to prevent the access of the atmos-
phere, it is plain that the lower surface of it must,
by being in contact with the earth, continually decay.

With regard to the other argument drawn from the
known increase of the ice in some places, Mr. Coxe
does not deny it; but insists, that there is no continual
increase of the whole, but that if it increases in some
places, it diminishes in others, and his opinion in this
respect was confirmed by those who frequent the
mountains.

GLACIS, in building, an easy insensible slope or
dclivity.

The descent of the glacie is less steep than that of the
talus. In gardening, a descent sometimes begins in
lulus, and ends in glacies.

The glacies of the corniche, is an easy imperceptible
slope in the cymatium, to promote the descent and drain-
off the rain water.

GLACIES, in Fortification, that mass of earth which
serves as a parapet to the covered way, sloping easily
towards the champain or field.

GLADE, in Gardening and Agriculture, an opening
and light passage made through a wood, by lopping
of the branches or trees along that way.

GLADIATORS, in antiquity, persons who fought,
generally in the arena at Rome, for the entertain-
ment of the people.

The gladiators were usually slaves, and fought out
necessity; though sometimes freemen made profession
thereof, like our prize-fighters, for a livelihood.

The Romans borrowed this cruel diversion from the
Asiatics: some suppose that there was policy in the prac-
tice, the frequent combats of gladiators tending to
accustom the people to despise dangers and death.

The origin of such combats seems to be as follows:
From the earliest times with which we have any ac-
quaintance in profane history, it had been the custom
to sacrifice captives, or prisoners of war, to the mas-
se of the great men who had died in the engagement; but
Achilles, in the Iliad, lib. xxiii, sacrifices twelve young
Trojans to the masse of Patroclus; and in Virgil, lib.
xi, ver. 81.Æneas sends captives to Evander, to be
sacrificed at the funeral of his son Pallas.

In course of time they came also to sacrifice slaves at
the funerals of all persons of condition: this was ever
esteemed a necessary part of the ceremony; but as it
would have appeared barbarous to have massacred
them like beasts, they were appointed to fight with each
other, and endeavour to save their own lives by killing
their adversary. This seemed somewhat less inhuman,
because there was a possibility of avoiding death, by an
exertion of skill and courage.

This occasioned the profession of gladiator to become
an art: hence arose masters of the art, and men learned
to fight and exercise. These masters, whom the Latins
called armie, bought them slaves to be trained up
in this cruel trade, whom they afterwards sold to such as
had occasion to present the people with so horrible a
show.

These exhibitions were at first performed near the se-
pulchre of the deceased, or about the funeral pie; but
were afterwards removed to the circus and amphithe-
tres, and became ordinary amusements.

The first show of gladiators, called munus gladiatorium,
was exhibited at Rome, according to Valerius Maxime,
and when one of the combatants received a remarkable wound, his adversary or the people cried out, Habet, or Hoc habet. The first part of the engagement was called ventillare, praerudere; and the second dimicare ad certum, or versus armis pugnare; and some authors think, with much probability, that it is to these two kinds of combat that St Paul alludes in the passage 1 Cor. ix. 26, 27. "I fight not as one that beareth the air; but I keep my body, and bring it into subjection."

If the vanquished surrendered his arms, it was not in the victor's power to grant him life; it was the people during the time of the republic, and the prince or people during the time of the empire, that were alone empowered to grant the boon. The reward of the conqueror was a branch of palm tree, and a sum of money, probably collected among the spectators: sometimes they gave him his confé, or dismissed him by putting one of the wooden foils or rude in his hand; and sometimes they even gave him his freedom, putting the pileus on his head. The sign or indication, whereby the spectators showed that they granted the favour, was premere pollicem, which M. Dacier takes to be a clenching of the fingers of both hands between one another, and so holding the two thumbs upright close together; and, when they would have the combat finished and the vanquished slain, veerterunt pollicem, they bent back the thumb; which we learn from Juvenal, Sat. iii. ver. 36. The gladiators challenged or defied each other, by showing the little finger; and, by extending this, or some other, during the combat, they owned themselves vanquished, and begged mercy from the people: Victi ex tum digiti veste à populo postulabant, says the old scholiast on Persius.

There were various kinds of gladiators, distinguished by their weapons, manner, and time of fighting, &c. as, The andabates, mentioned under Andabate. The cawbattari, who always fought in troops or companies, number against number; or, according to others, who fought promiscuously, without any certain order. The dimachoi, who fought armed with two poniards or swords, or with sword and dagger. The esseradiri, who fought in cars. The fiscates, or Caesariani, who belonged to the emperor's company; and who, being more robust and dexterous than the rest, were frequently called for, and therefore named also postulatisti. Several other kinds are mentioned in the ancient authors.

**Gladiators War (bellum Gladiatorium or Spartacum),** called also the servile war, was a war which the Romans sustained about the year of their city 68 B.C. Spartacus, Crito, and Oenomaus, having escaped, with other gladiators to the number of seventy-four, out of the place where they had been kept at Capua, gathered together a body of slaves, put themselves at their head, rendered themselves masters of all Campania, and gained several victories over the Roman praetors. At length they were defeated in the year 86 B.C., at the extremity of Italy; having, in vain, attempted to pass over into Sicily.

This war proved very formidable to the Romans. Crassus was not able to finish it: the great Pompey was forced to be sent as general.

The Dying **Gladiator**, a most valuable monument of ancient sculpture, which is now preserved in the palace of Chigi. This man, when he had received the mortal stroke, is particularly careful ut procument hominem, "that he might fall honourably." He is seated in a reclining posture on the ground, and has just strength sufficient to support himself on his right arm; and in his expiring moments it is plainly seen, that he does not abandon himself to grief and dejection; but is solicitous to maintain that firmness of aspect which the gladiators valued themselves on preserving in this season of distress, and that attitude which they had learnt of the masters of defence. He fears not death, nor seems to betray any tokens of fear by his countenance, nor to shed one tear: quis meditatur gladiator ingemuit, quis culmus mutavit unquam, quis non modo velit, cernat iam decubit turpiter, says Cicero, in that part of his Tusculan where he is describing the astonishing firmness of those persons. We see, in this instance, notwithstanding his remaining strength, that he has but a moment to live; and we view him with attention, that we may see him expire and fall: thus the ancients knew how to animate marble, and give it almost every expression of life.

**GLADIOLUS, Corn Flag,** a genus of plants belonging to the triandria class, and in the natural method ranking under the sixth order, Ensata. See Botantal Index.

**GLAIR of eggs,** is the same as the white of egg, and is used as a varnish for preserving paintings. For this purpose, it is beat to an inconspicuous consistence, and commonly mixed with a little brandy or spirit of wine, to make it work more freely, and with a lump of sugar to give it body and rigour its concretion, and then spread over the picture or painting with a brush.

**GLAMORGANSHIRE, a county of South Wales,** said to have derived its name from a contraction of the Welsh words Gwuald Morgan, or "the county of Morgan," and supposed to have been thus called from a prince of this part of the country, said to have been killed 800 years before the birth of our Saviour; but some other writers derive the name from the word Mor, which in the British tongue signifies the sea; this being a maritime county. It is bounded on the south and part of the west, by Bristol channel; on the north-west, by Caermarthenshire; on the north by Brecknockshire; and on the east, by Monmouthshire. It extends 48 miles in length from east to west, 21 in breadth from north to south, and is 116 in circumference. It is divided into 10 hundreds, in which are one city, 7 market towns, 118 parishes, 17,758 houses, and, in 1811, 85,629 inhabitants. It is in the diocese of Llandaff. This county, in the time of the Romans, was part of the district inhabited by the Silures, and had several Roman stations. Thus Boeroton, a few miles to the south of Cowbridge, is supposed to be the Bovium of Antoninus: Neth is his Nidum; and Loghor, to the west of Swansea, to be his Leucarum. The principal rivers of this county are the Rhymney, the Tafl, the Ogmore, the Aran, the Cleaugh, and the Tawe. The air, in the south part, is temperate and healthful; but the northern part, which is mountainous, is cold and piercing, full of thick woods, extremely barren, and thin of inhabitants. The mountains, however, serve to feed herds of cattle, and send forth streams which add greatly to the fertility of the other parts of the county.
Glamorgan—county: they have likewise coal and lead ore. The south part is so remarkably fertile, pleasant, and populous, that it is generally styled the garden of Wales; but it has no manufacture. This county was formerly full of castles, most of which are now fallen to decay. It has many small harbours on the coast for exporting coals and provisions. Of the former it sends large quantities both to England and Ireland; but of the latter, to England almost solely, especially butter. It sends two members to parliament, one for the shire, and one for the borough of Cardiff the capital. See Glamorganshire, Supplement.

GLAMOUR, or Glanner, an old term of popular superstition in Scotland, denoting a kind of magical mist believed to be raised by sorcerers, and which deluded their spectators with visions of things which had no real existence, altered the appearance of those which really did exist, &c. The eastern nations have a similar superstition, as we may learn from the Arabian Nights Entertainments and other works of oriental fiction.

GLAND, in Anatomy. See Anatomy Index.

GLANDERS. See FARRIERS Index.

Glandore, a town of Ireland, situated in the county of Cork and province of Munster, near the harbour of that name.

Glandore Harbour, situated two leagues west of the Galley-head in the county of Cork, province of Munster, N. Lat. 51° 22'. W. Long. 8° 56'. Between this harbour and Ros the coast continues high and bold, with only two small coves; that to the east called Milleove, and that to the west Cowroe. This harbour lies three miles west of Ros; and though small, is an exceeding good one; near it is a castle of the same name, and on the upper end is a deep and dangerous glin, called the Leap. Glandore gives title of earl to the family of Crose.

Glandulæ REMALES. See Anatomy Index.

GLANS, in Anatomy, the tip or button of the penis, or that part covered with the prepuce, called also balanum. See Anatomy Index.

GLANS is also used to denote the tip or extremity of the clitoris, from its resemblance, both in form and use, to that of the penis. See Anatomy Index.

GLANVIL, JOSEPH, a learned and ingenious, but fanciful and credulous, writer in the 17th century, was born at Plymouth in 1636, and bred at Oxford. He became a great admirer of Mr Baxter, and a zealous person for a commonwealth. After the Restoration, he published The Vanity of Dogmatizing; was chosen a fellow of the Royal Society; and, taking orders in 1662, was presented to the vicarage of Frome-Selwood in Somersetshire. The same year he published his Lex Orientalis: in 1665, his Scepsis Scientifica; and in the year following, Some Philosophical Considerations touching the being of Witches and Witchcraft, and other pieces of the same subject. In 1665, he published Plus ultra; or, The Progress and Advancement of Knowledge since the Days of Aristotle. He likewise published A Seasonable Recommendation and Defence of Reason; and Philosophia Pia, or A Discourse of the Religious Temper and Tendencies of the Experimental Philosophy. In 1678 he was made a prebendary of Worcester, and died in 1680.

GLARIS, one of the cantons of Switzerland, is bounded on the east, partly by the Grisons, and partly by the territory of Sargans; on the north, by the bailiwick of Gaster, and by the lake Wahlestatt; on the east, by the canton of Schwits; and on the south, by part of the canton of Uri, and part of the league of the Grisons. It is a mountainous country, and contains about 20,000 inhabitants.

GLARIS, a town of Switzerland, capital of the canton of the same name, is seated in a plain, at the foot of high craggy mountains. The streets are large, and the houses kept in good repair. It has some public buildings; among which are two churches, one in the middle of the town, and the other without upon an eminence. In this eminence there is a cavern, with grotesque figures formed by the water that drops therein. The general assemblies of the country were formerly held on the first Sundays in May, where all the males above the age of sixteen were obliged to appear. Both the Calvinists and the Roman Catholics are tolerated in this town, and they have divine service by turns in the same church. It is seated on the river Lint, E. Long. 9° 13'. N. Lat. 47° 6'. Population about 2500.

Glasgow, a large city of Lanarkshire or Clydesdale in Scotland, situated in W. Long. 4° 16'. N. Lat. 55° 52'.

Concerning the foundation of this city we have no authentic records. The word in the Gaelic language signifies a gray smith; from whence it has been inferred, that some spot in the most ancient part of the city was originally the residence of some blacksmith who had become eminent in his profession, so that the place went by his name.

In the year 560, a bishopric is said to have been Bishops of founded here by Saint Mungo, or Kentigern, supposed to be the son of Thanates, daughter of Loth king of the Picts; but in what state the town at that time was, is altogether uncertain. Most probably the priests and disciples who attended St Kentigern would contribute considerably towards its advancement; the aged and infirm, who were unfit for the purposes of war, or such as were religiously inclined, would come and settle round the habitation of the holy man, in order to have the benefit of his prayers; and as a number of miracles were said to have been wrought at his tomb, the same causes would still contribute to the increase of the town.

History has not informed us of the name of the prince who founded and endowed the bishopric of Glasgow in favour of St Kentigern. But from an abstract of the life of Kentigern (contained in Mr Innes's Critical Essay on the Ancient Inhabitants of Scotland), which was written in the 12th century, we learn, that the saint being ill used by Marken or Marcus, one of the kings of the Britons, retired into Wales. On the invitation of Roderie, however, one of Marken's successors, he returned to Glasgow, and enjoyed the see till 637, when he died. He was buried in the church of Glasgow, where his monument is still to be seen; and we find him marked among the saints in the Roman calendar, January 13, 577.

The immediate successors of Kentigern were Baldred and Conwal. The first established a religious house at Lenninam; the second went into Lothian to preach to the Saxons; and both of them are ranked as saints in the Roman calendar, Baldred on the 6th of March.
March 608, and Conwal on the 18th of May 612. From this time, however, till the 1115, we have no distinct accounts concerning the city or bishopric of Glasgow. We find then, that David I., king of Scotland, made an attempt to retrieve the people from a state of gross barbarity into which they were fallen, and restored to the church those lands of which she had been robbed. The only account we have of the transactions with regard to Glasgow, during that period, is in the inquisition made by David concerning the church lands of Glasgow, and is as follows.—"This church, by the divine appointment, admitted St. Kentigern into the bishopric, who furnished large draughts of knowledge to those thirsting after heavenly things, &c. But a fraudulent destroyer, employing his common wiles, brought in, after a long series of time, unaccountable scandals into the Cumbrian church. For after St. Kentigern and many of his successors were removed to heaven, various disturbances everywhere arising, not only destroyed the church and her possessions, but, wasting the whole country, drove the inhabitants into exile. These good men being destroyed, various tribes of different nations flocking in from several quarters, possessed the foresaid deserted country; but being of different origins, and varying from each other in their language and customs, and not easily agreeing among themselves, they followed the manners of the Gentiles, rather than those of the true faith. The inhabitants, of which unhappy and abandoned country, though living like brutes, the Lord, who chooses that none should perish, vouchsafed to visit in mercy," &c.

From the year 1116 to the Reformation, the records of the bishopric are tolerably complete. The most remarkable particulars furnished by them are the following:

In 1136, John Achaius, chosen bishop of Glasgow by David I., built and adorned a part of the cathedral, which he solemnly consecrated on the 9th of July. The king was present at the ceremony; and bestowed on the church the lands of Perdeky, now Patrick. This prelate also divided the diocese into the two archdeaneries of Glasgow and Teviotdale; and established the offices of dean, subdean, chancellor, treasurer, sacrist, chancellor, and successors; and settled a prebendary upon each of them, out of the donatives he received from the king.

In 1174, Joceline, abbot of Melrose, was elected bishop, and consecrated by Eakilus, bishop of Lunden in Denmark, the pope's legate for that kingdom, on the 1st of June 1175. He rebuilt the cathedral, or rather made an addition to the church already built by John Achaius. He also procured a charter from William king of Scotland, erecting Glasgow into a royal borough, and likewise a charter for a fair to be held there annually for eight days.

In 1335, John Lindsay, bishop of Glasgow, was killed in an engagement at sea with the English, as he was returning home from Flanders. His successor, William Rae, built the stone bridge over the Clyde. In the time of Matthew Glendoning, who was elected bishop in 1387, the great spire of the church, which had been built only of wood, was consumed by lightning. The bishop intended to have built another of stone; but was prevented by death, in 1408, from accomplishing his purpose. His successor, William Lander, laid the foundation of the vestry of the cathedral, and built the great tower of stone as far as the first battlement. The great tower of the episcopal palace was founded about the year 1437, on which Bishop Cameron expended a great deal of money.

In 1447, William Turnbull, a son of the family of Glase, Bedrule in Roxburghshire, was chosen bishop. He was a temporal, obtained from King James II. in 1450, a charter erecting the town and the patrimony of the bishop into a royal city, and the regality. He also procured a bull from Pope Nicholas V. for erecting an university within the city, which he endowed, and on which he also bestowed many privileges. He died in 1454, leaving behind him a most excellent character. The establishment of the college contributed more than any thing that had been formerly done towards the enlargement of the town. Before this time the town seemed to have been inconsiderable. Mr Gibson is of opinion, that the number of its inhabitants did not exceed 2000. But though the establishment of the university greatly increased the number of inhabitants, it in fact destroyed the freedom of the town. Bishop Turnbull seems to have made a point of it with King James II. that the city of Glasgow, with the bishop's forest, should be erected into a regality in his favour; which was accordingly done at the time above mentioned; and this at once took away all power from the citizens, and transferred it to the bishop. As the powers of the bishop, however, were reckoned by Turnbull insufficient to convey to the members of the university all that freedom which he wished to bestow upon them, he therefore obtained from the king a great many privileges for them; and afterwards he himself, with the consent of his chapter, granted them many more.

The good effects of the establishment of the college were very soon obvious in Glasgow. The number of its inhabitants increased exceedingly; the high street, from the convent of the Black Friars, to where the cross is now placed, was very soon filled up; the ancient road which led to the common being too far distant for the convenience of the new inhabitants, the Galows-gate began to be built. Soon after, the collegiate church of the blessed Mary (now the Tron church) being founded by the citizens, occasioned the Trengate street to be carried to the westward as far as the church. The rest of the city increased gradually towards the bridge, by the building of the Saltmarket street. The borough roads, and the cattle that grazed on the commons, were now found insufficient to maintain the increased number of inhabitants; for which reason a greater degree of attention than formerly was paid to the fishing in the river. Many poor people subsisted themselves by this occupation; they were incorporated into a society; and in order that they might be at hand to prosecute their business, they built a considerable part of the street now called the Bridge-gate, but at that time Fishers-gate.

Notwithstanding all this, however, the city of Glasgow did not for a long time attain the rank among the other towns of Scotland which it holds at present. In 1556, it held only the 11th place among them, as appears by Queen Mary's taxation. The introduction of the reformed religion proved for some time prejudicial to the opulence of the city. The money which
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had formerly been expended among the citizens by the bishop and his clergy, was now diverted into other channels; the advantages resulting from the university were also for a time lost; for as the reformers generally despised human learning, the college was in a manner deserted.

In the time of the civil wars, Glasgow suffered severely. The mischief attending intestine discord, destroyed were added a pestilence and famine; and to complete their misfortunes, a violent fire broke out in June 1652, which destroyed the greatest part of the Saltmarket, Trongate, and High street. The fronts of the houses at that time were mostly of wood, so that they became an easy prey to the flames. The fire continued with great violence for the space of 18 hours; by which a great many of the inhabitants were ruined, the habitations of almost 1000 families being totally destroyed. On this account collections were made through different parts of the country; and to prevent such accidents for the future, the fronts were built with freestone, which abounds in the neighbourhood.

By the charter given to Bishop Turnbull in 1450, the citizens had been deprived of the power of electing their own magistrates, which was thenceforth exercised by the bishop; which, however, was not done without some resistance on the part of the inhabitants. After the Reformation was introduced into Scotland, we find this power exercised by the citizens, the bishop, the earl of Lennox, and others. The idea that the town was a bishop's borough, and not a royal free borough, gave occasion to this unsettled manner of appointing the magistracy; and though, in 1633, they were declared to be a royal free borough by the parliament, yet their freedom of election was afterwards disturbed by the privy council, by Cromwell, and the duke of York. But on the 4th of June 1650, the town was declared free by a charter of William and Mary; and in confirmation of this charter it was inserted in the act of parliament, dated June 14th the same year, that they should have power to elect their own magistrates as freely and freely, in all respects, as the city of Edinburgh or any other royal borough within the kingdom; which freedom of election still continues.

By the assessment of the boroughs in 1665, we find the city of Glasgow reckoned the second in Scotland in point of wealth, which place it still continues to hold.

To account for this great increase of wealth, we must observe, that for a long time, even before the restoration of Charles II, the inhabitants of Glasgow had been in possession of the sale of both raw and refined sugars for the greatest part of Scotland; they had a privilege of distilling spirits from their molasses, free of all duty and excise; the herring fishery was also carried on to what was at that time thought a very considerable extent; they were the only people in Scotland who made soap; and they sent annually some hides, linens, &c., to Bristol, from whence they brought back in exchange, a little tobacco, sugar, and goods, of the manufacture of England, with which they supplied a considerable part of the kingdom. From the year 1707, however, in which the union between Scotland and England took place, we may date the prosperity of Glasgow.

By the union, the American trade was laid open to the inhabitants; and so sensible were they of their advantageous situation, that they began almost instantly to prosecute that commerce; an industrious application to which, ever since, hath greatly contributed to raise the city to the pitch of affluence and splendour which it at present enjoys. The city was now greatly enlarged; and as the community were sensible of the inconvenience that attended the want of a sufficient quantity of water for the river for carrying on their commerce, they resolved to have a port of their own nearer the mouth of the river. At first, they thought of making their harbour at Dumbarton: but as this is a royal borough, the magistrates opposed it; because they thought that the influx of sailors and others, occasioned by the harbour, would be so great, that a scarcity of provisions would be occasioned. The magistrates and town council of Glasgow, therefore, purchased some lands on the south side of the river Clyde for this purpose; and so expedients were they in making their harbour, and rearing their town, that in 1710 a bailey was appointed for the government of Fort-Glasgow. It is now a very considerable parish, and lies 21 miles nearer the mouth of Clyde than Glasgow.

In 1725, Mr Campbell, the member of parliament for Glasgow, having given his vote for having the malt tax extended over Scotland, a riot ensued among the lower class of people. In this disturbance, Mr Campbell's furniture was destroyed, and some ex-servicemen were maltreated for attempting to take an account of malt. General Wade, who commanded the forces in Scotland, had sent two companies of soldiers, under the command of Captain Bushel, to prevent any disturbance of this kind. Captain Bushel drew up his men in the street, where the multitude pelted them with stones. He first endeavoured to disperse the mob by firing with powder only: but this expedient failing, he ordered his men to load their pieces with ball; and, without the sanction of the civil authority, commanded them to fire four different ways at once. By this discharge about 20 persons were killed and wounded; which enraged the multitude to such a degree, that having procured some arms, they pursued Bushel and his men to the castle of Dumbarton, about 14 miles distant. General Wade being informed of this transaction, assembled a body of forces, and being accompanied by Duncan Forbes, lord advocate, took possession of the town: the magistrates were apprehended and carried prisoners to Edinburgh; but on an examination before the lords, their innocence was clearly proved, upon which they were immediately dismissed. Bushel was tried for murder, convicted, and condemned; but, instead of suffering the penalties of law, he was indulged with a pardon, and promoted in the service. Mr Campbell petitioned the house of commons for an indemnification of his losses: a bill was passed in his favour; and this, together with some other expences incurred in the affair, cost the town 9000l. sterling.

During the time of the rebellion 1745, the citizens of Glasgow gave proof of their attachment to revolution principles, by raising two battalions of 600 men each, for the service of government. This piece of loyalty, however, had like to have cost them dear. The rebels, in their journey south, took a resolution to plunder and burn the city: which would probably have been done, had not Mr Cameron of Lochiel threatened, in that case, to withdraw his clan. A heavy contribution, however, was laid on. The city was constituted
in the state of the trade of Glasgow than any event which had previously occurred, and formed indeed a new era in its history. From that time the progress of the town in commerce, population, and wealth, has been surprising.

The most ancient part of the city stands on a rising Mexican ground. The foundation of the cathedral is 104 feet higher than the bed of the river; and the descent from the high ground reaches to about 100 yards below the college. The rest of the city is built chiefly upon a plain, bounded southward by the Clyde, and northward by a gentle ridge of hills lying in a parallel direction with that river. These grounds, till lately, consisted of gardens and fields; but are now covered with buildings, in consequence of the increasing wealth and population of the city. The streets are all clean and well paved; and several of them intersecting one another at right angles, produce a very agreeable effect.

The four principal streets, crossing one another in that manner, divide the city into four equal parts; and the different views of them from the cross, or centre of intersection, have an air of great magnificence. The houses, consisting of four or five floors, are height, are built of hewn stone, generally in very good taste, and many of them elegant. The most remarkable public buildings are,

1. The Cathedral, or High Church, is a magnificent building, and its situation greatly to its advantage, as it stands higher than any part of the city. It has been intended to form a cross, though the transverse part has never been finished. The great tower is founded upon four large massy pillars, each of them about 30 feet in circumference. The tower itself is 254 feet square within; and is surrounded by a balustrade, within which rises an octagonal spire terminated by a vase. The tower upon the west end is upon the same level, but appears not to have been finished, though it is covered over with lead. In this tower is a very large bell 11 feet four inches in diameter. The principal entry was from the west; and the east block of the choir is now appropriated for a place of divine worship; and is divided from the remaining part by a stone partition, which is enclosed by another stone wall parting it from the nave. It is impossible to form an adequate idea of the awful solemnity of the place occasioned by the length of the roof and the range of pillars by which the whole is supported.

The nave of the church rises four steps higher than the choir; and on the west side stood the organ loft, formerly ornamented with a variety of figures, but now defaced. The pillars here are done in a better taste than those in the choir, and their capitals are ornamented with fruits. The arched roof of the aisle is supported by five pillars, over which was a fine terrace walk, and above it a large window of curious workmanship, but now shut up. On the north side of the altar is the vestry, being a cube of 28 feet, the roof arched and vaulted at top, and supported by one pillar in the centre of the house. Arched pillars from every angle terminate in the grand pillars, which is 19 feet high. The lower part of the south cross is made use of as a burying place for the clergy of the city; and is by much the finest piece of workmanship in the whole building. It is 55 feet long, 28 broad, and
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15 high; arched and vaulted at top, and supported by a middle range of pillars, with their capitals highly ornamented; corresponding to which are columns adjoining to the walls, which, as they rise, spring into semi-arches, and are everywhere met at acute angles by their opposites, and are ornamented with carvings at the closing and crossing of the lines. At the east end of the choir you descend by flights of steps upon each side into passages which, in former times, were the principal entries to the burying vault, which is immediately under the nave. It is now made use of as a parish church for the barony of Glasgow; and is full of pillars, some of them very massive, which support the arched roof; but it is a very uncomfortable place for devotion. The space under the altar and vestry, though now made use of as a burying place by the possessors of the barony, was formerly, according to tradition, employed for keeping of the relics; and indeed, from the beautiful manner in which this place is finished, one would imagine that it had not been destined for common use. Here is shown the monument of St Mungo, or Kentigern, with his figure lying in a cumbent posture.

The whole length of the cathedral within the walls is 284 feet, its breadth 65; the height of the choir, from the floor to the canopy, 90 feet; the height of the nave, 87 feet; the height of the middle tower, 220 feet. This fabric was begun by John Acharais in 1123, and consecrated in 1150; and continued by succeeding bishops till such time as it was finished in the manner in which it stands at present. The wealth of the see of Glasgow, however, was not sufficient for so great an undertaking, so that they were obliged to have recourse to all the churches of Scotland for assistance in it.

This venerable edifice was in danger of falling a victim to the frenzy of fanaticism in 1579; and owed its preservation to the spirit and good sense of the tradesmen, who, upon hearing the beat of drum for collecting the workmen appointed to demolish it, flew to arms, and declared that the first man who pulled down a single stone should that moment be buried under it.

Near the cathedral are the ruins of the bishop's palace or castle, enclosed with a wall of hewn stone by Archbishop James Beaton; the great tower built by Archbishop Cameron in 1426.

2. St Andrew's Church was begun by the community in 1739, and finished in 1756. It is the finest piece of modern architecture in the city; and is built after the model of St Martin's in the Fields, London, whose architect was the famous Gibbs. The length of the church is 304 feet, and its breadth 66. It has a fine arched roof, well ornamented with figures in stucco, and sustained by stone columns of the Corinthian order. Correspondent to the model, it has a place for the altar on the east, in which is a very ancient Venetian window; but the altar place being seated, makes this end appear to no great advantage. The fronts of the galleries and the pulpit are done in mahogany in a very elegant manner. The spire by no means corresponds with the rest of the building; and, instead of being an ornament, disgraces this beautiful fabric. Its height is 170 feet.

Besides the cathedral (which contains three congregations) and St Andrew's church, there is a number of others, as the College church, Ram's-born, Tron, St Enoch's and St George's; together with an English chapel, Highland church, several seceding meeting-houses, and others for sectaries of various denominations.

3. The College.—The front of this building extends the whole length of the east side, and is upwards of 350 feet long. The gate at the entrance is decorated with rustics, and over it are the king's arms. The building consists of two principal courts or squares. The first is 88 feet long and 44 broad. The west side is elevated upon stone pillars, on which are placed pilasters supporting the Doric entablature, and ornamented with arches forming a piazza. Above these is the public hall; the ascent to which is by a double flight of steps enclosed by a handsome stone balustrade, upon the right of which is placed a lion, and on the left an unicorn, cut in freestone. The spire stands on the east side, is 135 feet high, and has a very good clock. Under this is the gateway into the inner and largest court, which is 103 feet long and 70 broad. Over the entry, in a niche, is a statue of Mr Zacharias Boyd, who was a benefactor to the university. On the east side of the court is a narrow passage leading into a handsome terrace walk, gravelled, 122 feet long by 64 feet broad. This walk is enclosed to the east by an elegant edifice, with the inscription in the centre of which is "The University of Glasgow.

4. New Jail.—The old jail having become much too small in consequence of the rapid growth of the town, a new one was projected in 1805. As the Glasgow jail receives prisoners from the neighbouring counties, application was made first to them, and afterwards to government for assistance in defraying the expense, but without effect. In consequence of this the plan was reduced, and the expense, amounting to 34,800l. was defrayed from the funds of the burgh. The new jail was opened in 1814, and is admitted to be one of the most commodious and best arranged in the country. It is situated at the west end of the Green, in a healthy and well aired position; and besides a court house capable of containing 500 persons, and several other public offices, it contains 122 apartments for prisoners, sixteen large galleries for air and exercise, and two paved court yards, 60 feet by 46. The jail is formed into sixteen distinct allotments—eight for debtors, and eight for criminals. The building is amply supplied with pure water, and is carefully cleaned. There are four well aired infirmaries rooms, and a chapel which holds 200 persons. During the year ending 1st April 1819, no less than 1869 persons had been incarcerated—693 debtors and 1176 delinquents.
Bridewell.—Till the year 1798 there was no regular Bridewell in Glasgow. The present Bridewell, which is in Duke street, is six stories high, and contains a chapel, a work-room, and 103 cells, each eight feet by seven, with a public kitchen, apartments for the keeper, and several work-rooms. It has now, however, become too small for the city; and a scheme is at present in contemplation for erecting another on a more extensive scale, and a better plan.

6. The Guild Hall or Merchants House. This building is situated upon the south side of Bridgegate street; and is in length 82 feet, in breadth 31. The great hall, which is the whole length and breadth of the building, is so capacious, that it is better adapted for the reception of great and numerous assemblies than any other in the city. This house is adorned with a very elegant spire 200 feet high.

7. The Town's Hospital is a very neat building, consisting of two wings and a large front; the length 136 feet, the breadth of the centre 50 feet, and the depth of the wings 68 feet. Behind the building is an infirmary 127 feet long by 25 feet broad, the ascent to which is by a flight of steps. The lower part of this building is appointed for the reception of lunatics. The area between the buildings is large, which, with the agreeable open situation of the hospital on the river, must conduct to the health of the inhabitants.

8. The Grammar School is situated in the new part of the town, to the north-west, and was built in 1787. It is a very handsome building, containing a large hall, and six airy commodious teaching rooms. In this school there are four classes, the course being four years: each class is carried on the whole five years by the same master; so that, there being no rector, each master is head of the school one year in rotation. It is under the direction of a committee of the town council, who, assisted by the professors, clergy, and other persons of learning, frequently visit it during the session; and at an annual examination, prizes are distributed to the scholars according to their respective merits. The number of scholars is about 540. It is found that there are 10,200 persons educated in Glasgow who pay fees, besides 1100 educated at free or charity schools.

9. Bridges.—There are at Glasgow two stone bridges over the Clyde, and a wooden one. The Old Bridge at the foot of Stockwell street, was built by Bishop Rea in 1345. Ten feet were added to its breadth in 1777, and its present dimensions are, 415 feet in length, and 22 in breadth. The New Bridge is built in an elegant manner. It is 32 feet wide, with a commodious footway for passengers, five feet broad on each side, raised above the road made for carriages, and paved with freestone. This bridge is about 500 feet in length, and consists of seven arches, the faces of which are wrought in rustic, with a strong block cornice above. The arches spring but a little way above low water mark; which, though it renders the bridge stronger than if they sprung from taller piers, diminishes its beauty. This bridge was begun in 1768, and finished in 1772.

The Markets in King's Street are justly admired, as being the completest of their kind in Britain. They are placed on both sides of the street. That on the east side, appropriated entirely for butcher meat, is 112 feet in length, and 67 in breadth. In the centre is a spacious gateway, decorated on each side with coupled Ionic columns, set upon their pedestals, and supporting an angular pediment. At the north end is a very neat hall belonging to the incorporation of butchers, the front ornamented with rusticks and a pediment. The markets upon the west side of the street consist of three courts, set apart for fish, mutton, and cheese. The whole of the front is 173 feet, the breadth 46 feet; in the centre of which, as on the opposite side, is a very spacious gateway of the Doric order, supporting a pediment. This is the entry to the mutton market. Each of the other two has a well proportioned arch faced with rustics for the entrance. All these markets are well paved with freestone, have walks all round them, and are covered over for shelter by roofs standing upon stone piers, under which the different commodities are exposed to sale. They have likewise pump wells within, for cleansing away all the filth; which renders the markets always sweet and agreeable. These markets were erected in 1754.

11. The Market for Vegetables is neat and commodious; and the principal entry is decorated with columns. It is situated in the Candleriggs, and is hit out in the same manner with the markets in King's street.

12. The Guard House is a very handsome building, with a piazza formed by arches, and columns of the Ionic order set upon their pedestals. It was originally situated on the High street, at the corner of the Candleriggs street; but was afterwards carried near half way up the Candleriggs, where it occupies the ground on which the weigh-house formerly stood, and is made larger and more commodious than it was before. As an excellent new weigh-house has been erected at the head of the Candleriggs, and at the foot of the Candleriggs, or corner next the High street, where the guard-house was formerly situated, a superb new hotel has been built, containing 75 fire rooms.

The most remarkable public charities in Glasgow are,

1. Muirhead's or St Nicholas's Hospital. This was originally appointed to subsist 12 old men and a chaplain; but its revenues have, from some unknown causes, been lost; so that no more of them now remains than the paltry sum of 139l. 2s. 5d. Scots money, 12£ of which is annually divided among four old men, at the rate of 2l. 13s. 4d. sterling each.

2. Hutcheson's Hospital, was founded and endowed in 1659 by George Hutcheson of Lambhill, notary public, and Mr Thomas Hutcheson his brother, who was bred a preacher, for the maintenance of old men and orphans. The funds of this hospital were increased by James Blair, merchant in Glasgow in 1710, and by subsequent donations. The income, which is now large, is distributed in pensions to old people from 3l. to 2l., and in educating about 70 children. The sum distributed in pensions in 1819 was 1790l. 7s.

3. The Merchants House likewise distributes in pensions and other charities about 8ool. yearly.

4. The Town's Hospital, above described, was opened for the reception of the poor on the 15th of November 1733. The funds whence this hospital is subsisted are, the general session, the town council, the trade
house, and merchants house, the interest of money belonging to their funds, which are sums that have been mortgaged for the use of the house. These supplies, however, are found insufficient to defray the expenses of the house; for which reason an assessment is annually made upon the inhabitants in the following manner. The magistrates nominate 12, 14, or sometimes more gentlemen of known integrity and character, who have a list laid before them of all the inhabitants in town. This list they divide into 16 or 18 columns. Each of these columns contains the names of such inhabitants as carry on trade to a certain extent, or are supposed to be well able to pay the sum affixed to the particular column in which their names are inserted. If it is necessary to raise 500l. for instance, then each name, in every separate column, is valued at as much as the fortunes of the persons in each particular column are supposed to be. If 1000l. or more is to be raised, it is only continuing a proportional increase through the whole of the columns. This assessment has been gradually increasing. In 1782 it was 10,571; in 1800 it was 45,341, and in 1819 it was 10,303. The rate of assessment has also increased during the war from 1 to 3 shillings on 100l. of property.

