

# SCIENTIFIC TRACTS

AND

## FAMILY LYCEUM.

MARCH 15, 1834.

### THE VULTURE.

An account of some experiments made on the habits of the Vultures inhabiting Carolina, the **TURKEY BUZZARD\*** and the **CARRION CROW,†** particularly as it regards the extraordinary powers of smelling, usually attributed to them.—By **J. BACHMAN.**

**ALTHOUGH** the vultures inhabiting the Southern States are among the most common of our larger species of birds—remaining with us during the whole year,—building their nests in the hollows of fallen trees and stumps around our plantations—resting on our housetops and seeking their food around our markets and in the very streets of our cities, yet it appears that a difference of opinion exists with regard to some of their faculties, and particularly whether they find their food by their sense of smell or of sight.

It has been the long established belief of all civilized nations, since the time of the Romans, that vultures were possessed of extraordinary olfactory powers by which they were enabled to scent their food at the distance of many miles. Whether this opinion was founded on truth, or whether it was a vulgar error, having its origin with the thousands of others which have been handed down from age to age, originating in ignorance or superstition, cannot be fully ascertained until satisfactory experiments are made on the olfactory powers of the vultures of Southern Europe, Asia and Africa.

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\* *Cathartes Aura* Ill.

† *Cathartes Iota* Bonn.

All the writers on American Ornithology, have ascribed to the vultures of the United States, the same extraordinary powers of smell, with the single exception of Mr. Audubon, who, in a paper published in Jameson's Journal, Edinburgh, 1826, detailed a series of experiments made in America several years previous, from which he came to the conclusion that these birds are guided to their food altogether by the eye. He found by repeated experiments, that vultures were attracted by a dried deer-skin, stuffed in imitation of that animal, and that in these instances, when no effluvia could exist, they could not have been led to it by the scent. He next concealed a dead animal in the heat of summer, in such a way that it could not be observed by the vultures, although the scent was not obstructed; here it was suffered to decay without having been discovered by these birds.

He next procured two young carrion crows, which he tamed and reared in a cage, the back part of which was so closed that objects approaching from that side could not be seen. Whenever he came with food to the front of the cage, the birds jumped at the bars, commenced hissing and putting their bills towards each other, as if expecting to be fed mutually, as their parent had done; when, however, the cage was silently approached from behind with animals and flesh, however putrid, no movement was made by the birds to indicate their having observed by the effluvia, that their favorite food was near.

The sentiments thus expressed by Audubon, were at the time, and are still, treated with a good deal of severity, both in Europe and in his native country.

It has always appeared to me an act of injustice to condemn any man for expressing an opinion on subjects of Natural History, merely, because from his own investigation, he had arrived at different conclusions from those who had lived before him, particularly when the error could be so easily detected by instituting a similar course of experiments; such a course of conduct would be a bar to all improvements, and the sincere inquirer after truth would have to contend against a host of prejudices from those, who, adopting the opinions of others, refused to

make those inquiries which would satisfy their own minds, that their opinions were fortified and confirmed by *experience*.

The details of the experiment made by Audubon, are of such a character, that either the conclusions at which he arrived are correct, and our vultures do not possess extraordinary olfactory powers, or he has given to the world an unfair statement, and is therefore not a man of veracity, and is undeserving of the confidence of the community. Should such an impression be unhappily made on the public mind, it will not only have a tendency to destroy his usefulness, but will deprive him of those pecuniary resources which are requisite to enable him to carry on successfully a very expensive publication; a publication which cannot fail to prove a very important acquisition to the natural history of our country—and to establish an abiding monument to the fame of its author.

The lovers of American Ornithology, who feel under many obligations to the man who has devoted so many years of his life to this interesting department of Natural Science, will not condemn him unheard; and those particularly of our Southern States, who would show themselves very careless observers of nature, and very indifferent to the character and fame of Audubon, if, possessing as they do so many favorable opportunities for investigation, they did not institute some inquiries, not only to do an act of justice to a distinguished naturalist, but to ascertain an interesting fact in natural history.

