(For the Scientific American.)

Electro-Magnetism as a Moving Power.

Your paper of the 24th ult. contains some remarks upon the subject of Electro-Magnetism as a moving power, which seem to require a brief reply "at my hands." Firstly,—the writer takes unnecessary pains to show that electro-magnetism is far inferior to steam as a motive power—a fact never doubted by any one conversant with the subject; and he further supposes that persons investigating electro-magnetic power are not generally "acquainted with the economy of steam." I cannot agree with him, but, on the contrary, I do not consider that a person can be well qualified to investigate this subject without being very likely to possess a competent knowledge of the economy of steam; and I have never yet met with an investigator of electro-magnetism who did not evince an acquaintance with steam power. Upon the subject of steam we have enough written, and "he who runs may read;" but upon electro-magnetism there is a great dearth of published matter, and the subject itself is recondite and difficult. Your writer, in referring to my preference for the rotary form of the engine, says, I have "fallen back upon Davidson's and Avery's plans." As to Davidson's engine, it was fully tested by myself on a large scale in Boston, in 1837, and it was invented and tried in Baltimore by Dr. Edmonson, in 1834. [See Silliman's Journal]. But your writer misapprehends the case: I have "fallen back" upon no one. The rotary form of the axial engine, as well as the reciprocating, differs most essentially from any engines ever before tried. In my reciprocating engines, the *magnetic piston*, if I may so call it, is impelled with nearly an equal force throughout the stroke, and this for any length of stroke desired. The rotary axial is the perfection of the improvement, and does not seem to involve the difficulties inherent in rotary steam engines, for my *pistons* require no *packing*. When the description of my engine is published, which will be ere long, I think your writer and others will appreciate its peculiarities, and I hope he will suspend his judgment till he has an opportunity of being well acquainted with its details. I have never claimed for electro-magnetic power that it is or would be, superior to steam, that is, in every respect, nor is it necessary that it should be, to answer the purposes of my investigations. The cost of the power has been with me a subordinate question, knowing full well that other more important questions had to be settled first before ever the cost could be fairly ascertained. The abstract rule laid down by M. Joule, Messrs. Hunt, Scoresby, Oersted, and others, of the absolute duty performed by a given quantity of zinc, is well enough as far as their experiments went, but is of little or no value in the practical question of the availability of this power. To illustrate my meaning, take the highest duty of coal in the best condensing engines in the world; will any one pretend to say that there is no room for improvement even there? Why, in the Cornish engines, within a few years, the expense of a horse-power has been reduced from 10d. to 2d. per diem. But suppose it be admitted that the minimum cost has been attained; how many engines in the world can be worked as cheap as those engines? In reality, M. Joule's calculation makes the expense of magnetic power less than is steam power at the present day in some of our locomotive engines. The cost, therefore, I say, is not the practical question, and if the magnetic power will cost more than the dearest steam power, still, if we render it an *available* power in other respects, it must come into use for many and perhaps most purposes, by reason of its great advantages over steam in point of safety, simplicity of construction, readiness for operation, compactness of machinery, and, lastly, one very important condition, viz., there need be no consumption of material when power is not wanted for use.

Your writer is a friend to progression in art and science, liberal and candid, but in running so severe a parallel between magnetic and steam power he disparages the former, and, in effect, discourages the new enterprise. The comparison is unfair for magnetism, for it is yet in its infancy, and steam is full grown. The proper appreciation of magnetic power is to be had by comparing it with steam in an equal stage of its developement, when it will be seen that the magnetic power rather carries the palm. Steam power has not yet reached its climax, but it seems as if it were approaching its culmination, as its march seems to be comparatively slow; while magnetic power, evidently in its inception, is progressing rapidly. The first steam locomotive applied in England, in 1804, made, on a level plane, five miles an hour wrth about 15 tons, and ten years after, the celebrated Mr. Stephenson constructed a locomotive which was considered a great improvement, and carried eight carriages, about 30 tons, four miles an hour; and in 1829, after 25 years of experience, (and all the while "invention was stimulated by necessity"), Mr. Stephenson produced his locomotive, the ROCKET, which made an average speed of 15 miles an hour, with 17 tons, consuming about one pound of coke per mile to a ton, as in the two trips of 70 miles, 1,085 lbs. of coke were consumed. With my magnetic locomotive just as it is, I would willingly have entered the *list* with the Rocket in point of power, speed, and expense of working. I feel confident, however, that the magnetic locomotive is capable of carrying two loaded passenger cars to Baltimore at the rate of 20 miles an hour, as soon as some of the very great and obvious defects are remedied.