5. Wilson’s Charity for the education of boys, was founded by George Wilson, who in 1778 left 3000l. for that purpose. This fund is now considerably increased, and gives education and clothing to 48 boys, who each continues four years, so that 12 are admitted annually.

Besides these, there are many public schools for the education of children; as well as many institutions of private societies for the purpose of relieving the indigent and instructing youth, such as Graham’s Society, Buchan’s Society, the Highland Society, &c. These last pot annually 20 boys apprentices to trades, and during the first three years give them clothing and education.

The university of Glasgow owes its origin, as we have already observed, to Bishop Turnbull. The institution consisted at first of a rector, a dean of faculty, a principal who taught theology, and three professors of philosophy; and, after this, the civil and canon laws were taught by some clergymen. From the time of its establishment in 1450 to the Reformation in 1560, the college was chiefly frequented by those who were intended for the church; its members were all ecclesiastics, and its principal support was derived from the church. The Reformation brought the university to the verge of destruction: masters, students, and servants, all forsake it. The magistrates were so sensible of the loss which the community had sustained by this desertion, that they endeavored to restore it in 1572, by bestowing upon it considerable funds, and prescribing a set of regulations for its management. These, however, proved insufficient; for which reason King James VI. erected it anew, by a charter called the Novus Erectio, 1577, and bestowed upon it the teinds of the parish of Govan. The persons who were to compose the new university were, a principal, three professors of philosophy, four students bursars, one economist, a principal’s servant, a janitor, and cook.

Since the year 1577, the funds of the university have been considerably increased by the bounty of kings and the donations of private persons. The professors have therefore also been increased: so that at present the university of Glasgow consists of a chancellor, rector, dean of faculty, principal, and 14 professors (six of them in the gift of the crown), together with bursars, &c. The archbishop of Glasgow was formerly chancellor of the university ex officio; at present, the chancellor is chosen by the rector, dean of faculty, principal, and masters.

The chancellor, as being the head of the university, is the fountain of honour, and in his name are all academic degrees bestowed. The office of rector is to exercise that academic jurisdiction in disputes among the students themselves, or between the students and citizens, which is bestowed upon the greater part of the universities in Europe. He is chosen annually in the comitia; that is, in a meeting in which all the students, as well as the other members of the university, have a voice. Immediately after his admission, he has been in use to choose certain persons as his assessors; and counselors in his capacity of judge; and, in former periods, it was customary to name the ministers of Glasgow, or any other gentlemen who had no connexion with the university; but, for a great while past, the rector has constantly named the dean of faculty, the principal, and masters, for his assessors; and he has always been, and still is, in the daily practice of judging in the causes belonging to him, with the advice of his assessors. Besides these powers as judge, the rector summons and presides in the meetings of the university for the election of his successor; and he is likewise in use to call meetings of the professors for drawing up addresses to the king, electing a member to the general assembly, and other business of the like kind.

The dean of faculty has, for his province, the giving direction with regard to the course of studies; the judging, together with the rector, principal, and professors, of the qualifications of those who desire to be created masters of arts, doctors of divinity, &c.; and he presides in meetings which are called by him for these purposes. He is chosen annually by the rector, principal, and masters.

The principal and masters, independent of the rector and dean, compose a meeting in which the principal presides; and as they are the persons for whose behalf chiefly the revenue of the college was established, the administration of that revenue is therefore committed to them. The revenue arises from the teinds of the parish of Govan, granted by King James VI. in 1577; from the teinds of the parishes of Renfrew and Kilbride, granted by the same monarch in 1617, and confirmed by King Charles I. on the 28th of June 1629; from the teinds of the parishes of Calder, Old and New Monkland, conveyed to them by a charter from Charles II. in 1670; from a task of the archbishopric; and from several donations conferred by private persons.

The college of Glasgow, for a very considerable time after its erection, followed the mode of public teaching which is common even to this day in Oxford and Cambridge, and in many other universities throughout Europe; that is, each professor gave a few lectures every year, gratia, upon the particular science which he professed; but in place of this, the professors have, for a great while past, adopted the mode of private teaching: that is, they lecture and examine two hours every
every day during the session, viz. from the 10th of October to the 10th of June; a method which comes much cheaper to the student, as he has it in his power, if he is attentive, to acquire his education without being under the necessity of employing a tutor. They have also private classes, in which they teach one hour per day. The number of students who attended this college at the various classes in the session 1819-1820, was no less than 1264.

The trade of Glasgow is said to have been first promoted by one Mr William Elphinstone in 1430. This trade was most probably the curing and exporting of salmon; but the first authentic document concerning Glasgow as a trading city is in 1546. Complaints having been made by Henry VIII., king of England, that several English ships had been taken and robbed by vessels belonging to Scotland, an order of council was issued, discharging such captures for the future; and among other places made mention of in this order is the city of Glasgow. The trade which at that time the carried on could not be great. It probably consisted of a few small vessels to France loaded with pickled salmon; as this fishery was, even then, carried on to a considerable extent, by Glasgow, Renfrew, and Dumfries. Between the years 1630 and 1660, a very great degree of attention seems to have been paid to inland commerce by the inhabitants of Glasgow. Principal Baillie informs us, that the increase of Glasgow arising from this commerce was exceedingly great. The exportation of salmon and of herrings was also continued and increased. In the war between Britain and Holland during the reign of Charles II., a privateer was fitted out in Clyde to cruise against the Dutch. She was called the Lion of Glasgow, Robert MacAllan commander; and carried five pieces of cannon, and 60 hands.

A spirit of commerce appears to have arisen among the inhabitants of Glasgow between the years 1660 and 1707. The citizens who distinguished themselves most during this period were Walter Gibson, John Anderson, Captain cruised and packed in one year 100 lasts of herrings, which he sent to St Martin's in France on board of a Dutch vessel called the St Agate of 450 tons burden; his returns were brandy and salt. He was the first who imported iron from Stockholm into Clyde. Anderson is said to have been the first who imported white wines.

Whatever their trade was at this time, it could not be considerable: the ports to which they were obliged to trade lay all to the eastward: the circumnavigation of the island would therefore prove an almost unsurmountable bar to the commerce of Glasgow; and of consequence the people on the east coast would be possessed of almost all the commerce of Scotland. The union with England opened a field for commerce for which the situation of Glasgow, so convenient in respect to the Atlantic, was highly advantageous. Since that time the commerce of the east coast was declined, and that of the west increased to an amazing degree. No sooner was the treaty of union signed, than the inhabitants of Glasgow began to prosecute the trade to Virginia and Maryland; they chartered vessels from Whitehaven, sent out cargoes of goods, and brought back tobacco in return. The method in which they at first proceeded in this trade was certainly a very prudent one. A supercargo went out with every vessel. He bartered his goods for tobacco, until such time as he had either sold off his goods, or procured as much tobacco as was sufficient to load his vessel. He then immediately set out on his return; and if any of his goods remained unsold, he brought them home with him. While they continued to trade in this way, they were of great advantage to the country, by the quantity of manufactures which they exported; their own wealth began to increase; they purchased ships of their own; and, 1718, the first vessel of the property of Glasgow crossed the Atlantic. Their imports of tobacco were now considerable, and Glasgow began to be looked upon as a considerable port: the tobacco made at the ports of Bristol, Liverpool, and Whitehaven, was observed to dwindle away; the people of Glasgow began to send tobacco to these places, and to underwrite the English even in their own ports. Thus the jealousy of the latter was soon excited, and they took every method to ruin the trade of Glasgow. The people of Bristol presented memorials to the commissioners of the customs at London against the trade of Glasgow, in 1717. To these memorials the merchants of Glasgow sent such answers to the commissioners, as convinced them that the complaints of the Bristol merchants were without foundation. But in 1731, a most formidable confederacy was entered into by almost all the tobacco merchants in South Britain against the trade of Glasgow. Those of London, Liverpool, and Whitehaven, presented severally to the lords of the treasury, petitions, arranging the Glasgow merchants of frauds in the tobacco trade. To these petitions the Glasgow people gave in reply; and the lords of the treasury, after a full and impartial hearing, were pleased to dismiss the cause with the following sentence: "That the complaints of the merchants of London, Liverpool, and Whitehaven, were groundless; and that they proceeded from a spirit of envy, and not from a regard to the interest of trade, or of the king's revenue."

But the efforts of these gentlemen did not stop here. They brought their complaints into the house of commons. Commissioners were sent to Glasgow in 1722, who gave in their reports to the house in 1723. The merchants sent up distinct and explicit answers to these reports; but such was the interest of their adversaries, that these answers were disregarded. New officers were appointed at the ports of Greasock and Port Glasgow, whose private instructions seem to have been to ruin the trade if possible by putting all imaginable hardships upon it. Hence it languished till the year 1737; but after that time it began to revive, though even after its revival it was carried on but slowly for a considerable space of time.

At last, however, the active and enterprising spirit of the merchants, seconded the natural advantages of their situation, prevailed over all opposition; and the American trade continued to flourish and increase until the year 1775, inasmuch that the importation of tobacco into Clyde that year from the provinces of Virginia, Maryland, and Carolina, amounted to 57,467 hogsheads. But since the breach with America, this trade has now greatly fallen off, and very large sums
are said to remain due to the merchants from that quarter of the world.

With regard to the manufactures of Glasgow, Mr. Gibbon is of opinion that the commerce to America first suggested the idea of introducing them, in any considerable degree at least. The first attempts in this way were about the year 1725, and their increase for some time was very slow, nor did they begin to be considerable till great encouragement was given by the legislature to the linen manufacture in Scotland. The first causes of the success of this manufacture were the act of parliament in 1748, whereby the wearing of French cambrics was prohibited under severe penalties; that of 1751, allowing weavers in flax or hemp to settle and exercise their trade anywhere in Scotland free from all corporation dues; and the bounty of three halfpence per yard on all linens exported at and under 18d. per yard. Since that time a spirit of manufacture has been excited among the inhabitants of Glasgow; and great variety of goods, and in very great quantity, have been manufactured. Checks, linen, and linen and cotton, are manufactured to a great extent. Printed linens and cottons were begun to be manufactured in 1738; but they only made garments till 1754, when handkerchiefs were first printed.

Besides these, a great variety of articles are manufactured at Glasgow, of which our limits will not permit us to enter into a detail, such as soap, refining of sugar, ironmongery, brass, jewellery, glass both common and white, pottery, &c. Types for printing are made in this city by Dr. Wilson and Sons, equal, if not superior, in beauty to any others in Britain. Printing of books was first begun here by George Anderson about the year 1658. But there was no good printing in Glasgow till the year 1735, when Robert Utie printed several books in a very elegant manner. The highest perfection, however, to which printing hath yet been carried in this place, or perhaps in any other, was by the late Robert and Andrew Foulis, (who began in the year 1740); as the many correct and splendid editions of books printed by them in different languages sufficiently testify. Some of their classics, it is said, are held in such high esteem abroad, as to sell nearly at the price of ancient MSS. The same gentlemen also established an academy of painting; but the wealth of Scotland being unequal to the undertaking, it has been since given up.

The inventions and improvements introduced into the cotton manufacture by Hargreaves, Arkwright, and others, gave a new impulse to this species of industry. The people of Glasgow now found the manufacture of these articles very profitable, and about 1786 had begun to abandon the manufacture of cambrics, lawns, gauzons, and other light fabrics of linen, which had grown up there in the course of the century; and before 1792 the former of these manufactures had almost entirely superseded the latter. About 1782 the annual value of the whole manufactures of Glasgow did not exceed 800,000l., and in 1815 it was estimated that 1,000,000 yards of cotton cloth were manufactured at Glasgow, valued at 5,200,000l. In the spinning department there were in 1819 fifty-four mills employed, containing nearly 600,000 spindles; and the capital invested in buildings and machinery for carrying on this branch is estimated 1,000,000l. For weaving this yarn there are 2800 looms moved by mechanical power, producing weekly about 8400 pieces of cloth; and there are, as nearly as can be ascertained, 32,000 hand looms.

One of the late improvements most deserving of attention is the construction of steam boats. Glasgow was the first town in Britain to adopt this improvement, and it is now the centre of a greater amount of steam boat navigation than any other town in the island. These vessels were introduced by Mr. Henry Bell, an ingenious self-taught engineer in 1812; and in 1819 there were no less than 20 of them plying on the Clyde, and sailing some of them as far as Liverpool. The passage between Glasgow and Greenock, which is 26 miles, is usually performed in three hours. So much has this new invention increased the intercourse between these two places, that previous to its introduction it was calculated that not more than fifty persons passed and repassed in a day, whereas now the number is seldom less than four or five hundred.

Besides various improvements in the old streets, several handsome new ones as well as new squares have been added. The site of these new buildings is the tract of rising ground already mentioned as the north boundary of the town previous to its late extension. The western part of it, which is perfectly level, is occupied by a spacious square, denominated George's Square. The grass plot in the middle is enclosed with a handsome iron railing. The square is deficient in regularity; the houses on the west side being a story higher than those of the east; but in other respects it is very neat. Farther west a variety of new streets have been built, all of which are in a neat, and many in a very elegant style of architecture. St. George's church, a simple but elegant structure, with a very handsome tower, was opened in 1807. St. John's church, which is considerably larger, was opened in 1810. The Roman Catholic chapel, erected a few years ago, is admired as a good specimen of the Gothic style. The New Theatre in Queen street, which was opened in 1804, is a handsome edifice, and cost 18,500l. Among the objects of a purely ornamental nature lately erected, may be mentioned the brass statue of Sir John Moore, placed at the south side of George's square, and the stone obelisk in honour of Lord Nelson, which stands in the Green.

On the same or south side of the town, westward, is the Broomielaw, where the quay is situated. Till within these few years, the river here, and for several miles distance, was so shallow and so obstructed by shoals, as to admit only of small craft from Greenock, Fort Glasgow, and the Highlands; but of late it has been cleared and deepened so as to admit vessels of considerable burthen; and it is intended to make the depth as nearly equal as possible to that of the canal, in order that the vessels from Ireland and the west coast may come up Clyde and unload at the Broomielaw.

The government of the city of Glasgow is vested in a provost and three bailies, a dean of guild, descommiss, reversioner, and a treasurer, with a common council of six, &c. of 13 merchants and 12 mechanics. The provost and the city two of the bailies must, by the set of the borough, be elected from the merchant rank, and the other bailies from...
from the trades rank, i.e. the mechanics. The provost is, from courtesy and custom, styled lord provost.

He is properly lord of the police of the city, president of the community, and is as officio a justice of the peace for both the borough and county.

Many of the inhabitants of Glasgow were convinced of the necessity of a new system of police, a number of years before the sanction of parliament was obtained for that purpose, which was granted in the year 1800. The act vested the management of the police in the lord provost, bailies, dean of guild, dean convener, and 24 commissioners, one being chosen out of each ward into which the city is divided. The object of the bill was to procure an extension of the royalty, to pave, light, and clean the streets, for regulating the police, and nominating officers and watchmen, appointing commissioners, raising funds, and granting certain powers to the magistrates and council, town and dean of guild courts, and for several other purposes.

In framing this system of police, it was wisely provided that the commissioners shall not enjoy the office for life; nor even for a long period, but upon the supposition of being re-elected, and that every person properly qualified may have a chance for the office, and by consequence be entitled to a voice in the management of the funds and the establishment.

In order to raise funds for defraying the expense of the police establishment, the lord provost, magistrates and commissioners, on the first Monday of September, annually assess all occupiers, renters, or possessors of dwelling houses, cellars, shops, warehouses, and other buildings within the royalty, in proportion to the rent. The act expired in 1857, and was then renewed for 14 years longer. The rates of assessment fixed by the second, are as follows:

On the yearly rent of subjects valued
At 4l. and under 6l. sterling annually, 5d. per pound.
At 6l. and under 10l., 7½d. do.
At 10l. and under 15l., 11d. do.
At 15l. and upwards, 13. 3d. do.

The rates actually levied however under the police act have generally been under this amount. In 1817–18 it was 4d. 6d. 9d. and 1s. The disbursements for lighting, watching, and cleaning, during the same year, amounted to £1,617. The establishment consisted of 20 officers, 80 watchmen, 20 patrol, and 16 scavengers. The number of lamps was 1,472. In 1819 about two-thirds of the lamps were lighted with gas.

The officers have power to bring to justice persons guilty of street robberies, house-breakings, assaults, thefts, shoplifting, picking pockets, frequenters of disorderly houses; to suppress mobs and riots; to assist in extinguishing fires, in guarding and watching the streets, and in assisting the magistrates in every thing which relates to the police, peace, and good order of the city. These officers have hitherto given general satisfaction in the discharge of their duty, by seeing that the streets are kept clean, well lighted and guarded. In a word, property and personal safety are well secured.

Many whole and elegant streets have of late years been added to it, so that its rapid extension, increasing population, and flourishing commerce, justly entitle it to rank with any city in Scotland, or perhaps in the British empire.

The revenue of the town arises from a duty upon all grain and meal brought into the city (which tax is denominated the land); from the rents of lands and houses the property of the community; from an import of two pennies Scots upon every Scots pint of ale or beer brewed, inbrought, or sold within the city; from certain duties payable out of the market; from the rents of the seats in churches; from the duties of carrage at the quay, at the weigh-house, &c. As to the tonnage on the river, the portage of the bridge, and statute work; these, making no part of the city revenue, are kept separate and distinct under the management of commissioners appointed by act of parliament.

About the time of the Union, the number of inhabitants in Glasgow was reckoned about 14,000. In 1765, when a new division of the parishes took place, they were estimated at 28,000. In 1785, when an accurate survey was made, the number was 45,886, including the inhabitants of the suburb, the Calton, Gorbals, and Anderston. Since that time, the new buildings, as above noticed, have been erected, and the city has become greatly more populous. In 1791 the number of inhabitants was found to be 66,578. In 1811 they amounted to 110,460, and in 1830 to 147,197. Glasgow is therefore at present indisputably the second city in Britain for population. The rent of shops and houses in 1773 was £36,706l. and in 1820 it had increased to 286,340l.

The climate of Glasgow, similar to that of most other parts of the island, is variable; but there are some circumstances peculiar to its local situation which tend to affect it more than that of some other places nearer the middle of the country. That part of the country which Glasgow is situated, is almost in the narrow part of the isthmus betwixt the Forth and Clyde, from which position the air is frequently refreshed by temperate breezes from the sea. The wind is south-west and west for nearly two-thirds of the year, and is saturated with vapour in its passage across the Atlantic; and the sky being frequently clouded with it, the heat of summer are not so intense as in some other places. Fogs are not so common as in the neighbourhood of Edinburgh, and severe frosts are seldom of long continuance, nor are snows either very deep, nor do they lie long. Thunder and lightning are rare about Glasgow, and seldom destructive.

The soil in the vicinity is partly a rich clay and partly a light sand. The grain raised about the city is not sufficient for the consumption of the inhabitants, but vast quantities are brought from Ireland, Ayrshire, and the east country. While digging the foundation for the Tontine buildings in the midst of the city, a piece of a boat was found several feet below the surface of the ground, imbedded in sand and gravel, from which it would appear that the channel of the river had once run in that direction. In August 1801, while repairing a division of the cathedral, below the pavement opposite the pulpit, about two feet deep, part of a human skeleton was found, and a gold chain about 30 inches long lying above the bones of the leg. The date on the stone was 1599, but the inscription in the Saxo character was wholly effaced.
The general character of the people is that of industry and attention to business, by which many of them have arisen to a state of independence. They were formerly said to be remarkable for severity and apparent sanctity of manners; but at present they are not more distinguished in this respect than any of their neighbours. The crimes of robbery and house-breaking have, of course, increased with the increase of population; but many of these may be fairly charged upon strangers, and it would be uncandid on that account to attach blame to the inhabitants at large. See Glasgow, Supplement.

GLASS, a transparent, brittle, factitious body, produced from sand melted in a strong fire with fixed alkaline salts, lead, slags, &c. till the whole becomes perfectly clear and fine. The word is formed of the Latin glasium, a plant called by the Greeks lamin, by the Romans vitrum, by the ancient Britons guadam, and by the English wood. We find frequent mention of this plant in ancient writers, particularly Caesar, Vitruvius, Pliny, &c. who relate that the ancient Britons painted or dyed their bodies with glasium, guadam, vitrum, &c. i.e. with the blue colour procured from this plant. And hence the factitious matter we are speaking of came to be called glass; as having always somewhat of this bluishness in it.

At what time the art of glass-making was first invented, is altogether uncertain. Some imagine it to have been invented before the flood: but of this we have no direct proof, though there is no improbability in the supposition; for we know, that it is almost impossible to excite a very violent fire, such as is necessary in metallurgical operations, without vitrifying part of the bricks or stones whereon the furnace is built. This indeed might furnish the first hints of glass-making; though it is also very probable, that such imperfect vitrifications would be observed a long time before people thought of making any use of them.

Neri traces the antiquity of glass as far back as the time of Job. That writer, speaking of the value of wisdom (chap. xxviii. verse 17.), says, that gold and crystal cannot equal it. But this word, which Neri will have to signify factitious glass, is capable of a great many different interpretations, and properly signifies only whatever is beautiful or transparent. Dr Merret will have the art to be as ancient as that of pottery or the making of bricks, for the reasons already given, viz. that by all vehement heat some imperfect vitrifications are produced. Of this kind undoubtedly was the fossil glass mentioned by Frang. Emperor. to have been found under ground where great fires had been. But it is evident, that such imperfect vitrifications might have passed unnoticed for ages; and consequently we have no reason to conclude from thence, that the art of glass-making is of such high antiquity.

The Egyptians boast, that this art was taught them by their great Hermes. Aristophanes, Aristote, Alexander Aphrodiseus, Lucretius, and St John the divine, put it out of all doubt that glass was used in their days. Pliny relates, that it was first discovered accidentally in Syria, at a mound in the river Belus, by certain merchants driven thither by a storm at sea; who being obliged to continue there and dress their victuals by making a fire on the ground, where there was great plenty of the herb kafri; that plant, burning to ashes, its salts mixed and incorporated with the sand, or stones fit for vitrification, and thus produced glass; and that, this accident being known, the people of Sidon in that neighbourhood essayed the work, and brought glass into use; since which time the art has been continually improving. Be this as it will, however, the first glass-houses mentioned in history were erected in the city of Tyre, and here was the only staple of the manufacture for many ages. The sand which lay on the shore for about half a mile round the mouth of the river Belus was peculiarly adapted to the making of glass, as being neat and glittering; and the wide range of the Tyrian commerce, gave an ample vent for the productions of the furnace.

Mr Nixon, in his observations on a plate of glass found at Herculeanum, which was destroyed A. D. 80, on which occasion Pliny lost his life, offers several probable conjectures as to the uses to which such plates might be applied. Such plates, he supposes, might serve for specula or looking glasses; for Pliny, in speaking of Sidon, adds, sigum etiam specula ex cogitation: the reflection of images from these ancient specula being effected by besmearing them behind, or tinging them through with some dark colour. Another use in which they might be employed, was for adorning the walls of their apartments, by way of wainscot, to which Pliny is supposed to refer by his vitrea camera, lib. xxxvi. cap. 25. § 64. Mr Nixon farther conjectures, that these glass plates might be used for windows, and that the laminae of lapis specularis and phengites, which were improvements in luxury mentioned by Seneca and introduced in his time, Ep. xx. However, there is no positive authority relating to the usage of glass windows earlier than the close of the third century: Manifestus est (says Lactantius*), mentem esse, qua per obuwis ea quae sunt oppo, De opif. sita, transpictiat, quasi per fennestras lucere vitre aut Dei, cap. 5. speculari lapide obtusatas.

The first time we hear of glass made among the Romans was in the reign of Tiberius, when Pliny relates that an artist had his house demolished for making glass malleable, or rather flexible; though Petronius Arbiter, and some others, assure us, that the emperor ordered the artist to be beheaded for his invention. It appears, however, that before the conquest of Britain by the Romans, glass-houses had been erected in this island, as well as in Gaul, Spain, and Italy. Hence, in many parts of the country are to be found amulets of glass, having a narrow perforation and thick rim, denominated by the remaining Britons glinesus maid-redth or glass adders, and which were probably in former times used as amulets by the druids.

It can scarcely be questioned that the Britons were sufficiently well versed in the manufacture of glass, to form out of it many more useful instruments than the glass beads. History indeed assures us, that they did manufacture a considerable quantity of glass vessels. These, like their amulets, were most probably green, blue, yellow, or black, and many of them curiously streaked with other colours. The process in the manufacture would be nearly the same with that of the Gauls or Spaniards. The sand of their shores being reduced to a sufficient degree of fineness by art, was mixed with three-fourths
of its weight of their nitre (much the same with our kelp), and both were melted together. The metal was then poured into other vessels, where it was left to harden into a mass, and afterwards replaced in the furnace, where it became transparent in the boiling, and was afterwards figured by blowing, or modelling in the lathe, into such vessels as they wanted.

It is not probable that the arrival of the Romans would improve the glass manufacture among the Britons. The taste of the Romans at that time was just the reverse of that of the inhabitants of this island. The former preferred silver and gold to glass for the composition of their drinking vessels. They made indeed great improvements in their own at Rome, during the government of Nero. The vessels then formed of this metal rivalled the bowls of porcelain in their dearness, and equalled the cups of crystal in their transparency. But these were by far too costly for common use; and therefore, in all probability, were never attempted in Britain. The glass commonly made use of by the Romans was of a quality greatly inferior; and, from the fragments which have been discovered at the stations or towns of either, appears to have consisted of a thick, sometimes white, but mostly blue green, metal.

According to venerable Bede, artists skilled in making glass for windows were brought over into England in the year 674, by Abbot Benedict, who were employed in glazing the church and monastery of Wreemouth. According to others, they were first brought over by Wilfrid, bishop of Worcester, about the same time. Till this time the art of making such glass was unknown in Britain; though glass windows did not begin to be common before the year 1180; till this period they were very scarce in private houses, and considered as a kind of luxury, and as marks of great magnificence. The Romans had them first, next France, from whence they came into England.

Venice, for many years, excelled all Europe in the fineness of its glasses; and in the thirteenth century, the Venetians were the only people that had the secret of making crystal looking glasses. The great glass works were at Muran, or Murano, a village near the city, which furnished all Europe with the finest and largest glasses.

The glass manufacture was first begun in England in 1587; the finer sort was made in the place called Crutched Friars, in London; the fine flint glass, still inferior to that of Venice, was first made in the Savoy house, in the Strand, London. This manufacture appears to have been much improved in 1635, when it was carried on with sea coal or pit coal instead of wood, and a monopoly was granted to Sir Robert Mansell, who was allowed to import the fine Venetian flint glasses for drinking, the art of making which was not brought to perfection before the reign of William III. But the first glass plates, for looking glasses and coach windows, were made, 1673, at Lambeth, by the encouragement of the duke of Buckingham; who, in 1670, introduced the manufacture of fine glass into England, by means of Venetian artists, with amazing success. So that within a century past, the French and English have not only come up to, but even surpassed the Venetians, and we are now no longer supplied from abroad.

The French made a considerable improvement in the art of glass, by the invention of a method to cast very large plates, till then unknown, and scarce practised yet by any but themselves and the English. That court applied itself with a laudable industry to cultivate and improve the glass manufacture. A company of glassmen was established by letters patent; and it was provided by an act of parliament that the working in glass should not derogate any thing from nobility, but even that none but nobles should be allowed to work therein.

An extensive manufactory of this elegant and valuable branch of commerce was first established in Lancashire, about the year 1773, through the spirited exertions of a very respectable body of proprietors, who were incorporated by an act of parliament. From those various difficulties constantly attendant upon new undertakings, when they have to contend with powerful foreign establishments, it was for some time considerably embarrassed; but government, of late, having taken off some restrictions that bore hard upon it, and made some judicious regulations relative to the mode of levying the excise duty, it now bide fair to rival, if not surpass, the most celebrated continental manufactories, both with respect to the quality, brilliancy, and size of its productions.

With regard to the theory of vitrification, we are almost totally in the dark. In general, it seems to be understood that state in which solid bodies are, by the vehement action of fire, fitted for being dissipated or carried off in vapour. In all vitrifications there is a plentiful evaporation: and if any solid substance is carried off in vapour by the intense heat of a burning speculum, a vitrification is always observed previously to take place. The difference, then, between the state of fusion and vitrification of a solid body we may conceive to be, that in the former the element of fire acts upon the parts of the solid in such a manner as only to disjoin them, and render the substance fluid; but in vitrification the fire not only disjoins the particles, but combines with them in a latent state into a third substance; which, having now as much fire as it can contain, can receive no further change from that element except being carried off in vapour.

But though we are unable to effect this change upon solid bodies without a very violent heat, it is otherwise in the natural processes. By what we call crystallization, nature produces more perfect glasses than we can make with our furnaces. These are called precious stones; but in all trials they discover the essential properties of glass, and not of stones. The most distinguishing property of glass is its resisting the force of fire, so that this element cannot calcine or change it as it does other bodies, but can only melt it, and then carry it off in vapours. To this last all the precious stones are subject. The diamond (the hardest of them all) may be dissipated in a less degree of heat than what would dissipate common glass. Nor can it be any objection to this idea, that some kinds of glass are capable of being converted into a kind of porcelain by a long-continued cementation with certain materials. This change happens only to those kinds of glass which are made of alkaline salt and sand; and Dr. Lewis hath shown that this change is produced by the dissipation of the saline principle, which is the least fixed of the two. Glass, therefore, we may still consider as a substance upon which the last
has no other effect than either to melt or dissipate it in
vacuum.

The other properties of glass are very remarkable,
some of which follow:

1. It is one of the most elastic bodies in nature. If
the force with which glass balls strike each other be
reckoned 16, that wherewith they recede by virtue of
their elasticity will be nearly 15.

2. When glass is suddenly cooled, it becomes ex-
ceedingly brittle; and this brittleness is sometimes at-
tended with very surprising phenomena. Hollow balls
made of unannealed glass, with a small hole in them,
will fly to pieces by the heat of the hand only, if the
hole by which the internal and external air communi-
cate be stopped with a finger. Some vessels, however,
made of such unannealed glass have been discovered,
which have the remarkable property of resisting very
hard strokes given from without, though they shiver
to pieces by the shocks received from the fall of
very light and minute bodies dropped into their cav-
ities. These glasses may be made of any shape, so
that they be observed in making them, that their
bottom be thicker than their sides. The thicker the
bottom is, the easier do the glasses break. One whose
bottom is three fingers breadth in thickness flies with
as much ease at least as the thinnest glass. Some of
these vessels have been tried with strokes of a mallet
sufficient to drive a nail into wood tolerably hard, and
have held good without breaking. They have also
resisted the shock of several heavy bodies, let fall into
their cavities, from the height of two or three feet;
as musket balls, pieces of iron or other metal, pyrites,
jasper, wood, bone, &c. But this is not surprising,
as other glasses of the same shape and size will do the
same: but the wonder is, that taking a shiver of
flint of the size of a small pea, and letting it fall into
the glass only from the height of three inches, in about
two seconds, the glass breaks, and sometimes at the very
moment of the shock; nay, a bit of flint no larger
than a grain, dropped into several glasses successively,
though it did not immediately break them, yet when
set by, they all flew in less than three quarters of an
hour. Some other bodies produce the same effect with
flint; as sapphire, diamond, porcelain, hard tempered
steel; also marbles such as boys play with, and like-
wise pearls.

These experiments were made before the Royal So-
CIETY; and succeeded equally when the glasses were
held in the hand, when they were rested on a pillow,
put in water, or filled with water. It is also remark-
able, that the glasses broke upon having their bottoms
slightly rubbed with the finger, though some of them
did not fly till half an hour after the rubbing. If
the glasses are everywhere extremely thin, they do not
break in these circumstances.

Some have pretended to account for these phe-
omena, by saying, that the bodies dropped into the
vessels cause a concussion which is stronger than the
cohesive force of the glass, and consequently that a
rupture must ensue. But why does not a ball of iron,
gold, silver, or copper, which are perhaps a thousand
times heavier than the flint, produce the same effect?
It is because they are not elastic. But surely iron
is more elastic than the end of one's finger. Mr Euler
has endeavoured to account for these appearances from
his principles of percussion. He thinks that this ex-
periment entirely overthrows the opinion of those who
measure the force of percussion by the exterior, or ab-
olute apparent strength of the stroke. According
to his principles, the great hardness and angular fi-
gure of the flint, which makes the space of contact
with the glass extremely small, ought to cause an im-
pression on the glass vastly greater than lead, or any
other metal; and this may account for the flint's
breaking the vessel, though the bullet, even falling
from a considerable height, does no damage. Hollow
cups made of green bottle glass, some of them three
inches thick at the bottom, were instantly broken by a
shiver of flint weighing about two grains, though they
had resisted the shock of a musket ball from the height
of three feet.

That Mr Euler's theory cannot be conclusive more
than the other, must appear evident from a very slight
consideration. It is not by angular bodies alone that
the glasses are broken. The marbles with which chil-
dren play are round, and yet they have the same effect
with the angular flint. Besides, if it was the mere
force of percussion which broke the glasses, undoub-
tedly the fracture would always take place at the very
instant of the stroke; but we have seen that this did
not happen sometimes till a very considerable space of
time had elapsed. It is evident, therefore, that this
effect is occasioned by the putting in motion some
subtle fluid with which the substance of the glass is
filled; and that the motions of this fluid, when once
excited in a particular part of the glass, soon propa-
gate themselves through the whole or greatest part of it,
by which means the cohesive power becomes at last too
weak to resist them. There can be little doubt that
the fluid just now mentioned is that of electricity. It
is known to exist in glass in very great quantity; and
it also is known to be capable of breaking glasses even
when annealed with the greatest care, if put into too
violent a motion. Probably the cooling of glass hastily
may make it more electric than is consistent with its
cohesive power, so that it is broken by the least in-
crease of motion in the electric fluid by friction or
otherwise. This is evidently the case when it is bro-
ken by rubbing with the finger; but why it should
also break by the mere contact of flint and the other
bodies above mentioned, has not yet been satisfactorily
accounted for.

A most remarkable phenomenon also is produced in Rotation
of glass tubes placed in certain circumstances. When these
glass tubes are laid before a fire in a horizontal position, having
their extremities properly supported, they acquire a
rotatory motion round their axis, and also a progressive
motion towards the fire, even when their supports are
declining from the fire, so that the tubes will move a
little way up hill towards the fire. When the progres-
sive motion of the tubes towards the fire is stopped by
any obstacle, their rotation still continues. When the
tubes are placed in a nearly upright posture, leaning to
the right hand, the motion will be from east to west;
but if they lean to the left hand, their motion will be
from west to east; and the nearer they are placed to
the perfectly upright posture, the less will the motion
be either way.

If the tube is placed horizontally on a glass pane,
the fragment, for instance, of coast window-glass, in-
stead
Glass.

Instead of moving towards the fire, it will move from it, and about its axis in a contrary direction to what it had done before; nay, it will recede from the fire, and move a little up hill when the plane inclines towards the fire. These experiments are recorded in the Philosophical Transactions. They succeeded best with tubes about 20 or 22 inches long, which had in each end a pretty strong pin fixed in cork for an axis.

Attempts to account for it.

The reason given for these phenomena, is the swelling of the tubes towards the fire by the heat, which is known to expand all bodies. For, say the adopters of this hypothesis, granting the existence of such a swelling, gravity must pull the tube down when supported near its extremities; and a fresh part being exposed to the fire, it must also swell out and fall down, and so on.—But without going farther in the explanation of this hypothesis, it may be here remarked, that the fundamental principle on which it proceeds is false; for though fire indeed makes bodies expand, it does not increase them in weight; and therefore the sides of the tube, though one of them is expanded by the fire, must still remain in equilibrio; and hence we must conclude, that the causes of these phenomena remain yet to be discovered.

Glass is less dilatable by heat than metallic substances, and solid glass sticks are less dilatable than tubes. This was first discovered by Col. Roy, in making experiments in order to reduce barometers to a greater degree of exactness than hath hitherto been found practicable; and since his experiments were made, one of the tubes 18 inches long, being compared with a solid glass rod of the same length, the former was found by a pyrometer to expand four times as much as the other, in a heat approaching to that of boiling oil.—On account of the general quality which glass has of expanding less than metal, M. de Luc recommends it to be used in pendulums: and he says it has also this good quality, that its expansions are always equal, and proportioned to the degrees of heat; a quality which is not to be found in any other substance yet known.