No one who will read Mr. Audubon's paper on the subject, containing a full detail of a number of experiments on the habits of our vultures, can deny, that if he intended to deceive the world, he certainly chose a subject where detection was easy and certain. In our Southern States, these birds are so abundant as to have become a nuisance, particularly in our cities. It is but an act of justice to Mr. Audubon to state, that in his frequent visits to Charleston, he has fearlessly invited investigation on this disputed subject.

During his absence he wrote to me on several occasions, urging me to make further experiments; a number of

engagements prevented me from devoting as much time to the subject as was necessary to investigate it in such a manner as to prove satisfactory to my mind, and I postponed it to a more leisure period. On the recent visit however of Mr. Audubon, I consented to institute these inquiries, in the prosecution of which, I was aided by the intelligence and experience of such disinterested naturalists and men of science as could be obtained.

It will be observed that our experiments were confined to our two species of vulture—*Cathartes Aura* and *Cathartes Iota*, which are so common in Carolina. There are three other species which have been described by authors, to frequent the southern and western portions of the United States. The Vulture *Californianus* (Lath.) undoubtedly exists west of the Rocky Mountains, as specimens were procured near the Columbia River by Mr. Douglass, but we have no evidence of its existing to the eastward of that great chain. The existence in the United States of the great condor,\* is only conjectured from a bill, and a quill-feather brought by Lewis and Clarke from the Columbia River, and deposited in the Philadelphia Museum. The beautiful king of the vulture† is said to appear occasionally in Florida, upon what authority I am unable to state. None of the gentlemen, however, who have resided at Key West, and other portions of Florida for many years, have been able to find this bird. Mr. Audubon, however, in his indefatigable exertions in that country, found a different species which was not before known to exist in the United States—the Caracara Eagle,‡ of which I have received several specimens through the kindness of Dr. B. B. Strobel and Dr. Leitner, that had been procured between Tampa Bay and Key West. Whatever powers of smelling these (with us rare species) may possess, I am unable to state from actual experiment. But it will probably be discovered that their olfactory powers have been as much overrated, as was the size of the famous Condor, whose quill-feather, even as late as 1830, was described as ‘twenty good paces long,’ and which, on actual measure-

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\**Cathartes Gryphus* Temm.

†*Cathartes Papa* Ill.

‡*Polyborus Vulgaris*.

ment, has been found of less dimensions than that of several species existing on the Eastern Continent. But laying aside speculations on a subject which time and further observations only can decide, I proceed to a detail of facts that have come under my observation.

On the 16th Dec. 1833, I commenced a series of experiments on the habits of our vultures, which continued till the end of the month, and these have been renewed at intervals till the 15th of Jan. 1834. Written invitations were sent to all the professors of the two Medical Colleges in this city, to the officers and some of the members of the Philosophical Society, and such other individuals as we believed might take an interest in the subject. Although Mr. Audubon was present during most of this time, and was willing to render any assistance required of him, yet he desired that we might make the experiments ourselves—that we might adopt any mode that the ingenuity or experience of others could suggest, of arriving at the most correct conclusions. The manner in which these experiments were made, together with the results, I now proceed to detail.

There were two points, in particular, on which the veracity of Audubon had been assailed; 1st, Whether the vultures feed on fresh or putrid flesh, and 2nd, Whether they are attracted to their food by the eye or scent.

On the first head it was unnecessary to make many experiments, it being a subject with which even the most casual observer among us is well acquainted. It is well known that the roof of our market-house is covered with these birds every morning, waiting for any little scrap of fresh meat that may be thrown to them by the butchers. At our slaughter-pens the offal is quickly devoured by our vultures, whilst it is yet warm, from the recent death of the slain animal. I have seen the Vultur Aura a hundred miles in the interior of this country, where he may be said to be altogether in a state of nature, regaling himself on the entrails of a deer which had been killed not an hour before. Two years ago, Mr. Henry Ward, who is now in London, and who was in the employ of the Philosophical Society of this city, was in the habit of depositing at the

foot of my garden in the suburbs of Charleston, the fresh carcasses of the birds he had skinned, and in the course of half an hour, both species of vulture, particularly the turkey buzzard, came and devoured the whole. Nay, we discovered that vultures fed on the bodies of those of their own species that had been thus exposed. A few days ago, a vulture that had been killed by some boys in the neighborhood, and that had fallen near the place where we were performing our experiments, attracted on the following morning the sight of a turkey buzzard, who commenced pulling off its feathers and feeding upon it. This brought down two of the black vultures, who joined him in the repast. In this instance, the former chased away the two latter to some distance, an unusual occurrence, as the black vulture is the strongest bird, and generally keeps off the other species. We had the dead bird lightly covered with some rice chaff, where it still remains undiscovered by the vultures.