I had lately an opportunity of seeing how great was the friction of the machinery of the locomotive. They have at our station here, one of the largest and strongest horses I ever saw, and he is well trained to the work of pulling cars. In removing the magnetic car from its station, this horse was attached to it, but was found to be unable to pull it up the grade over which the car was propelled by magnetism 6 miles an hour. It required five men and this horse to get the car over this grade, and it was lighter by two tons than when driven by magnetic power; and moreover, when it ascended this grade at six miles an hour, the power of the battery was not fully up; and I have discovered a cause of great additional friction when the engine was in action, the remedy for which is obvious.

In regard to the doctrine of Liebig, that the zinc cannot give out more power than the coal required to smelt it, it is unfortunate, and though entertaining the highest respect for his reputation and ubility, I must pronounce it a *practical absurdity*. It is reasonable to suppose that a given amount of zinc combining with oxygen, would not eliminate more heat than would be required to overcome this affinity, but we have no proof of any such relation of electricity to heat as to make the mechanical power of the one the measure of the mechanical power of the other. Whatever may be the connection and analogy between heat and electricity, we must consider them as distinct forces, in their mechanical relations. In the combustion of coal we develope heat as the motive force, and no electricity; in the oxidation of zinc in the battery, we develope both heat and electricity, the latter only being the motive force. The *absolutism* of forces regulating affinities, may be interesting as a matter of speculation, but, as furnishing a practical estimate for the amount of mechanical or available power, it cannot stand, and necessarily involves the unwarrantable assumption that the whole power or inherent force may be eliminated and rendered available in each case. But Liebig goes still further: he maintains that the heating power of the current is the equivalent of its mechanical power through electro-magnetism; or, in other words, that the heat developed by the passage of the current ought to raise steam enough to furnish a power equivalent to the electro-magnetic power of the same current, and from the fact that the mechanical force derived from steam raised by the heating power of the current is so small compared with that obtained by the combustion of coal, he arrives at the conclusion that electro-magnetic power "can never be used." The speculation is thus pursued up to a point where facts are brought in to its support, and fortunately where facts enough can be adduced to subvert the whole doctrine. I will take but one, and one that can be easily admitted; or, rather, I will propound a question: "how many pairs of plates would be required to operate through their calorific or steam power the lever of the receiving magnet in Morse's telegraph, say through a circuit of 80 miles? I saw an experiment some years ago at the Capitol, when gunpowder was fired through this length of circuit, the powder being at the Capitol and the battery at Baltimore. Fifty pairs of Grove's battery, such as they used for the telegraph, would not ignite a platinum wire one-thousandth of an inch in diameter. It finally required 75 pairs to fire the powder. Ten pairs of such plates will work the receiving magnet through this circuit vigorously. I leave it to mechanical minds here to form their own conclusions. The truth is, that the cost of electro-magnetic power, or any other power, is circumstantial, and the attempt to predicate the whole economy of magnetic power upon the cost of coal and cost of zinc, and the fact that coal is found native and zinc not, is, in effect, to make nature's laws and operations amenable to market prices and other contingencies. Yours, &c. CHAS. G. PAGE.

Washington, D. C., June 3, 1851.

[This communicatian will be answered next week.

Floating of Rafts.

In number 38, in the article about floating rafts, we said, "a person not satisfied with our answer should assign a reason." The author of the letter therein is not satisfied, and presents his theory; it is this, "rafts are carried to their destination by the force of gravity merely, independent of the motion of the water in the said direction." The raft," he says, "would float down the river if its motion, (the water's) could be arrested entirely." This is his theory, and we do not say, *we are not satisfied*, he is welcome to his opinion. But let us show how he reasons against his own theory—he considers the bed of the river an inclined plane, and says, "the water lubricates the inclined plane, and the greater the quantity of water contained within the bed of the stream, the greater the motion of both raft and current, because the distance from the bottom and banks, and the portion of the water retarded by friction against them, is thereby increased and the direct motion of the water less interfered with by the revolving or eddying motion consequent on that friction." That's it exactly friend; don't you see it is the water that carries the raft along—that gives it momentum. Now stop the current friend, according to your theory, and see how fast the raft will travel. Ah, you will say, "then we shall have no inclined plane." True, for we never bring up an impossibility to prove anything. We happen to know something about rafting personally. We lay down the following proposition;

1st. Rafts are carried by the motion of the current, and receive their momentum from the water.