Glass appears to be more fit for the condensation of vapours than metallic substances. An open glass filled with water, in the summer time, will gather drops of water on the outside, just as far as the water in the inside reaches; and a person’s breath blown on it manifestly moistens it. Glass also becomes moist with dew, when metals do not. See Dew.

6. A drinking glass partly filled with water, and rubbed on the rim with a wet finger, yields musical notes, higher or lower as the glass is more or less full; and will make the liquor frisk and leap. See Harmonia.

7. Glass is possessed of very great electrical virtues. See Electricity, par. 8.

Materials for Making of Glass. The materials whereof glass is made, we have already mentioned to be salt and sand or silicious earth.

1. The salt here used is procured from a sort of ashes brought from the Levant, called pot awrion, or rochetta; which ashes are those of a sort of water plant called kali, cut down in the summer, dried in the sun, and burnt in heaps, either on the ground or on iron grates; the ashes falling into a pit, grow into a hard mass, or stone, fit for use. It may also be procured from common kelp, or the ashes of the fucus esculentus. See Kelp.

To extract the salt, these ashes, or polverine, are powdered and sifted, then put into boiling water, and there kept till one-third of the water be consumed; the whole being stirred up from time to time, that the ashes may incorporate with the fluid, and all its salts be extracted: then the vessel is filled up with new water, and boiled over again, till one half be consumed; what remains is a sort of ley, strongly impregnated with salt. This ley, boiled over again in fresh coppers, thickens in about 24 hours, and shows its salt; which is to be baled out, as it shoots, into earthen pans, and then into white glass, to drain and dry. This done, it is grossly pounded, and then put in a sort of oven, called calcant, to dry. It may be added, that there are other plants, besides kali and fucus which yield a salt fit for glass: such are the common way thistle, bramble, hops, wormwood, wood, tobacco, fern, and the whole leguminous tribe, as pea, beans, &c.

Pearl ashes form a leading flux in the manufacture of glass, and mostly supply the place of the Levant ashes, the barillas of Spain, and many other kinds, which were formerly brought here for making both glass and soap.

There are other fluxes used for different kinds of glass, and for various purposes, as calcined lead, nitre, sea salt, borax, arsenic, smiths’ clinkers, and wood ashes, containing the earth and lithivate salts as produced by incineration. With regard to these several fluxes, we may observe, in general, that the more calc of lead, or other metallic earth, enters into the composition of any glass, so much the more fusible, soft, coloured, and dense this glass is, and reciprocally.

The colours given to glass by calces of lead, are shades of yellow: on the other hand, glasses that contain only saline fluxes partake of the properties of salts; they are less heavy, less dense, harder, whiter, more brilliant, and more brittle than the former; and glasses containing both saline and metallic fluxes do also partake of the properties of both these substances. Glasses too saline are easily susceptible of alteration by the action of air and water: especially those in which alkalis prevail; and these are also liable to be injured by acids. Those that contain too much borax and arsenic, though at first they appear very beautiful, quickly tarnish and become opaque when exposed to air. By attending to these properties of different fluxes, phlogistic or saline, the artist may know how to adjust the proportions of these to sand, or powdered flints, for the various kinds of glass. See the article Vitrification.

3. The sand or stone, called by the ancients tarsis is the second ingredient in glass, and that which gives it the body and firmness. These stones, Agricola observes, must be such as will fuse; and of these such as are white and transparent are best; so that crystal challenges the precedence of all others.

At Venice they chiefly use a sort of pebble, found in the river Tesino, resembling white marble, and called cuogalo. Indeed Ant. Neri assures us, that all stones which will strike fire with steel, are fit to vitrify; but Dr Morret shows, that there are some exceptions from this.
sort of fullers earth, or tobacco-pipe clay, of which earth they also make their melting pots. In Britain the pots are made of Stourbridge clay.

Mr Blancourt observes that the worst and roughest work in this art is the changing the pots when they are worn out or cracked. In this case the great working hole must be uncovered; the faulty pot must be taken out with iron hooks and forks, and a new one must be speedily put in its place, through the flames, by the hands only. For this work, the man guards himself with a garment made of skins, in the shape of a pantaloons, that covers him all but his eyes, and is made as wet as possible; the eyes are defended with a proper sort of glass.

Instruments for Making of Glass. The instruments made use of in this work may be reduced to these that follow. A blowing pipe, made of iron, about two feet and a half long, with a wooden handle. An iron rod to take up the glass after it is blown, and to cut off the former. Scissors to cut and shape the glasses, &c. An iron ladle with the end of the handle cased with wood, to take the metal out of the furnace, and put it into the workman’s pots. A small iron ladle cases in the same manner, to skim the alkaline salt that swims at top. Shovels, one like a peel, to take up the great glasses; another like a fire-shovel, to feed the furnace with coals. A hooked iron fork, to stir the matter in the pots. An iron rake for the same purpose, and to stir the frit. An iron fork, to change or pull the pots out of the furnace, &c.

Compositions for White and Crystal Glass. 1. To make crystal glass, take of the whitest tarsos, pounded small, and scoured as fine as flour, 200 pounds; of the salt of polverine 130 pounds; mix them together and put them into the furnace called the color; first heating it. For an hour keep a moderate fire, and keep stirring the materials with a proper rake, that they may incorporate and calcine together; then increase the fire for five hours; after which take out the matter; which being now sufficiently calcined, is called frit. From this frit make a frit in a dry place, and cover it up, and let it from the dust for three or four months. Now to make the glass or crystal: take of this crystal frit, called also ballot; set it in pots in the furnace, adding to it a due quantity of magnesia or manganese: when the two are fused, cast the flour into fair water, to clear it of the salt called sandiver; which would otherwise make the crystal obscure and cloudy. This liquor must be repeated again and again, as often as needful, till the crystal be fully purged; or this scum may be taken off by means of proper ladles. Then set it to boil four, five, or six days; which done, see whether it have manganese enough; and if it be yet greenish, add more manganese, at discretion, by little and little at a time, taking care not to over-dose it, because the manganese inclines it to a blackish hue. Then let the metal clarify, till it becomes of a clear and shining colour; which done, it is fit to be blown or formed into vessels at pleasure.

2. Flint glass, as it is called by us, is of the same general kind with that which in other places is called crystal glass. It has this name from being originally made with calcined flints, before the use of the white sand was understood; and retains the name, though the flints are now used in the composition of it. This flint glass differs from the other, in having lead for its flux, and white sand for its body; whereas the fluxes used for the crystal glass are salts or arsenic, and the body consists of calcined flints or white river pebbles, tarsos, or such stones. To the white sand and lead a proper proportion of nitre is added, to burn away the phlogiston of the lead, and also a small quantity of magnesia; and in some works they use a proportional quantity of arsenic to aid the fluxing ingredients. The most perfect kind of glass may be made by fusing with a very strong fire 120 pounds of the white sand, 50 pounds of red lead, 40 pounds of the best pearl ashes, 20 pounds of nitre, and five ounces of magnesia. Another composition of flint glass, which is said to come nearer to the kind now made, is the following: 120 pounds of sand, 54 pounds of the best pearl ashes, 36 pounds of red lead, 12 pounds of nitre, and 6 ounces of magnesia. To either of these a pound or two of arsenic may be added, to increase the flux of the composition. A cheaper composition of flint glass may be made with 120 pounds of white sand, 33 pounds of the best pearl ashes, 90 pounds of nitre, 6 pounds of arsenic, and four ounces of magnesia; or instead of the arsenic may be substituted 15 pounds of common salt; but this will be more brittle than the other. The cheapest composition for the white kind of flint glass consists of 120 pounds of white sand, 30 pounds of red lead, 20 pounds of the best pearl ashes, 10 pounds of nitre, 15 pounds of common salt, and six pounds of arsenic. The best German crystal glass is made of 120 pounds of calcined flints or white sand, 70 pounds of the best pearl ashes, 10 pounds of salpetre, half a pound of arsenic, and five ounces of magnesia. And a cheaper composition is formed of 120 pounds of calcined flints or white sand, 46 pounds of pearl ashes, 7 pounds of nitre, 6 pounds of arsenic, and 5 ounces of magnesia.

A glass much harder than any prepared in the common way, may be made by means of borax in the following manner. Take four ounces of borax, and an ounce of fine sand; reduce both to a subtle powder, and melt them together in a large close crucible set in a wind furnace, keeping up a strong fire for half an hour; then take out the crucible, and when cold break it, and there will be found at the bottom a pure hard glass capable of cutting common glass like a diamond. This experiment, duly varied, says Dr Shaw, may lead to several useful improvements in the arts of glass, enamels, and factitious gems, and shows an expedient method of making glass, without any fixed alkali, which has been generally thought an essential ingredient in glass, and it is not yet known whether calcined crystal or other substances being added to this salt instead of sand, it might not make a glass approaching to the nature of a diamond.

There are three principal kinds of glasses, distinguished by the form or manner of working them; viz. I. Round glass, as those of our vessels, phials, drinking glasses, &c. II. Table or window glass, of which there are divers kinds; viz. crown glass, jealouse glass, &c. III. Plate glass, or mirror glass.

1. Working or Blowing Round Glass. The working furnace, we have observed, is round, and has six bocas
When the glass is pierced, the defects of it are perceived; if it is tolerably perfect, the workman lays the tube horizontally on a little iron tressel, placed on the support of the aperture of the furnace. Having exposed it to the heat for about half a quarer of an hour, he takes it away, and with a pair of long and broad shears, extremely sharp at the end, widens the glass, by insinuating the shears into the hole made with the puncheon, whilst the assistant, mounted on the stool, turns it round, till at last the opening is so large as to make a perfect cylinder at bottom. When this is done, the workman lays his glass upon the tressels at the mouth of the furnace to heat it: he then gives it to his assistant on the stool, and with large shears cuts the mass of matter up to half its height. There is at the mouth of the furnace an iron tool called pontil, which is now heating, that it may unite and coalesce with the glass just cut, and perform the office which the tube did before it was separated from the glass. This pontil is a piece of iron six feet long, and in the form of a cane or tube, having at the end of it a small iron bar, a foot long, laid equally upon the long one, and making with it a T. This little bar is full of the matter of the glass, about four inches thick. This red hot pontil is presented to the diameter of the glass, which coalesces immediately with the matter round the pontil, so as to support the glass for the following operation. When this is done, they separate the tube from the glass, by striking a few blows with a chisel upon the end of the tube, which has been cooled; so that the glass breaks directly, and makes this separation, the tube being discharged of the glass now adhering to the pontil. They next present to the furnace the pontil of the glass, laying it on the tressel to heat, and reddening the end of the glass, that the workman may open it with his shears, as he has already opened one end of it, to complete the cylinder; the assistant holding it on his stool as before. For the last time, they put the pontil on the tressel, that the glass may become red hot, and the workman cuts it quite open with his shears, right over against the forementioned cut; this he does as before, taking care that both cuts are in the same line. In the mean time, the man who looks after the carquises comes to receive the glass upon an iron shovel two feet and a half long without the handle, and two feet wide, with a small border of an inch and a half to the right and left, and towards the handle of the shovel. Upon this the glass is laid, flattening it a little with a small stick a foot and a half long, so that the cut of the glass is turned upwards. They separate the glass from the pontil, by striking a few gentle blows between the two with a chisel. The glass is then removed to the mouth of the hot carquise, where it becomes red hot gradually; the workman, with an iron tool six feet long, and widened at the end in form of a club at cards four inches long, and two inches wide on each side, very flat, and not half an inch thick, gradually lifts up the cut part of the glass to unfold it out of its form of a flattened cylinder, and render it smooth, by turning it down upon the hearth of the carquise. The tool already described being insinuated within the cylinder, performs this operation by being pushed hard against all the parts of the glass. When the glass is thus made quite smooth, it is pushed to the bottom of the carquise.
there are any full cisterns; laying as many plates in each carquisse as it will hold, and stopping them up with doors of baked earth, and every chink with cement, as soon as they are full, to let them anneal, and cool again, which requires about 14 days.

The first running being dispatched, they prepare another, by filling the cisterns anew from the matter in the pots; and after the second, a third; and even a fourth time, till the melting pots are quite empty.

The cisterns at each running should remain at least six hours in the furnace to whiten; and when the first annealing furnace is full, the casting table is to be carried to another. It need not here be observed, that the carquisses, or annealing furnaces, must first have been heated to the degree proper for them. It may be observed, that the oven full, or the quantity of matter, commonly prepared, supplies the running of 18 glasses, which is performed in 18 hours, being an hour for each glass. The workmen work six hours, and are then relieved by others.

When the pots are emptied, they take them out, as well as the cisterns, to scrape off what glass remains, which otherwise would grow green by continuance of fire, and spoil the glasses. They are not filled again in less than 36 hours; so that they put the matter into the furnace, and begin to run it every 54 hours.

The manner of heating the large furnaces is very singular; the two tisors, or persons employed for that purpose, in their shirts, run swiftly round the furnace without making the least stop: as they run along, they take two billets, or pieces of wood, which are cut for the purpose: these they throw into the first tisart; and continuing their course, do the same for the second. This they hold without interruption for six hours successively; after which they are relieved by others, &c.

It is surprising that two such small pieces of wood, and which are consumed in an instant, should keep the furnace to the proper degree of heat; which is such that a large bar of iron, laid at one of the mouths of the furnace, becomes red hot in less than half a minute.

The glass, when taken out of the melting furnace, needs nothing farther but to be ground, polished, and foliated.

4. Grinding and Polishing of Plate Glass. Glass is made transparent by fire; but it receives its lustre by the skill and labour of the grinder and polisher; the former of whom takes it rough out of the hands of the maker.

In order to grind plate glass, they lay it horizontally upon a flat stone table made of a very fine grained freestone; and for its greater security they place it down with lime or stucco; for otherwise the force of the workmen, or the motion of the wheel with which they grind it, would move it about.

This stone table is supported by a strong frame A, made of wood, with a ledge quite round its edges, rising about two inches higher than the glass. Upon this glass to be ground is laid another rough glass not above half so big, and so loose as to slide upon it; but cemented to a wooden plank, to guard it from the injury it most otherwise receive from the scraping of the wheel to which this plank is fastened, and from the weights laid upon it to promote the grinding or triturating of the glasses. The whole is covered with a wheel B, ccxliv. made
the philosopher's stone, may be prepared in the following manner: take of the second composition for hard glass above described, and of the composition for paste, of each five pounds, and of highly calcined iron an ounce; mix them well, and fuse them till the iron be perfectly vitrified, and has tinged the glass of a deep transparent yellow brown colour. Powder this glass, and add to it two pounds of powdered glass of antimony; grind them together, and thus mix them well. Take part of this mixture, and rub into it 80 or 100 leaves of the counterfeit leaf gold called Dutch gold; and when the parts of the gold seem sufficiently divided, mix the powder containing it with the other part of the glass. Fuse the whole with a moderate heat till the powder run into a vitreous mass, fit to be wrought into any of the figures or vessels into which it is usually formed; but avoid a perfect liquefaction, because that in a short time destroys the equal diffusion of the spangles, and vitrifies, at least in part, the matter of which they are composed; converting the whole into a kind of transparent olive-coloured glass. This kind of glass is used for a great variety of toys and ornaments with us, who at present procure it from the Venetians.

Chalcedony. A mixture of several ingredients with the common matter of glass, will make it represent the semi-opaque gems, the jaspers, agates, chalcedonies, &c. The way of making these seems to be the same with the method of making marbled paper, by several colours dissolved in several liquors, which are such as will not readily mix with one another when put into water, before they are cast upon the paper which is to be coloured. There are several ways of making these variously coloured glasses, but the best is the following.

Dissolve four ounces of fine leaf silver in a glass vessel in strong aquafortis; stop up the vessel, and set it aside. In another vessel, dissolve five ounces of quicksilver in a pound of aquafortis, and set this aside. In another glass vessel, dissolve in a pound of aquafortis three ounces of fine silver, first calcined in this manner, amalgamate the silver with mercury, mix the amalgam with twice its weight of common salt well purified; put the mixture in an open fire in a crucible, that the mercury may fly off, and the silver be left in form of powder. Mix this powder with an equal quantity of common salt well purified, and calcine this for six hours in a strong fire; when cold, wash off the salt by repeated boilings in common water, and then put the silver into the aquafortis. Set this solution also aside. In another vessel, dissolve in a pound of aquafortis three ounces of sal ammoniac; pour off the solution, and dissolve it in a quarter of an ounce of gold. Set this also aside. In another vessel, dissolve three ounces of sal ammoniac in a pound of aquafortis; then put into the solution cinnabar, crocus maris, ultramarine, and ferretto of Spain, of each half an ounce. Set this also aside. In another vessel, dissolve in a pound of aquafortis three ounces of sal ammoniac; then put into it crocus maris made with vinegar, calcined tin, saffier, and cinnabar, of each half an ounce; let each of these be powdered very fine, and put gently into the aquafortis. Set this also aside. In another vessel, dissolve three ounces of sal ammoniac in a pound of aquafortis, and add to it brass calcined with brimstone, brass thricely calcined, manganese, and scales of iron which fall from the smith's anvil, of each half an ounce; let each be well powdered, and put gently into the vessel. Then set this also aside. In another vessel, dissolve two ounces of sal ammoniac in a pound of aquafortis, and put to it verdigris an ounce, red lead, crude antimony, and the caput mortuum of vitriol, of each half an ounce; put these well powdered leisurely into the vessel, and set this also aside. In another vessel, dissolve two ounces of sal ammoniac in a pound of aquafortis, and add orpiment, white arsenic, painters lake, of each half an ounce.

Keep the above nine vessels in a moderate heat for 15 days, shaking them well at times. After this poor all the matters from these vessels into one large vessel, well luted at its bottom; let this stand six days, shaking it at times; and then set it in a very gentle heat, and evaporate all the liquor, and there will remain a powder of a purplish green.

When this is to be wrought, put into a pot very clear metal, made of broken crystalline and white glass that has been used; for with the virgin frit, or such as has never been wrought, the chalcedony can never be made, as the colours do not stick to it, but are consumed by the frit. To every pot of 20 pounds of this metal put two or three ounces of this powder at three several times; incorporate the powder well with the glass; and let it remain an hour between each time of putting in the powders. After all are in, let it stand 24 hours; then let the glass be well mixed, and take an essay of it, which will be found of a yellowish blue; return this many times into the furnace; when it begins to grow cold, it will show many waves of different colours very beautifully. Then take tartar eight ounces, root of the chimney two ounces, crocus maris made with brimstone, half an ounce; let these be well powdered and mixed, and put them by degrees into the glass at six times, waiting a little while between each putting in. When the whole is put in, let the glass boil and settle for 24 hours; then make a little glass body of it; which put in the furnace many times, and see if the glass be enough, and whether it have on the outside veins of blue, green, red, yellow, and other colours, and have, beside these veins, walls like those of the chalcedonies, jaspers, and oriental agates, and if the body kept within looks as red as fire.

When it is found to answer this, it is perfect, and may be worked into toys and vessels, which will always be beautifully variegated; these must be well annealed, which adds much to the beauty of their veins. Masses of this may be polished at the lapidary's wheel as natural stones, and appear very beautiful. If in the working the matter grow transparent, the work must be stopped, and more tartar, root, and crocus maris, must be put to it, which will give it again the necessary body and opacity, without which it does not show the colours well.

Chrysolite colour may be made of ten pounds of either of the compositions for hard glass described above, and six drachms of calcined iron.

Red cornelian colour may be formed by adding one pound of glass of antimony, two ounces of the calcined vitriol called scarlet ochre, and one drachm of magnesite or magnesia, to two pounds of either of the compositions
Glass. The glass of antimony and magnesia are first fused with the other glass, and then powdered and ground with the scarlet oche; the whole mixture is afterwards fused with a gentle heat till all the ingredients are incorporated. A glass resembling the white cornelian may be made of two pounds of either of the compositions for hard glass, and two drachmas of yellow oche well washed, and one ounce of calcined bones: grind them together, and fuse them with a gentle heat.

Emerald colour. See Green below.

Garnet colour. To give this colour to glass, the workmen take the following method. They take an equal quantity of crystal and rosetta frit, and to every hundred weight of this mixture they add a pound of manganese and an ounce of prepared saffron: these are to be powdered separately, then mixed and added by degrees to the frit while it is in the furnace. Great care is to be taken to mix the manganese and saffron very perfectly; and when the matter has stood 24 hours in fusion, it may be worked.

Glass of this kind may be made by adding one pound of glass of antimony, one drachm of manganese, and the same quantity of the precipitate of gold by tin, to two pounds of either of the compositions for hard glass; or the precipitate of gold may be omitted, if the quantities of the glass of antimony and manganese be doubled.

Gold colour. This colour may be produced by taking ten pounds of either of the compositions for hard glass, omitting the saltpetre; and for every pound adding an ounce of calcined borax, or, if this quantity doth not render the glass sufficiently fusible, two ounces; ten ounces of red tartar of the deepest colour; two ounces of magnesia; and two drachmas of charcoal of sallow, or any other soft kind. Precipitates of silver baked on glass will stain it yellow, and likewise give it a yellow colour on being mixed and melted with. For 50 times the precipitate of nitreous compositions; the precipitate from aquafortis by fixed alkalies seems to answer best. Yellow glasses may also be obtained with certain preparations of silver, particularly with Prussian blue. But Dr Lewis observes, that the colour does not constantly succeed, nor approach to the high colour of gold, with silver or with iron. The nearest imitations of gold which he has been able to produce have been effected with antimony and lead. Equal parts of the glass of antimony, of flint calcined and powdered, and of mignon, formed a glass of a high yellow; and with two parts of glass of antimony, two of mignon, and three of powdered flint, the colour approached still more to that of gold. The last composition exhibited a multitude of small sparkles interpersed throughout its whole substance, which gave it a beautiful appearance in the mass, but were really imperfections, owing to air bubbles.

Neri directs, for a gold yellow colour, one part of red tartar and the same quantity of manganese, to be mixed with a hundred parts of frit. But Knobloch observes, that these proportions are faulty; that one part, or one and a quarter, of manganese, is sufficient for a hundred of frit; but that six parts of tartar are hardly enough, unless the tartar is of a dark red colour, almost blackish; and that he found it expedient to add to the tartar about a fourth of its weight of powdered charcoal. He adds, that the glass swells up very much in melting, and that it must be left unstrained, and worked as it stands in fusion. Mr. Samuel More, in repeating and varying this process in order to render the colour more perfect, found that the manganese is entirely unessential to the gold colour; and that the tartar is no otherwise of use than in virtue of the coaly matter to which it is in part reduced by the fire, the phlogiston or inflammable part of the coal appearing in several experiments to be the direct tinging substance. Mr. Pott also observes, that common coals give a yellow colour to glass; that different coaly matters differ in their tinging power; that caput mortuum of root and lamp black answer better than common charcoal; and that the sparkling coal, which remains in the retort after the rectification of the thick empyreumatic animal oils, is one of the most active of these preparations. This preparation, he says, powdered, and then burnt again a little in a close vessel, is excellent for tinging glass, and gives yellow, brown, reddish, or blackish colours, according to its quantity; but the frit must not be very hard of fusion, for in this case the strong fire will destroy the colouring substance before the glass melts: and he has found the following composition to be nearly the best; viz. sand two parts, alkali three parts; or sand two, alkali three, calcined borax one; or sand two, alkali two, calcined borax one; and though saltpetre is hardly used at all, or very sparingly, for yellow glasses, as it too much volatilizes the colouring substance; yet here for the most part a certain proportion of it, easily determined by trial, is very necessary; for without it the concentrated colouring matter is apt to make the glass too dark, and even of an opaque pitchy blackness. It does not certainly appear that there is any material diversity in the effects of different coals, the difference being probably owing to the different quantities of the inflammable matter which they contain; so that a little more shall be required of one kind than of another for producing the same degree of colour in the glass. Nor does the softness or fusibility of the frit appear to be in any respect necessary.

Gold-coloured spangles may be diffused through the substance of glass, by mixing the yellow tares with powdered glass, and bringing the mixture into fusion.

Green. This colour may be imparted to glass by adding three ounces of copper precipitated from aquafortis, and two drachms of precipitated iron, to nine pounds of either of the compositions for hard glass. The finest method of giving this beautiful colour to glass is this: Take five pounds of crystalline metal that has been passed several times through water, and the same quantity of the common white metal of polverine, four pounds of common polverine frit, and three pounds of red lead; mix the red lead well with the frit, and then put all into a pot in a furnace. In a few hours the whole mass will be well purified; then cast the whole into water, and separate and take out the lead; then return the metal into the pot, and let it stand a day longer in fusion; then put in the powder of the residuum of the vitriol of copper, and a very little crocus maris, there will be produced a most lively and elegant green, scarce inferior to that of the oriental emerald. There are many ways of giving a green to glass, but all are greatly inferior to this.—To make a sea green, the finest crystalline glass only must be used, and no manganese must.
must be added at first to the metal. The crystal frit must be melted thus alone; and the salt, which swims like oil on its top, must be taken off with an iron ladle very carefully. Then to a pot of twenty pounds of this metal add six ounces of calcined brass, and a fourth part of the quantity of powdered saffier; this powder must be well mixed and put into the glass at three times; it will make the metal swell at first, and all must be thoroughly mixed in the pot. After it has stood in fusion three hours, take out a little for a proof; if it be too pale, add more of the powder. Twenty-four hours after the mixing the powder the whole will be ready to work; but must be well stirred together from the bottom, lest the colour should be deepest there, and the metal at the top less coloured, or even quite colourless. Some use for this purpose half crystal frit and half rochetta frit, but the colour is much the finest when all crystal frit is used.

*Lapis lazuli* colour. See *Lapis Lazuli*.

*Opal* colour. See *Opal*.

*Purple of a deep and bright colour* may be produced by adding to ten pounds of either of the compositions for hard glass, above described, six draehms of saffier and one draehm of gold precipitated by tin; or to the same quantity of either composition one ounce of manganese and half an ounce of saffier. The colour of anemystery may be imitated in this way.

*Red.* A blood-red glass may be made in the following manner: Put six pounds of glass of lead, and ten pounds of common glass, into a pot glazed with white glass. When the whole is boiled and refined, add by small quantities, and at small distances of time, copper calcined to a redness as much as on repeated proofs is found sufficient; then add tartar in powder by small quantities at a time, till the glass is become as red as blood; and continue adding one or other of the ingredients till the colour is quite perfect.

*Ruby.* The way to give the true fine red of the ruby, with a fair transparency, to glass, is as follows: Calcine in earthen vessels gold dissolved in aqua regia; the menstruum being evaporated by distillation, more aqua regia added, and the abstraction repeated five or six times, till it becomes a red powder. This operation will require many days in a hot furnace. When the powder is of a proper colour, take it out: and when it is to be used, melt the finest crystal glass, and purify it by often casting it into water; and then add, by small quantities, enough of this red powder to give it the true colour of a ruby, with an elegant and perfect transparency.

The process of tinging glass and enamels by preparations of gold was first attempted about the beginning of the last century. Libavius, in one of his tracts entitled *Alchymia*, printed in 1626, conjectures that the colour of the ruby proceeds from gold, and that gold dissolved and brought to redness might be made to communicate a like colour to factitious gems and glass. On this principle Neri, in his Art of Glass, dated in 1611, gives the process above recited. Glauber in 1648 published a method of producing a red colour by gold, in a manner which is of the vitreous kind, though not perfect glass. For this purpose he ground powdered flint or sand with four times its weight of fixed alkaline salt: this mixture melts in a moderately strong fire, and when cool looks like glass, but exposed to the air runs into a liquid state. On adding this liquor to solution of gold in aqua regia, the gold and fient precipitate together in form of a yellow powder, which by calcination becomes purple. By mixing this powder with three or four times its weight of the alkaline solution of flint, drying the mixture, and melting it in a strong fire for an hour, a mass is obtained of a transparent ruby colour and of a vitreous appearance; which nevertheless is soluble in water, or by the moisture of the air, on account of the redundancy of the salt. The Honourable Mr Boyle, in a work published in 1685, mentions an experiment in which a like colour was introduced into glass without fusion; for having kept a mixture of gold and mercury in digestion for some months, the fire was at last immoderately increased, so that the glass burst with a violent explosion; and the lower part of the glass was found tinged throughout of a transparent red colour, hardly to be equalled by that of rubies.

About the same time Cassius is said to have discovered the precipitation of gold by tin, and that glass might be tinged of a ruby colour by melting it with this precipitate; though he does not appear, says Dr. Lewis, from his treatise *De Aura*, to have been the discoverer of either. He describes the preparation of the precipitate and its use; but gives no account of the manner of employing it, only that he says one draehm of gold duly prepared will tinge ten pounds of glass.

This process was soon after brought to perfection by Kunckel; who says, that one part of the precipitate is sufficient to give a ruby colour to 1280 parts of glass, and a sensible redness to upwards of 1500 parts; but that the success is by no means constant. Kunckel also mentions a purple gold powder, resembling that of Nerio, which he obtained by insipissating solution of gold to dryness; abstracting from it fresh aqua regia three or four times, till the matter appears like oil; then precipitating with strong alkaline ley, and washing the precipitate with water. By dissolving this powder in spirit of salt and precipitating again, it becomes, he says, extremely fair; and in this state he directs it to be mixed with a due proportion of Venice glass.

Orechal, in a treatise entitled *Sol sine Vesta*, gives the following process for producing a very fine ruby. He directs the purple precipitate made by tin to be ground with six times its quantity of Venice glass into a very fine powder, and this compound to be very carefully mingled with the frit or vitreous composition to be tinged. His frit consists of equal parts of borax, sitra, and fixed alkaline salt, and four times as much calcined flint as of each of the salts; but he gives no directions as to the proportion of the gold precipitate or mode of fusion. Helliot describes a preparation, which, mixed with Venice glass, was found to give a beautiful purple enamel. This preparation consists of equal parts of solution of gold and of solution of zinc in aqua regia, mixed together, with the addition of a volatile salt prepared from sal ammoniac by quicklime, in sufficient quantity to precipitate the two metals. The precipitate is then gradually heated till it acquires a violet colour. However, though a purple or red colour, approaching to that of ruby, may, by the methods above recited, be baked on glass or enamels, and introduced into the mass by fusion, the way of equally diffusing such
ske a colour through a quantity of fluid glass is still, says Dr Lewis, a secret. The following process for making the ruby glass was communicated to Dr Lewis by an artist, who ascribed it to Knuckel. The gold is directed to be dissolved in a mixture of one part of spirit of salt and three of aquafortis, and the tin in a mixture of one part of the former of these acids with two of the latter. The solution of gold being properly diluted with water, the solution of tin is added, and the mixture left to stand till the purple matter has settled to the bottom. The colourless liquor is then poured off, and the purple sediment, while moist and not very thick, is thoroughly mixed with powdered flint or sand. This mixture is well ground with powdered nitre, tartar, borax, and arsenic, and the compound melted with a suitable fire. The proportions of the ingredients are 2560 parts of sand, 384 of nitre, 240 of tartar, 240 of borax, 28 of arsenic, five of tin, and five of gold.

Topaz Colour. Glass resembling this stone may be made by pulverizing ten pounds of either of the compositions for hard glasses with an equal quantity of the gold-coloured glass, and fusing them together.

White opake and semitransparent glass may be made of ten pounds of either of the compositions for hard glass, and one pound of well calcined horn, ivory, or bone; or an opake whitenseness may be given to glass by adding one pound of very white arsenic to ten pounds of flint glass. Let them be well powdered and mixed by grinding them together, and then fused with a moderate heat till they are thoroughly incorporated. A glass of this kind is made in large quantities at a manufactury near London; and used not only for different kinds of vessels, but as a white ground for enamel in dial plates and snuff boxes, which do not require finishing with much fire, because it becomes very white and fusible with a moderate heat.

Yellow. See Gold colour above.

Painting in Glass. The ancient manner of painting in glass was very simple: it consisted in the mere arrangement of pieces of glass of different colours in some sort of symmetry, and constituted what is now called mosaic work. See Mosaic.

In process of time they came to attempt more regular designs, and also to represent figures heightened with all their shades; yet they proceeded no farther than the contours of the figures in black with water colours, and hatching the draperies after the same manner on glasses of the colour of the object they designed to paint. For the carnation, they used glass of a bright red colour; and upon this they drew the principal lineament of the face, &c. with black.

At length, the taste for this kind of painting improving considerably, and the art being found applicable to the adorning of churches, basiliques, &c. they found out means of incorporating the colours in the glass itself, by heating them in the fire to a proper degree; having first laid on the colours. A French painter at Marseilles is said to have given the first notion of this improvement, upon going to Rome under the pontificate of Julius II.; but Albert Durer and Lucas of Leyden were the first that carried it to any height.

This art, however, has frequently met with much interruption, and sometimes been almost totally lost; of which Mr Walpole gives us the following account, in his Anecdotes of Painting in England.

"The first interruption given to it was by the reformation, which banished the art out of churches; yet it was in some measure kept up in the escutcheons of the nobility and gentry in the windows of their seats. Towards the end of Queen Elizabeth's reign it was omitted even there; yet the practice did not entirely cease. The chapel of our Lady at Warwick was ornamented and painted by Robert Dudley, Earl of Leicester, and the windows of St. Mary de Redcliffe". The glass-painter's name yet remains, with the date 1574: and in some of the chapels at Oxford the art again appears, dating itself in 1622, by the hand of no contemptible master.

"I could supply even this gap of 48 years by many dates on Flemish glass; but no body ever supposed that the secret was lost so early as the reign of James I. and that it has not perished since will be evident from the following series, reaching to the present hour.

"The portraits in the windows of the library at All Souls, Oxford. In the chapel at Queen's College there are twelve windows dated 1518. P. C. a Tipler on the painted glass in the chapel at Warwick, 1574. The windows at Wadham's College; the drawing pretty good, and the colours fine, by Bernard Van Linge, 1622. In the chapel at Lincoln's Inn, a window with the name Bernard, 1623. This was probably the preceding Van Linge. In the church of St. Leonard, Shoreditch, two windows by Baptista Stanton, 1634. The windows in the chapel at University College, Oxford, Giles pinxit, 1637. At Christ Church, Isaac Oliver, aged 84, 1700. Window in Merton Chaplel, William Price 1700. Windows at Queen's New College, and Mauuin, by William Price, the son, now living, whose colours are fine, whose drawing is good, and whose taste in ornaments and mosaic is far superior to any of his predecessors; is equal to the antique, to the good Italian masters, and only surpassed by his own singular modesty.

"It may not be unwelcome to the curious reader to see some anecdotes of the revival of taste for painted glass in England. Price, as we have said, was the only painter in that style for many years in England. Afterwards one Rowell, a plumber at Reading, did some things, particularly for the late Henry earl of Pembroke; but Rowell's colours soon vanished. At last he found out a very durable and beautiful red: but he died in a year or two, and the secret with him. A man at Birmingham began the same art in 1756 or 1757, and fitted up a window for Lord Lyttleton, in the church of Hagley; but soon broke. A little after him, one Peckett at York began the same business, and has made good proficiency. A few lovers of that art collected some dispersed panes from ancient buildings, particularly the late Lord Cobham, who erected a Gothic temple at Stowe, and filled it with arms of the old nobility, &c. About the year 1753, one Asciiotti, an Italian, who had married a Flemish woman, brought a parcel of painted glass from Flanders, and sold it for a few guineas to the Honourable Mr Batemen, of Old Windsor. Upon that I sent Asciiotti again to Flanders, who brought me 450 pieces, for which, including the expense of his journey, I paid him thirty-six guineas. His wife made more journeys for the same purpose;
Glass and sold her cargo to one Palmer, a glazier in St. Martin's lane, who immediately raised the price to one, two, or five guineas for a single piece, and fitted up entire windows with them, and with mosaics of plain glass of different colours. In 1761, Paterson, an auctioneer at Essex house in the Strand, exhibited the two finest collections of painted glass imported in like manner from Flanders. All this manufacture consisted in rounds of Scripture stories, stained in black and yellow, or in small figures of black and white; birds and flowers in colours, and Flemish coats of arms.

The colours used in painting or staining of glass are very different from those used in painting either in water or oil colours.