2nd. Is the vulture attracted to its food by the sense of smell or sight? A number of experiments were tried to satisfy us on this head, and all led to the same result; a few of these I proceed to detail.

1st. A dead hare,\* a pheasant,† a kestrel,‡ (a recent importation from Europe,) together with a wheelbarrow full of offal from the slaughter-pens were deposited at the foot of my garden. A frame was raised above it at the distance of twelve inches from the earth, this was covered with brush-wood, allowing the air to pass freely beneath it, so as to convey the effluvium far and wide, and although twenty-five days have now gone by, and the flesh has become offensive, not a single vulture appears to have observed it, though hundreds have passed over it, and some very near it, in search of their daily food. Although the vultures did not discover this dainty mess, the dogs in the vicinity, who appear to have better olfactory nerves, frequently visited the place, and gave us much trouble in the prosecution of our experiments.

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\**Lepus timidus*.

†*Phasianus Colchicus*.

‡*Falco Tinunculus*.

2d. I now suggested an experiment which would enable us to test the inquiry whether the vulture could be attracted to an object by the sight alone. A coarse painting on canvass was made representing a sheep skinned and cut open. This proved very amusing—no sooner was this picture placed on the ground than the vultures observed it, alighted near, walked over it, and some of them commenced tugging at the painting. They seemed much disappointed and surprized, and after having satisfied their curiosity, flew away. This experiment was repeated more than fifty times, with the same result. The painting was then placed within ten feet of the place where our offal was deposited—they came as usual, walked around it, but in no instance evinced the slightest symptoms of their having scented the offal which was so near them.

3d. The most offensive portions of the offal were now placed on the earth, these were covered over by a thin canvass cloth—on this was strewed several pieces of fresh beef. The vultures came, ate the flesh that was in sight, and although they were standing on a quantity beneath them, and although their bills were frequently within the eighth of an inch of this putrid matter, they did not discover it. We made a small rent in the canvass, and they at once discovered the flesh and began to devour it. We drove them away, replaced the canvass with a piece that was entire : again they commenced eating the fresh pieces exhibited to their view, without discovering the hidden food they were trampling upon.

4th. The medical gentlemen who were present made a number of experiments to test the absurdity of a story, widely circulated in the United States, through the newspapers, that the eye of a vulture, when perforated and the sight extinguished, would in a few moments be restored, in consequence of his placing his head under his wing, the down of which was said to renew his sight. The eyes were perforated ; I need not add that although they were refilled and had the appearance of rotundity, yet the bird became blind, and that it was beyond the power of the healing art to restore his lost sight. His life was, however, preserved by occasionally putting food into his mouth.

In this situation they placed him in a small out-house, hung the flesh of the hare (which had now become offensive) within his reach, nay, they frequently placed it within an inch of his nostrils, but the bird gave no evidence of any knowledge that his favorite food was so near him. This was repeated from time to time during an interval of twenty-four days (the period of his death) with the same results.

We were not aware that any other experiments could be made to enable us to arrive at more satisfactory conclusions, and as we feared if prolonged, they might become offensive to the neighbors, we abandoned them.

As my humble name can scarcely be known to many of those into whose hands this communication may fall, I have thought proper to obtain the signature of some of the gentlemen who aided me in, or witnessed these experiments; and I must also add, that there was not an individual among the crowd of persons who came to judge for themselves, who did not coincide with those who have given their signatures to this certificate.

We, the subscribers, having witnessed the experiments made on the habits of the vultures of Carolina (*Cathartes Aura* and *Cathartes Iota*) commonly called Turkey Buzzard and Carrion Crow, feel assured that they devour fresh as well as putrid food of any kind, and that they are guided to their food altogether through their sense of sight and not that of smell.

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MARTIN STROBEL.

