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THE ELECTRO-MAGNETIC TELEGRAPH.

We have had occasion of late to call attention to the brilliant discoveries of Professor Joseph Henry in electricity, of which one of the prominent results was the production of a practicable electric telegraph, the main features of which were adopted and introduced by Morse, upon whom so much of honor, fame, and wealth have been bestowed, and in whose renown we, in common with all his countrymen, justly take pride. But while we heartily rejoice in the worldwide, substantial celebrity that Professor Morse enjoys, we perceive no good reason why it should be deemed a detraction from his honors, to notice and praise the labors of those whose achievements preceded him in the same field.

The *Journal of the Telegraph,* we are sorry to observe, goes off into a spasm of indignation whenever the mere suggestion is thrown out that some other person than Morse may have had a hand in the production of the telegraph. In its last number, it also presents a recent opinion by Dr. L. D. Gale, formerly an examiner in the Patent Office, now advanced in years, who thinks that Henry is entitled to credit as the discoverer of a new *fact in science,* while Morse, by putting that fact into *a machine,* is entitled to be called the first inventor of the telegraph. According to the reasoning of Dr. Gale, it is the *making of the machine* that is of the greatest importance and entitles a man to the greatest honors. We wish we could have persuaded the old gentleman to think in some such way as this years ago, when he was in the Patent Office. He used then to say it was the principle of the invention, or the new fact in science, that was the grand point, not the mere form in which it was expressed, and he used to reject applications for patents unmercifully unless they contained a new principle. The editor of the *Journal* coincides with Dr. Gale's new way of thinking, and in an editorial article under the heading "What is Invention?" assumes that it is *not* the discovery of a principle of Nature, but it is the application and successful adaptation of the discovery to the production of novel practical results. Professor Morse himself defines invention as the combination of things known to produce a new effect. Still other definitions even more comprehensive might be given, although no one will dissent from those above mentioned as far as they go.

Assuming then, as all these gentlemen admit, that the invention of the telegraph consisted not in a fact in science, but in *the form of a machine by which telegraph signals could be communicated at long distances,* who was the inventor of the telegraph?

Whoever first made such a machine is, according to Dr. Gale and the *Journal,* and Professor Morse himself, the real and true inventor, and the man to whom they ought not to hesitate to do honor and justice. The following we believe to be undeniable truths in telegraphic history:

1st. That Joseph Henry was the first inventor and maker of the electro-magnet in the form substantially as now used in nearly all telegraph instruments, that of Morse included.

2nd. That this same electro-magnet is the motor or actuating power of nearly all electric telegraphs and other electric machinery, and without it they could not operate.

3d. That Joseph Henry was the first to discover that the use of the intensity current galvanic battery, in combination with his magnet, was necessary to produce a practicable electro-magnetic telegraph.

4th. That Joseph Henry was the first to announce, and to point out how to make, a practicable electro-magnetic telegraph instrument.

5th. That Joseph Henry was the first to construct and put into actual operation a practicable electro-magnetic telegraph instrument.

6th. That Joseph Henry was the first to construct and put into operation an electro-magnetic telegraph instrument in which his magnet and the intensity current battery were used in combination.

7th. That in 1831 an electro-magnetic telegraph machine was put into operation by Henry, and intelligible signals made by the movement of a bar operated by his electro-magnet, which latter he used in combination with the intensity current battery.

8th. That Henry's electro-magnet and a signalling bar working in combination therewith, and the use of the intensity battery in combination with the magnet (all of which improvements were discovered by Henry) constitute the essential features of Morse's and nearly all other electro-magnetic telegraph instruments.

9th. That Morse, in making his instrument, copied every essential part thereof from Henry's operating instrument, to wit: Morse copied, 1, Henry's electro-magnet; 2, Henry's combination of a signalling bar with that magnet; 3, Henry's use of the intensity current battery in combination with the magnet.

The real status of the case, then, as between Henry and and Morse, appears to be this:—Henry was the *first inventor* of the telegraph, and Morse was the *introducer of Henry's inventions,* and also a secondary inventor.