For black, take scales of iron, one ounce; scales of copper, one ounce; jet, half an ounce: reduce them to powder, and mix them. For blue, take powder of blue, one pound; sal nitre, half a pound; mix them and grind them well together. For carmin, take red chalk, eight ounces; iron scales, and lathar of silver, of each two ounces; gum arabic, half an ounce; dissolve in water; grind all together for half an hour as stiff as you can; then put it in a glass and stir it very well, and let it stand to settle 14 days. For green, take red lead one pound; scales of copper, one pound; and flint, five pounds; divide them into three parts; and add to them as much sal nitre; put them into a crucible, and melt them with a strong fire; and when it is cold, powder it, and grind it on a porphyry. For gold colour, take silver, an ounce; antimony, half an ounce; melt them in a crucible; then pour the mass to powder, and grind it on a copper plate; add to it yellow ochre, or brick dust calcined again, 15 ounces; and grind them well together with water. For purple, take minium, one pound; brown stone, one pound; white flint, five pounds; divide them into three parts, and add to them as much sal nitre as one of the parts; calcine, melt, and grind as you did the green. For red, take jet, four ounces; lathar of silver, two ounces; red chalk, one ounce; powder them fine, and mix them. For white, take jet, two parts; white flint, ground on a glass very fine, one part; mix them. For yellow, take Spanish brown, ten parts; leaf silver, one part; antimony, half a part; put all into a crucible, and calcine them well.

In the windows of ancient churches, &c., there are to be seen the most beautiful and vivid colours imaginable, which far exceed any of those used by the moderns, not so much because the secret of making those colours is entirely lost, as that the moderns will not go to the charge of them, nor be at the necessary pains, by reason that this sort of painting is not now so much in esteem as formerly. Those beautiful works which were made in the glass houses were of two kinds.

In some, the colour was diffused through the whole substance of the glass. In others, which were the more common, the colour was only on one side, scarce penetrating within the substance above one-third of a line; though this was more or less according to the nature of the colour, the yellow being always found to enter the deepest. These last, though not so strong and beautiful as the former, were of more advantage to the workmen, by reason that on the same glass, though already coloured, they could show other kinds of colours where there was occasion to embroider draperies, enrich them with foliages, or represent other ornaments of gold, silver, &c.

In order to this, they made use of emery, grinding or wearing down the surface of the glass till such time as they were got through the colour to the clear glass. This done, they applied the proper part of the other side of the glass. By these means, the new colours were hindered from running and mixing with the former, when they exposed the glasses to the fire, as will appear hereafter.

When indeed the ornaments were to appear white, the glass was only bared of its colour with emery, without tingling the place with any colour at all; and this was the manner by which they wrought their light and heightenings on all kinds of colour.

The first thing to be done, in order to paint or stain glass, in the modern way, is to design, and even colour, the whole subject on paper. Then they choose such pieces of glass as are clear, even, and smooth, and proper to receive the several parts; and proceed to distribute the design itself, or papers it is drawn on, into pieces suitable to those of the glass; always taking care that the glasses may join in the contours of the figures and the folds of the draperies; that the carnations, and other finer parts, may not be impaired by the lead with which the pieces are to be joined together. The designs being made, they mark all the glasses as well as papers, that they may be known again: which done, applying every part of the design upon the glass intended for it, they copy or transfer the design upon this glass with the black colour diluted in gum water, by tracing and following all the lines and strokes as they appear through the glass with the point of a pencil.

When these strokes are well dried, which will happen in about two days, the work being only in black and white, they give a slight wash over with urine, gum arabic, and a little black; and repeat it several times, according as the shades are desired to be heightened; with this precaution, never to apply a new wash till the former is sufficiently dried.

This done, the lights and risings are given by rubbing off the colour in their respective places with a wooden point, or the handle of the pencil.

As to the other colours above mentioned, they are used with gum water, much as in painting in miniature; taking care to apply them lightly, for fear of effacing the outlines of the design; or even, for the greater security, to apply them on the other side; especially yellow, which is very piercing to the other colours, by blending therewith. And here too, as in pieces of black and white, particular regard must always be had not to lay colour on colour, or lay on a new lay, till such time as the former are well dried.

It may be added that the yellow is the only colour that penetrates through the glass and incorporates therewith by the fire; the rest, and particularly the blue, which is very difficult to use, remaining on the surface, or at least entering very little. When the painting of all the pieces is finished, they are carried to the furnace or oven to anneal or bake the colours.

The furnace here used is small, built of brick, from 18 to 30 inches square. At six inches from the bottom is an aperture to put in the fuel and maintain the fire.
GLASS. See GILDING.

Impressions of antique Gems taken in GLASS. See GEMS.

GLASS of Lead, a glass made with the addition of a large quantity of lead, of great use in the art of making counterfeit gems. The method of making it is this: Put a large quantity of lead into a potter's kiln, and keep it in a state of fusion with a moderate fire, till it is calcined to a gray, loose powder; then spread it in the kiln, and give it a greater heat, continually stirring it to keep it from running into lumps; continue this several hours, till the powder becomes of a yellow colour; then take it out, and sift it fine: this is called calcined lead. Take of this calcined lead 45 pounds, and crystalline or other frit 12 pounds; mix these as well as possible together; put them into a pot, and set them in the furnace for ten hours; then cast the whole, which will be now perfectly melted, into water; separate the loose lead from it, and return the metal into the pot; and after standing in fusion 12 hours more, it will be fit to work. It is very tender and brittle, and must be worked with great care, taking it slowly out of the pot, and continually wetting the marble it is wrought upon.

It is well known that ceruse or white lead, minium, litharge, and all the other preparations and calcines of lead, are easily fused by a moderate fire, and formed into a transparent glass of a deep yellow colour. But this glass is so penetrating and powerful a flux, that it is necessary to give it a greater consistence, in order to render it fit for use. With this view, two parts of calcined lead, e. g. minium, and one part of sand or powdered limet, may be put into a crucible of refractory clay, and baked into a compact body. Let this crucible, well closed with a luted lid, be placed in a melting furnace, and gradually heated for an hour, or an hour and a half; and afterwards let the heat be increased so as to obtain a complete fusion, and continued in that state for the same time: let the crucible remain to cool in the furnace; and when it is broken a very transparent yellow coloured glass will be found in it. Some add nitre and common salt to the above mixture, because these salts promote the fusion and the more equal distribution of the sand. This glass of lead has a considerable specific gravity, and its lowest part is always the heaviest. It is an important flux in the essays of ores to facilitate their separation.

Glass of lead is capable of all the colours of the gems in very great perfection. The methods of giving them are these: for green, take pulverine frit 20 pounds, lead, calcined 16 pounds; sift both the powders very fine; then melt them into a glass, separating the unmixed lead, by plunging the mass in water; after this return it into the pot, and add brass thrice calcined six ounces, and one pennyweight of cinnabar made with vinegar; put this in at six different times, always carefully mixing it together, and take a proof of it; when the colour is right, let it stand eight hours, and then work it. If instead of the calcined brass the same quantity of the caput mortuum of the vitriolum veneris be used, the glass is yet much finer.

For topaz colour, take crystal frit 15 pounds, calcined lead 12 pounds; mix them well together, by sifting the powders through a fine sieve; then set them in a furnace not too hot, and separate the superfluous unmixed lead, by casting the whole into water; repeat this twice: then add half gold yellow glass, and let them incorporate and purify, and they will be of the true and exact colour of the oriental topaz.

For sea green, take crystal frit 16 pounds, calcined lead 10 pounds; mix and sift them together, and set them in a pot in a furnace; in 12 hours the whole will be melted; then cast it into water, and separate it from the loose lead; put them into the furnace again for eight hours; then separate the loose lead by washing a second time, and return it to the pot for eight hours more.

Muscovy Glass. See MICA, MINERALOGY. Ink. Painting on Glass by means of Prints. See Backg.-painting.

Glass Porcelain, the name given by many to a modern invention of imitating the china ware with glass. The method given by M. Beaumain, who was the first that carried the attempt to any degree of perfection, is shortly this: The glass vessels to be converted into porcelain are to be put into a large earthen vessel, such as the common earthen dishes are baked in, or into sufficiently large crucibles; the vessels are to be filled with a mixture of fine white sand, and of fine gypsum or plaster stone burnt into what is called plaster of Paris, and all the interstices are to be filled up with the same powder, so that the glass vessels may nowhere touch either one another, or the sides of the vessel they are baked in. The vessel is to be then covered down and luted, and the fire done the rest of the work; for this is only to be put into a common potter's furnace, and when it has stood there the usual time of the baking the other vessels, it is to be taken out, and the whole contents will be found no longer glass, but converted into a white, opaque substance, which is a very elegant porcelain, and has almost the properties of that of China.

The powder, which has served once will do again so well as fresh, and that for a great many times: nay, it seems, ever so often. The cause of this transmutation, says Macquer, is probably that the vitriolic acid of the gypsum quits its basis of calcareous earth, and unites with the alkaline salt and salines earth of the glass, with which it forms a kind of salt, different from the calcareous selenite, by the interposition of which matter the glass acquires the qualities of porcelain.

Glass Pots, the vessels in the glass trade used for melting the glass. Those for the white glass works are made of a tobacco pipe clay, brought from the isle of Wight, which is first well washed, then calcined, and afterwards ground, to a fine powder in a mill; which being mixed, with water, is then trod with the bare feet till it is of a proper consistence to mould with the hands into the proper shape of the vessels. When these thus made, they are afterwards annealed over the furnace. Those for the green glass works are made of the monsach, and another sort of clay from Staffordshire: they make these so large as to hold three or four hundred weight of metal. And besides these, they have a small sort called piling pots, which they set upon the larger, and which contain a finer and more nice metal fit for the nicest works.

The clay that is used for this purpose, should be of the purest and most refractory kind, and well cleansed from all sandy, fuscous, and pyritic matters; and
to this it will be proper to add ground crucibles, white sand, calcined flints duly levigated, or a certain proportion of the same clay baked, and pounded not very finely. The quantity of baked clay that ought to be mixed with the crude clay, to prevent the pots from cracking when dried, or exposed to a great heat, is not absolutely determinable, but depends on the quality of the crude clay, which is more or less fat. M. D'Antin, in a memoir on this subject, proposes the following method of ascertaining it: The burnt and crude clay, being mixed in different proportions, should be formed into cakes, one inch thick, and four inches long and wide. Let these cakes be slowly dried, and exposed to a violent heat, till they become as hard and as much contracted as possible, and in this state be examined; and the cake, he says, which has suffered a diminution of its bulk equal only to an eighteenth part, is made of the best proportions. He observes, in general, that most clays require that the proportion of the burnt should be to the fresh as four to five.

**Tim Glass.** The same with Bismuth. See Bismuth, Chemistry Index.

Glasses are distinguished, with regard to their form, use, &c. into various kinds, as drinking glasses, optical glasses, looking glasses, burning glasses, &c. **Drinking Glasses.** Are simple vessels of common glass or crystal, usually made in form of an inverted cone. Each glass consists of three parts, viz. the bowl, the bottom, and the foot; which are all wrought or blown separately.

Nothing can be more dexterous and expeditions than the manner of blowing these parts: two of them opened, and all three joined together. An idea is only to be had thereof, by seeing it actually done. For the method of gilding the edges of drinking glasses, see Gilding on Enamel and Glass.

Optical Glasses. See Optics.

The improvements hitherto made in telescopes by means of combining lenses made of different kinds of glass, though very great, are yet by no means adequate to the expectations that might reasonably be formed, if opticians could fall on any method of obtaining pieces of glass sufficiently large for pursuing the advantages of Mr Dollond's discovery. Unfortunately, however, though the board of longitude have offered a considerable reward for bringing this art to the requisite perfection, no attempt of any consequence has hitherto been made. Mr Kair is of opinion, that the accomplishment of this is by no means an easy task; as it requires not only a competent knowledge of the properties of glass fitted for the purpose (the faults not being evident to common inspection), but a considerable degree of chemical knowledge is also necessary in order to invent a composition by which these faults may be avoided; and lastly, a kind of dexterity in the execution of the work, which can only be acquired by practice.

Our author, however, thinks, that if the subject were more generally understood, and the difficulties more fully pointed out, for which purpose he makes the following remarks, the end may be more easily accomplished.

1. The rays of light passing through a glass lens or prism, or through any other medium of unequal thickness, are refracted; but not in an equal manner, the blue, violet, &c. being more refracted than the red.

2. Hence it happens, that the rays of light, when refracted by a common lens, do not all unite in one focus, but in reality form as many different foci as there are colours; and hence arise the prismatic colours, or irises, which appear towards the borders of the image formed by the common convex lenses, and which render the vision extremely indistinct.

3. The indistinctness of vision produced by this cause, which is sensible in telescopes of a small aperture, increases in so great a proportion, viz. as the cubes of the diameters, that it seemed impossible to increase the power of dioptric telescopes greatly, without extending them to a very inconvenient length, unless this confusion of colours could be corrected.

4. It was known that different transparent bodies possessed different degrees of refractive power; and until Mr Dollond discovered the contrary, it was supposed, that the refractions of the coloured rays were always in a determined ratio to one another. On this supposition it seemed impossible to correct the faults of refracting telescopes: for it was supposed, that if the dispersion of light produced by a convex lens were counteracted by another lens or medium of a concave form, the refraction would be totally destroyed; and this indeed would be the case, if the two mediums were made of the same matter; and from some experiments made by Sir Isaac Newton, this was supposed to be actually the case in all substances whatever.

5. From considering that the eyes of animals are formed of mediums of different colours, it occurred first to Mr David Gregory, the celebrated professor of astronomy at Oxford, and then to Mr Euler, that, by a combination of mediums which had different refractive powers, it might be possible to remedy the imperfections of dioptric telescopes. It does not, however, appear, that either of these gentlemen understood the true principle on which these phenomena depend. Mr Euler executed his idea by forming a compound object lens from two glass lenses with water interposed, but his attempt was not attended with success. Mr Dollond, however, was led by some arguments adduced by Mr Kringenstein of Sweden, to repeat one of Sir Isaac Newton's experiments, and which had induced even that great philosopher himself to suppose that the improvement afterward executed by Mr Dollond was impossible. This experiment was made by Sir Isaac Newton, by placing a glass prism within a prismatic vessel filled with water, in such a manner that the rays of light which were refracted by the glass prism should pass through and be refracted in a contrary direction by the water prism. In this manner the refraction of the light was entirely destroyed. But when Mr Dollond repeated the experiment, he found, that, contrary to his own expectations, when the angles of the two prisms were so proportioned that they counteracted each other's mean refraction, then colours appeared; and on the other hand, when they were so proportioned that the dispersion of the coloured rays was counteracted, the mean refraction still subsisted; which evidently proved, that the mean refractive and dispersive powers of glass and water were not proportional to one another.

6. To apply this to the proposed improvement, Mr Dollond examined several kinds of glass. Crown glass was found to possess the smallest dispersive power in proportion to its refraction; while flint glass possessed
the greatest dispersive power in proportion to its refraction, was also very great. By comparing these two exactly together, he found, that a wedge of white flint glass whose angle was about 2° degrees, and another of crown glass whose angle was 2° degrees, refracted very nearly alike. He found also, that, when the wedge was ground to such angles, the refraction produced by the flint glass was that produced by the crown glass nearly as two to three; the refracted light was then free from colour. On measuring the general refracting powers of these two glasses, he found, that in flint glass, the sine of the angles of the rays was to the sine of mean refraction as 1 to 1.583; and that in crown glass, the sine of incidence was to the sine of mean refraction as 1 to 1.53.

The methods of determining the different refractive powers of glass are given under the the article Optics. Here we shall only observe, that two kinds of glass are necessary for the construction of achromatic telescopes; one of which shall possess as small, and the other as great, dispersive powers, relative to their mean refracting powers, as can be produced. The difference of the glass in this respect, depends on the quality of the glass and the proportion of the ingredients employed in their composition. Crown glass, which is composed of sand melted by means of the ashes of sea weeds, barilla or kelp, both which fluxes are known to consist of vegetable earth, alkali, and neutral salt, is found to give the smallest dispersive power. Plate glass, which consists of sand melted by means of fixed vegetable alkali, with little or no vegetable earth, gives a greater dispersive power; but both these give much less than flint glass, which consists of sand melted by means of minium and fixed alkali. It appears, therefore, that the dispersion of the rays is greatest when minium, or probably other metallic calcines, are made use of; and that alkalis give a greater power of dispersion than vegetable or other earths. Mr. Zieher of Petersburg, however, informs us, that he has made a kind of glass, much superior in this respect to flint glass; but it does not as yet appear whether it is more fit for optical purposes than that commonly made use of. There seems no difficulty in augmenting the density of the glass, as that is found to depend on the quantity of minium or other flux; but thus we unfortunately increase also the capital fault to which flint glass and all compositions of that kind are subject; namely, the being subject to veins or small threads running through it. By these, even when so small as to be imperceptible to the naked eye, the rays which fall on them are diverted from their proper direction, and thereby render the images confused. This is owing to the greater density of the veins, as appears by their being observed on white paper, when the glass is held between the paper and the sun or a candle at a proper distance. The rays of light being then made to converge by the superior density of the veins, their images will appear as bright lines bordered with obscure edges on the paper. Flint glass is so much subject to this kind of imperfection, that it is with difficulty the opticians can pick out pieces of the size commonly used from a large quantity of the glass. It is farther to be regretted, that the minium which produces the greatest dispersive power, is likewise the very substance which renders flint glass much more subject to these imperfections than any other. The reason is, that the sand and earthy matters mix uniformly in fusion; and having not only a considerable degree of affinity towards each other, but also not much different from each other, they are not apt to separate. On the other hand, when such a heavy substance as minium is added to these earthy substances, though it has a pretty strong tendency to unite with the earthy substances, it has none with the fixed alkali, which is another ingredient in this glass. Hence some parts of the glass will contain more metallic matter than the rest; particularly that near the bottom of the pot, which is so full of large veins as to be applied only to the making of wares of little value. The veins in this case are formed by the descent of the minium at the bottom, which in its passage forms threads or veins by dragging other parts of the glass along with them.

The correction of this fault appears therefore to be very difficult. M. Macquer informs us, that he had in vain tried to remove it by very long fusion and a fierce fire; which indeed others have found by experience not to correct, but to augment the evil. Mr. Keir is of opinion that some new composition must be discovered, which, when with a sufficient refractive power should possess a greater unity of texture; but he is likewise of opinion, that scarce any alteration in this respect could be made without injuring the colour of the glass. For optical purposes, however, our author does not think that an alteration in the colour of the ingredients would be very detrimental. "I am convinced (says he), that glasses sensibly tinged with colour, might transmit as much or more light than the best flint glass. For the colourless appearance of flint glass is an optical deception. The minium gives it a considerable tinge of yellow, and the alkali inclines it to a bluish cast, besides the colour arising from a greater or less impurity of the materials; so that the glass would actually be very sensibly coloured, unless, by the addition of manganese, which is known to give a purplish red. Thus the other tinges are counteracted, but not effaced or destroyed as has been frequently imagined. By the mixture of the three principal colours, red, yellow, and blue, more or less exactly counterposed, a certain dark amber, or which, as not any one of the colours predominates, no coloured tinge appears, but the effect is merely a diminution of the transparency of the glass, which, however, is too small for ordinary observation." Mr. Keir is even of opinion, that a certain tinge of yellow would in many cases be of service, because it would exclude some of the blue rays, which being most refrangible are most injurious to the distinctness of vision.

Very considerable difficulties, however, must arise in attempting improvements of this kind; as the experiments must all be tried on a very large scale. This is not only attended with a very heavy expense in itself on account of the quantity of materials employed, but from the heavy duty of excise, which is rigorously exacted whether the glass be manufactured into saleable articles or not. It is observed in the manufacture of every kind of glass, that the glass in the middle of the area or transverse section of a pot is much purer and freer from veins and other imperfections than the part which is near the sides, and that near the bottom is the worst of all. Consequently it is chiefly large pots, such as are used in manufactures, that there
is a probability of success. Very fine and beautiful
glasses, called paste and artificial gems, may be made in
smaller pots or crucibles; but this glass is suffered to
c cool and subside in the vessel, by which means the con-
tiguous parts are more uniform in their texture than
can be expected in a piece of glass taken out of the pot
while hot in the common way, by making it adhere
and twist round an iron rod or pipe. But although the
method of allowing the glass to cool in the pots is
very advantageous for the purposes of the jeweller, it is
by no means applicable to those of the optician. Glass
cooled in that gradual manner, suffers some degree of
crystallization or peculiar arrangement of its parts; the
consequence of which is, that the rays of light are
certain refractions independent on the form of the glass,
which greatly affect the distinctness of vision in telescopes.

Musical Glasses. See Harmonica.

Looking Glasses. See Looking Glass, Mirror,
and Foliating.

Burning Glass. See Burning Glass.

Weather Glass. See Barometer.

Cupping Glass. See Surgery.

Hour Glass. See Hour Glass.

Watch Glass. See Watch.

Glass Work. See Salsola, Botany Index.

GLASTONBURY, a town of Somersetshire in
England; situated in W. Long. 2° 41'. N. Lat. 51° 9'.
It is noted for a famous abbey, some magnificent
ruins of which still remain. The curious structure called
the Abbey's kitchen is still pretty entire. The monks
pretend that it was the residence of Joseph of Arima-
thea, and of St. Patrick. The king of the West Saxons erected a church here, which he and the suc-
ceeding kings enriched to such a degree, that the abbob
lived like a prince, had the title of lord, and sat
among the barons in parliament; and no person, not
even a bishop or prince, durst set foot on the isle of
Avalon, in which the abbey stands, without his leave.
The revenue of the abbey was above 40,000l. per ann.
besides seven parks well stored with deer. The last ab-
bot (Richard Whiting), who had 100 monks, and 300
domestics, was hanged in his pontificals, with two of
his monks, on the Tor, a high hill in the neigh-
bourhood, for refusing to take the oath of supremacy to
Henry VIII. and surrender his abbey when required.
Edgar and many other Saxon kings were buried here;
and, as some will have it, Arthur the British king.
Every cottage here has part of a pillar, a door, or a
window of this fabric; of which there still remain the
ruins of the choir, the middle tower and the chapels.
The walls that remain of the abbey are overgrown with
ivy, and the aspect of the whole is both melancholy and
venerable. There are two parish churches. This
town, while under the protection of its abbots, was
a parliamentary borough, but it lost that and its privilege
of a corporation; the latter of which was, however, re-
stored by Queen Anne, who granted it a new charter for
a mayor and burgesses. The only manufactury here is
stockings. At a little distance from the old church, and
facing the monks churchyard, are two remarkable
pyramids, with inscriptions, that are in characters un-
intelligible, and an image in bishop's vestments. The
story of the Glastonbury thorn, and of its budding upon
Christmas day, is well known. This is not correctly
true; but if the winter is mild, it always buds about
the latter end of December, but later if the weather is
severe. Population 2337 in 1811.

GLATZ, a strong town of Silesia, capital of a
county of the same name, seated on the river Neisse,
and well fortified with a castle. The town contains
about 6700 inhabitants. The county was ceded to the
king of Prussia by the queen of Hungary in 1742;
and is about 45 miles in length, and 25 in breadth.
It has mines of pit coal, silver, and iron; good quar-
ries, plenty of cattle, and fine springs of mineral water.
The town is situated in E. Long. 16° 26'. N. Lat.
50° 15'.

GLAUBER, JOHN RHODOPHlus, a celebrated German
chemist, who flourished about the year 1646. He
wrote a great number of different treatises on chemis-
try, some of which have been translated into Latin and
French. All his works have been collected into
one volume, entitled Glauberae concentratuus, which was
translated into English, and printed at London, in folio,
in 1689.

Glauber's Salts, or Sulphate of Soda. See Chemistry
Index.

GLACOMA, in Medicine and Surgery, the name of
a disease in the eye, wherein the crystalline humour
is turned of a blueish or greenish colour, and its trans-
parency hereby diminished.—The word comes from
γαθώς, castus, "sea-green, sky-coloured or grayish."

Those in whom this disorder is forming, discover it
hence, that all objects appear to them as through a cloud
or mist; when entirely formed, the visual rays are all
intercepted, and nothing is seen at all.

It is reckoned incurable, when inveterate, and in
adult persons: and even under other circumstances, is
very difficult of cure, externals proving of little service.
The internals best suited to it, are those used in
the gutta serena. Jul. Caesar Claudinus, Consul 74, gives
a remedy for the glaucoma.

The glaucoma is usually distinguished from the cata-
arrach or suffusion, in this, that in the cataract the white-
ness appears in the pupil, very near the corner; but it
shows deeper in the glaucoma. See Surgery Index.

GLAUCUS, a marine god, or deity of the sea.
There are a great many fabulous accounts of this di-
vinity: but the poetical history of him is, that before
his deification, he was a fisherman of the town of An-
thedon, who having one day taken a considerable num-
ber of fishes, which he laid upon the bank, on a sudden
perceived, that these fishes, having touched a kind of
herb that grew on the shore, received new strength, and
leaped again into the sea: upon the sight of which ex-
traordinary accident, he was tempted to taste of the
herb himself, and presently leaped into the sea after
them, where he was metamorphosed into a Triton, and
became one of the sea gods.

GLAUX, a genus of plants belonging to the pen-
tandria class, and in the natural method ranking under
the 17th order, Culcycanthemus. See Botany Index.

GLAZIER, an artificer who works in glass.—The
principal part of a glazier's business consists in fitting
panes of glass to the sashes and window frames of houses,
pictures, &c. and in cleaning the same.

GLAZING, the crusting over earthen ware with a
vitreous substance, the basis of which is lead. See
Glass of Lead.

The workers of common earthen ware, however, are,
not
not at the trouble of thus previously making a pure

glass of lead. Their usual composition for glazing their
ware is formed of white sand 42 pounds, of red lead 20
pounds, of pearl ashes 20 pounds, and of common salt
12 pounds. Powder the sand by grinding it, and then
add it to the other ingredients and grind them to-
gether; after which calcine them for some time with a
moderate heat, and when the mixture is cold, pound it
to powder; and when wanted for use temper it with
water. The proportion of these ingredients may be oc-
casionally varied. The ware after being turned on the
wheel and dried in the open air, is covered over with
the above composition by means of a brush; and when
set in the furnace the violent heat soon reduces it to a
perfect glass, covering the whole internal and external
surface of the vessel.

We may observe, however, in general, that lead ought
to be excluded from the composition of glazings, and
other fluxes substituted in its stead. A transparent
glazing may be prepared without lead, by calcining 40
pounds of white sand, 25 pounds of pearl ashes, and 15
pounds of common salt; and proceeding as before: and
a more perfect transparent glazing may be made of
sand 40 pounds, of wood ashes perfectly burnt 30
pounds, of tallow, and of common salt 12 pounds.

The following receipts are taken for the most part from Knuckleck, who says, that they are the
true glazings used at Delft and other Dutch manu-
factories.

Black is made of eight parts of red lead, iron filings
three, copper ashes three, and zaffir two measures.
This when melted will make a brown black; and if you
want it blacker, add more zaffir to it.

Blue is thus prepared: Take lead ashes or red lead
one pound, clear sand or powdered flints two pounds,
common salt two pounds, white calcined tartar one
pound, Venice or other glass half a pound, zaffir half
a pound; mix them well together and melt them for
several times, quenching them always in cold water.
If you would have it fine and good, it will be pro-

per to put the mixture into a glass furnace for a day
or two.

Another blue glazing may be formed of one pound of
tartar, a quarter of a pound of red lead, half an
ounce of zaffir, and a quarter of a pound of powdered
flints, which are to be fused and managed as in the last
receipt. Or, take two pounds of calcined lead and tin,
add five pounds of common salt, five pounds of pow-
dered flints, and of zaffir, tartar, and Venetian glass,
each one pound. Calcine and fuse the mixture as be-
fore. Or, again, take of red lead one part, of sand
three parts, and of zaffir one part. For a violet blue
glazing, take four ounces of tartar, two ounces of red
lead, five ounces of powdered flints, and half a drachm
of manganese.

Brown is made of red lead and flints of each 14
parts, and of manganese two parts fused; or of red
lead 12 parts, and manganese one part fused. A brown
glazing, to be laid on a white ground, may be made of
manganese two parts, and of red lead and white
glass of each one part, twice fused.

Gold coloured is made of 12 parts of lead ashes, and
one of white glass.

Gold coloured. Take of litharge three parts, of sand
or calcined flint one part; pound and mix these very
good together, then run them into a yellow glass with
a strong fire. Pound this glass, and grind it into a
subtle powder, which moisten with a well saturated
solution of silver; make it into a paste, which put in
to a crucible, and cover it with a cover. Give it at first
a gentle degree of fire; then increase it, and continue
it till you have a glass, which will be green. Pound
this glass again, and grind it to a fine powder; moisten
this powder with some beer, so that by means of a
hair pencil you may apply it upon the vessels or any
piece of earthen ware. The vessels that are painted or
covered over with this glazing must be first well heated,
then put under a muffle; and as soon as the glass is
run, you must smoke them, by holding them over burning
vegetables, and take out the vessels. Mr Heismann of
Pettersburgh, who sent this receipt to the Royal Society,
uses the words offire debeb sium, which is rendered
smoke them, in the Transactions. Phil.Trans. N°49.
§ 6.

Knearckel gives several preparations for a gold co-
oured yellow glazing. This may be produced by fusi-
ing a mixture of three parts of red lead, two parts of
antimony, and one part of saffron or saffron; by again
melting the powdered mass, and repeating the opera-
tion four times, or by fusing together of this com-
position of red lead and antimony of each an ounce,
and of scales of iron half an ounce; or by calcining
and fusing together eight parts of red lead, six parts
of flints, one part of yellow ochre, one part of antimony,
and one part of white glass. A transparent golden-
parted glazing may be obtained by twice fusing red
lead and white flints, of each 12 parts, and of
flints of iron one part.

Green may be prepared of eight parts of litharge or
red lead, eight parts of Venice glass, four parts of
brass dust or flings of copper; or of ten parts of lith-
charge, twelve of flint or pebble, and one of red
sugar or copper ashes.—A fine green glazing may be pro-
duced by fusing one part of the Bohemian granite,
one part of flings of copper, one part of red lead, and
one part of Venetian glass; or by fusing one part of
white glass, the same quantity of red lead, and also
flings of coppe, powdering the mass, and adding one
part of Bohemian granite to the parts of this pow-
er. A fine green may be obtained by mixing and
grinding together any of the yellow glazings with
equal quantities of the blue glazings; and all the
shades and tints of green will be had by varying the
proportion of the one to the other, and by the choice of
the kind of yellow and blue.

Sea green is made of five pounds of lead ashes, one
pound of tin ashes, three pounds of flint, three quarters
of a pound of salt, half a pound of tartar, and half a
pound of copper dust.

Iron colour is prepared of 15 parts of lead ashes or
red lead, 15 of white sand or flints, and five of cal-
cined copper. This mixture is to be calcined and
fused.

Litur colour is prepared of 12 parts of litharge,
eight of salt, six of pebble or flint, and one of manga-

ese.

Purple brown consists of lead ashes 15 parts, class
sand or powdered flints 18 parts, manganese one part,
and white glass 25 measures, to which some add one
measure of zaffir.
Red is made of antimony three pounds, litharge or red lead three, and rust of iron one: grind them to a fine powder. Or, take two pounds of antimony, three of red lead, and one of calcined saffron of Mars, and proceed as before.

White. The white glazing for common ware is made of 40 pounds of clear sand, 75 pounds of litharge or lead ashes, 26 of pot ashes, and ten pounds of salt: these are three times melted into a cake, quenching it each time in clear cold water. Or it may be made of 50 pounds of clean sand, 70 of lead ashes, 30 of wood ashes, and 10 of salt.

For a fine white: Take two pounds of lead and one of tin; calcine them to ashes; of this take two parts, calcined flint, white sand, or broken white glass, one part, and salt one part; mix them well together and melt them into a cake for use. The trouble of calcining the tin and lead may be prevented by procuring them in a proper state.

A very fine white glazing may be obtained by calcining two parts of lead and one part of tin; and taking one part of this mass, and of flints and common salt of each one part, and fusing the mixture.

A white glazing may be also prepared by mixing 100 pounds of masticot, 60 pounds of red lead, 20 pounds of calcined tin or patty, and 10 pounds of common salt, and calcining and powdering the mixture several times.

Yellow is prepared of red lead three pounds; calcined antimony and tin, of each two pounds; or, according to season, of equal quantities of the three ingredients. These must be melted into a cake, then ground fine; and this operation repeated several times; or it may be made of 15 parts of lead one, three parts of litharge of silver, and 15 parts of sand. A fine yellow glazing may be procured by mixing five parts of red lead, two parts of powdered bisk, one part of sand, one part of the white glazings, and two parts of antimony, calcining the mixture and then fusing it. Or, take four parts of white glass, one part of antimony, three parts of red lead, and one part of iron scales, and fuse the mixture; or fuse 16 parts of flints, one part of iron filings, and 24 parts of litharge. A light yellow glazing may be produced, with ten parts of red lead, three parts of antimony, and three of glass, and two parts of calcined tin. See Gold colour. A. citron yellow is made of six parts of red lead, seven parts of fine red brick dust, and two parts of antimony. This mixture must be calcined day and night for the space of four days, in the ash hole of a glass-house furnace, and at last urged to fusion.

For the glazing of Delft ware, Porcelain, Stoneware, &c. see the articles Delft Ware, Porcelain, and Pottery.

The Romans had a method of glazing their earthen vessels, which in many respects appears to have been superior to ours. The common brown glazing easily scales off, cracks, and in a short time becomes disagreeable to the eye. Besides, it is very easily destroyed by acids; nor can vessels glazed in this manner be even employed to hold water, without part of it oozing through their pores. Lead is also very destructive to the human body; and if acids are unwarily put into vessels glazed with lead, the liquors will receive a very dangerous impregnation from the metal. The Roman glazing, which is yet to be seen upon urns dug up in several places, appears to have been made of some kind of varnish; and Pliny gives us a hint that it was made of bitumen. He tells us that it never lost its beauty, and that at length it became customary to glaze over statues in this manner. As this varnish sunk deep into the substance of the ware, it was not subject to those cracks and flaws which disfigure our vessels; and as it was not liable to be corroded by acids, it could not be subject to any of the accidents which may ensue from the use of vessels glazed with lead.

Gleed, or Gleax, a name used in the northern parts of the kingdom for the kite. See Falco, Ornithology Index.

Gleam is popularly used for a ray or beam of light. Among falconers a hawk is said to gleam when she casts or throws up filth from the gorge.

Glean, the act of gathering or picking up the ears of corn left behind after the field has been reaped and the crop carried home. By the customs of some countries, particularly those of Melon and Estampes, all farmers and others are forbid, either by themselves or servants, to put any cattle into the fields, or prevent the gleaners in any manner whatever for the space of 24 hours after the carrying off the corn, under the penalty of confiscation.

Glebe, among miners, signifies a piece of earth in which is contained some mineral ore.

Glebe, in Law, the land belonging to a parish church besides the tithes.

Glechoma, Ground Ivy, a genus of plants belonging to the didynamia class, and in the natural method ranking under the 42d order, Verticillatae. See Botany Index.

Gleditsia, Triple Throned Acacia, or Honey Locust, a genus of plants belonging to the polygama class, and in the natural method ranking under the 33d order, Lomentacae. See Botany Index.

Gleet, in Medicine, the flux of a thin limpid humour from the urethra. See Medicine Index.

Glendalough, otherwise called the Seven Churches, anciently a celebrated town of Ireland, situated five miles north-west of Rathdrum, in the county of Wicklow, and province of Leinster. The name signifies "the valley of the two lakes." In this valley, surrounded by high and almost inaccessible mountains, St. Kevin or Cavan, called also St. Coemgen, about the middle of the 6th century, founded a monastery, which in a short time from the sanctity of its founder was much resorted to, and at length became a bishoprick and a religious city. St. Kevin died 3d June 618, aged 123; and on that day annually numbers of persons flock to the Seven Churches to celebrate the festival of that venerated saint. During the middle ages the city of Glendalough, called by Hovedon, Episcopatus Bistogniensis, was held in great esteem, and received several valuable donations and privileges, its episcopal jurisdiction extending to the walls of Dublin. About the middle of the 12th century, on some account or other, it was much neglected by the clergy; and became, instead of a holy city, a den of thieves, wherefore Cardinal Papiro, in 1214, united it to the see of Dublin, which union was confirmed by King John. The O'Toole's chiefs of...
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Glendalough, however, by the assistance of the Pope, continued long after this period to elect bishops and abbots to Glendalough, though they had neither revenues or authority, beyond the district of Tuatha, which was the western part of the county of Wicklow; in consequence of which the city was suffered to decay, and had become nearly a desert, in 1497, when Dennis White, the last titular bishop, surrendered his right in the cathedral church of St Patrick, Dublin. From the ruins of this ancient city still remaining, it appears to have been a place of consequence, and to have contained seven churches and religious houses; small indeed, but built in a neat elegant style, in imitation of the Greek architecture: the cathedral, the walls of which are yet standing, was dedicated to St Peter and St Paul. South of the cathedral stands a small church roofed with stone, nearly entire; and in several parts of the valley are a number of stone crosses, some of which are curiously carved, but without any inscriptions. In the north-west corner of the cemetery belonging to the cathedral stands a round tower, 95 feet high, and 15 in diameter; and in the cemetery of a small church, on the south side of the river, near the great lake, called the Rheestart church, are some tombs, with Irish inscriptions, belonging to the O'Tools. In a perpendicular projecting rock on the south side of the great lake, 30 yards above the surface of the water, is the celebrated bed of St Kevin, hewn out of the rock, exceedingly difficult of access and terrible of prospect. Amongst the ruins have been discovered a number of stones, curiously carved, and containing inscriptions in the Latin, Greek, and Irish languages. As this city was in a valley, surrounded on all sides, except the east, by high, barren, and inaccessible mountains, the artificial roads leading there to are by no means the least curious part of the remains; the principal is that leading into the county of Kildare through Glendason. This road for near two miles is yet perfect, composed of stones placed on the edges, making a firm and durable pavement, about 10 feet broad. At a small distance from St Kevin's bed, on the same side of the mountain, are to be seen the ruins of a small stone building called Saint Kevin's cell.