It now remains for naturalists to account for the errors which have for so many ages existed with regard to the power of scent ascribed to our vultures. Indeed, it is highly probable that facts elicited from the experiments of Audubon on our two species of vulture, strengthened by those instituted on this occasion, may apply to all the rest



of the genera. Perhaps it may be discovered, that the whole family of vultures are altogether indebted to the eye in their search after food ; indeed this may yet be found true in regard to the whole feathered tribe. It is, I believe, a common practice in England, for persons who attend on the decoys for wild ducks, to carry a piece of burning peat which they hold near their mouths, to prevent the birds from smelling them, as it is also customary in America to burn gunpowder in various portions of the cornfields, under an impression that the smell of the powder will frighten away the crows. The powder manufacturers can have no great objection to this latter practice, and it must be confessed, that it is among the most innocent ways that powder can be wasted. But I fear that this will not benefit the crops of the farmer. These birds, together with the raven,\* and even the wild turkey,† can be approached under cover of a bank or tree, and if they do not either see or hear you, it will, I apprehend, be a difficult matter for them to find you out, by their olfactory powers. Indeed I am of opinion that while to quadrupeds (particularly carnivorous ones) the faculty of scent is their peculiar province, this organ is but imperfectly developed in birds. As it does, however, exist, (although in an inferior degree), I am not disposed to deny to birds the power of smell altogether, nor would I wish to advance the opinion that the vulture does not possess the faculty of smelling in the slightest degree, (although it has not been discovered by our experiments). All that I contend for is, that he is not assisted by this faculty in procuring his food—that he cannot smell better, for instance, than hawks or owls, who, it is known, are indebted altogether to their sight, in discovering their prey. If our vultures had to depend on their olfactory powers alone, in procuring food, what would become of them in cold winters, in Kentucky and other of our western states, where they remain all the year, and where the earth is bound up with frost for months at a time, and where consequently, during that

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\* *Corvus Corax.*

† *Meleagris Gallipavo.*

period, putridity does not take place? And if they depended alone on tainted meat for food, how soon would the whole race (at least in our temperate climates) die of hunger?

How easily error may be perpetuated from age to age, we may learn from a thousand other visionary notions, which the careful observations of recent travellers and naturalists have exploded. At this day, the belief is very general in this country, that immediately after a deer has been killed, the vultures, at the distance of many miles, are seen coming in a direct line, against the wind, scenting the slaughtered animal. This may be accounted for, with a little observation, upon rational principles. When a deer\* is killed, the entrails are immediately taken out; these, together with the blood which covers the earth to some extent, are seen by some passing bird—he directly commences sailing around the neighborhood—he is observed by those at a distance; the peculiar motion of his wings, well known to those of his own species, communicates to them the intelligence that something good for them is perceived. These, hastening to the place, give information to those who are still further off, and in the course of an hour, a very great number are guided to the spot. But it will scarcely be argued, that this great concourse of vultures has been attracted by the effluvium of putrid flesh, since the animal has been killed but an hour before.

In the prosecution of our experiments, we discovered that the powers of sight in our vultures were not as great as those possessed by the falcon tribe. A dead fowl was discovered by them at the distance of 70 or 80 yards; a sheep at 100 or 120 yards. These, however, were stationary objects, lying on the ground. One of their own species, however, flying in the air, is no doubt observed by them at a much greater distance. It may easily be conceived why the sight of the vulture is less acute than that of hawks or eagles. The latter prey upon birds, quadrupeds, &c., for which they have to hunt, the former feed chiefly upon dead birds, quadrupeds or reptiles, and fre-

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\* *Cervus Virginianus*.

quently those of a large size, which it requires no extraordinary powers of vision to discover. An argument much relied upon by those who advocate the doctrine of the olfactory powers of vultures, is the circumstance of their usually flying against the wind, as if to discover and follow some current of tainted air. This practice, it may easily be perceived, is not more common to the vulture than to that of any other bird. It is a mistaken idea, that birds in their migrations, or on any other occasion, prefer flying with the wind. This is inconvenient and uncomfortable to them, and the careful observer of the flight of birds, is well convinced that all birds—the vulture among the rest, prefer facing the wind, not to enable them to smell their food, but to render their flight more easy and pleasant.