2nd. The momentum imparted to the raft deprives the moving body (the water) of a quantity of force equal to that which it, the raft, receives.

3rd. It is gravity which moves the raft, but not its own, it is the gravitating force of the water; to prove this, a log will lie on an inclined plane of boards of 50 feet inclined to the mile, till doomsday, while it will be moved along with the water, having only a descent of 5 feet to the mile.

4th. A body of less specific gravity than another, and partly merged in it, could not move, by the known laws of gravity, unless the sustaining body moved. This is the case with the log and the water.

5th. The speed of the raft will be according to its form, the rougher and heavier, the slower.

6th. Some water moves as fast as the raft.

7th. The velocity of the river is according to its incline, form of its bottom, and banks.

8th. The water in the middle of a river has a greater velocity than that at the sides, and the surface greater than that at the bottom.

9. It is common for the surface water in rivers to travel 10 miles for the raft's 4, and yet the raft be nearer the end of its journey. This is owing to bends and contractions in rivers. Raftsmen know this, and rafts without raftsmen to guide them make mighty fine trips on rapid crooked rivers—a great deal faster than the water, eh? Ask an old raftsmen. A river carrying a raft is just like a great number of *bearers* who take the load one after another and carry it along on their shoulders. At every bend of the river, there are two gangs, the one shoots off at an angle and takes a long round about road, and the other is slower but takes a shorter road; the raftsman takes the slower but shorter road, and this is the reason why the raft gets ahead of the water.

10. The surface of the water and the raft will move with equal velocity for 100 miles, if the line of the river is straight and the banks smooth. It is wrong in mechanical langnage to say "a body moves by gravity," when it is carried by another.

N. B.—We have recieved a communication from a new correspondent who says "the raft has a tendency to move to the centre of the earth by gravity, and this is what causes it to move, and it would go there, only for the resistance of the earth and water beneath it, and the air above it." He does not appear to be aware that the air on the surface of a current of water moves along with it.

Next week we will publish a short communication on the subject, which will end the discussion for the present.

(For the Scientific American.)

Iron Ore in Essex County, N. Y.

Tons of ore raised in Essex Co., in 1850:

In Crownpoint—Penfield, 2,000; Hammond, 4,000—none shipped.

In Moriah—By Goff, 7,000, Port Henry Iron Co. ore bed, half a mile from the lake. By Foot, 4,500, Foot's Iron Co., half a mile from the lake. By Hull, 2,500, No. 75 Ore Bed; by Storrs, 4,000, Rousseau Ore Bed; by Miller, 500, No. 50 Ore Bed; by Rousseau, 7,000. Rousseau Ore Bed; by Sherman, 6,000, New Ore Bed; by Lee, 6,000, New Ore Bed—5 to 7 miles from the lake. Doad, 3,500.

Elizabethtown, (supposed), 1,500.

Amounting, altogether, to 48,500 tons of raw ore.

Very little ore is worked up in Moriah, about half of it being shipped to Clinton Co., and the rest to Vermont and other parts of New York, New Jersey, Virginia, and Philadelphia and Pittsburgh, Pa. Mr. Goff has just informed me that, owing to the superior quality and richness of his ore, it will pay shipping to Pittsburgh, Pa.

The ore sells on the dock for $1,75 to $3,25, raw, and for $2,25 to $4,50, separated.

A new bed of superior ore, about 2 miles from the lake, is being worked this year.

Product of the Moriah ore mines in 1850: —13,666 tons raw ore, average value on the dock $2,25—$30,748,50; 27,332 tons separated ore, average value $3,25—$88,832,25; total, $118,580,75.

But the depression of the iron business and competition has shorn mining of its profits.

CLARK RICH.

Port Henry, N. Y., June 6, 1851.

Natural Soap in New Mexico.

John Gorman, Assistant Marshal, who was engaged in taking the census of New Mexico, discovered in the Town of Chimallo, in Rio Arriba county, a substance resembling soap. It makes a lather like soap, and has the property of removing grease spots or stains ont of any kind of cloth. When put in water it immediately slacks like lime. At the place where the discovery was first made, it is even with the surface, and about fifteen yards square. It is rotten on the top to about the depth of three feet, but appears cleaner and sounder at greater depths. It can be taken out in large lumps, of ten or fifteen pounds weight. It is as white as snow, and seems to exist in large quantities. Specimens have been forwarded to the Census Office at Washington.

If one ounce of powdered gum trajacanth, in the white of six eggs, well beaten, is applied to a window, it will prevent the rays of the sun from getting in.