Glenoides, the name of two cavi[ities, or small depressions, in the inferior part of the first vertebra of the neck. See Mica, Mineralogy Index.

GLIMMER, or GLIST. See MICA, MINERALOGY INDEX.

GLINUS, in Botany, a genus of plants belonging to the decandria class; and in the natural method ranking under the 22nd order, Caryophyllae. See Botany Index.

GLIRES, the name of Linneaus's fourth order of mammals. See Mammalia Index.

GLISSON, FRANCIS, a learned English physician in the 17th century, was educated at Cambridge, and became rector professor of that university. In 1634 he was admitted a fellow of the College of Physicians in London. During the civil wars, he practised physic at Colchester, and afterwards settled in London. He greatly improved physic by his anatomical dissections and observations, and made several new discoveries of singular use towards establishing a rational practice. He wrote, 1. De rachitis, &c. 2. De lymphaductis

GLOB, super repetita; with the Anatomia prolegomena, et Anatomia hepatis. 3. De natura substantia energica; seu de vita naturae, ejusque tribus primis. 4. Tractatus de ventriculo et intestinis, &c. The world is obliged to him for the capsula communis, or vagina portae.

GLISTER, in Surgery. See CLYSTER.

GLOBBA, a genus of plants belonging to the monandra class. See Botany Index.

GLOBE, in Geometry, a round or spherical body, more usually called a Sphere. See SPHERE.

Globe is more particularly used for an artificial sphere of metal, plaster, paper, or other matter; on whose convex surface is drawn a map, or representation either of the earth or heavens, with the several circles conceived thereon. See GEOGRAPHY.

Globes are of two kinds, terrestrial and celestial; each of very considerable use, the one in astronomy, and the other in geography, for performing many of the operations thereon, in an easy obvious manner, so as to be conceived without any knowledge of the mathematical grounds of those arts.

The fundamental parts, common to both globes, are an axis, representing that of the world; and a spheric shell, or cover, which makes the body of the globe, on the external surface of which the representation is drawn. See Geography Index.

Globes, we have observed, are made of different materials, viz. silver, brass, paper, plaster, &c. Those commonly used are of plaster and paper. For the construction of globes, see Geography Index.

For the uses, &c. of the globes, see Geography and Astronomy.

GLOBE Animal. See ANIMALCULE.

GLOBE Fish. See OSTRACION, Ichthyology Index.

GLOBULARIA, GLOBULAR BLUE DAISY; a genus of plants, belonging to the tetrandria class; and in the natural method ranking under the 48th order, Aggergata. See Botany Index.

GLOBULE, a diminutive of globe, frequently used by physicians in speaking of the red particles of the blood. See BLOOD.

GLOUCESTER, the capital of Gloucestershire, in England, 106 miles from London. It is an ancient city; and by Antonius is called Cleveum, or Cleveum, which Camden thinks was formed from the British Cære-Gluve, signifying "a fair city." It was one of the 28 cities built by the Britons before the arrival of the Romans, who made it one of their colonies, and in the eighth century it was esteemed one of the noblest cities in the kingdom. It has suffered considerably by fire at different periods. It stands upon a hill; and from the middle of the city, where the four principal streets meet, there is a descent every way, which makes it not only clean and healthy, but adds to the beauty of the place. Forging of iron seems to have been its manufacture so early as the time of William the Conqueror. King Henry VIII. made it the see of a bishop with a dean and six prebends. Its castle, which was erected in the time of William the Conqueror, is very much decayed; part of it is leased out by the crown; and the rest serves for a prison, one of the best in England. In its cathedral, which is an ancient but magnificent fabric, and has a tower reckoned
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Gloucester, one of the most curious pieces of architecture in England, are the tombs of Robert, Duke of Normandy, son to William the Conqueror, and of Edward II., and there is a whispering place like to that of St. Paul's at London. In the chapter house lies Strongbow, who conquered Ireland. There are 12 chapels in it, with the arms and monuments of many great persons. King John made it a borough to be governed by two bailiffs. Henry III. was crowned here, made it a corporation. By its present charter from Charles I. it is governed by a steward, who is generally a nobleman; a mayor; a recorder; 12 aldermen, out of whom the mayor is chosen; a town clerk; two sheriffs, chosen yearly out of 26 common councillors; a sword-bearer; and four sergeants at mace. Here are 12 incorporated trading companies, whose masters attend the mayor on all public occasions, &c. Besides the cathedral, there are five parish churches in this city; which is likewise well provided with hospitals, particularly an infirmary upon the plan of those at London, Winchester, Bath, &c. Here is a good stone bridge over the river Severn, with a quay, wharf, and custom house; but most of its business is engrossed by Bristol. King Edward I. held a parliament here in 1292, wherein some good laws were made, now called the Statutes of Gloucester; and he erected a gate on the south side of the abbey, still called by his name, though almost demolished in the civil wars. King Richard II. also held a parliament here: and King Richard III., in consideration of his having (before his accession to the crown) borne the title of Duke of Gloucester, added the two adjacent hundreds of Dudston and King's Barton to it, gave it its sword and cap of maintenance, and made it a county of itself by the name of the county of the city of Gloucester. But after the Restoration the hundreds were taken away by act of parliament, and the walls pulled down; because the city shut the gates against Charles I. when he besieged it in 1643; by which, though the siege was raised by the earl of Essex, it had suffered 25,000l. damage, having 241 houses destroyed, which reduced it so much that it has scarce recovered its former size and grandeur. Before that time it had 11 parish churches, but six of them were then demolished. Here are abundance of crosses, and statues of the English kings, some of whom kept their Christmas here; several market houses supported with pillars; and large remains of monasteries, which were once so numerous, that it gave occasion to the monkish proverb, As sure as God is in Gloucester. Here is a barley market; and a hall for the assizes, called the Booth Hall. Its chief manufacture is pins. Under the bridge is a water engine to supply the town, and it is served with it also from Robin Hood's well, to which is a fine walk from the city. Camden says, that the famous Roman way, called Ermin Street, which begins at St. David's in Pembroke-shire, and reaches to Southampton, passes through this city. Here is a charity school for above 80 children, of whom above 70 are also clothed; and a well endowed blue-coat school. Population 8280 in 1811. The city sends two members to parliament. W. Long. 2. 13. N. Lat. 51. 48.

GLOCESTERSHIRE, a county of England, is bounded on the west by Monmouthshire and Herefordshire, on the north by Worcestershire, on the east by Oxfordshire and Warwickshire, and on the south by Wiltshire, and part of Somersetshire. It is sixty miles in length, twenty-six in breadth, and one hundred and sixty in circumference; containing 1,100,000 acres, 320 parishes, 1229 villages, 2 cities, and 28 market towns. In 1811 it contained 54,000 houses, and 28,514 inhabitants. It sends only 8 members to parliament, 6 for three towns, viz. Gloucester, Tewkesbury, and Cirencester; and two for the county. Its manufactures are woolen cloths of various kinds, men's hats, leather, pens, paper, bar iron, edge tools, nails, wire, tinmed plates, brass, &c.; and of the principal articles of commerce of the county, it exports cheese 8000 tons; bacon, grain, cider, 3000l. worth; perry, 4000l. worth, &c. It lies in the diocese that takes its name from the capital, and in the Oxford circuit. The air of the county is very wholesome, but the face of it is very different in different parts: for the eastern part is hilly, and is called Cotteswold; the western woody, and called the Forest of Dean; and the rest is a fruitful valley, through which runs the river Severn. This river is in some places between two and three miles broad; and its course through the county, including its windings, is not less than seventy miles. The tide of flood, called the Boar, rises very high, and is very impetuous. It is remarkable, that the greatest tides are one year at the full moon, and the other at the new; one year the night tides, and the next the day. This river affords a noble conveyance for goods and merchandise of all sorts to and from the county; but it is watered by several others, as the Wye, the Avon, the Isis, the Leyden, the Frome, the Strout, and Windrush, besides lesser streams, all abounding with fish, the Severn in particular with salmon, conger eels, and lampreys. The soil is in general very fertile, though pretty much diversified, yielding plenty of corn, pasture, fruit, and wood. In the hilly part of the county, or Cotteswold, the air is wharper than in the lowlands; and the soil, though not so fit for grain, produces excellent pasture for sheep; so that of the four hundred thousand that are computed to be kept in the county, the greater part are fed here. Of these sheep the wool is exceeding fine; and hence it is that this shire is so eminent for its manufacture of cloth, of which fifty thousand pieces are said to have been made yearly, before the practice of clandestinely exporting English wool became so common. In the vale, or lower part of the county, through which the Severn passes, the air and soil are very different from those of the Cotteswold: for the former is much warmer, and the latter richer, yielding the most luxuriant pastures; in consequence of which, numerous herds of black cattle are kept, and great quantities of that excellent cheese, for which it is so much celebrated, made in it. The remaining part of the county, called the

Burlington, on the south by Salem and Cumberland, is bounded on the east by the Atlantic ocean, and on the west by Gloucester-Delaware. It contains 13,172 inhabitants, besides 191 slaves. Gloucester in Virginia is a well cultivated and fruitful county, about 55 miles long and 30 broad, with a population of 13,498 souls, among whom are included 7063 slaves.
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Forest of Dean, was formerly almost entirely overrun with wood, and extended 20 miles in length, and 10 in breadth. It was then a nest of robbers, especially towards the Severn; but now it contains many towns and villages, consisting chiefly of miners, employed in the coal pits, or in digging for or forging iron ore, with both which the forest abounds. These miners have their particular laws, customs, courts, and judges: and the king, as in all royal forests, has a sworn-mote for the preservation of the vert and venison. This forest was anciently, and is still noted for its oaks, which thrive here surprisingly; but as there is a prodigious consumption of wood in the forges, it is continually dwindling away. A navigable canal is made from Stroud to Framilode, forming a junction between the Severn and Thames. Its chalybate springs are, St Anthony's well, in Abbenhall parish; at Barrow and Maredon, in Bodington parish; at Ashchurch, near Tewkesbury; at Dumbleton, near Winchcombe; at Exzington, near Dursley; and at Cheltenham. Its ancient fortifications, attributed to the Romans, Saxons, or Danes, are Aston and Wick, and at Downton, Dixton, Adelsthorpe, Knole, Over Upton, and Hanham. See Geography, Supplement.

GLOCHIDON, a genus of plants, belonging to the monoeccia class. See Botany Index.

GLOGAW, a strong town of Germany, in Silesia, and capital of a duchy of the same name. It is not very large, but is well fortified on the side of Poland. It has a handsome castle, with a tower, in which several counsellors were condemned by Duke John, in 1498, to perish with hunger. Besides the Papists, there are a great number of Protestants and Jews. It was taken by assault, by the king of Prussia, in 1741, and the garrison made prisoners. After the peace in 1742, the king of Prussia settled the supreme court of justice here, the being next to Breslaw, the most populous place in Silesia. It is seated on the river Oder, in E. Long. 16. 15. N. Lat. 51. 39.

GLOGAW the LESS, a town of Silesia, in the duchy of Oppeln, now in the possession of the king of Prussia. It is 15 miles south of Oppeln, and 45 northwest of Breslaw. E. Long. 16. 15. N. Lat. 51. 30.

GLORIA PARI, among ecclesiastical writers. See Doxology.

GLORIOSA, SUPERB LILY, a genus of plants, belonging to the hexandria class, and in the natural method ranking under the 11th order, Sarmentosa. See Botany Index.

GLORY, renown or celebrity. The love of renown, or desire of fame and reputation, appears to be one of the principal springs of action in human society. Glory, therefore, is not to be condemned, as some of the ancient philosophers affected to teach: but it imports us to regulate our pursuit after it by the dictates of reason; and if the public approbation will not follow us in that course, we must leave her behind.—We ought to have our judgments well instructed as to what actions are truly glorious; and to remember, that in every important enterprise, as Seneca observes, "Receit factis factum merces est; officiis revocatus, urum officium est." The reward of a thing well done, is to have done it; the fruit of a good office, is the office itself." Those who by other methods scatter their names into many mouths, show they rather hunt after a great reputation than a good one, and their reward is often infamy than fame.

Men generally, and almost instinctively, affix glory only to such actions as have been produced by an innate desire for public good; and we measure it by that degree of influence which any thing done has upon the common happiness.

If the actions of the hero conduct soonest to glory and with the greatest splendour, and if the victorious general is so great after a signal engagement; it is because the service he has done is for the moment, and for all; and because we think without reflecting, that he has saved our habitations, our wealth, and our children, and every thing that attaches us to life. If the man of science, who in his study has discovered and calculated the motions of the heavenly bodies, who in his alchemic has unveiled some of the secrets of nature, or who has exhibited to mankind a new art, rises to fame with less noise; it is because the utility which he procures is more widely diffused, and is often of less service to the present than to succeeding generations.

The consequences, therefore, of these two advantages are as opposite as the world is different; and while the benefits procured by the warrior appear to have no more influence, and while his glory becomes obscure, that of a celebrated writer or inventor still increases, and is more and more enlarged. His works every day bring back his name to that age which uses them, and thus still add to his celebrity and fame.

This posthumous fame indeed has been derided by some writers. In particular, the author of the Religio of Nature delineated has treated it as highly irrational and absurd. "In reality (says he) the man is not known ever the more to posterity, because his name is transmitted to them: He doth not live, because his name does. When it is said Julius Caesar subdued Gaul, conquered Pompey, &c. it is the same thing as to say, the conqueror of Pompey was Julius Caesar; i.e. Caesar and the conqueror of Pompey is the same thing; Caesar is as much known by one designation as by the other. The amount then is only this, that the conqueror of Pompey conquered Pompey; or somebody conquered Pompey; or neither, since Pompey is as little known now as Caesar, somebody conquered somebody. Such a poor business is this boasted immortality! and such is the thing called glory among us! To discerning men this fame is mere air, and what they despise if not sham."

But surely it were to consider too curiously (as Horatio says to Hamlet) to consider thus. For (as the elegant author of Fitzosborne's Letters observes) although fame with posterity should be, in the strict analysis of it, no other than what is here described, a mere uninteresting proposition, amounting to nothing more than that somebody acted meritoriously; yet it would not necessarily follow, that true philosophy would banish the desire of it from the human breast: for this passion may be (as most certainly it is) viscerally implanted in our species, notwithstanding the corresponding object should in reality be very different from what it appears in imagination. Do not many of our most refined and even contemplative pleasures owe their existence to our mistakes? It is but extending some of our sense
to a higher degree of acuteness than we now possess them, to make the fairest views of nature, or the noblest productions of art, appear horrid and deformed. To see things as they truly and in themselves are, would not always, perhaps, be of advantage to us in the intellectual world, any more than in the natural. But, after all, who shall certainly assure us, that the pleasure of virtuous fame dies with its possessor, and reaches not to a farther scene of existence? There is nothing, it should seem, either absurd or unphilosophical in supposing it possible at least, that the praises of the good and the just, the sweetest music to an honest ear in this world, may be echoed back to the mansions of the next; that the poet's description of Fame may be literally true, and though she walks upon earth, she may yet lift her head into heaven.

To be convinced of the great advantage of cherishing this high regard to posterity, this noble desire of an after life in the breath of others, one need only look back upon the history of the ancient Greeks and Romans. For what other principle was it which produced that exalted strain of virtue in those days, that may well serve, in too many respects, as a model to these? Was it not the consensuum latus honorum, the incorrupteae benes judicative (as fully cause it), "the surest approbation of the good, the uncorrupted applause of the wise," that animated their most generous pursuits?

In short, can it be reasonable to extinguish a passion which nature has universally lighted up in the human breast, and which we constantly find to burn with most strength and brightness in the noblest and best formed bosoms? Accordingly revelation is so far from endearing to eradicate the seed which nature has thus deeply planted, that she rather seems, on the contrary, to cherish and forward its growth. To be exalted with honour, and to be had in everlasting remembrance, are in the number of those encouragements which the Jewish dispensation offered to the virtuous; and the person from whom the sacred Author of the Christian system received his birth, is herself represented as rejoicing that all generations should call her blessed.

GLOSS, a comment on the text of any author, to explain his sense more fully and at large, whether in the same language or any other. See the article COMMENTARY. The word, according to some, comes from the Greek γλῶσσα, "tongue;" the office of a gloss being to explain the text, as that of the tongue is to discover the mind.

Gloss is likewise used for a literal translation, or an interpretation of an author in another language word for word.

Gloss is also used in matters of commerce, &c. for the lustre of a silk, stuff, or the like.

GLOSSARY, a sort of dictionary, explaining the obscure and antiquated terms in some old author; such are Du Cange's Latin and Greek Glossaries, Spelman's Glossary, and Kennet's Glossary at the end of his Parochial Antiquities.

GLOSSOPETRA, or GLOTTOPETRA, in Natural History, a kind of extraneous fossil, something in form of a serpent's tongue; frequently found in the island of Malta and other places.

The vulgar notion is, that they are the tongues of serpents petrified; and hence their name, which is a compound of γλῶσσα, "tongue" and πέτρα, "stone." Hence also their traditional virtue in curing the bites of serpents. The general opinion of naturalists is, that they are the teeth of fishes, left at hand by the waters of the deluge, and since petrified.

The several sizes of the teeth of the same species, and those of the several different species of sharks, afford a vast variety of these fossil substances. Their usual colours are black, bluish, whitish, yellowish, or brown; and in shape they usually approach to a triangular figure. Some of them are simple; others are tricepsiate, having a small point on each side of the large one: many of them are quite straight; but they are frequently found crooked, and bent in all directions; many of them are serrated on their edges, and others have them plain; some are undulated on their edges, and slightly serrated on these undulations. They differ also in size as much as in figure; the larger being four or five inches long, and the smaller less than a quarter of an inch.

They are most usually found with us in the strata of blue clay, though sometimes also in other substances, and are frequent in the clay pits of Richmond and other places. They are very frequent also in Germany, but nowhere so plentiful as in the island of Malta.

The Germans attribute many virtues to these fossil teeth; they call them cordials, audorifics, and aseiphamics: and the people of Malta, where they are extremely plentiful, hang them about their children's necks to promote dentition. They may possibly be of as much service this way as an anodyne necklace; and if suspended in such a manner that the child can get them to its mouth, may, by their hardness and smoothness, be of the same use as a piece of coral.

GLOSSITIS, in Anatomy, the narrow slit at the upper part of the aspera arteria, which is covered by the epiglottis when we hold our breath and when we swallow. The glottis, by its dilatation and contraction, modulates the voice. See Anatomy, No. 183.

GLOVE, a covering for the hand and wrist.

Glovors, with respect to commerce, are distinguished into leathern gloves, silk gloves, thread gloves, cotton gloves, worsted gloves, &c. Leathern gloves are made of sheep-skin, kid, lamb, doe, elk, buff, &c. Gloves now pay a duty to the king, which increases according to their value.

To throw the glove, was a practice or ceremony very usual among our forefathers; being the challenge whereby another was defied to single combat. It is still retained at the coronation of our kings; when the king's champion casts his glove in Westminster hall. See Champion.

Fayn supposes the custom to have arisen from the eastern nations, who in all their sales and deliveries of lands, goods, &c. used to give the purchaser their glove as a way of livery or investiture. To this effect he quotes Ruth iv. 7, where the Chaldee paraphrase calls glove what the common version renders by shoe. He adds, that the Rabbins interpret by glove that passage in the Hebraic Psalm, In dividem extenderam calcanum meum, "Over Edom will I cast out my shoe." Accordingly, among us, he who took up the glove, declared thereby his acceptance of the challenge; and as a part of the ceremony, continues Fayn, took the glove off his own right hand, and cast it upon the ground,
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Glover, to be taken up by the challenger. This had
the force of a mutual engagement on each side, to meet
at the time and place which should be appointed by the
king, parliament, or judges. The same author asserts,
that the custom which still obtains of blessing gloves
in the coronation of the kings of France, is a remain of
the eastern practice of giving possession with the glove,
lib. xvi. p. 1017, &c.

Anciently it was prohibited the judges to wear
gloves on the bench. And at present in the stable of
most princes, it is not safe going from without pulling off
the gloves.

GLOVER, Richard, the author of Leonidas and
several other esteemed works, was the son of Richard
Glover, a Hamburgh merchant in London, and was
born in St Martin's lane in the year 1712. He very
early showed a strong propensity to and genius for
poetry; and while at school, he wrote, amongst other
pieces, a poem to the memory of Sir Isaac Newton,
 prefixed to the view of that incomparable author's
philosophy, published in 1708; in 1728, by his intimate
friend Dr Pemberton. But though possessed of talents
which were calculated to excel in the literary world, he
was content to devote his attention to commerce, and
at a proper period commenced a Hamburgh merchant.
He still, however, cultivated literature, and associated
with those who were eminent in science. One of his
earliest friends was Matthew Green, the ingenious but
obscure author of some admirable poems, which in
1737, after his death, were collected and published by
Mr Glover. In 1737 Mr Glover married Miss Nunn,
with whom he received a handsome fortune; and in
the same month published Leonidas, a poem in 4to,
which in this and the next year passed through three
editions. This poem was inscribed to Lord Cobham;
and on its first appearance was received by the world
with great approbation, though it has since been un
accountably neglected. Lord Lyttleton, in a popular
publication called Common Sense, and in a poem ad
ressed to the author, praised it in the warmest terms;
and Dr Pemberton published, Observations on Poetry,
especially epic, occasioned by the late poem upon Leo
nidas, 1738, 12mo, merely with a view to point out its
beauties. In 1739, Mr Glover published "London,
or the Progress of Commerce," 4to; and a ballad en
titled, Hosier's Ghost. Both these pieces seem to have
been written with a view to incite the public to resent
the misbehaviour of the Spaniards; and the latter had
a very considerable effect. The political dissensions at
this period raged with great violence, and more especi
ally in the metropolis; and at different meetings of
the livour on those occasions, Mr Glover was always
called to the chair, and acquitted himself in a very able
manner, his conduct being patriotic and his speeches
masterly. His talents for public speaking, his know
ledge of political affairs, and his information concern
ing trade and commerce, afterwards armed him out to
the merchants of London as a proper person to con
duct their application to parliament on the subject
of the neglect of their trade. He accepted the office;
and in summing up the evidence gave very striking
proofs of his oratorical powers. This speech was pro
nounced Jan. 27. 1742.

In the year 1744 died the duchess of Marlborough,
and by her will left to Mr Glover and Mr Mallet
500l. each, to write the History of the Duke of Marl
borough's Life. This bequest, however, never took
place. It is supposed, that Mr Glover very early re
ounced his share of it; and Mallet, though he con
tinued to talk of performing the task almost as long as
he lived, is now known never to have made the least
progress in it. About this period Mr Glover withdrew
a good deal from public notice, and lived in retire
ment. He had been unsuccessful in his business; and
with a very laudable delicacy had preferred an obscure
retreat to popular observation, until his affairs should
put on a more prosperous appearance. He had been
honoured with the attention of Frederick prince of
Wales, who once presented him with a complete set of
the classics, elegantly bound; and, on his absenting
himself for some time on account of the embarrassment
in his circumstances, sent him, it is said, 500l.
The prince died in March 1751; and in May following
Mr Glover was once more drawn from his retreat by
the importunity of his friends, and stood candidate for
the place of chamberlain of London. It unfortunately
happened that he did not declare himself until most of
the livour had engaged their votes; by which means
he lost his election.

In 1753, Mr Glover produced at Drury Lane his
tragedy of Boadicea; which was acted nine nights,
in the month of December. It had the advantage of
the performance of Mr Garrick, Mr Mossop, Mrs Gibber,
and Mrs Pritchard. From the prologue it seems to
have been patronized by the author's friends in the
city; and Dr Pemberton wrote a pamphlet to recommend it.—In 1761, Mr Glover published Medea, a
tragedy written on the Greek model; but it was not
acted until 1767, when it appeared for the first time
on the stage at Drury Lane for Mrs Yates's benefit.
At the accession of his present majesty, he appears to
have surmounted the difficulties of his situation.
In the parliament which was then called, he was chosen
member for Weymouth, and continued to sit as such
until the dissolution of it. He, about this time, in
terested himself about India affairs, at one of Mr Sal
vian's elections; and in a speech introduced the fable
of the man, horse, and bear; and drew this conclusion,
that, whenever merchants made use of armed forces to
maintain their trade, it would end in their destruction.

In 1770, the poem of Leonidas requiring a new
edition, it was reprinted in two volumes 10mo, cor
rected throughout, and extended from nine books to
twelve. It had also several new characters added, be
sides placing the old ones in new situations. The im
provements made in it were very considerable; but we
believe the public curiosity, at this period, was not suf
ficiently alive to recompense the pains bestowed on this
once popular performance. The calamities arising from
the wounds given to public credit, in June 1772, by
the failure of the bank of Douglas, Heron, and Co. in
Scotland, occasioned Mr Glover's taking a very active
part in the settling those complicated concerns, and in
stopping the distress then so universally felt. In Fe
bruary 1774, he called the annuitants of that banking
house together, at the King's Arms tavern, and laid
proposals before them for the security of their dem
ands, with which they were fully satisfied. He also
undertook to manage the interests of the merchants
and traders of London concerned in the trade to Ger
man
many and Holland, and of the dealers in foreign linens, in their application to parliament in May 1774. Both the speeches made on these occasions were published in a pamphlet in that year. In the succeeding year he engaged on behalf of the West India merchants in their application to parliament, and examined the witnesses and summoned up the evidence in the same masterly manner he had done on former occasions. For the assistance he afforded the merchants in this business, he was complimented by them with a service of plate, of the value of 300l. The speech which he delivered in the house was in the same year printed. This, we believe, was the last opportunity he had of displaying his oratorical talents in public. Having now arrived at a period of life which demanded a recess from business, Mr Glover retired to ease and independence, and spent the remainder of his days with dignity and with honour. It is probable that he still continued his attention to his muse, as we are informed that, besides an epic poem of considerable length, he has left some tragedies and comedies behind him in manuscript. After experiencing for some time the infirmities of age, he departed this life 25th November 1785; leaving behind him a most estimable character as a man of probity and a writer. The Glowlworm. See Lampyrus, Entomology Index.

GLUCINA, in Chemistry, an eatheary substance which was discovered by Vauquelin in 1798, in analyzing the emerald, of which it forms a component part. For an account of its properties and combinations, see Chemistry, No. 1165.

GLUCKSTADT, a strong and considerable town of Germany, in the circle of Upper Saxony, and duchy of Holstein, with a strong castle, and subject to Denmark. It is seated on the river Elbe, near its mouth, and 28 miles from Hamburg. E. Long. 9° 20'. N. Lat. 53° 31'.

GLUE, among artificers, a tenacious viscid matter, which serves as a cement to bind or connect things together.

Glues are of different kinds, according to the various uses they are designed for, as the common glue, glove glue, and parchment glue; whereas the two last are more properly called size.

Hamel du Monceau has written one of the best works on the subject of glue. According to this author, glue was at first principally prepared from the membranous, tendinous, and cartilaginous parts of animals, and after being dried, they were melted into tablets. It is certain, however, that every animal substance containing jelly, may be used in the manufacture of glue; and, according to Du Hamel himself, a strong, but black-coloured glue may be obtained from bones and harts-horn, after they are dissolved in Papin's digester. Of the truth of this fact Papin himself likewise assures us, for he prepared a jelly from bones, and even from ivory, by which he glued together some pieces of broken glass; and subsequent experiments made by other chemists have confirmed his assertion.

To the information contained on this subject in the works of Papin, Spelman has added many valuable remarks. He not only extracted glue from bones, but also from all the solid parts of animals, by boiling alone, as well as from the teeth of the sea horse, the wild boar, the wood-rose, and the viper.

The glue manufactured in Europe is of different kinds; but that which is made in England is esteemed the best. Its colour is of a brownish red. The Flender glue is considered as of an inferior quality to that made in England, while the glue manufactured in France is not so good as either. The reason assigned for this difference of quality is, that bones and sinews are made use of by the Flemish and French in the manufacture of this article, while the English employ skins, which yield a much stronger glue. Dr Lewis informs us that the English steep and wash the cuttings of the hides in water, then boil them in fresh water till the liquor becomes of a proper consistency; after which they strain it through baskets, allow it to settle, then expose it to further evaporation, and pour it into flat moulds, where it unites. When thoroughly cooled, it is converted into solid cakes, which are cut into pieces, and dried on a kind of net.

Grenet for many years turned his attention to the manufacturing of glue. Having made a number of experiments on every substance formerly employed for this purpose, he found that bones afford the most abundant quantity of glue, and yield it with facility. Having deprived them of the fat they contain, he procured a jelly by simply boiling them, which, when dried, and thus changed into glue, he found superior to that which was prepared in France, and nearly equal to the best glue of commerce.

From the experiments of Parmentier, it appears that six pounds of button-makers raspings yielded a pound of excellent glue, not inferior to that which is manufactured in England. The glue which he obtained from the filings of ivory was equally as good, but more highly coloured. The filings of horn yielded none of this substance.

To obtain glue as colourless as possible, a very small quantity of water should be employed for extracting the jelly, by which means it may be concentrated without long evaporation, as exposure to heat has always a greater or less influence on the colour in proportion to the time. The whiteness and transparency of the Flender glue are said to originate from an adherence to this plan.

In their consistence, colour, taste, smell, and solubility, glues are found to differ from each other. Some glues will dissolve by agitation in cold water, while others are only soluble at the point of ebullition. It is generally admitted that the best glue is transparent, of a brownish yellow colour, and having neither taste nor smell. It is perfectly soluble in water, forming a viscous fluid, which, when dry, preserves its tenacity and transparency in every part, and has more solidity, colour and viscidity, in proportion to the age and strength of the animal from which it is produced.

For the following account of the manufacture of glue, we are indebted to Mr John Clerk of Newcastle. "The improvement (he observes) of any manufacture depends upon its easy access to men of science, and a prudential theorist can never be better employed than in attempting to reduce to regularity or to system the manufactures that may fall under his attention. In conformity to the first principle, I made some notes whilst visiting a glue manufactory a few years ago in Southwark, and those, interwoven with the remarks on that subject of some chemists of the first respectability, I take the liberty of sending.
Glue, sending you: at the same time I must beg of you, or your correspondents, that where it may be corrected in any manner, it may be done, and I shall feel myself obliged by the attention.

"Glue is an impissated jelly, made of the parings of hides or horns of any kind, the pelts obtained from furnaces, and the hoofs and ears of horses, oxen, calves, sheep, &c. quantities of all which are imported in addition to the home supply, by many of the great manufacturers of this article: these are first digested in lime water, to cleanse them as far as it can from the grease or dirt they may have contracted; they are then steeped in clean water, taking care to stir them well from time to time; afterwards they are laid in a heap, and the superabundant water pressed out; then they are boiled in a large brass caldron with clean water, skimming off the dirt as it rises, and further cleansed by putting in, after the whole is dissolved, a little melted alum or lime finely powdered, which, by their detereive properties, still further purge it: the skimming is continued for some time, when the mass is strained through baskets, and suffered to settle, that the remaining impurities, if any, may subsist; it is then poured gently into the kettle again, and further evaporated by boiling a second time, and skimming, until it becomes of a clear but darkish brown colour: when it is thought to be strong enough (which is known either by the length of time a certain quantity of water and materials have boiled, or by its appearance during ebullition), it is poured into frames or moulds of about six feet long, one broad, and two deep, where it hardens gradually as the heat decreases: out of these troughs or receivers it is cut, when cold, by a spade, into square pieces or cakes, and each of these placed within a sort of wooden box, open in three divisions to the back; in the glue as yet soft, is taken a table by women, where they divide it into three pieces (A) with an instrument not unlike a bow, having a brass wire for its string; with this they stand behind the box and cut by its openings, from front to back; the pieces thus cut are taken out into the open air, and dried on a kind of coarse net work, fastened in movable sheds of about four feet square, which are fastened in rows in the glue-maker's field (every one of which contains four or five rows of net work); when perfectly dry and hard, it is fit for sale.

"That is thought the best glue which swells considerably without melting, by three or four days immersion in cold water, and recovers its former dimensions and properties by drying. Glue that has got frost, or that looks thick and black, may be melted over again and refined, with a sufficient quantity added of fresh to overcome any injury it may have sustained; but it is generally put into the kettle after what is in it has been purged in the second boiling. To know good from bad glue, it is necessary for the purchaser to hold it between his eye and the light, and if it appears of a strong dark brown colour, and free from cloudy or black spots, the article is good."

A glue that is colourless and of superior quality, is obtained from the skins of eels, and known by the name of isinglass. It is even procured from vellum, parchment, and some of the white species of leather; but for common purposes this is by far too expensive, and is only made use of in those cases of delicate workmanship where glue would be too gross. The skins of the rabbit, hare, and cat, are made use of in the manufacturing of size, by those who are employed in gilding gold, polishing, and painting, in various colours.

From the experiments of Mr Hatchett it appears, that membrane yields different quantities of gelatine, the solutions of which evaporated to dryness, afforded him an opportunity of observing the different degrees of viscosity and tenacity of mucilage, size, and glue. He also found that the more viscid glues are obtained with greater difficulty than such as are less so. When a cake of glue has been steeped three or four days in cold water, it is considered of the best quality, if it swell much without being dissolved, and if, when taken out, it recovers its original figure and hardness by drying.

On comparing the skins of different animals, Mr Hatchett found, that such as were most flexible more readily yielded their gelatine, and that produced from the skin of the rhinoceros was by far the most viscid of any. The true skin of any animal was most affected by long boiling; but the hide of the rhinoceros was the most insoluble. He found that hair was not so much affected as skin, but the cartilages of the joints, when boiled long in water, were as perfectly soluble as the cutis, which is not the case with the other cartilages, as they afford little or no gelatine. The horns of the ox, ram, and goat, are very different from those of the stag; and the small quantity of gelatine they are found to contain is produced more gradually, and with greater difficulty.

According to Hatchett, the effects of diluted nitric acid on the substances commonly employed in the manufacturing of glue, were exactly analogous to those of boiling water, and were always most powerful on those substances which contained the greatest quantity of gelatine. Almost all animal substances are convertible either into glue or soap, with this additional advantage, that those parts of them which would not be employed in making the one, are the most proper in the manufacturing of the other.

Another fine species of glue, known by the name of isinglass, is the produce of certain fish, very common in the Russian seas, found on entering the rivers Volga, Lyak, Don, and Danube. In Muscovy it is prepared of the sturgeon and the storked, which yield the most beautiful isinglass. The fish from fresh water are esteemed the best, as they afford an isinglass more flexible and transparent than any other.

When the bladder is extracted, it is washed in water to free it from the blood, if any adheres to it, but not otherwise. It is then cut longitudinally, and the outer membrane taken off, the colour of which is brown, while the other membrane is so fine and white as to be

(A) When the women, by mistake, cut only two, that which is double the size is called a bishop, and thrown into the kettle again.

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GLUTEUS, a name common to three muscles whose office it is to extend the thigh. See ANATOMY, Table of the Muscles.

GLUTON, See Mustela, Mammalia Index.

GLUTTONY. See Glaucus, Mammalia Index.

There is a morbid sort of gluttony, called fomes cominiae, "dog-like appetite," which sometimes occurs, and renders the person seized with it an object of pity and of cure as in other diseases: (see BULIM.)—But professed habitual gluttons may be reckoned amongst the monsters of nature, and deemed in a manner punishable for endeavouring to bring a dearness or famine into the places where they live. For which reason, people think King James I. was in the right, when a man being presented to him who could eat a whole sheep at one meal, he asked "What he could do more than another man?" and being answered "He could not do so much," said, "Hang him then; for it is unfit a man should live that eats so much as 20 men, and cannot do so much as one."