It may next be inquired, for what purpose are the wide nostrils and olfactory nerves given to the vultures, if they are not intended to assist them in procuring their food? To this I answer, that the olfactory nerves of our vultures are not larger than those of many other birds, and their nostrils are less even than those of the hooping crane,\* which discovers its food, (as I strongly suspect every bird does), by the eye alone. The wide orifice in the beaks of vultures, and which is generally considered as the true nostril, is probably a wise provision of nature to enable a bird which from its filthy habits of feeding, is continually exposed to have its nostrils closed up—to blow out any substance calculated to obstruct them. The same may be said of the hooping crane, which, from the manner of its digging for roots in the earth, is liable to the same inconveniences. Several heads of the vultures are now in the hands of individuals connected with our medical colleges for dissection. A satisfactory elucidation of the subject will require time, patience, and an extensive knowledge of comparative anatomy in regard to the various species of birds. The result of these investigations will probably be communicated to the public in the course of a few months.

After having resorted to the means detailed above, to satisfy myself of the accuracy of the statements of Audu-

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\* *Grus Americanus* Temm.

bon, as regards the habits of the turkey buzzard detailed in Jameson's Journal, I once more carefully read over his remarks on the subject, and I now feel bound to declare, that every statement contained in that communication, is in accordance with my own experience, after a residence of twenty years in a country where the vultures are more abundant than any other birds—and I have reason to hope from the characters of the writers who have doubted his veracity, that when they have read a detail of these experiments, they will either repeat them to the satisfaction of their own minds, or place confidence in the statements of those who have taken this trouble; and that they, with that generosity of feeling so distinctive of those who are engaged in liberal and kindred pursuits, will be gratified to assign to Audubon, that meed of praise which he so undoubtedly merits.

*Charleston, Jan. 18th. 1834.*

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[Furnished for the Tracts and Lyceum.]

FURTHER OBSERVATIONS ON THE QUADRATURE OF THE  
CIRCLE.

HAVING sometimes reflected on the quadrature of the circle, though I have never attempted the solution of this long celebrated problem, and my ideas being excited afresh upon this subject by the reading of some articles in the Tracts and Lyceum relating to it, I have undertaken to commit some of my cogitations to paper.

I have long been convinced of the inanity of all the pretended solutions of the question, which so frequently intrude themselves on the public. I have, however, permitted fancy to intrude itself into the field of mathematics, and consequently, have imagined things concerning the solution of this irreducible. I am inclined to think it not only true, but actually demonstrable, that the expression of the quadrature, or in other words, the ratio of the diameter and circumference of a circle, to the determination of

which this question reduces itself, is not merely incommensurable in numbers, but inexpressible by any algebraic formula, other than an *irreducible* infinite series. That is, that it is not expressible in terms of surd roots of any kind, or at least, of the second degree.

The expressions of surd roots are, it is well known to mathematicians, capable of actual geometric development, the square root of 2 being involved in the expression of the diagonal line of a square, for instance. Now though a *portion* of the *numerical development* of the ratio of the diameter and circumference of the circle has been actually obtained, yet no geometrical process has ever been discovered, of which we could avail ourselves, actually to develop this ratio. Now the expression of the dimensions of a curve would seem, in the nature of things, to be of a *different kind* from the expressions of rectilineal quantities. No part of a circle, unless we take an arc infinitely small or a circle infinitely large, can be compared with a right line. Then, since surds of the second degree are expressions of right lines, I think we may conclude, that the ratio sought cannot be expressed in terms of surds of the second degree. This is by no means a demonstration, but it may serve to show how remote we are from being able to form a conception of the *kind* of quantity of which curved lines are the expression.

If this question ever meets with a true *geometrical* solution, I am convinced that it will be in no other way than the following: that some curve of the higher orders may be discovered, whose relation to the circle shall be such, that it, or some of its dependent lines, may cut the circle at such points, as that if a square were made to intersect the circle in those points, its area would be that of the circle. But after all, if any curve be discovered which will give the true section of the circle, let it be remembered, that it will not render the area of the circle less incommensurable; and that this intersecting curve will and must be as incommensurable as the circle itself.