Those who object to this view of the case may ask themselves the following question:

Suppose Congress, in its wisdom, should see fit now to grant to Joseph Henry a patent for his electro-magnetic inventions of 1831, for the production of telegraph signals and other useful purposes: what would then become of the Morse instrument, which was not patented until 1840? The answer is plain. The use of the Morse instrument would be a clear infringement of Henry's patent, the Morse machine being a secondary invention.

Congress has already given us an example of its willingness to recognize at any time the real origin of important inventions, as evinced in its grant of the Page patent, for electrical devices, that had for years been in public use. Time works wonders, and it is not the most improbable thing in the world that the *Journal* will yet have occasion to assist in the support of a patent to Joseph Henry as the legitimate and first inventor of the Electro-magnetic Telegraph.

THE PROBLEM OF FLIGHT.

To dangle, helpless, from the tail of a gas ball is as yet the utmost extent to which "birds without feathers" have been able to successfully essay aerial navigation, unless we make an exception in favor of M. Dupuy de Lôme, whose machine we will allude to anon. Floating away passively, at the mercy of ever shifting winds, only able to descend or ascend by the rude methods of letting out gas or throwing out ballast, the balloonist sees birds skimming away with ease and rapidity at will, with or against air currents, and feels humiliated at the long list of failures which stand on record in the history of aeronautics.

By nature comparatively a slow moving animal, man has contrived ways to distance the fleetest land and marine creatures. He plunges boldly into the deep, moves about in it, or rapidly skims its surface; but in the atmospheric ocean, all he can yet do is to dive and float. The moment he disconnects himself from land or water, he loses the power of locomotion, and the power even to guide the motion of the bubble which supports him. Like the down of the thistle, he is tossed about by every capricious air current, thrown into the tops of trees, dropped upon desert wastes, or soused into water at the sport of wind sprites. Going up, he knows he must come down, but where he will alight, or whether he will come down easy, he cannot determine.

Aeronautical societies have been formed, thousands of devices have been tried and abandoned, yet man, who has ransacked his resources, must still envy the birds that possess a power yet unattained by him. Is it beyond human skill to solve this problem?

There are many who still retain faith in the possibility of aerial navigation by the human race. We do not deny this possibility, but judging from past failures, it would, to say the least, seem remote.

Yet there is only one thing lacking. Could we guide a balloon by means independent of the winds, we could go where we wish through the air. In sailing vessels, the water floats us, the winds propel, and the rudder guides. In balloons, the air floats, the winds propel, but nothing guides.

On page 100, Vol. XIX, a correspondent of this paper made a suggestion which, we think, was at least a hint at one means of securing the long needed control over the course of balloons, though it could only be applied to balloons designed to traverse over water. He proposed to provide a balloon with a perpendicular mast extending through its central axis to some distance above and below the balloon proper. To this mast he would attach, at right angles, a spar which should extend to some considerable distance fore and aft of the balloon. From this spar he would extend ropes to a keel floating upon the water, which keel was to serve the two-fold purpose of ballast, rudder, and storage chamber for materials out of which to generate a fresh supply of gas, when needed to replenish the balloon.

Now we consider it more than probable that the machine, as described by our correspondent, would have added one more to the list of failures, had it been tried. There were faults in detail all too plainly evident, but the principle, of guiding a body floating in air by a device acting upon water, does not appear to us chimerical. In order to make use of one body guiding another, supported by still a third, it is necessary that the third body should be at rest, or moving with less velocity than the first. The suspended body, thus carried along by the suspending or supporting body at a higher speed than that of the guiding body, will, if brought into contact with the latter, be reacted upon, and have the direction of its motion changed according to the nature of the reaction.

This is precisely the principle of the rudder. The vessel moves faster than the water, and carries the rudder along at the same velocity, so that if the direction of the rudder be changed, it is reacted upon by the water, and the stern of the vessel is forced to the right or left according as the rudder is deflected.