The emperor Clodius Albinus would devour more apples at once than a bushel would hold. He would eat 500 figs to his breakfast, 100 peaches, 10 melons, 20 pounds weight of grapes, 100 great-snappers, and 400 oysters. "Feye upon him (with Lipius); God keep such a curse from the earth."

One of our Danish kings named Hardiknute was so great a glutton, that a historian calls him Baccus de Porco, "Swine's mouth." His tables were covered four times a-day with the most costly viands that either the air, sea, or land, could furnish; and as he lived he died; for, reveling and carousing at a wedding banquet at Lambeth, he fell down dead. His death was so welcome to his subjects, that they celebrated the day with sports and pastimes, calling it Hock tide, which signifies scorn and contempt. With this king ended the reign of the Danes in England.

One Phagon, under the reign of the emperor Aurelius, at one meal, ate a whole boar, 100 loaves of bread, a sheep, and drank above three gallons of wine.

We are told by Fuller, that one Nicholas Wood, "Worthies," of Harrison in Kent, ate a whole sheep of 16s. price of 66. at one meal, raw; at another time 30 dozen of pigeons. At Sir William Sibbel's in the same county, he ate as much victuals as would have sufficed 30 men. At Lord Wotton's mansion house in Kent, he devoured at one dinner 84 rabbits; which, by computation, at half a rabbit a man, would have sufficed 168 men. He ate to his breakfast 18 yards of black pudding. He devoured a whole hog at one sitting down; and after it, being accommodated with fruit, he ate three pecks of damosins.

A counsellor at law, whose name was Mallet, well known in the reign of Charles I. ate at one time an ordinary provided in Westminster for 30 men at 12d. a-piece. His practice not being sufficient to supply him with better sort of meat, he fed generally on offal, ox livers, hearts, &c. He lived to almost 60 years of age, and for the seven last years of his life ate as moderately as other men. A narrative of his life was published.

GLYCINE, KNOBBED-ROOTED LIQUORICE-VETCH; a genus of plants belonging to the diaphilus class; and in the natural method ranking under the 32d order, Papilionaceae. See BOTANY Index.

GLYCIRRHIZA, LIQUORICE; a genus of plants belonging to the diaphilus class; and in the natural method ranking under the Papilionaceae. See BOTANY and MATERIA MEDICA Index.

GLYNN, a county in the lower district of Georgia, in America, bounded on the east by the ocean, on the north by the river Altamaha, by which it is separated from Liberty county, and on the south by Camden. The principal produce is cotton and rice. The chief town is Brunswick.

GLYPH, in Sculpture and Architecture, denotes any canal or cavity used as an ornament.

GMELIN, JOHN GEORGE, M.D. public lecturer on botany and physic at Tubingen, member of the Royal Society of Gottingen, and of the Academy of Sciences at Stockholm, was born on the 12th of August 1709, at Tubingen, where his father was an apothecary. Such was his diligence while at school, that he was qualified to attend the academical lectures at the age of 14, and was created doctor of medicine when only 10. He paid a visit about this time to the metropolis of the Russian empire, that he might have the pleasure of seeing some of his former teachers. There he became acquainted with Blumentrost, director of the academy, who introduced him to the meetings of the members, and procured for him an annual pension. At Petersburg he was so much esteemed, that when he intimated a wish in 1729 to return to Tubingen, he was honoured with a place among the regular members of the academy, and chosen professor of chemistry and natural history in the year 1731. In order to carry into execution a plan which had been formed by Peter the Great, for exploring a passage to China and Japan along the coast of the Russian empire,
Gmelin was selected along with two others, as properly qualified for that undertaking, and likewise to ascertain the boundaries of Siberia. The department of natural history was assigned to our author. He had with him his companions, six students, two draughtsmen, two hunters, two miners, four land-surveyors, and 12 soldiers, with a serjeant and drummer. They began their journey on the 19th of August 1733; and in 1736, Steller and a painter joined their society, in order to assist Gmelin in his arduous labours.

By exploring Kamtschatka, they hoped to accomplish their mission in a satisfactory manner, for which purpose Steller proceeded to this place, and the rest of the society continued their travels through Siberia. In February 1743 Gmelin returned to Petersburg in safety after a dangerous journey which lasted nine years and a half, but proved of the utmost importance to various branches of science. He resumed the offices which he had filled before; and having paid a visit in 1747 to his native country, he was chosen professor, while absent, in the room of Bachmeister deceased. He was seized with a violent fever in May 1755, which put an end to his valuable life, in the 45th year of his age. He was undoubtedly one of the most eminent botanists of the last century, and has rendered his name immortal by his Flora Siberica, see Historia plantarum Siberiae, in four parts, large quarto. He determined the boundaries between Europe and Asia, which every celebrated geographer has adopted since his day. Through all his works the traces of great modesty, a sacred regard to truth, and the most extensive knowledge of nature, are remarkably conspicuous.

Gmelin, Dr Samuel, was born in 1743 at Tübingen, where he also studied, and became doctor in medicine in 1763. He was afterwards admitted a member of the Imperial Academy of Sciences at St Petersburg. He commenced his travels in June 1768; and having traversed the provinces of Moscow, Voronez, New Russia, Azof, Casan, and Astracan, he visited, in 1770 and 1771, the different harbours of the Caspian, and examined with peculiar attention those parts of the Persian provinces which border upon that sea, of which he has given a circumstantial account in the three volumes of his travels already published. While extending his observations, he attempted to pass through the western provinces of Persia, which are in a perpetual state of warfare, and infested by numerous banditti. Upon this expedition, he quitted, in April 1772, Einzille, a small trading place in Ghilan, upon the southern shore of the Caspian; and, on account of many difficulties and dangers, did not, until December 2, 1773, reach Sallia, a town situated upon the mouth of the river Koor. Thence he proceeded to Baku and Kuba, in the province of Shirvan, where he met with a friendly reception from Ali Feth Khan, the sovereign of that district. After he had been joined by 20 Uralian Cossacks, and when he was only four days journey from the Russian fortress Kislar, he and his companions were, on the 5th of February 1774, arrested by order of Usméi Khan, a petty Tartar prince, through whose territories he was obliged to pass. Usméi urged as a pretence for this arrest, that 39 years ago several families had escaped from his dominions, and had found an asylum in the Russian territories; adding, that Gmelin should not be released until these families were restored. The professor was removed from prison to prison; and at length, wearied out with continued persecutions, he expired, July 27th, at Akmet-Kent, a village of Mount Caucasus. His death was occasioned partly by vexation for the loss of several papers and collections, and partly by disorders contracted from the fatigues of his long journey. Some of his papers had been sent to Kislar during his imprisonment, and the others were not without great difficulty rescued from the hands of the barbarian who had detained him in captivity. The arrangement of these papers, which will form a fourth volume of his travels, was at first consigned to the care of Gildemstadt, but upon his death has been transferred to the learned Pallas.

Gmelina, a genus of plants belonging to the di-dynamia class; and in the natural method ranking under the 40th order, Personatae. See Botany Index.

Gnaphalium, Cud-Weed, Goldy-Locks, Eternal Flower, &c.; a genus of plants belonging to the syngenesia class; and in the natural method ranking under the 49th order, Composite. See Botany Index.

Gnat. See Culex, Entomology Index.

Gnesna, a large and strong town of Russia, in the palatinate of Calish, with an archbishop's see, whose prelate was primatie of Poland, and viceroy during the vacancy of the throne. It was the first town built in the kingdom, and formerly more considerable than at present. E. Long. 17. 42 N. Lat. 52. 26.

Gnetum, a genus of plants belonging to the monoezia class. See Botany Index.

Gnidia, a genus of plants belonging to the octandria class. See Botany Index.

Gnomes, Gnomi, certain imaginary beings, who, according to the cabalists, inhabit the inner parts of the earth. They are supposed small in stature, and the guardians of quarries, mines, &c. See Fairy.

Gnomon, in Dialling, the style, pin, or cock of a dial, which by its shadow shows the hour of the day. The gnomon of every dial represents the axis of the earth: (See Dial and Dialling.)—The word is Greek, γνώμων, which literally implies something that makes a thing known; by reason that the style or pin indicates or makes the hour known.

Gnomon, in Astronomy, a style erected perpendicular to the horizon, in order to find the altitude of the sun. See Astronomy.

By means of a gnomon, the sun's meridian altitude, and consequently the latitude of the place, may be found more exactly than with the smaller quadrants. See Quadrant.

By the same instrument the height of any object may be found: for as the distance of the observer's eye from the gnomon, is to the height of the style; so is the distance of the observer's eye from the object, to its height.

For the uses and application of gnomons, see Geography.

Gnomon of a Globe; the index of the hour circle.

Gnomonics, the art of dialling. See Dialling.

Gnostics, ancient heretics, famous from the first rise of Christianity, principally in the east.
It appears from several passages of the sacred writings, particularly 1 John ii. 18, 1 Tim. vi. 20, and Col. ii. 8, that many persons were infected with the Gnostic heresy in the first century; though the sect did not render itself conspicuous, either for number or reputation, before the time of Adrian, when some writers erroneously date its rise.

The name is formed of the Latin gnostics, and that of the Greek γνωστικός, "knowing," of γνωσίς, "I know;" and was adopted by those of this sect, as if they were the only persons who had the true knowledge of Christianity. Accordingly, they looked on all other Christians as simple, ignorant, and barbarous persons, who explained and interpreted the sacred writings, in a too low, literal, and unedifying sense.

At first the Gnostics were only the philosophers and sages of those times, who formed for themselves a peculiar system of theology, agreeable to the philosophy of Pythagoras and Plato; to which they accommodated all their interpretations of Scripture. But

Gnostics afterwards became a general name, comprehending divers sects and parties of heretics, who rose in the first centuries, and who, though they differed among themselves as to circumstances, yet all agreed in some common principles. They were such as corrupted the doctrine of the gospel by a profane mixture of the tenets of the oriental philosophy, concerning the origin of evil and the creation of the world, with its divine truths. Such were the Valentinians, Simonians, Carpocratians, Nicolaitans, &c.

Gnostics was sometimes also more particularly attributed to the successors of the first Nicolaitans and Carpocratians, in the second century, upon their laying aside the names of the first authors. Such as would be thoroughly acquainted with all their doctrines, views, and visions, may consult St Irenaeus, Tertullian, Clemens Alexandrinus, Origen, and St Epiphanius; particularly the first of these writers, who relates their sentiments at large: and confutes them at the same time: indeed, he dwells more expressly on the Valentinians than any other sort of Gnostics; but he shows the general principles whereon all their mistaken opinions were founded, and the method they followed in explaining scripture. He accuses them of introducing into religion certain vain and ridiculous genealogies, i.e., a kind of divine processes or emanations which had no other foundation but in their own wild imaginations.

In effect, the Gnostics confessed that these scenes or emanations were nowhere expressly delivered in the sacred writings; but insisted at the same time, that Jesus Christ had intimations to them in parables to such as could understand him. They built their theology not only on the gospels and the epistles of St Paul, but also on the law of Moses and the prophets. These last laws were peculiarly serviceable to them, on account of the allegories and allusions with which they abound, which are capable of different interpretations: Though their doctrine, concerning the creation of the world by one or more inferior beings of an evil or imperfect nature, led them to deny the divine authority of the books of the Old Testament, which contradicted this idle fiction, and filled them with an abhorrence of Moses and the religion he taught; alleging, that he was actuated by the malignant author of this world, who consulted his own glory and authority, and not the real advantage of men. Their persuasion that evil resided in matter, as its centre and source, made them treat the body with contempt, discourage marriage, and reject the doctrine of the resurrection of the body and its re-union with the immortal spirit. Their notion, that malevolent genii presided in nature, and occasioned diseases and calamities, wars, and desolations, induced them to apply themselves to the study of magic, in order to weaken the powers or suspend the influence of their malignant agents.

The Gnostics considered Jesus Christ as the Son of God, and consequently inferior to the Father, who came into the world for the rescue and happiness of miserable mortals, oppressed by matter and evil beings; but they rejected our Lord's humanity, on the principle that every thing corporeal is essentially and intrinsically evil; and therefore the greatest part of them denied the reality of his sufferings. They set great value on the beginning of the gospel of St John, where they fancied they saw a great deal of their scenes, or emanations, under the Word, the Life, the Light, &c. They divided all nature into three kinds of beings, viz., lytic, or material; psychic, or animal; and pneumatic, or spiritual. On the like principle they also distinguished three sorts of men: material, animal, and spiritual. The first, who were material and incapable of knowledge, inevitably perished, both soul and body; the third, such as the Gnostics themselves pretended to be, were all certainly saved; the psychic, or animal, who were the middle between the other two were capable either of being saved or damned, according to their good or evil actions.

With regard to their moral doctrines and conduct, they were much divided. The greatest part of the sect adopted very sacerd rules of life, recommended rigorous abstinence, and prescribed severe bodily mortifications, with a view of purifying and exalting the mind. However, some maintained, that there was no moral difference in human actions; and thus confounding right and wrong, they gave a loose rein to all the passions, and asserted the innocence of following blindly all their motions, and of living by their tumultuous dictates. They supported their opinions and practice by various authorities; some referred to fictitious and apocryphal writings of Adam, Abraham, Zoroaster, Christ, and his apostles; others boasted, that they had deduced their sentiments from secret doctrines of Christ, concealed from the vulgar; others affirmed, that they arrived at superior degrees of wisdom by an innate vigour of mind; and others asserted, that they were instructed in these mysterious parts of theological science by Thudias, a disciple of St Paul, and by Matthias, one of the friends of our Lord. The tenets of the ancient Gnostics were revived in Spain, in the fourth century, by a sect called the Priscillianists.

The appellation Gnostic sometimes also occurs in a good sense, in the ancient ecclesiastical writers, and particularly Clemens Alexandrinus, who, in the person of his Gnostic, describes the characters and qualities of a perfect Christian. This point he labours in the seventh book of his Stromata, where he shows that none but the Gnostic or learned person, has any true religion. He affirms, that were it possible for the know-
GOA, a large and strong town of Asia, in the peninsula on this side the Ganges, and on the Malabar coast. It was taken by the Portuguese in 1508, and is the chief town of all their settlements on this side the Cape of Good Hope. It stands in an island of the same name, about 12 miles in length, and six in breadth; and the city is built on the north side of it, having the conveniency of a fine salt-water river, capable of receiving ships of the greatest burden, where they lie within a mile of the town. The banks of the river are beautified with a great number of handsome structures; such as churches, castles, and gentlemen's houses. The air within the town is wholesome, for which reason it is not so well inhabited now as it was formerly. The vicerey's palace is a handsome building; and stands at a small distance from the river, over one of the gates of the city, which leads to a spacious street, terminated by a beautiful church. This city contains a great number of handsome churches, convents, and cloisters, with a stately large hospital, all well endowed, and kept in good repair. The market place occupies an acre of ground; and in the shops about it may be had the produce of Europe, China, Bengal, and other countries of less note. Every church has a set of bells, some of which are continually ringing. There are a great many Indian converts; but they generally retain some of their old customs, particularly they cannot be brought to eat beef. The clergy are very numerous and illiterate; but the churches are finely embellished, and have great numbers of images. In one of these churches, dedicated to Bon Jesus, is the chapel of St Francisco de Xavieuer, whose tomb it contains: this chapel is a most superb and magnificent place; the tomb of the saint is entirely of fine black marble brought from Lisbon; on the four sides of it the principal actions of the life of the saint are most elegantly carved in bas-relieve; these represent his converting the different nations to the Catholic faith: the figures are done to the life, and most admirably executed: it extends to the top in a pyramidal form, which terminates with a crown of mother-of-pearl. On the sides of this chapel are excellent paintings, done by Italian masters; the subjects chiefly from Scripture. This tomb and the chapel appertaining to it, must have cost an immense sum of money; the Portuguese justly esteem it the greatest rarity in the place. The houses are large, and make a fine show; but within they are but poorly furnished. The inhabitants are contented with greens, fruits, and roots; which, with a little bread, rice, and fish, is their principal diet, though they have hogs and fowls in plenty. The river's mouth is defended by several forts and batteries, well planted with large cannon on both sides; and there are several other forts in different places.

GOA is the residence of a captain general, who lived formerly in great splendour. He is also commander in chief of all the Portuguese forces in the East Indies. They kept here formerly two regiments of European infantry, three legions of sepoys, three troops of native light horse, and a militia; in all about 5000 men. But Goa is at present on the decline, and in little or no estimation with the country powers; indeed their bigotry and superstitions attachment to their faith is so general, that the inhabitants of the city and island are now reduced to about 20,000; the chief part of whom have been baptized; for they will not suffer any Mussulman or Gentoo to live within the precincts of the city: and these few are unable to carry on the huck- andy or manufactures of the country. The court of Portugal is obliged to send out annually a very large sum of money, to defray the current expenses of the government; which money is generally swallowed up by the convents and soldier.

There was formerly an inquisition at this place, but it is now abolished; the building still remains, and by its black outside appears a fit emblem of the cruel and bloody transactions that passed within its walls! Provisions are to be had at this place in great plenty and perfection. E. Long. 73° 46'. N. Lat. 15° 28'.

GOAL. See GAOL.
GOAT. See CAPRA, MAMMALLA INDEX.
GOAT'S BEARD. See Tragopogon, BOTANY INDEX.
GOAT-SUCKER. See CAPRIMULGUS, ORNITHOLOGY INDEX.

GOBELIN, GILES, a celebrated French dye, is the reign of Francis I. discovered a method of dyeing a beautiful scarlet, and his name has been given ever since to the finest French scarlets. His house, is the suburb of St Marcel at Paris, and the river he made use of, are still called the Gobelins. An academy for drawing, and a manufactury of fine tapestries, were erected in this quarter in 1666; for which reason the tapestries are called the Gobelins.

GOBIUS, a genus of fishes belonging to the order of thoracics. See Ichthology INDEX.

GOBLET, or GOBELET, a kind of drinking cup, or bowl, ordinarily of a round figure, and without either foot or handle. The word is French, goblet; which Salmassius, and others, derive from the barbarous Latin copa. Boden deduces it from the Greek cupas, a sort of cup.

GOD, one of the many names of the Supreme Being. See CHRISTIANITY, METAPHYSICS, MORAL PHILOSOPHY, and THEOLOGY.

GOD is also used in speaking of the false deities of the heathens, many of which were only creatures to which divine honours and worship were superstitiously paid.

The Greeks and Latins, it is observablc, did not mean by the name of God, an all-perfect being, whereas of eternity, infinity, omnipresence, &c. were essential attributes; with them, the word only implied an excellent and superior nature; and accordingly they gave the
GOD

The appellation gods to all beings of a rank or class higher and more perfect than that of men, and especially to those who were inferior agents in the divine administration, all subject to the one Supreme. Thus men themselves, according to their system, might become gods after death; inasmuch as their souls might attain to a degree of excellence superior to what they were capable of in life.

The first divines, Father Bosu observes, were the poets: the two functions, though now separated, were originally combined; or, rather, were one and the same thing.

Now the great variety of attributes in God, that is, the number of relations, capacities, and circumstances, wherein they had occasion to consider him, put these poets, &c. under a necessity of making a partition, and of separating the divine attributes into several persons; because the weakness of the human mind could not conceive so much power and action in the simplicity of one single divine nature. Thus the omnipotence of God came to be represented under the person and appellation of Jupiter; the wisdom of God, under that of Minerva; the justice of God, under that of Juno.

The first idols or false gods that are said to have been adored, were the stars, sun, moon, &c. on account of the light, heat, and other benefits, which we derive from them. Afterwards the earth came to be deified, for furnishing fruits necessary for the subsistence of men and animals; then fire and water became objects of divine worship, for their usefulness to human life. In process of time, and by degrees, gods became multiplied to infinity: and there was scarce any thing but the weakness or caprice of some devotee or other elevated into the rank of deity; things useless or even destructive not excepted. See Mythology.

GODALMING, a town of England, in the county of Surrey, 33 miles from London. It is situated on the Wye, which has been rendered navigable for barges from Guildford, whence the communication is open to the Thames. The church is much admired for its neat and lofty spire. Here are manufactories of mixed and blue kerseys, of stockings, blankets, &c.

Population 3543 in 1811. W. Long. 0. 31. N. Lat. 51. 3.

GODDARD, JONATHAN, an eminent physician and chemist, and one of the first promoters of the Royal Society, was born about the year 1617. He was elected a fellow of the college of physicians in 1646, and appointed reader of the anatomical lecture in that college in 1647. As he took part against Charles I. accepted the wardenship of Merton-college, Oxford, from Oliver Cromwell when chancellor, and sat sole representative of that university in Cromwell's parliament, he was removed from his wardenship in a manner disgraceful to him by Charles II. He was however then professor of physic at Gresham college, to which he retired, and continued to attend those meetings that gave birth to the Royal Society; upon the first establishment of which he was nominated one of the council. Being fully persuaded that the preparation of medicines was no less the physician's duty than the prescribing thereof, he constantly prepared his own; and in 1668 published a treatise recommending his example to general practice. He died of an apoplectic fit in 1674; and his memory was preserved by the drops that bore his name, otherwise called Gutter Anglicana, the secret of which he sold to Charles II. for 5000l. and which Dr. Lister assures us was only the volatile spirit of raw silk rectified with oil of cinnamon or some other essential oil. But he claims more particular regard, if what Bishop Seth Ward says be true, that he was the first Englishman who made that noble astronomical instrument, the telescope.

GODDESS, a heathen deity of the female sex. The ancients had almost as many goddesses as gods: such were, Juno the goddess of air, Diana the goddess of woods, &c. and under this character were represented the virtues, graces, and principal advantages of life; truth, justice, piety, liberty, fortune, victory, &c.

It was the peculiar privilege of the goddesses to be represented naked on medallons; for it was supposed that the imagination must be awed and restrained by the consideration of the divine character.

GODFATHERS and GODMOTHERS, persons who, at the baptism of infants, answer: for their future conduct, and solemnly promise that they will renounce the devil and all his works, and follow a life of piety and virtue; and by this means lay themselves under an indispensable obligation to instruct them, and watch over their conduct.

This custom is of great antiquity in the Christian church; and was probably instituted to prevent children being brought up in idolatry, in case their parents died before they arrived at years of discretion.

The number of godfathers and godmothers is reduced to two, in the church of Rome; and three, in the church of England; but formerly they had as many as they pleased.

GODFREY of Bouillon, prince of Lorraine, a most celebrated crusader, and victorious general. He was chosen general of the expedition which the Christians undertook for the recovery of the Holy Land, and sold his dukedom to prepare for the war. He took Jerusalem from the Turks in 1099; but his pious, as historians relate, would not permit him to wear the diadem of the city where his father had been crowned with thorns. The sultan of Egypt afterwards sent a terrible army against him; which he defeated, with the slaughter of about 100,000 of the enemy. He died in 1160.

GODMANCHESTER, a town of Huntingdonshire 16 miles from Cambridge, and 57 from London. It has a bridge on the Ouse, opposite to Huntingdon; was formerly a Roman city, by the name of Duncape, where many Roman coins have been often dug up; and according to old writers, in the time of the Saxons it was the see of a bishop, and had a castle built by one Gormine a Danish king, from which the town was called Gormancester. It is a large village, containing 1779 inhabitants in 1811, and is seated in a fertile soil, abounding with corn. It is said that no town in England kept more ploughs at work than this has done. The inhabitants boast they formerly received our kings as they made a progress this way, with nine score ploughs at a time, finely adorned with their trappings, &c. James I. made it a corporation by the name of two bailiffs, 12 assistants, and the commonalty of the borough of Godmanchester. Here is a school, called the Free Grammar-School of Queen Elizabeth. On the west side of the town is a noble though ancient seat
of the earl of Sandwich. Near this place, in the London road between Huntingdon and Caxton, is a tree well known to travellers by the name of Beggar's Bush.

GODSTOW, a place north-west of Oxford, in a sort of island formed by the divided streams of the Isis after being joined by the Evenlode. It is noted for catching of fish and dressing them; but more so for the ruins of that nunnery which fair Rosamond quitted for the embraces of Henry II. The people show a great hole in the earth here, where they say is a subterraneous passage, which goes under the river to Woodstock, by which she used to pass and repass. Little more remains at present than ragged walls, scattered over a considerable extent of ground. An arched gateway, and another venerable ruin, part of the tower of the conventual church, are still standing. Near the altar in this church fair Rosamond was buried, but the body was afterwards removed by order of a bishop of Lincoln, the visitor. The only entire part is small, formerly a private chapel. Not many years since a stone coffin, said to have been Rosamond's, who, perhaps, was removed from the church to this place, was to be seen here. The building has been put to various uses, and at present serves occasionally for a stable.

GODWIN, Francis, successively bishop of Llandaff and Hereford, was born in 1567. He was eminent for his learning and abilities; being a good mathematician, an excellent philosopher, a pure Latinist, and an accurate historian. He understood the true theory of the moon's motion a century before it was generally known. He first started those hints afterwards pursued by Bishop Wilkins, in his "Secret and swift messenger;" and published "A catalogue of the lives of English bishops." He has nevertheless been accused as a great simoniac, for omitting no opportunity of disposing of preferments in order to provide for his children. He died in 1598.

GODWIN or Godwin Sands. See Kent.

GODWIT. See SCOLOPAX, Ornithology Index.

GOES, or TER GOES, a strong and considerable town of the United Provinces, in Zeland, and capital of the island of South Beuland. It communicates with the sea by a canal; and is 10 miles east of Middelburg, and 30 north of Gheem. Population 3700.

E. Long. 3° 50'. N. Lat. 51° 33'.

GOG and MAGOG, two names generally joined together in scripture, (Ezk. xxviii. 2, 3, &c. xxxii. 1, 2, &c. Rev. xx. 8.) Moses speaks of Magog the son of Japhet, but says nothing of Gog, (Gen. x. 2, 1 Chr. i. 5.) Gog was prince of Magog, according to Ezekiel. Magog signifies the country or people, and Gog the king of that country. The generality of the ancients made Magog the father of the Scythians and Tartars; and several interpreters discovered many footsteps of their name in the provinces of Great Tartary. Others have been of opinion that the Persians were the descendants of Magog; and some have imagined that the Goths were descended from Casp and Magog; and that the races described by Ezekiel, and undertakings by Gog against the saints, are no other than those which the Goths carried on in the fifth age against the Roman empire.

Bochart has placed Gog in the neighbourhood of Caucasus. He derives the name of this celebrated mountain from the Hebrew Gog Chasan "the fortress of Gog." He maintains that Prometheus, said to be chained to Caucasus by Jupiter, is Gog, and no other. Caucasus is a province in Iberia called the Gogarens.

Lastly, the generality believe, that Gog and Magog, mentioned in Ezekiel and the Revelation, are to be taken in an allegorical sense, for such princes as were enemies to the church and saints. Thus many by Gog in Ezekiel understand Antichrist Epiphanes, the persecutor of the Jews who were firm to their religion; and by the person of the same name in the Revelations, they suppose Antichrist to be meant, the great enemy of the church and faithful. Some have endeavoured to prove that Gog, spoken of in Ezekiel, and Cambyses king of Persia, were one and the same person; and that Gog and Magog in the Revelation denote all the enemies of the church, who should be persecutors of it to the consummation of ages.

GOGGLEs, in Surgery, are instruments used for curing squinting, or that distortion of the eyes which occasions this disorder. They are short conical tubes, composed of ivory stained black, with a thin plate of the same ivory fixed in the tubes near their anterior extremities. Through the centre of each of these plates is a small circular hole, about the size of the pupil of the eye, for the transmission of the rays of light. These goggles must be continually worn in the daytime, till the muscles of the eye are brought to act regularly and uniformly, so as to direct the pupil straight forwards; and by these means the cure will be sooner or later effected.

GOGMAGOG HILLS, are hills so called, three miles from Cambridge, remarkable for the inscriptions and other works cast up here; whence some suppose it was a Roman camp; and others, that it was the work of the Danes.

GOGUET, Antony Venus, a French writer, and author of a celebrated work, intituled, L'Orignes des Lois, des Arts, des Sciences, et de leur Progrès chez les anciens Peuples, 1758, 3 vols. 4to. His father was an advocate, and he was born at Paris in 1716. He was very supine as to abilities, and neglected even dull, in his early years; but his understanding developing itself, he applied to letters, and at length produced the above work. The reputation he gained by it was great; but he enjoyed it a very short time; dying the same year of the smallpox, which disorder, it seems, he always dreaded. It is remarkable, that Conrad Fugere, to whom he left his library and MSS. was so deeply affected with the death of his friend, as to die himself three days after him. The above work has been translated into English, and published in 3 vols. 8vo.

GOTO, a town of Italy, in the duchy of Mantua, taken by the Germans in 1527, and by the princes of Hesse in 1706. It is seated on the river Mincio, between the lake of Mantua and that of Garda, 10 miles north-west of Mantua. E. Long. 11°. N. Lat. 45° 16'.

GOLCONDA, a province of Hindostan, now called Hyderabad. It is bounded on the north by that of Orria, on the west by that of Balacota, on the south by Bissargar, and on the east by the gulf of Bengal. It abounds in corn, rice, and cattle; but that which renders it most remarkable are the diamond mines, which
Gold, which were formerly the most considerable in the world: they were usually purchased of the black merchants, who bought parcels of ground to search for these precious stones in. They have also mines of salt, fine iron for sword-blades, and curious callicicos and chintzes. As this is one of the few of the old Mogul governments remaining, more of the old forms and ceremonies of that great dynasty are retained at the nizam's court than at any other in Hindostan. There is a town of the same name, seated at the foot of a mountain. It was formerly the residence of the kings, and is now much frequented by the European merchants. E. Long. 75° 42' N. Lat. 17° 10'.

Gold, the most valuable of all the metals, is of a bright yellow colour when pure, but becomes more or less white in proportion as it is alloyed with other metals. It is the heaviest of all known bodies, platinum only excepted. See Chemistry and Mineralogy Index.

Method of Recovering Gold from Gold Works. The solubility of gold, and the indissolubility of silver, in aqua regia, affords a principle on which gold may be separated from the surface of silver; and, on this foundation, different processes have been contrived, of which the two following appear to be the best. Some powdered sal ammoniac, moistened with aquafortis into the consistence of a paste, is spread upon the gilt silver, and the piece heated till the matter smokes and becomes nearly dry: being then thrown into water, it is rubbed with a scratch brush composed of fine brass wire bound together; by which the gold easily comes off. The other way is, by potting the gilt silver into common aqua regia, kept so hot as nearly to boil, and turning it frequently till it becomes all over black; it is then to be washed with a little water, and rubbed with the scratch brush, to get off what gold the aqua regia may have left. This last method appears preferable to the other; as the same aqua regia may be made to serve repeatedly till it becomes saturated with the gold, after which the gold may be recovered pure by precipitation with sulphate of iron.

For separating gold from gilt copper, some direct a solution of borax to be applied on the gilt parts, but nowhere else, with a pencil, and a little powdered sulphur to be sprinkled on the places thus moistened; the principal use of the solution of borax seems to be to make the sulphur adhere; the piece being then made red hot, and quenched in water, the gold is said to be so far loosened as to be wiped off with a brush. Others mix the sulphur with nitre and tartar, and form the mixture with vinegar into a paste, which is spread upon the gilt parts.

Schutter recommends mechanical means, as being generally the least expensive, for separating gold from the surface both of silver and copper. If the gilt vessel is round, the gold is conveniently got off by turning it in a lathe, and applying a proper tool, a skin being placed underneath for receiving the shavings: he says it is easy to collect into two oceans of shavings all the gold of a gilt vessel weighing thrice as many pounds. Where the figure of the piece does not admit of this method, it is to be properly fixed, and scrapers applied of different kinds according to its size and figure; some large, and furnished with two handles, one at each end; others small and narrow, for penetrating into depressed parts. If the gold cannot be got off by either of these ways, the file must be had recourse to, which takes off more of the metal underneath than the turning tool or the scraper, particularly than the former. The gold scrapings or filings may be purified from the silver or copper they contain, by the methods described under the article Metallurgy.

The editors of the Encyclopedia give a method of recovering the gold from wood that has been gilt on a water size: this account is extracted from a memoir of the same subject, presented to the Academy of Sciences by M. de Montamy. The gilt wood is steeped for a quarter of an hour in a quantity of water sufficient to cover it, made very hot: the size being thus softened, the wood is taken out, and scrubbed piece by piece, in a little warm water, with short stiff bristle brushes of different sizes, some small for penetrating into the carvings, and others large for the greater dispatch in flat pieces. The whole mixture of water, size, gold, &c. is to be boiled to dryness, the dry matter made red hot in a crucible to burn off the size, and the remainder ground with mercury, either in a mortar, or, where the quantity is large, in a mill.

Gold-coast. See Guinea.

Gold-wire, a cylindrical ingot of silver, superficially gilt or covered with gold at the fire, and afterwards drawn successively through a great number of little round holes, of a wire-drawing iron, each less than the other, till it be sometimes no bigger than a hair of the head. See Wire-drawing.

Gold-wire flatted, is the former wire flatted between two rollers of polished steel, to fit it to be spun on a stick, or to be used flat, as it is, without spinning, in certain stuffs, lace, embroideries, &c. See Stuff, &c.

Gold-thread, or spun-gold, is flatted gold, wrapped or laid over a thread of silk, by twisting it with wheel and iron bobbins.

To dispose the wire to be spun on silk, they pass it between two rollers of a little mill: these rollers are of nicely polished steel, and about three inches in diameter. They are set very close to each other, and turned by means of a handle fastened to one of them, which gives motion to the other. The gold wire in passing between the two is rendered quite flat, but without losing any thing of its gilding, and is afterward so exceedingly thin and flexible, that it is easily spun on silk-thread, by means of a hand-wheel, and wound on a spool or bobbin. See Wire-drawing.

Gold-leaf or beaten gold, is gold beaten with a hammer into exceeding thin leaves, so that it is computed, that an ounce may be beaten into 1600 leaves, each three inches square, in which state it takes up more than 153,032 times its former surface.

The preparation of gold-leaf, according to Dr. Lewis, is as follows:

"The gold is melted in a black-lead crucible, with
some borax, in a wind furnace, called by the workmen a wind hole: as soon as it appears in perfect fusion, it is poured out into an iron ingot mould, six or eight inches long, and three quarters of an inch wide, previously greased, and heated, so as to make the tallow run and smoke, but not to take flame. The bar of gold is made red hot, to burn off the unctuous matter, and forged on an anvil into a long plate, which is further extended by being passed repeatedly between polished steel rollers, till it becomes a ribbon as thin as paper. Formerly the whole of this extension was procured by means of the hammer, and some of the French workmen are still said to follow the same practice: but the use of the flattening mill both abridges the operation, and renders the plate of more uniform thickness. The ribbon is divided by compasses, and cut with shears into equal pieces, which consequently are of equal weights: these are forged on an anvil till they are an inch square; and afterwards well nestled, to correct the rigidity which the metal has contracted in the hammering and flattening. Two ounces of gold, or 560 grains, the quantity which the workmen usually melt at a time, make 150 of these squares, whence each of them weighs six grains and two-fifths, and as 962 grains of gold make a cubic inch, the thickness of the square plates is about the 766th part of an inch.

In order to the further extension of these pieces into fine leaves, it is necessary to interpose some smooth body between them and the hammer, for softening its blow, and defending them from the rudeness of its immediate action: as also to place between every two of the pieces some proper intermedium, which, while it prevents their uniting together, or injuring one another, may suffer them freely to extend. Both these ends are answered by certain animal membranes.

The goldbeaters use three kinds of membranes; for the outside cover, common parchment made of sheep skin; for interlaying with the gold, first the smoothest and closest vellum, made of calf skin; and afterwards the much finer skins of ox gut, stripped off from the large straight gut slip open, curiously prepared on purpose for this use, and hence called gold-beater's skin. The preparation of these is a distinct business, practiced by only two or three persons in the kingdom, some of the particulars of which I have not satisfactorily learned. The general process is said to consist, in applying one upon another, by the smooth sides, in a moist state, in which they readily cohere and unite inseparably; stretching them on a frame, and carefully scraping off the fat and rough matter, so as to leave only the fine exterior membrane of the gut; beating them between double leaves of paper, to force out what unctuousity may remain in them; moistening them once or twice with an infusion of warm spices; and lastly, drying and pressing them. It is said, that some calcined gypsum, or plaster of Paris, is rubbed with a hare's foot both on the vellum and the ox gut skins, which fills up such minute holes as may happen in them, and prevents the gold leaf from sticking, as it would do to the simple animal membrane. It is observable, that, notwithstanding the vast extent to which the gold is beaten between these skins, and the great tenacity of the skins themselves, yet they sustain continual repetitions of the process for several months, without extending or throwing thinner. Our workmen find, that, after 70 or 80 repetitions, the skins, though they contract no flaw, will no longer permit the gold to extend between them; but that they may be again rendered fit for use by impregnating them with the virtue which they have lost, and that even holes in them may be repaired by the dexterous application of fresh pieces of skin: a microscopical examination of some skins that had been long used plainly showed these repairs. The method of restoring their virtue is said in the Encyclopædia to be, by interlaying them with leaves of paper moistened with white wine vinegar, beating them for a whole day, and afterwards rubbing them over as at first with plaster of Paris. The gold is said to extend between them more easily, after they have been used a little, than when they are new.