A method has been discovered, or is in progress, as your correspondent is informed, of solving the problem by constructing *spherical logarithms* which are to give the

whole solution in full, without any approximation whatever. The discoverer has been employed, it seems, some years in the prosecution of his object, and only waits a remuneration for his toil, to lay the matter before the public.

This thing may have something at the bottom of it, and it merits examination; but the business looks a little too much like the alchymists' plan of changing lead to gold, which required years for completion, and which few were able to understand, or were permitted to look into. It is, we presume, the same that Mr. A. Y. refers to in his article on this subject in the last number of the Tracts and Lyceum.

O. S.

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To the Editor of the Tracts and Lyceum.

I HAVE been interested in reading the communication in the Tracts and Lyceum, concerning the Springfield Somnambulist, and several inquiries respecting her having suggested themselves, which, being answered, might elucidate the philosophy of the mental phenomena of the case, I take the liberty to propose them.

Was the patient, *during her paroxysms*, ever made acquainted with her then actual state, and if so, what effect had that on her?

How extended was the knowledge she possessed during these paroxysms, and to what things did it relate?

How much of this knowledge was evidently *a portion* of that which she possessed in her waking hours, and how much, and what part was peculiar to her sleeping state?

How is it probable that particular portions of this peculiar knowledge could have been obtained?

When changes in things under her observation took place during her sanity, how were they regarded by her during her sleeping paroxysms?

Perhaps some of your readers have seen a French story of a Josephine, who was a somnambulist, and who, when in one of these fits, was directed to write a statement of what she was doing, and to sign it. She did so, and on

awaking, recognized her hand-writing, though she had no recollection of writing it. What might be the effect of similar experiments upon the lady in question?

Are the circumstances attending the paroxysms traceable to any peculiar state of some organ or organs of the brain?

Do any of the powers of these organs manifest themselves in a strong and palpable manner, especially such organs as are not powerful during her ordinary waking state?

A READER.

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[Furnished for the Tracts and Lyceum.]

#### THE WHIPPOORWILL.

HAVING never seen any particular account of the habits of the *whippoorwill*, and being under the impression that they are not well known, I thought the following remarks might be interesting to some.

The peculiar cry of this singular bird, which resounds in all our groves during the early summer evenings, is familiar to every one; but its *object*, in making this cry, is perhaps known to few among the acquaintances of this nocturnal visitor.

It seems that it is the call of the bird to its mate. Having lived where they came nightly to the very door, I have had a good opportunity to watch their habits, as far as the dusk of twilight would permit. After the call of whippoorwill had been repeated for some time, another individual would frequently arrive, and then it ceased. There was then heard a kind of croaking in a low and subdued tone, or else a clucking, with intervals of over a second between each note.

From these circumstances, we have good reason to believe that the cause assigned is the true one. From the apparently solitary habits of the bird, and the time at which it comes out from its solitudes of the forest, it would

seem necessary that the bird should have some means of indicating its place to its mate.

A similar provision is assigned to the glow-worm, whose winged partner would with difficulty find its creeping consort, were it not thus provided; and this is no doubt the use of the flickering taper of the fire-fly, which we all have loved from our childhood.

The whippoorwill begins to sing about the first of May, but is not much heard till near the middle. His song gradually dies away in June, and, by midsummer, he is hardly to be heard. He is one of our most singular birds, and, I think, peculiar to our country. ORNIS.

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[From the Advocate of Science.]

#### TRANSPORTATION OF PERIODICALS.

A WRITER in the Boston Tracts and Lyceum has been indulging in some speculations relating to the conveyance of papers and periodicals over the United States. He objects to the post office system as being too expensive; and more so than necessary, from the rapidity with which the mails are transported: our mail stages carrying a load of 1000 pounds at the rate they now proceed, and at three times the expense of conveying the same load at a moderate rate. He states, that to transport this load, on the present system, the horses are changed every twelve miles. To carry the load thirty-six miles, therefore, twelve horses are required; at the rate of four miles an hour, four horses would transport this load in wagons. Hence, at a moderate speed, a load of magazines and books would be conveyed at one third the cost of transportation by rapid mail stages; and this would greatly promote the diffusion of knowledge.

We do not accord with this writer's project, for several reasons. The first is, because the evil he complains of—the postage on periodicals—may be remedied by other means, without retarding their progress over the country.