Now if two balloons were attached to a floating keel that would prevent them moving to leeward (one balloon at each end of the keel), and the keel were supplied with a rudder to change its direction, and if between the two balloons were extended a spar and a sail of proper dimensions, we should have a machine that could be guided, and which, with a wind directly aft, would have to overcome only the resistance due to the displacement of water by the keel and the skin friction thereon. With a thin keel, the sum of these resistances would be small and a high velocity could undoubtedly be attained. With side winds, there would be but little drifting, and we think a fair rate of speed could be made, and that beating to windward might be successfully accomplished.

But if this principle cannot be thus successfully applied, there are perhaps other and better ways to accomplish the desired result, and we are confident this is the most promising direction in which to look for any immediate advance in aeronautics. We are not aware that experiments have been tried to test the feasibility of guiding balloons by the resistance of water, though it has been proposed to ballast them by floating weights.

It is stated that M. Dupuy de Lôme has made an application of a double screw and a rudder to the basket of a balloon, by which he can guide the entire machine to some extent. Glowing accounts have been published in regard to the success of the trial made with this machine, but the following statement, from the columns of a cotemporary, gives probably as full credit to the experiment as it deserves:

"The machine was brought head to the wind at a hight of about a thousand feet; but, although the screw was kept hard at work, the voyagers were taken northward in obedience to a southerly wind, very much as if they were in a balloon of the old fashioned sort. They landed at last, in safety, at Noyon in Picardy, and the trip is regarded as having proved that if M. de Lôme cannot sail with his 'air ship' directly against the wind, he can considerably retard the usual progress to leeward, and possibly change the direction of progress so as to make it a few points more favorable than an ordinary balloon. This is something gained, although we should like more evidence as regards the alleged facts."

LIGHT VERSUS HEAVY SHAFTING.

Much as has been thought and written upon the subject of shafting, our observation leads us to believe there yet remains a great lack of general information upon it. The laws of transmission of power are, as a rule, well understood by professional engineers, but the majority of those who use shafting, in comparatively small establishments, have only a very imperfect comprehension of these principles. With a view to present them as clearly as we can to the comprehension of all such, this article is penned.

The transmission of power always takes place by pressure acting through distance. Time enters as an element in calculating the amount of power transmitted compared with some fixed standard, as the horse power, or 33,000 pounds raised one foot in one minute. Pressure may act for any length of time without the transfer of motion, and as motion or heat is always the result of transmission of power from one body to another, it follows that, by observing whether motion or heat (or both) take place, we may determine whether any power has been transmitted. A weight resting upon a fixed support exerts pressure, but transmits no power. A body moving in absolute space exerts no pressure, and consequently transmits no motion to any other body. Its velocity neither increases nor diminishes, unless it receives some impulse or check from contact with other bodies moving either faster or slower than *it* moves. Two bodies in contact, moving in space with the same velocity and in the same direction, exert no pressure on each other except that caused by their mutual attraction. Let the forward ball meet with resistance and instantly pressure is generated between the two balls, and the product of this pressure in pounds, multiplied by the distance in feet the resistance must be encountered, is the power which will be transmitted by one ball to the other, and from the latter to the resistance.

The elements of power referred to the above standard are, then, pressure, distance, and time. The unit of pressure is that equal to such action of gravity as is measured by a pound. We therefore speak of the unit of pressure as being one pound. The unit of distance is one foot. When any number of units of pressure is multiplied by a number of units of distance, physicists have agreed to give the product the denomination of *foot pounds,* which represents the work performed as compared with the unit of work, namely, one pound raised one foot against the action of gravity, or the *foot pound.* The elements of velocity are distance and time. The greater the velocity with which power is transmitted, the less will be the constant pressure required to transmit a given amount of power and perform a specific amount of work in a given time.

To sustain great pressure requires great strength, and increased strength of a given material having a specified form implies increased weight. Increased weight implies increased friction. It is, therefore, a theoretical fact proved in