The beating of the gold is performed on a smooth block of black marble, weighing from 200 to 600 pounds, the heavier the better; about nine inches square on the upper surface, and sometimes less, fitted into the middle of a wooden frame, about two feet square, so that the surface of the marble and the gold form one plane. But the sides are furnished with a high ledge, and the front, which is open, has a leather flap fastened to it, which the gold-beater takes before him as an apron, for preserving the fragments of gold that fall off. Three hammers are employed, all of them with two round and somewhat convex faces, though commonly the workman uses only one of the faces: the first, called the catch hammer, is about four inches in diameter, and weighs 15 or 16 pounds, and sometimes 20, though few workmen can manage those of this last size: the second, called the shoddering hammer, weighs about 12 pounds, and is about the same diameter: the third, called the gold hammer, or finishing hammer, weighs 10 or 11 pounds, and is nearly of the same width. The French use four hammers, differing both in size and shape from those of our workmen: they have only one face, being in figure truncated cones. The first has very little convexity, is near five inches in diameter, and weighs 14 or 15 pounds; the second is more convex than the first, about as narrow, and scarcely half its weight; the third, still more convex, is only about two inches wide, and four or five pounds in weight: the fourth or finishing hammer is near as heavy as the first, but narrower by an inch, and the most convex of all. As these hammers differ so remarkably from ours, I thought proper to insert them, leaving the workmen to judge what advantage one set may have above the other.

A hundred and fifty of the pieces of gold are interlaid with leaves of vellum, three or four inches square, one vellum leaf being placed between every two of the pieces, and about 20 more of the vellum leaves on the outside; over these is drawn a parchment case, open at both ends, and over this another in a contrary direction, so that the assemblage of gold and vellum leaves is kept tight and close on all sides. The whole is beaten with the heaviest hammer, and every now and then turned upside down, till the gold is stretched to the extent of the vellum; the case being from time to time opened for discovering how the extension goes on, and the packet, at times, bent and rolled.
rolled as it were between the hands, for procuring sufficient freedom to the gold, or, as the workmen say, to make the gold work. The pieces taken out from between the yellow leaves, are cut in four with a steel knife; and the 600 divisions, hence resulting, are interlaid, in the same manner, with pieces of the ox-gut skins five inches square. The beating being repeated with a lighter hammer till the golden plates have again acquired the extent of the skins, they are a second time divided in four: the instrument used for this division is a piece of iron, the leaves being laid as before, so that the moisture of the air or breath condensing on a metallic knife would occasion them to stick to it. These last divisions being so numerous, that the skins necessary for interposing between them would make the package too thick to be beaten at once, they are parted into three parcels, which are beaten separately, with the smallest hammer, till they are stretched for the third time to the size of the skins: they are now found to be reduced to the greatest thinness they will admit of; and indeed many of them, before this period, break or fail. The French workmen, according to the minute detail of this process given in the Encyclopaedia, repeat the division and the beating once more; but as the squares of gold, taken for the first operation, have four times the area of those used among us, the number of leaves from an equal area is the same in both methods, viz. 16 from a square inch. In the beating, however simple the process appears to be, a good deal of address is requisite, for applying the hammers so as to extend the metal uniformly from the middle to the sides; one improper blow is apt not only to break the gold leaves, but to cut the skins.

After the last beating, the leaves are taken up by the end of a cane instrument, and, being blown flat on a leather cushion, are cut to a size, one by one, with a square frame of cane made of a proper sharpness, or with a frame of wood edged with cane: they are then fitted into books of 25 leaves each, the paper of which is well smoothed, and rubbed with red bole to prevent their sticking to it. The French, for sizing the leaves, use only the cane knife; cutting them first straight on one side, fitting them into the book by the straight side, and then paring off the superfluous parts of the gold about the edges of the book. The size of the French gold leaves is from somewhat less than three inches to three and three-quarters square; that of ours, from three inches to three and three-eighths.

The process of gold-beating is considerably influenced by the weather. In wet weather, the skins grow somewhat damp, and in this state make the extension of the gold more tedious: the French are said to dry and press them at every time of using; with care not to overdry them, which would render them unfit for farther service. Our workmen complain more of frost, which appears to affect the mettalline leaves themselves: in frost, a gold leaf cannot easily be blown flat, but breaks, wrinkles, or runs together.

Gold leaf ought to be prepared from the finest gold; as the admixture of other metals, though in too small a proportion to affect sensibly the colour of the leaf, would dispose it to lose of its beauty in the air. And indeed there is little temptation to the workman to use any other; the greater hardness of alloyed gold occasioning as much to be lost in point of time and labour, and in the greater number of leaves that break, as can be gained by any quantity of alloy that would not be at once discoverable by the eye. All metals render gold harder and more difficult of extension. Even silver, which in this respect seems to alter its quality less than any other metal, produces with gold a mixture sensibly harder than either of them separately, and this hardness is in no art more felt than in the goldbeater's. The French are said to prepare what is called the green gold leaf, from the composition of one part of copper and two of silver with eight of gold. But this is probably a mistake: for such an admixture gives no greenness to gold: and I have been informed by our workmen, that this kind of leaf is made from the same fine gold as the highest gold-coloured sort, the greenish hue being only a superficial tint induced upon the gold in some part of the process: this greenish leaf is little otherwise used than for the gilding of certain books.

"But though the goldbeater cannot advantageously diminish the quantity of gold in the leaf by the admixture of any other substance with the gold, yet means have been contrived for some particular purposes, of saving the precious metal, by producing a kind of leaf, called party-gold, whose basis is silver, and which has only a superficial coat of gold upon one side: a thick leaf of silver and a thinner one of gold, laid flat on one another, heated and pressed together, unite and cohere; and being then beaten into fine leaves, as in the foregoing process, the gold, though its quantity is only about one-fourth of that of the silver, continues everywhere to cover it, the extension of the former keeping pace with that of the latter."

But it is to be observed by Mr Nicholson, that pure gold is too ductile to be worked between the goldbeater's skin. The newest skins will work the finest gold, and make the thinnest leaf, because they are the smoothest. Old skins, being rough or foul, require coarser gold. The finer the gold, the more ductile; insomuch, that pure gold, when driven out by the hammer, is too soft to force itself over the irregularities, but would pass round them, and by that means become divided into narrow slips. The finest gold for this purpose, has three grains of alloy in the ounce, and the coarsest twelve grains. In general the alloy is six grains, or one-eighth part. That which is called pale gold contains three pennyweights of silver in the ounce. The alloy of gold leaf is silver, or copper, or both, and the colour is produced of various tints accordingly. Two ounces and two pennyweights of gold is delivered by the master to the workman, who, if extraordinarily skilful, returns two thousand leaves, or eighty books of gold, together with one ounce and six pennyweights of waste cuttings. Hence one book weighs 4.8 grains; and as the leaves measure 3.3 inches in the side, the thickness of the leaf is one hundred and eighty-two thousandth part of an inch.

The yellow metal called Dutch-gold is fine brass. It is said to be made from copper plates, by cementation with calamine, without subsequent fusion. Its thickness, compared with that of leaf gold, proved as 19 to 4, and under equal surfaces it is considerably more than twice as heavy as the gold. Jour. vol. I.
Gold.  
GOLD.  
It must be observed, however, that gold is beaten more or less, according to the kind or quality of the work it is intended for; that for the gold-wire-drawers to gild their ingots withal, is left much thicker than that for gilding the frames of pictures, &c. See Gilding.

Gold Brocade. See Brocade.

Gilding. See Gold. Fulminating Gold. See Chemistry Index.

Mosaic Gold, is gold applied in panels on a proper ground, distributed into squares, lozenges, and other compartments; part of which is shadowed to raise or heighten the rest. See MOSAIC.

Gold Plates for Enamelling are generally made of ductile gold, whose fineness is from 22½ to 23½ carats; and the finest gold is the best for this purpose, unless where some parts of the gold are left bare and unpolished, as in watch-cases, snuff-boxes, &c. for which purpose a mixture of alloy is necessary, and silver is preferred to copper, because the latter disposures the plates to tarnish and turn green. See ENAMELLING.

Shell-Gold is that used by the gilders and illuminers, and with which gold letters are written. It is made by grinding gold leaves, or gold-beaters fragments, with a little honey, and afterwards separating the honey from the powdered gold by means of water. When the honey is washed away, the gold may be put on paper or kept in shells; whence its name. When it is used, it is diluted with gum-water or soap-suds. The German gold-powder, prepared from the Dutch gold leaf in the same manner, is generally used; and when it is well scoured with varnish, answers the end in japanners gilding as well as the genuine.

Gold Size for burnished gilding is prepared of one pound and a half of tobacco-pipe clay, half an ounce of red chalk, a grain of black lead, forty drops of sweet oil, and three drams of gum animi. Add a little warm water; grind the clay, chalk, and black lead; separately, very fine in water; then mix them together, add the oil and tallow, and grind the mixture to a due consistence.

Gold size of japanners may be made by pulverizing gum animi and asphaltum, of each one ounce; red lead, litharge of gold, andumber, of each one ounce and a half, mixing them with a pound of linseed oil, and boiling them, observing to stir them till the whole be incorporated, and appears on growing cold of the consistence of tar; strain the mixture through a flannel, and keep it stopped up in a bottle for use. When it is used, it must be ground with as much vermillion as will give it an opaque body, and diluted with oil of turpentine, so that it may be worked freely with the pencil. A simple preparation consists of one pound of linseed oil and four ounces of gum animi; powder the gum, and mix it gradually with the boiling oil; let it remain to boil till it becomes of the consistence of tar; strain it through a coarse cloth; keep and use it as the other.

Gold-Finch. See Fringilla, Ornithology Index.

Gold Fish. See Cyprinus, Ichthyology Index.

GOLDEN, something that has a relation to gold or consists of gold.

GOLDEN-Calf, was a figure of a calf, which the Israelites cast in that metal, and set up in the wilderness to worship during Moses's absence in the mount; and which that legislator at his return burnt, grided to powder, and mixed with the water the people were to drink off; as related in Exod. xxxii. The commentators have been divided on this article; the pulverizing of gold, and rendering it potable, is a very difficult operation in chemistry. Many, therefore, suppose it done by a miracle; and the rest, who allow of nothing supernatural in it, advance nothing but conjectures as to the manner of the process. Moses could not have done it by simple calcination, nor amalgamation, nor antimony, nor calcination; nor is there any of those operations that quadrates with the text.

M. Stahl has endeavored to remove this difficulty. The method Moses made use of, according to this author, was by dissolving the metal with bary sulphur; only, instead of the vegetable alkali, he made use of the Egyptian natron, which is common enough throughout the east.

GOLDEN-Fleece, in the ancient mythology, was the skin or fleece of the ram upon which Phryxus and Hella are supposed to have swam over the sea to Colchis; and which being sacrificed to Apollo, was hung upon a tree in the grove of Mars, guarded by two brazen-hoofed bulls, and a monstrous dragon that never slept; but was taken and carried off by Jason and the Argonauts.

Many authors have endeavored to show that this fable is an allegorical representation of some real history, particularly of the philosophers' stone. Others have explained it by the profit of the wool trade to Colchis, or the gold which they commonly gathered there with fleeces in the rivers. See Argonauts.

Order of the GOLDEN Fleece, is a military order instituted by Philip the Good, duke of Burgundy, in 1439. It took its denomination from a representation of the golden fleece, borne by the knights on their collars, which consisted of flints and steel. The king of Spain is now grand-master of the order, in quality of duke of Burgundy: the number of knights is fixed to thirty-one.

It is usually said to have been instituted on occasion of an immense profit which that prince made by wool; though others will have a chemical mystery couched under it, as under that famous one of the ancients, which the adepts contend to be no other than the secret of the elixir, wrote on the fleece of a sheep.

Olivier de la Marche writes, that he had suggested to Philip I. archduke of Austria, that the order was instituted by his grandfather Philip the Good duke of Burgundy, with a view to that of Jason; and that John German bishop of Chalons, chancellor of the order, upon this occasion made him change his opinion, and assured the young prince that the order had been instituted with a view to the fleece of Golias. William bishop of Tournay, chancellor likewise of the order, pretends that the emperor had in view both the golden fleece of Jason and Jacob's fleece; i.e. the specked sheep belonging to this patriarch, according to agreement made with his father-in-law Laban. Which sentiment gave birth to a great work of this prelate in two parts: in the first, under the symbol of the fleece of Jason, is represented the virtue of megalomaniac, which a knight ought to possess; and under the symbol of the fleece of Jacob he represents the virtue of justice.

Paradis
Goldsmith, Oliver, a celebrated English writer, was born at Roscommon in Ireland in the year 1732. His father, who possessed a small estate in the county, had nine sons, of whom Oliver was the third. He was originally intended for the church; and with that view, after being well instructed in the classics, was, with his brother, the Rev. Henry Goldsmith, placed in Trinity College, Dublin, about the latter end of the year 1749. In this seminary of learning he continued a few years, when he took a bachelor's degree: but his brother not being able to obtain any preferment after he left the college, Oliver, by the advice of Dean Goldsmith of Cork, turned his thoughts to the study of physic; and, after attending some courses of anatomy in Dublin, proceeded to Edinburgh in the year 1751, where he embraced the several branches of medicine under the different professors in that university. His benevolent disposition soon involved him in unexpected difficulties; and he was obliged precipitately to leave Scotland, in consequence of engaging himself to pay a considerable sum of money for a fellow-student.

A few days after, about the beginning of the year 1754, he arrived at Sunderland, near Newcastle, where he was arrested at the suit of a tailor in Edinburgh, to whom he had given security for his friend. By the good offices of Laughlen Maclane, Esq. and Dr Sleigh, who were then in the college, he was soon delivered out of the hands of the bailiff; and took his passage on board a Dutch ship to Rotterdam, where, after a short stay, he proceeded to Brussels; he then visited great part of Flanders; and after passing some time at Strasburg and Louvain, where he obtained a degree of bachelor of physic, he accompanied an English gentleman to Bern and Geneva.

It is undoubtedly fact, that this ingenious unfortunate man travelled on foot most part of his tour. He had left England with very little money; and being of a philosophical turn, and at that time possessing a body capable of sustaining every fatigue, and a heart not easily terrified at danger, he became an enthusiast to the design he had formed of seeing the manners of different countries. He had some knowledge of the French language and of music, and he played tolerably well on the German flute; which, from an amusement, became at some times the means of subsistence. His learning produced him a hospitable reception at most of the religious houses; and his music made him welcome to the peasants of Flanders and other parts of Germany. "Whenever I approached," he used to say, "a peasant's house towards night-fall, I played one of my most merry tunes; and that procured me not only a lodging, but subsistence for the next day: but in truth (his constant expression), I must own, whenever I attempted to entertain persons of a higher rank, they always thought my performance odious, and never made me any return for my endeavours to please them."

On Mr Goldsmith's arrival at Geneva, he was recommended as a proper person for a travelling tutor to a young man, who had been unexpectedly left a considerable sum of money by his uncle Mr S——, formerly an eminent pawnbroker near Holborn. This youth, who had been articled to an attorney, on receipt of his fortune determined to see the world; and, on his engaging with his preceptor, made a proviso that he should be permitted to govern himself; and Goldsmith soon found his pupil understood the art of directing in money-concerns extremely well, as avarice was his prevailing passion. His questions were usually how money might be saved, and which was the least expensive course of travelling; whether any thing could be bought that would turn to account when disposed of again in London? Such curiosities on the way as could be seen for nothing he was ready enough to look at; but if the sight of them was to be paid for, he usually asserted that he had been told they were not worth seeing. He never paid a bill that he would not observe how amazingly expensive travelling was, and in this, though he was not yet twenty-one. During Goldsmith's continuous stay in Switzerland, he assiduously cultivated his poetical talent, of which he had given some striking proofs while at the college of Edinburgh. It was here he sent the first sketch of his delightful poem called the Traveller, to his brother the clergyman in Ireland, who, giving him fame and fortune, had retired with an amiable wife, to happiness and obscurity, on an income of only 40l a-year.

From Geneva Mr Goldsmith and his pupil visited the south of France; where the young man, upon some disagreement with his preceptor, paid him the small part of his salary which was due, and embarked at Marseilles for England. Our wanderer was left once more upon the world at large, and passed through a variety of difficulties in traversing the greatest part of France. At length his curiosity being satisfied, he bent his course towards England, and arrived at Dover the beginning of the winter 1738. When he came to London, his stock of cash did not amount to twolives in a stranger in this metropolis, his mind was filled with the most gloomy reflections on his embarrassed situation. With some difficulty he discovered that part of the town in which his old acquaintance Dr Sleigh resided. This gentleman received him with the warmest affection, and liberally invited him to share his purse till some establishment could be procured for him. Goldsmith, unwilling to be a burde to his friend, a short time after eagerly embraced an offer which was made him to assist the late Rev. Dr Milner in instructing the young gentlemen at the academy at Peckham; and acquitted himself greatly to the Doctor's satisfaction for a short time; but having obtained some reputation by the criticisms he had written in the Monthly Review, Mr Griffith, the proprietor, engaged him in the compilation of it; and resolute to pursue the profession of writing, he returned to London, as the mart where abilities of every kind were sure of meeting distinction and reward. As his finances were by no means in a good state, he determined to adopt a plan of the strictest economy; and took
Goldsmith took lodgings in an obscure court in the Old Bailey, where he wrote several ingenious little pieces. The late Mr. Newberry, who at that time gave great encouragement to men of literary abilities, became a kind of patron to our young author; and introduced him as one of the writers in the Public Ledger, in which his Citizen of the World originally appeared, under the title of Chinese Letters.

Fortune now seemed to take some notice of a man she had long neglected. The simplicity of his character, the integrity of his heart, and the merit of his productions, made his company very acceptable to a number of respectable families; and he emerged from his shabby apartments in the Old Bailey to the palatia of the Temple, where he took handsome chambers, and lived in a genteel style. The publication of his Traveller, and his Vicar of Wakefield, was followed by the performance of his comedy of the Good-natured Man at Covent Garden theatre, and placed him in the first rank of the poets of the age.

Among many other persons of distinction who were desirous to know him was the duke of Northumberland; and the circumstance that attended his introduction to that nobleman is worthy of being related, in order to show a striking trait of his character. "I was invited," said the Doctor, (as he was then universally called), "by my friend Mr. Percy, to wait upon the duke, in consequence of the satisfaction he had received from the perusal of one of my productions. I dressed myself in the best manner I could; and, after studying some compliments I thought necessary on such an occasion, proceeded to his apartments, and accused the servants that I had particular business with his Grace. They showed me into an antechamber; where, after waiting some time, a gentleman very genteelly dressed made his appearance. Taking him for the duke, I delivered all the fine things I had composed in order to compliment him on the honour he had done me; when, to my great astonishment, he told me I had mistaken him for his master, who would see me immediately. At that instant the duke came into the apartment; and I was so confused on the occasion, that I wanted words barely sufficient to express the sense I entertained of the duke's politeness, and went away extremely chagrined at the blunder I had committed."

Another feature of his character we cannot help laying before the reader. Previous to the publication of his Deserted Village, the bookseller had given him a note for one hundred guineas for the copy, which the Doctor mentioned a few hours after to one of his friends: who observed, it was a very great sum for so short a performance. "In truth," replied Goldsmith, "I think so too; I have not been easy since I received it; therefore I will go back and return him his note," which he absolutely did; and left it entirely to the bookseller to pay him according to the profits produced by the sale of the piece, which turned out very considerable.

During the last rehearsal of his comedy intitled She stoops to Conquer, which Mr. Coleman had no opinion would succeed, on the Doctor's objecting to the repetition of one of Tony Lumpkin's speeches, being apprehensive it might injure the play, the manager with great keenness replied, "Paus, my dear Doctor, do not be fearful of squibs, when we have been sitting almost these two hours upon a barrel of gunpowder." The piece, however, contrary to Mr. Coleman's expectation, was received with uncommon applause by the audience; and Goldsmith's pride was so hurt by the severity of the above observation, that it entirely put an end to his friendship for the gentleman that made it.

Notwithstanding the great success of his pieces, by some of which it is asserted, upon good authority, he cleared 1500l. in one year, his circumstances were by no means in a prosperous situation, which was partly owing to the liberality of his dispositions, and partly to an unfortunate habit he had contracted of gaming; the arts of which he knew very little of, and consequently became the prey of those who were unprincipled enough to take advantage of his simplicity.

Just before his death he had formed a design for executing an Universal Dictionary of Arts and Sciences, the prospectus of which he actually published. In this work several of his literary friends, (particularly Sir Joshua Reynolds, Dr. Johnson, Mr. Beaumier, and Mr. Garrick,) had undertaken to furnish him with articles upon different subjects. He had entertained the most sanguine expectations from the success of it. The undertaking, however, did not meet with that encouragement from the booksellers which he had imagined it would undoubtedly receive; and he used to lament this circumstance almost to the last hour of his existence.

He had been for some years afflicted, at different times, with a violent strangury, which contributed not a little to embitter the latter part of his life; and which, united with the vexations which he had undergone upon other occasions, brought on a kind of habitual despondency. In this unhappy condition he was attacked by a nervous fever, which, being improperly treated, terminated in his dissolution on the 4th of April 1774.

As to his character, it is strongly illustrated by Mr. Pope's line,

In wit a man, simplicity a child.

The learned leisure he loved to enjoy was too often interrupted by distresses which arose from the liberality of his temper, and which sometimes threw him into loud fits of passion: but this impetuousness was corrected upon a moment's reflection; and his servants have been known, upon these occasions, purposely to throw themselves in his way, that they might profit by it immediately after; for he who had the good fortune to be reproved, was certain of being rewarded for it. The universal esteem in which his poems were held, and the repeated pleasure they give in the perusal, is a striking test of their merit. He was a staid and correct observer of nature; happy in the selection of his images, in the choice of his subjects, and in the harmony of his versification; and, though his embarrassed situation prevented him from putting the last hand to many of his productions, his Hermit, his Traveller, and his Deserted Village, bid fair to claim a place among the most finished pieces in the English language.

Besides the works already mentioned, he wrote, 1. History of the earth and animated nature, 6 vols 8vo. 2. History of England, 4 vols 8vo. 3. History of Rome, 2 vols. 4. Abridgements of the two last, for
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GOLDSMITH. 5. A view of experimental philosophy, 3 vols 8vo; a posthumous work, not esteemed.

6. Miscellaneous, &c.

GOLF, the name of a certain game among the Scots, and said to be peculiar to their country. Among them it has been very ancient; for there are statutes prohibiting it as early as the year 1477, lest it should interfere with the sport of archery. It is commonly played on rugged broken ground, covered with short grass, in the neighbourhood of the sea shore. A field of this sort is in Scotland called links. The game is generally played in parties of one or two on each side. Each party has an exceeding hard ball, somewhat larger than a hen's egg. This they strike with a slender and elastic club, of about four feet long, crooked in the head, and having lead run into it, to make it heavy. The ball being struck with this club, will fly to the distance of 200 yards, and the game is gained by the party who puts his ball into the hole with the fewest strokes. But the game does not depend solely upon the striking of the longest ball, but also upon measuring the strength of the stroke, and applying it in such direction as to lay the ball in smooth ground, whence it may be easily moved at the next stroke. To encourage this amusement, the city of Edinburgh, A.D. 1744, gave to the company of golfers a silver club, to be played for annually by the company, the victor to append a gold or silver piece to the prize. It has been played for every year since, except the years 1746 and 1747. For their better accommodation, 22 members of the company subscribed 30l. each in the year 1768, for building a house, where their meetings might be held. The spot chosen for this purpose was the south-west corner of Leith Links, where an area was taken in feu from the magistrates of Edinburgh, and a commodious house and tavern built upon it.

GOLIUS, JAMES, a celebrated professor of Arabic and the mathematics at Leyden, was descended from a very honourable family, and born at the Hague in the year 1556. He was put to the university of Leyden, where he studied under Erpinus; and having made himself master of all the learned languages, applied himself to the mathematics, physic, and divinity. He afterwards travelled into Africa and Asia; and became greatly esteemed by the kings of Morocco, and the sultan of the Turks. He at length returned to Leyden, loaded with manuscripts; and in 1624, succeeded Erpinus in the Arabic chair. As he had been an eyewitness of the wretched state of Christianity in the Mahometan countries, he was filled with the compassion of a fellow-Christian; and none ever solicited for a place of honour and profit with greater earnestness, than he for procuring a new edition of the New Testament, in the original language, with a translation into the vulgar Greek, by an Archimandrite; and as there are some of these Christians who use the Arabic tongue in divine service, he also took care to have dispersed among them an Arabic translation of the confessions of the Protestants, together with the Catechism and Liturgy. In 1626, he was also chosen professor of mathematics; and discharged the functions of both professorships with the greatest applause during 40 years. He was likewise appointed interpreter in ordinary to the states for the Arabic, Turkish, Persian, and other eastern languages, for which he had an annual pension, and a present of a gold chain, with a very beautiful medal, which he wore as a badge of his office. He published, 1. The life of Tamerlane, written in Arabic. 2. The history of the Saracens, written by El Menar. 3. Alferagius's Elements of Astronomy, with a new version, and learned commentaries. 4. An excellent Arabic lexicon. 5. A Persian Dictionary. He died in 1667.

GOLTZIUS, HENRY, a famous engraver and painter, born in 1558, at Mulbreek in the duchy of Juliers. He was taught the art of engraving by Theodore Garenbert; and succeeded very wonderfully in it, notwithstanding the disadvantage of a lame hand, which was occasioned by his falling into the fire whilst young. He was first employed by his master, and afterwards he worked for Philip Galle. Domestic troubles and ill health occasioned him to travel. He went through Germany into Italy; and passed under a feigned name, that his studies might not be interrupted. He visited Bologna, Florence, Naples, and Venice, constantly applying himself to drawing from the antique statues, and the works of the great masters. At Rome he resided the longest; and there he produced several excellent engravings from Polidoro Raphael, and other eminent painters. On his return to his native country he established himself at Haarlem, where he engraved many of the drawings which he had made during his absences in Italy. He died at Haarlem in 1617, aged 59. He is said to have been 40 years old before he began to paint: yet his pictures are spoken of with great commendation; but as he did not produce any great number of them, they are rarely to be met with. As an engraver, he deserves the highest commendation. No man ever surpassed, and few have equalled, him in the command of the graver and freedom of execution. He copied the style of Albert Durer, Lucas of Leyden, and other old masters, with astonishing exactness. Sometimes his engravings are neat in the extreme; at other times they are performed in a bold open manner, without the least restraint. He also engraved several of his own designs on wood, in that manner which is distinguished by the appellation of chiaro-securo. Of his prints, which are very numerous, it may here suffice to specify two or three of the most celebrated: 1. Six large upright plates, known by the name of master pieces. These, it is said, he engraved to convince the public that he was perfectly capable of imitating the styles of Albert Durer, Lucas Van Leyden, and other masters, whose works were then held in higher estimation than his own: for he had adopted a new manner, which he pursued because he thought it superior, and not because he was incapable of following the others. It is reported that with one of them, the Circumcision, which he smoked to give it the more plausible air of antiquity, he actually deceived some of the most eminent connoisseurs of the day; by one of whom it was bought for an original engraving of Albert Durer. The subjects of these plates are, The Annunciation of the Virgin; the Meeting of the Virgin with Elizabeth, called the Visitation; the Nativity of Christ; the Circumcision of Christ; the Adoration of the Wise Men; the Holy Family. 2. The Judgment of Midas, a large plate lengthwise. 3. The Venetian Ball, a large plate lengthwise, from Theodore Bernard. 4. The Boy and Dog.
GOMBAULD, John Ogier, one of the best French poets in the 17th century, and one of the first members of the French academy, was born at St Just de Lussac. He acquired the esteem of Mary de Medicis, and of the wit of his time. He was a Protestant, and died in a very advanced age. He wrote many works in verse and prose. His epigrams, and some of his sonnets, are particularly esteemed.

GOMBROON, by the natives called Bandar Abassi, a city of Persia, situated in N. Lat. 27° 20′ E. Long. 55° 40′. The name of Gombroon, or Comorong, Captain Hamilton tells us, it had from the Portuguese; because it was remarkable for the number of prawns and shrimps caught on its coasts, by them called comorong. This city owes its wealth and grandeur to the demolition of Hormuz, and the downfall of the Portuguese empire in the East Indies. It is now reckoned one of the greatest marts in the East, was built by the great Shah Abbas, and from him, as some think, obtained the name of Bandar Abassi, which signifies the court of Abas. It stands on a bay about nine leagues to the northward of the east end of the island of Kishmish, and three leagues from the famous Ormus. The English began to settle here about the year 1631, when, in consideration of their services against the Portuguese, Shah Abbas granted them half the customs of that port. This was confirmed by a phirmaund, and duly regarded, till the English began to neglect the services they had stipulated. Whether the company has any emolument from the customs at present, is what we cannot pretend to ascertain. The town is large, but its situation bad; wanting almost everything that contributes to the happiness and even support of life. Towards the land it is encompassed by a sort of wall; and towards the sea are several small forts with a platform, and a castle or citadel, provided with cannon to secure it and the road from the attempts of an enemy by sea. The houses in most of the streets are so out of repair, some half down, others in a heap of rubbish, that a stranger would imagine the town had been sacked and ravaged by a barbarous people; not a vestige of the wealth really contained in the place appearing in view. The bazaars and shops round them are kept, for the most part, by Banians, whose houses are generally in good order. Most of the houses are built with earth and lime, but some of the best with stone. Many of them have a sort of ventilators at top, which contributes greatly to the health of the inhabitants in the hot seasons of the year. The most sickly months here are April, May, September, and October. With fish and mutton the inhabitants are well supplied. Rice is imported from India; and wheat is so plenty, that the poor subsist chiefly by bread and dates. The country heretofore abounds in the most delicious fruits, as apricots, peaches, pomegranates, pears, mangoes, grapes, quinces, plums, sweet quinces, and water melons. The apricots, however, are small, and extremely dangerous if eaten to excess.

Those conveniences are more than overbalanced by the scarcity of fresh water, with which the inhabitants are supplied from Asseen, a place seven miles distant, there not being a spring or well in the town. Persons of condition keep a camel constantly employed in bringing fresh and wholesome water. Captain Hamilton gives it as his opinion, that one cause of the unwholesomeness of this city is the reflection of the rays of light from a high mountain to the north of it. He says, that when the beams are reflected from this mountain, they almost fire the air, and, for two or three months in the year, render the situation intolerable. For this reason the people of condition retire into the country, to pass the heats of June, July, and August. The very sea, during this season, is affected, insomuch that the stench is no less disagreeable than that of putrid carcases; and this is increased by the quantities of shell-fish left on the shore, from which an exhilaration arises that tarnishes gold and silver, and is less tolerable than the bilge-water of a tight ship. At Asseen the English factory have a country house and gardens, to which they retire occasionally. Here they have whole groves of Seville orange trees, though not natural to the country, thrive very well, and are always verdant, bearing ripe and green fruit, with blossoms, all at the same time. They have likewise tanks and ponds of fine fresh water, with every thing else that can moderate the heat of the climate, and render life agreeable and elegant. About ten miles from Asseen is a place called Minoa, where are cold and hot natural baths, reckoned infallible in the cure of all scrofulous disorders, rheumatisms, and other diseases, by bathing.

Gombroon is extremely populous, on account of the commerce carried on by the Dutch and English factories, as well as the natives. The English factory is close by the sea, at some distance from the Dutch, which is a commodious and fine new building. A great part of the company's profit arises from freights. As the natives have but one good ship of their own, and are extremely ignorant of navigation, they freight their goods for Surat, and other Indian places, in English and Dutch bottoms, at an exorbitant rate. The commodities of the Gombroon market are, fine wines of different kinds, raisins, almonds, kish-mishes, prunellas, dates, pistachio-nuts, ginger, silks, carpets, leather, tуть, galbanum, ammoniac, assafoetida, tragacanth, with other gums, and a variety of shop medicines. These are in a great measure the produce of Carmania, which they bring to Gombroon in caravans. The English company had once a small factory in the province of Carmania, chiefly for the sake of a fine wool produced there, and used by the hatters. The said company had once a project of carrying a breed of the Persian goats to St Helena; but whether it was executed, or what success it met with, we cannot say. Although the company pay no customs, they usually make a present to the shabander, to avoid the trouble he has in his power to give them. All private traders with the company's pass, enjoy the same privileges, on paying two per cent. to the company, one to the agent, and one to the broker. All private trade, either by European or country ships, has long been engrossed by the company's servants.

GOMERA, one of the Canary islands, lying between Ferro and Teneriffe. It has one good town of the same name, with an excellent harbour, where the Spanish
Spanish fleet often taken in refreshments. It is about 20 miles long and 10 broad, and is extremely fertile, though little cultivated. It is subject to the Spaniards, who conquered it in 1445. W. Long. 17° 10'. N. Lat. 28° 0'.

GOMORRAH, in Ancient Geography, one of the cities of the plain or of the vale of Siddim in Judea, destroyed together with Sodom by fire from heaven, on account of the wickedness of the people. To determine its particular situation at present is impossible.

GOMOZIA, a genus of plants belonging to the tetrandria class. See Botany Index.

GOMPHOSIS, in Anatomy, that kind of articulation by which the teeth are fixed in the jaw-bone. See Anatomy, No. 2.

GOMPHRÆNA, GLOBE AMARANTH; a genus of plants belonging to the pentandria class; and in the natural method ranking under the 54th order, Miscellaneous. See Botany Index.

GONAUCA, the name of a nation inhabiting the Cape, and supposed by Dr. Sparrman to be a mixture of Hottentots and Caffres. See Hottentots.

GONDAR, the capital of Abyssinia; situated, according to Mr Bruce's observations, in latitude 12° 30'. north, and longitude 57° 40'. east from Greenwich. It lies upon the top of a hill of considerable height, and consists of about 10,000 families in times of peace. The houses are chiefly of clay, with roofs thatched in the form of cones. At the west end of the town is the king's palace; formerly, as Mr Bruce informs us, a structure of considerable consequence, being a large square building four stories high, flanked with square towers, and affording from the top of it a magnificent view of all the country southward to the lake Tzan. It was built in the time of Facelis, by masons from India, and by such Abyssinians as had been instructed in architecture by the Jesuits before their expulsion. Great part of it is now in ruins, having been burnt at different times; but there is still ample lodging in the two lowest floors, the audience chamber being above 120 feet long. By the side of this structure there have been built by different kings apartments of clay only, in the fashion of their own country. The palace, with all its contiguous buildings, is surrounded by a double stone wall thirty feet high and a mile and a half in circumference, with battlements upon the outer wall, and a parapet roof between the outer and inner, by which you can go along the whole and look into the street. The hill on which the town is built rises in the middle of a deep valley, through which run two rivers: one of which, the Kakha, coming from the Mountain of the Sun, flanks all the south of the town; while the other, called the Angrah, falling from the mountain Woggora, encompasses it on the north and north-east; and both rivers unite at the bottom of the hill about a quarter of a mile south of the town. Upon the bank opposite to Gondar, on the other side of the river, is a large town of Mahometans; a great part of whom are employed in taking care of the king's and nobility's equipage, both when they take the field and when they return from it. They are formed into a body under proper officers; but never fight on either side, being entirely confined to the occupation just mentioned, in which by their care and dexterity in pitching and striking the tents, and in leading and conducting the baggage-waggons, they are of great service.—The valley of Gondar is described as having three outlets; one south, to Demebe, Maitsha, and the Agows; another on the north-west, towards Sennar, from which it is distant 120 miles, over the Mountain of the Sun; and the third north, leading to Woggora, over the high mountain Lamalmon, and so on through Tigre to the Red Sea.

GONDI, JOHN FRANCIS PAUL, Cardinal de Retz, was the son of Philip Emanuel de Gondi, Count de Joigny, lieutenant-general, &c. and was born in 1613. From a doctor of the Sorbonne, he first became coadjutor to his uncle John Francis de Gondi, whom he succeeded in 1654 as archbishop of Paris; and was finally made a cardinal. This extraordinary person has drawn his own character in his memoirs with impartiality. He was a man who, from the greatest degree of debauchery, and still languishing under its consequences, made himself adored by the people as a preacher. At the age of 23, he was at the head of a conspiracy against the life of Cardinal Richelieu; he precipitated the parliament into cabals, and the people into sedition: he was (says M. Voltaire) the first bishop who carried on a civil war without the mask of religion. However, his intrigues and schemes turned out so ill, that he was obliged to quit France; and he lived the life of a vagrant exile for five or six years, till the death of his great enemy Cardinal Mazarin, when he returned on certain stipulated conditions. After assisting in the conclave at Rome, which chose Clement IX. he retired from the world, and ended his life like a philosopher in 1679; which made Voltaire say, that in his youth he lived like Calilone, and like Atticus in his old age. He wrote his Memoirs in his retirement; the last edition of which is that of Amsterdam, 4 vols 12mo., 1715.

GONDOLA, a flat boat, very long and narrow, chiefly used at Venice to row on the canals. The word is Italian, gondola. Du Cange derives it from the vulgar Greek σουδόλος, "a bark," or "little ship;" Lancelot deduces it from γυναίκα, a term in Athenæus for a sort of vase.

The middle-sized gondolas are upwards of thirty feet long and four broad: they always terminate at each end in a very sharp point, which is raised perpendicularly to the full height of a man.

The address of the Venetian gondoliers, in passing along their narrow canals, is very remarkable: there are usually two to each gondola, and they row by pushing before them. The fore-man rests his oars on the left side of the gondola: the hind man is placed on the stern, that he may see the head over the till or covering of the gondola, and rests his oars, which is very long, on the right side of the gondola. The gondola is also the name of a passage-boat of six or eight ears, used in other parts of the coast of Italy.

GONIOMETRY, a method of measuring angles, so called by M. de Lagry, who gave several papers, on this method, in the Memoirs of the Royal Academy an. 1724, 1725, 1729. M. de Lagry's method of goniometry consists in measuring the angles with a pair of compasses, and that without any scale whatever, except an undivided semicircle. Thus, having any angle drawn
G O O

G O O

Good, Good Hope.

G O O

Good, Good Hope.

drawn upon paper, to be measured; produce one of the sides of the angle backwards behind the angular point; then with a pair of fine compasses describe a pretty large semicircle from the angular point as a centre, cutting the sides of the proposed angle, which will intercept a part of the semicircle. Take then this intercepted part very exactly between the points of the compasses, and turn them successively over upon the arc of the semicircle, to find how often it is contained in it, after which there is commonly some remainder: then take this remainder in the compasses, and in like manner find how often it is contained in the last of the integral parts of the first arc, with again some remainder: find in like manner how often this last remainder is contained in the former; and so on continually, till the remainder become too small to be taken and applied as a measure. By this means he obtains a series of quotients, or fractional parts, one of another, which being properly reduced into one fraction, give the ratio of the first arc to the semicircle, or of the proposed angle to two right angles, or 180 degrees, and consequently that angle itself in degrees and minutes. *Hutton’s Math. Dict.*

GONORRHOEA, an efflux of white, greenish, or differently-coloured matter, from the urethra; most commonly owing to venereal infection. See MEDICINE and SURGERY Index.

GONZAGA, Lucretia, was one of the most illustrious ladies of the 16th century; and much celebrated for her wit, her learning, and her delicate style. Hortensio Lando wrote a beautiful panegyrical poem upon her, and dedicated to her his dialogue of moderating the passions. Her beautiful letters have been collected with the greatest care. We learn from these, that her marriage with John Paul Manfrone was unhappy.—She was married when she was not 14 years of age, and his conduct afterwards gave her infinite uneasiness. He engaged in a conspiracy against the Duke of Ferrara; was detected and imprisoned by him; but, though condemned by the judges, not put to death. She did all in her power to obtain his enlargement, but in vain; for he died in prison, having shown much impatience under his misfortunes, as made it imagined he had lost his senses. She never would listen afterwards to any proposals of marriage, though several were made to her. All that came from her pen was so much esteemed, that a collection was made even of the notes she wrote to her servants; several of which are to be met with in the edition of her letters.

GOOD, in general, whatever is apt to increase pleasure, to diminish pain in us; or, which amounts to the same, whatever is able to procure or preserve to us the possession of agreeable sensations, and remove those of an opposite nature.

Moral Good, denotes the right conduct of the several senses and passions, or their just proportion and accommodation to their respective objects and relations. See Morals.

Good Bearing (bonus gestus), signifies an exact carriage or behaviour of a subject towards the king and the people, whereunto some persons upon their misbehaviour are bound: and he that is bound to this, is said to be more strictly bound than to the peace: because where the peace is not broken, the surety de bono gestu may be forfeited by the number of a man’s company, or by their weapons.

Good Behaviour, in Law, an exact carriage and behaviour to the king and his people.

A justice of the peace may, at the request of another, or where he himself sees cause, demand surety for the good behaviour; and to that end the justice may issue his warrant against any persons whatsoever, under the degree of nobility; but when it is a nobleman, complaint is to be made in the court of chancery, or king’s bench, where such nobleman may be bound to keep the peace. Infants and feme-coverts, who ought to find surety by their friends, may be bound over to their own good behaviour; as also lunatics, that have sometimes lucid intervals, and all others who break the peace, or being suspected to do it by alarums, assaults, battery, wounding, fighting, quarrelling, threatening, &c. A person may be likewise bound to his good behaviour for a scandalous way of living, keeping bawdy-houses, gaming-houses, &c. and so may common drunkards, whoresoners, common whores, cheaters, libellers, &c. He who demands surety for the peace, on any violence offered, must take an oath before the justice, that he goes in fear of his life, or some bodily harm, &c. and that it is not out of malice, but from a regard to his own safety.

Good Breeding. See Good Manners.

Good Friday, a fast of the Christian church, in memory of the sufferings and death of Jesus Christ. It is observed on the Friday in Holy or Passion week; and it is called, by way of eminence, good, because of the blessed effects of our Saviour’s sufferings, which were a propitiatory or expiating sacrifice for the sins of the world. The commemoration of our Saviour’s sufferings has been kept from the very first ages of Christianity, and was always observed as a day of the strictest fasting and humiliation. Among the Saxons it was called Long-Friday; but for what reason, except on account of the long fastings and offices then used, is uncertain. On Good Friday the pope sits on a plain form: and, after service is ended, when the cardinals wait on him back to his chamber, they are obliged to keep a deep silence, as a testimony of their sorrow. In the night of Good-Friday, the Greeks perform the obsequies of our Saviour round a great crucifix laid on a bed of state, adorned with flowers; these the bishops distribute among the assistants when the office is ended. The Armenians, on this day, set open a holy sepulchre, in imitation of that of Mount Calvary.

Good Hope, or Cape of Good Hope, a promontory of Africa, with a town and a considerable territory, now subject to Britain. It is situated in the country of the Hottentots: for an account of whom, see the article Hottentots.

The Cape of Good Hope has been generally esteemed the most southerly point of Africa, though it is not truly so. In *Phillips’s Voyage to Botany Bay*, we are told, that the land which projects farthest to the south is a point to the east of it, called by the English *Cape Legulius*; a name corrupted from the original Portuguese *das Agulhas* which, as well as the French *appellation des Aiguielles*, is descriptive of its form, and would rightly be translated Needle cape.

On approaching the cape, a very remarkable eminence
Good Hope, hence may in clear weather be discovered at a considerable distance; and is called the Table mountain from its appearance, as it terminates in a flat horizontal surface, from which the face of the rock descends almost perpendicularly. In the mild or summer season, which commences in September, and continues till March, the Table Land or Mountain, is sometimes suddenly capped with a white cloud, by some called the spreading of the Table-cloth. When this cloud seems to roll down the steep face of the mountain, it is a sure indication of an approaching gale of wind from the south-east which generally blows with great violence, and sometimes continues a day or more, but in common is of short duration. Oft a moment's appearance of this cloud, the ships in Table Bay begin to prepare for it, by striking yards and top-masts, and making every thing as snug as possible.—A little to the westward of the Table Land, divided by a small valley, stands on the right-hand side of Table Bay a round hill, called the Sugar Loaf; and by many the Lion's Head, as there is a continuance from it contiguous to the sea, called the Lion's Rump; and when you take a general view of the whole, it very much resembles that animal with his head erect. The Sugar Loaf or Lion’s Head, and the Lion’s Rump, have each a flag staff on them, by which the approach of ships is made known to the governor, particularizing their number, nation, and the quarter from which they come. To the eastwards, separated by a small chasm from the Table Land, stands Charles's Mount, well known by the appellation of the Devil's Tower, or Devil's Head; and so called from the violent gusts of wind supposed to issue from it when it partakes of the cap that covers the Table Mountain. Gusts at this appearance of a degree of force the wind acquires in coming through the chasm. When this phenomenon appears in the morning, which is by no means so frequent as in the evening, the sailors have a saying, as the Devil’s Tower is almost contiguous to the Table Land, that the old gentleman is going to breakfast; if in the middle of the day, that he is going to dinner; and if in the evening, that the cloth is spread for supper. Table-mountain rises about 350 feet above the level of the sea; the Devil's Tower, about 350; and the Lion's Head, 2704. In the neighbourhood of the latter lies Constantia, a district consisting of two farms, wherein the famous wines of that name are produced.

The above-described high lands form a kind of amphitheatre about the Table-valley, where the Cape-town stands. This is situated at the bottom of the middle height, or Table-mountain; and almost in the centre of the Table Bay, so called from that mountain.—This bay, it is observed in Phillips's Voyage, cannot properly be called a port, being by many men a station of security; it is exposed to all the violence of the winds which set into it from the sea; and is far from sufficiently secured from those which blow from the land. The gusts which descend from the summit of Table-mountain are sufficient to force ships from their anchors, and even violently to annoy persons on the shore, by destroying any tents or other temporary edifices, which may be erected, and raising clouds of fine dust, which produce very troublesome effects. A gale of this kind, from the south-east, blew for three days successively when Captain Cook lay here in his first voyage; at which time, he informs us, the Resolution was the only ship in the harbour that had not dragged her anchor. The storms from the sea are still more formidable; so much so, that ships have frequently been driven by them from their anchorage, and wrecked at the head of the bay. But these accidents happen chiefly in the guade mousson, or winter months, from May 14th to the same day of August; during which time few ships venture to anchor here. Our fleet arriving later, lay perfectly un molested as long as it was necessary for it to remain in this station.—False Bay, on the south-east side of the Cape, is more secure than Table Bay during the prevalence of the west wind, but is not so strong gales from the south-east. It is, however, less frequent, being 24 miles of very heavy road distant from Cape Town, whence almost all necessaries must be procured. The most sheltered part of False Bay is a recess on the west side, called Simon's Bay."

Mr. White, in his Journal of a Voyage to New South Wales, thus describes Cape Town. From the shipping, he observes, the town appears pleasantly situated, but at the same time small; a deception that arises from its being built in a valley with such stupendous mountains directly behind it. On landing, however, you are surprised, and agreeably disappointed, to find it not only extensive, but well built, and in a good style; the streets spacious, and intersecting each other at right angles with great precision. This exactness in the formation of the streets, when viewed from the Table Land, is observed to be very great. The houses in general are built of stone, cemented together with a glibulous kind of earth which serves as mortar, and after long standing is not strained out of place. As to their height they do not in common exceed two stories, on account of the violence of the wind, which at some seasons of the year blows with great strength and fury. For the same reason thatch has been usually preferred to tiles or shingles; but the bad effects that have proceeded from this mode when fires happen, has induced the inhabitants in all their new buildings to give the preference to slates and tiles. The lower parts of the houses, according to the custom of the Dutch nation, are not only uncommonly neat and clean in appearance, but they are really so; and the furniture is rather rich than elegant. But this is by no means the case with the bed-rooms or upper apartments; which are very bare and ill furnished. The streets are rough, uneven, and unpaved. But many of the houses have a space flagged before the door; and others have trees planted before them, which form a pleasant shade, and give an agreeable air to the streets.

The only landing-place is at the east end of the town, where there is a quay running some paces into the sea, with several cranes on it; the convenience of loading and unloading the scows that come alongside. To this place excellent water is conveyed by pipes, which makes the watering of ships both easy and expeditions. Close to the quay, on the left hand, stands the castle and principal fortress; a strong extensive work, having excellent accommodations for the troops, and for many of the civil officers belonging to the company. Within the gates, are the principal stores; which are spacious as well as convenient. This fort covers and defends the east part of the town and harbour.
Good Hope, a town, near Amsterdam fort does the west part. The latter, which has been built since Commodore Johnston's expedition, and whereon both French and Dutch inhabitants have been united to render it effectual and strong, is admirably planned and calculated to annoy and harass ships coming into the bay. Some smaller detached fortifications extend along the coast, both to the east and west, and make landing, which was not the case before the late war, hazardous and difficult.

In a word, Cape Town is at this time fortified with strength, regularity, and judgment. It consists of 1145 houses, inhabited by about 5000 whites and people of colour, and 10,000 blacks.

There are two churches in the town; one large, plain, and unadorned, for the Calvinists, the prevailing sect; and a smaller one for the Lutherans. The hospital, which is large and extensive, is situated at the upper end of the town, close to the company's garden, where the convalescents reap the benefit of a wholesome pure air, perfumed with the exhalations of a great variety of rich trees, aromatic shrubs, and numerous plants and flowers; and likewise have the use of every production of it.

The territory round the Cape is distinguished by three chains of mountains, running parallel to one another and to the coast. The first chain, called Lange Kloof, or Long Pass, runs parallel to the southern coast, at the distance of from 20 to 60 miles, widening towards the west. The second chain, called Zwart Berg, or Black Mountain, is considerably higher and more rugged than the first, and consists often of double or triple ranges. The belt interposed between the Zwart Berg and the Lange Kloof is nearly of the same breadth as that between the Lange Kloof and the sea, and is considerably more elevated. Beyond the Zwart Berg, at an interval of 80 or 100 miles, rises the Nieuwelds Gebirg, the highest chain in southern Africa, and the summits of which are generally covered with snow. Its elevation is supposed to be 10,000 feet. The belt or plain interposed between the two last ridges is more elevated than any of the former, so that southern Africa forms as it were a succession of terraces rising above one another. The plain next the sea is covered with a deep and fertile soil, watered by numerous rivulets, well clothed with grass and with a beautiful variety of trees and shrubs. Rains are frequent, and from its proximity to the sea, it enjoys a more mild and equable temperature than the interior and remoter parts of the colony. The second terrace contains a considerable proportion of well watered and fertile lands, but these are mixed with large tracts of the arid desert called Karroo. The third terrace, called the Great Karroo, is composed of a vast plain 300 miles in length, and nearly 100 in breadth, the soil of which is of a hard and impenetrable texture, and destitute almost of any trace of vegetation.

It is obvious, from this outline, that a large portion of the settlement must be devoted to complete and hopeless sterility. The Karroo, of which the greatest part of the second, and the whole of the third and largest belt is composed, is quite unoccupied by man or animal. Only a few shrubbed and parched plants occasionally meet the eye, faintly extending their half withered fibres along the ground. The surface consists of clay, thinly sprinkled over with sand, and is scarcely ever moistened with a shower of rain. The hills, which sometimes break the surface of these plains, are equally destitute of plants as the plain beneath. The upper regions of all the chains of mountains consist of masses of naked sandstone. Mr. Barrow, in short, concludes, that seven-tenths of the settlement for a great part of the year, and a large proportion of it; at all times, is destitute of the least appearance of verdure. The climate of the Cape is besides subject to various disadvantages. It is deluged with rain during the cold season; while, in the hot months, scarcely a shower falls to refresh the earth. During this season also a dry wind blows, having the pungent effects of the African sirocco, blasting vegetation, and relaxing the human frame. Tempestuous winds are besides extremely common, and often uproot trees and destroy the crops. There are, however, many spots about the Cape of extreme fertility. But the want of roads, or other means of transporting commodities, renders the good soil often of no value. The Cape town is supplied with grain from places generally at more than one and less than three days' journey distant. Beyond that, ground can only be applied to the purpose of grazing with advantage.

Wine and brandy are the staple produce of the Cape. The Constantia wine, raised only on two farms, is pretty much esteemed; but the mode of management is far too rude and slovenly to produce good wine generally; and notwithstanding the encouragement given to the Cape wines, by diminishing the duties, they are not relished in Britain. Some attempts, it is understood, are now making to improve the process of manufacture. Tobacco, aloe, with almonds, and fruits of almost all kinds, succeed extremely well, but are not much cultivated. Attempts are now making to colonize the country round the Cape with British settlers; time can only shew whether it will succeed.

The inhabitants of the Cape, though in their persons large, stout, and athletic, have not all that phlegm about them which is the characteristic of Dutchmen in general. The physical influence of climate in some degree account for this; for it is well known that in all southern latitudes the temper and disposition of the people are more gay, and that they are more inclined to luxury and amusements of every kind, than the inhabitants of the northern hemisphere. The ladies are lively, good natured, and familiar; and from a peculiar gay turn, they admit of liberties that would be thought reprehensible in England, though perhaps they are seldom oversteep the bounds of virtue as the women of other countries.

The heavy draft work about the Cape is mostly performed by oxen; which are here brought to an uncommon degree of usefulness and docility. It is not uncommon to see 14, 16, and sometimes 18, in one of their teams; when the roads are heavy, they sometimes, though rarely, yoke 20; all which the Hottentots, Malas, and Cape slaves, have in the most perfect subjection and obedience. One of those fellows places himself on the fore part of the waggons, or, when loaded, on the top of the load, and with a tremendous long whip, which from its size he is obliged to hold in both
The colony of the Cape comprehends at least 420,000 square miles; yet the whole population of whites, blacks, and Hottentots, does not exceed 60,000 souls, or a single individual for every two square miles. The rural occupants may be divided into the wine-growers, the corn-farmers, and the graziers. The first, who reside in the immediate vicinity of the Cape, are the most civilized and comfortably situated of the peasants. Their property is usually about 20 acres in extent, and held in freehold. The corn-farmers or farmers, reside generally at the distance of two or three days journey from the Cape. The agriculture is extremely rude. Their plough, an unwieldy machine, drawn by 14 or 16 oxen, does little more than skim the surface. They use almost no manure, and tread out the corn by the feet of horses. The grazier is the least cultivated, and indeed is half a savage. All these classes employ Hottentots, who are not slaves, strictly speaking, but in a condition nearly as bad.

GOOD Manners. See MANNERS.

GOOINGS, in sea-language, are clamps of iron bolted on the stern-post of a ship, whereon to hang the rudder and keep it steady; for which purpose there is a hole in each of them, to receive a correspondent spindle bolted on the back of the rudder, which turns thereby as upon hinges.

GOOSE. See ANAS, ORNITHOLOGY INDEX. The goose was held in great esteem amongst the Romans for having saved the Capitol from the invasion of the Gauls by cackling and clapping its wings. Geese were kept in the temple of Juno; and the censers, when they entered upon their office, provided meat for them. There was also an annual feast at Rome, at which they carried a silver image of a goose in state; and hanged a dog, to punish that animal because he did not bark at the arrival of the Gauls.

GOOSE-ANDER. See Mergus, Ornithology Index.

GOOSE-BERRY. See Ribes, Botany Index.

GOOSE-NECK, in a ship, a piece of iron fixed on the one end of the tiller, to which the laniard of the whip-staff or the wheel-ropes comes, for steering the ship.

GOOSE-WING, in the sea language. When a ship sails before, or with a quarter-wind on a fresh gale, to make the more haste, they launch out a boom and sail on the lee-side; and a sail so fitted is called a goose-wing.

GORCUM, a town in South Holland, which carries on a considerable trade in cheese and butter. It is situated on the rivers Ligne and Maese, in E. Lang. 4° 55', N. Lat. 51° 49'.

GORDIANUS I. A Roman general, was for his valour and virtues chosen emperor by the army in the reign of Maximinus, A. D. 237; but his son, whom he had associated with himself in the throne, being slain by Capellian, the governor of Mauritania for Maximinus, Gordianus killed himself the same year. See Rome.

GORDIANUS III. grandson of the former, a renowned warrior, and styled The guardian of the Roman Commonwealth. He was treacherously assassinated by Philippus, an Arabian; one of his generals; who, to the eternal disgrace of the Romans of that era, succeeded him in the empire, A. D. 244. See Rome.

GORDIANUS-KNOT,
GOR

Gorged &c. and in that case it is said, the lion or cygnet is
suffocated with a ducal coconut, &c.

Gorged is also used when the gorge or neck of a
peacock, swan, or the like bird, is of a different co-

cour or metal from the rest.

GORGET, a kind of breast-plate, like a half-moon,
with the arms of the prince thereof; worn by the of-
cicers of foot. They are to be either gilt or silver,
according to the colour of the buttons on the uni-
forms.

GORGET, or GORGET, in Surgery, is the name
which the French give to the concave or cannulated
conductor, used in lithotomy. See Surgery Index.

GORGONA, a small island of Italy, in the sea of
Tuscany, and near that of Corsica, about eight miles
in circumference; remarkable for the large quantity
of anchovies taken near it. E. Long. 10. 0. N. Lat.
43. 22.

GORGONA, a small island of the South sea, 12 miles
west of the coast of Peru, in America. It is indifferent
high land, very woody, and some of the trees are
very tall and large, and proper for masts. It is about
10 miles in circumference, and has several springs and
rivulets of excellent water, but is subject to constant
moist cold rains. W. Long. 72. 3. S. Lat. 30.

GORGONIA, in Natural History, a genus of zoo-
ophytes, which formerly were called cerastophytons, and
are known in English by the names of sea-fans, sea-fea-
tures, and sea-whips. Linnaeus and Dr. Pallas consider
them as of a mixed nature in their growth, between
animals and vegetables; but Mr. Ellis shows them to
be true animals of the polype kind, growing up in a
branched form resembling a shrub, and in no part vege-
table. They differ from the fresh water polype in
many of their qualities, and particularly in producing
from their own substance a hard and solid support, serv-
ing many of the purposes of the bone in other animals.
This is formed from a concreting juice thrown out from
a peculiar set of longitudinal parallel tubes, running a-
long the internal surface of the fleshy part: in the coats
of these tubes are a number of small orifices, through
which the osseous liquor exudes, and concreting, forms
the layers of that hard part of the annular circles,
which some, judging from the consistence rather than the
texture, have erroneously denominated wood. The
surface of the gorgonia is composed of a kind of scales,
so well adapted to each other as to serve for defence
from external injuries: and the flesh, or, as some have
called it, the bark or cortex, consists of proper mus-
cles and tendons for extending the openings of their
cells; for sending forth from thence their polype suc-
kers in search of food; and for drawing them in sud-
denly, and contracting the siphenter muscles of these
starry cells, in order to secure these tender parts from
danger; and also of proper secretory ducts, to furnish
and deposit the osseous matter that forms the stem
and branches as well as the base of the bone. Mr. El-
lis affirms, that there are ovaries in these animals, and
thinks it very probable that many of them are vivipa-
rous. See Zooptites.

GORCONS, in antiquity and Mythology. Au-
thors are not agreed in the account they give of the
Gorgons. The poets represent them as three sisters,
whose names are Stheno, Euryale, and Medusa; the
latter of whom was mortal, and, having been deliver-
ed by Neptune, was killed by Perseus; the two far-
mer were subject neither to age nor death. They are
described with wings on their shoulders, with serpents
round their heads, their hands were of brass, and their
teeth of a prodigious size, so that they were objects of
terror to mankind. After the death of Medusa, her
sisters, according to Virgil, were appointed to keep
the gate of the palace of Pluto.

Multaeque praeterea variarum monstra ferarum—
Gorgones, Harpyiaeque—

Diodorus Siculus will have the Gorgons and Amazons
to have been two warlike nations of women, who in-
habited that part of Libya which lay on the lake Tri-
donis. The extermination of these female nations
was not effect ed till Hercules undertook and perfor-
med it.

Pausanias says, the Gorgons were the daughters of
Phorbas; after whose death, Medusa, his daughter,
reigned over the people dwelling near the lake Tri-
donis. The queen was passionately fond of hunting
and war, so that she laid the neighbouring countries
quite waste. At last Perseus having made war on
them, and killed the queen herself, when he came to
take a view of the field of battle, he found the queen's
corpse so extremely beautiful, that he ordered her
head to be cut off, which he carried with him to show
his countrymen the Greeks, who could not behold it
without being struck with astonishment.

Others represent them as a kind of monstrous wo-
men, covered with hair, who lived in woods and forests.
Others, again, make them animals, resembling wild
sheep, whose eyes had a poisonous and fatal influence.

GORITIA, or GORITZ, a strong town of Ger-
many, in the circle of Austria, and duchy of Carniola,
with a castle; seated on the river Lizonzo, 20 miles
north-east of Aquileia, and 70 north-east of Venice.
E. Long. 13. 43. N. Lat. 46. 12.

GORLES, ABRAHAM, an eminent antiquary,
was born at Antwerp, and gained a reputation by col-
cecting medals and other antiques. He was chiefly
 fond of the rings and seals of the ancients, of which he
published a prodigious number in 1601, under this
title, Daucti lithisca: sive Annularum Sigilliorum, quorum
opus priscos tam Graecos quam Romanos usus es ferro,
dec., argentos et aurum. Promptuarii. This was the
first part of the work: the second was entitled, Vari-
rum Gemmarum, quibus antiquitas in signando usi sola
sculptura. This work has undergone several editions,
the best of which is that of Leyden, 1655: for it not
only contains a vast number of cuts, but also a short
explanation of them by Gronovius. In 1680, he pub-
lished a collection of medals: which, however, if we
may believe the Scaligeranae, it is not safe always to trust.
Gorles pitched upon Delft for the place of his resi-
dence, and died there in 1659. His collections of
antiques were sold by his heirs to the prince of Wales.

GOBLITZ, a town of Germany, in Upper Lusatia,
now subject to Prussia. It is a handsome strong place,
and seated on the river Neisse, in E. Long. 15. 15.
N. Lat. 51. 10.

GORTERIA, a genus of plants belonging to the
syngenesia class, and in the natural method ranking
under the 49th order, Compositae. See Botany Index.

GOSHAWK. See Falco, Ornithology Index.

GOSHEN,
GOSHEN, in Ancient Geography, a canton of Egypt, which Joseph procured for his father and his brethren when they came to dwell in Egypt. It was the most fruitful part of the country; and its name seems to be derived from the Hebrew, Geshem, which signifies "rain;" because this province lying very near the Mediterranean, was exposed to rains, which were very rare in other cantons, and more especially in Upper Egypt. Calmet does not question but that Goshen, which Joshua (x. 43. xi. 16. xv. 51.) makes part of the tribe of Judah, is the same as the land of Goshen, which was given to Jacob and his sons by Pharaoh king of Egypt; (Gen. xlvi. 26.) It is certain that this country lay between Palestine and the city of Tana, and that the allotment of the Hebrews reached southward as far as the Nile, (Josh. xiii. 3.)

GOSLAR, a large and ancient town of Lower Saxony, and in the territory of Hildesheim. It was here that gunpowder was first invented, by a monk as is generally supposed. It is a large place, but the buildings are in the ancient taste. It was formerly a free city, but was given to Prussia in 1802, and ceded by that power to Hanover in 1814. It is seated on a mountain, near the river Gose, and near it are rich mines of iron. The inhabitants are famous for brewing excellent beer. E. Long. 10. 26. N. Lat. 51. 15.

Gospel, the history of the life, actions, death, resurrection, ascension, and doctrine of Jesus Christ.—The word is Saxon, and of the same import with the Latin term evangelium, which signifies "glad tidings," or "good news."

This history is contained in the writings of St Matthew, St Mark, St Luke, and St John; who from thence are called evangelists. The Christian church never acknowledged any more than these four gospels as canonical; notwithstanding which, several apocryphal gospels are handed down to us, and others are entirely lost.

GOSPORT, a town of Hampshire, 70 miles from London, in the parish of Alverstock. It has a ferry over the mouth of the harbour to Portsmouth, and is a large town and of great trade, especially in time of war. Travellers choose to lodge here, where every thing is cheaper and more commodious for them than at Portsmouth. The mouth of the harbour, which is not so broad here as the Thames at Westminster, is secured on this side by four forts, and a platform of above 20 cannon level with the water. Here is a noble hospital built for the cure of the sick and wounded sailors in the service of the navy; besides a free school.

GOSSAMER is the name of a fine filmy substance, like cobwebs, which is seen to float in the air, in clear days in autumn, and is more observable in stubble-fields, and upon furze and other low bushes. This is probably formed by the flying spider, which, in traversing the air for food, shoots out these threads from its anus, which are borne down by the dew, &c.

GOSSEYPIUM, or COTTON, a genus of plants belonging to the monadelphia class, and in the natural method ranking under the 37th order, Columnifera.

See Botany Index.

The American islands produce cotton shrubs of various sizes, which rise and grow up without any culture; especially in low and marshy grounds. Their produce is of a pale red; some paler than others; but Gossypium, so short that it cannot be spun. None of this is brought to Europe, though it might be usefully employed in making of hats. The little that is picked up, serves to make mattresses and pillows.

The cotton-shrub that supplies our manufactures, requires a dry and stony soil, and thrives best in grounds that have already been filled. Not but that the plant appears more flourishing in fresh lands than in those which are exhausted; but while it produces more wood, it bears less fruit.

A western exposure is fittest for it. The culture of it begins in March and April, and continues during the first spring-rains. Holes are made at seven or eight feet distance from each other, and a few seeds thrown in. When they are grown to the height of five or six inches, all the stems are pulled up, except two or three of the strongest. These are cropped twice before the end of August. This precaution is the more necessary, as the wood bears no fruit till after the second pruning; and, if the shrub was suffered to grow more than four feet high, the crop would not be the greater, nor the fruit so easily gathered. The same method is pursued for three years; for so long the shrub may continue, if it cannot conveniently be renewed oftener with the prospect of an advantage that will compensate the trouble.

This useful plant will not thrive if great attention is not paid to pluck up the weeds that grow about it. Frequent rains will promote its growth; but they must not be incessant. Dry weather is particularly necessary in the months of March and April, which is the time of gathering the cotton, to prevent it from being discoloured and spotted.

When it is all gathered in, the seeds must be picked out from the wool with which they are naturally mixed. This is done by means of a cotton-mill; which is an engine composed of two rods of hard wood, about 18 feet long, 18 lines in circumference, and fluted two lines deep. They are confined at both ends, so as to leave no more distance between them than is necessary for the seed to slip through. At one end is a kind of little millstone, which, being put in motion with the foot, turns the rods in contrary directions. They separate the cotton, and throw out the seed contained in it.

GOTHA, a town of Germany, in the circle of Upper Saxony, and capital of the duchy of Saxe-Gotha, in E. Long. 10. 40. N. Lat. 50. 57. Some fancy this town had its name from the Goths, and that they fortified it in their march to Italy; but it was only a village till surrounded with walls by the bishop of Mentz in 964. It is situated in a fine plain on the river Leina, well built and strongly fortified. Here are two handsome churches and a very good hospital. Its chief trade is in dyers weed, of which they have three crops, but the third grows wild. The neighbouring country produces a vast deal of corn. The castle or ducal palace of Gotha was rebuilt in the 16th century by duke Ernest, surmamed the Pious, who caused both the town to be encompassed with ditches and ramparts, and gave it the name of Friedenstein, or the Castle of Peace, in opposition to its ancient name of Grimmerstein, or the Castle of the Furies. It is situated on a neighbouring eminence, from whence there is a vast
The duchy of Saxo Gotha is about 30 miles long, and 20 broad. It contains an area of about 500 square miles, and its population is estimated at 82,000. The duchy is the head of the Ernestine line of Saxony, descended from the elector John Frederick the Magnanimous, who was deprived of the electorate by the emperor Charles V. in 1574; since which the youngest branch, called the Albertine, has enjoyed it. He has several other principalities besides that of Saxo Gotha; and his revenues are computed at 130,000. a-year, with which he maintains about two thousand regular troops. As he is the most powerful of all the Saxon princes of the Ernestine branch; so of all the courts of Saxony, next to that of Dresden, he has the most numerous and the most magnificent. His guards are well clothed, his liveries rich, and his tables served with more elegance than profusion. And yet by the prudent management of his public finances, his subjects are the least burdened with taxes of any state in Germany. The religion is Lutheran.

GOTHARD, one of the highest mountains of Switzerland; and from the top, where there is an hospital for monks, is one of the finest prospects in the world. It is eight miles from Aldorf.

GOTHEBOURG, GOTHEBOURG, or GOTTENBURG. See GOTTENBURG.

GOTHIC, in general, whatever has any relation to the Goths: thus we say, Gothic customs, Gothic architecture, &c. See ARCHITECTURE.

GOTHLAND, the most southern province of Sweden, being a peninsula, encompassed on three sides by the Baltic sea, or the channel at the entrance of it. It is divided into several parts, which are, East Gothland, West Gothland, Smaland, Halland, Bleking, and Schonen. It was the only possession of the kings of Denmark, but was ceded to Sweden in 1654. The principal towns of Gothland are Calmæ, Landskron, Christianople, Daleberg, Gothenburgh, Holmest, Lunden, Malmone, and Vexio.

GOTHS, a warlike nation, and above all others famous in the Roman history, came originally out of Scandinavia (the name by which the ancient distinguished the present countries of Sweden, Norway, Lapland, and Finnmark). According to the most probable accounts they were the first inhabitants of those countries; and from thence went colonies into the islands of the Baltic, the Cimbrian Cherneseus, and the adjacent places yet destitute of inhabitants. The time of their first settling in Scandinavia, and the time when they first peopled with their colonies the above-mentioned islands and Cherneseus, are equally uncertain; though the Gothic annals suppose the latter to have happened in the time of Beruc the great grandfather of Abraham. This first migration of the Goths is said to have been conducted by their king Eric; in which all the ancient Gothic chronicles, as well as the Danish and Swedish ones, agree. Their second migration is supposed to have happened many ages after; when, the above-mentioned countries being overstocked with people, Beric, at that time king of the Goths, went out with a fleet in quest of new settlements. He landed in the country of the Ulmergians; now Pomerania; drove out the ancient inhabitants, and divided their lands among his followers. He fell next upon the Vandals, whose country bordered on that of the Ulmergians, and overcame them; but instead of forcing them to abandon their country, he only made them share their possessions with the Goths.

The Goths who had settled in Pomerania and the adjacent parts of Germany being greatly increased, insomuch that the country could no longer contain them, they undertook a third migration in great numbers, under Fillner, named the Great, the fifth prince after leaving Scandinavia; and taking their route eastward, entered Scythia, advanced to the Cimmerian Bosphorus, and driving out the Cimmerians, settled in the neighborhood of the Falas Mazos. Thence, in process of time, being greatly increased in Scythia, they resolved to seek new settlements; and accordingly taking their route eastward, they traversed several countries, and at length returned into Germany.

Their leader in this expedition was the celebrated Woden, called also Woden, Oden, Odin, Godan, and Gudon. Of this Woden many wonderful things are related in the Sueo-gothic chronicles. He was king of the Asgardians, whom the northern writers will have to be the same with a people called Aspergians, mentioned by Strabo and Ptolemæus. By Strabo they are placed near the Cimmerian Bosphorus. Aspergus was the metropolis of a province which Strabo calls Asia; and Woden and his followers are styled by the ancient Gothic writers Asa, Asianæ, and Asiææ. The kings of Aspergus were masters of all that part of Scythia which lay to the westward of Imaus, and was by the Latins called Scythis intrà Imaus, or "Scythia within Imaus."

At what time Woden reigned in this country, is quite uncertain; but all historians agree, that he went out in quest of new settlements with innumerable numbers of people following him. He first entered Roszania, comprehending the countries of Prussia, Livonia, and a great part of Muscovy. From thence he went by sea into the north parts of Germany; and having reduced Saxony and Jutland, he last settled in Sweden, where he reigned till his death, and became so famous that his name reached all countries, and he was by the northern nations worshipped as a god. He is supposed to have brought with him the Norse characters out of Asia, and to have taught the northern nations the art of poetry; whence he is styled the father of the Scalids or Scalidi, their poets, who described in verse the exploits of the great men of their nation, as the bards did among the Greeks and Britons.

The Romans distinguished the Goths into two classes; the Ostrogoths and Vinigoths. These names they received before they left Scandinavia, the Vinigoths being softened by the Latins from Westeroths, or those who inhabited the western part of Scandinavia, as the Ostrogoths were those who inhabited the eastern part of that country. Their history affords nothing of moment till the time of their quarrelling with the Romans; which happened under the reign of the emperor Caracalla, son to Severus. After that time their his
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