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JOSEPH HENRY AND THE ELECTRIC TELEGRAPH.

It is not often that the discoverer of great scientific truths obtains in his lifetime the full measure of credit that properly belongs to him; and the reason for this injustice is to be found in the abstruse and unintelligible nature of the researches which early explorers have to make, often carrying them beyond the reach of the popular mind; but the practical man who applies the discoveries, and "out of the nettle danger plucks the flower safety," generally runs away with all the honor, and, surrounded by a halo of glory, amid the roar of cannon and the applause of the multitude, is pronounced to be the real benefactor of his race. The present moment is perhaps an opportune one for us to consider the claims of a man still living to a large share in whatever of value and honor there may be attached to the invention of the magnetic telegraph.

If the telegraph were an estate, subject to partition by order of the Court, the number of heirs whose claims would have to be considered would be found to be very great.

The Court would have to go back to the ancient Greeks, who, 600 years before the Christian era, discovered the peculiar property of amber, *elektron*, from which the whole science of electricity derives its name. Then the claims of the heirs of Gilbert, who in 1600, in England, added a long list of electrical bodies to those previously known, and was one of the greatest philosophers of his own or of any age, would have to receive due attention. And thus by degrees we should pass by Franklin, Galvani, Volta, Davy, Oersted, Seebeck, Ampère, Arago, Ohm, Schweiggers, Sturgeon, Wheatstone, Gauss, Weber, Steinheil, Faraday, Daniell, Grove, Jacobi, Nobili, Page, and a good many others, whose claims in a court of justice would have to receive due consideration, and finally we should reach the names of the truly illustrious Americans, Professor Joseph Henry and Professor Samuel F. B. Morse.

We do not propose to trace the history of the telegraph down through all the ages indicated in the imperfect list given above. The story has been repeatedly told, sometimes in a popular way, sometimes in scientific language, and each author has contrived to add something new to the general stock of our knowledge of the subject. In this embarrassment of riches it is not surprising that the popular mind should be a little confused, and that a multitude can always be found to shout for every new pretender, "the king is dead; long live the king!" The whole history of the telegraph could only be written by a scientific man of unusual acquirements. It would involve immense research, profound knowledge of physics, and rare linguistic attainments; and, after the work was done, none but scientific men could understand or appreciate it. A popular story is quite another affair, and narrations of this character are as abundant as the number of advocates who for money, from friendship, or from enthusiasm, have been found to present the claims of their favorites to the consideration of the public. We shall not attempt to write a scientific or a popular history, but confine ourselves to a statement of what Professor Henry has done, without intending to detract from the praise due to anybody else. We feel that justice has never been rendered to Professor Henry, and it is time that the great omission should be supplied. The first essential fact which rendered the electromagnetic telegraph possible was discovered by Oersted, in the winter of 1819–20. Then followed the important contributions of Arago and Ampère in 1820. In 1825 Sturgeon first produced what is properly known as the electromagnet, in the form of a horse-shoe, but the power of this magnet was very slight in consequence of the manner in which he wound the wires, and its chief value was in suggesting a new path for future research.

The next improvement was made by Professor Henry, and this consisted in insulating the conducting wire itself, instead of the rod to be magnetized, and covering the whole surface of the iron with a series of coils in close contact. Henry's magnet was described in Silliman's *Journal* in 1831; and, in 1832, a mechanical arrangement was put up in the Albany Academy for making signals and sounding a bell through a wire more than a mile in length. Previous to Professor Henry's investigations, the means of developing magnetism in soft iron were imperfectly understood, and no electromagnet, applicable to the telegraph, was known. The particular form of battery adapted to project the current through a long conductor was first pointed out by Henry, and he was the first to magnetize a piece of iron at a distance and to call attention to the fact of the applicability of the experiment to the telegraph. The principles developed by him were applied to render the various machines invented by Gauss, Weber, Steinheil, Wheatstone, and Morse effective at a distance. The galvanometer now employed for transmitting messages by the Atlantic Cable, is about as close an imitation of the apparatus devised by Henry for ringing a bell, in the Albany Academy in 1832, as the different circumstances of the cases require. And the electromagnet, now used for the telegraph all over the world, is the one invented and described by Henry in 1831. Whether the instrument used be a semaphore, that is, carrying evanescent signals, or a telegraph making a permanent record, the engine for driving the works by aid of the battery is the electromagnet invented by Professor Henry.

The magnet is the power behind the throne; it drives the electric clock and the magneto-electric machine; it frightens away burglars, gives the alarm of fire, warns of danger, explodes the mine, transmits signals, sends messages by the needle, and makes permanent record by the telegraph.

The philosopher who discovered the scientific principles upon which the electromagnet is founded, and who invented the form of apparatus best adapted to demonstrate these principles, must be regarded by the whole world as having made the chief contribution towards the application of electromagnetism to the various wants of man. This philosopher was Joseph Henry, and to him was accorded the homage of the whole scientific world for his magnificent researches.

While we very properly render great credit to the inventors of the various forms of apparatus now commonly called telegraphs, let us not forget the man who disclosed to us the power with which to drive not only this but every other magneto-electric machine. All honor to the great American philosopher, Joseph Henry!

EXTRACTING GOLD FROM WASHINGS AND POOR ORES.

Our Australian advices of the latest date report the discovery of an agent for extracting the ultimate residue of gold from ores and water, after the ordinary means of search and smelting have done their best. The new process is so important to the miner, and so simple in preparation and application that we look eagerly for the result of a trial of it in some of the rich gold fields with which our country abounds. The matter is deserving serious consideration, the more so that we recently read a statement from California that in the earlier years of gold mining in that State, not less than fifty per cent of the gold was left unresolved in the refuse earth.

The new process is one of amalgamation, and consists in treating the ore or refuse with a new compound, which has been patented in Australia by two gentlemen from Ballarat, and is called by them saccharate of mercury. This preparation consists of mercury triturated with sugar, until an impalpable powder is formed, and the metal cannot be discerned in it except by using a powerful magnifying glass. The powder is dry, and is to be mixed with the so called exhausted earth, the water, or the washings of the quartz-crushing machines. Our informants tell us that it will attract and attach to itself all the gold disseminated in the earth or held in suspension in the liquid. The usual system of amalgamation can be carried on simultaneously with the use of the new preparation as an accelerator. The ease with which the saccharate can be prepared, and its comparative cheapness render it unnecessary for us to say more under this head, and we proceed to give the results of a few experiments with it in Australia.

The inventors tested, on Sept. 13, 1870, 6 pounds of tailings which contained gold equal to 25 ounces 16 pennyweights, and on October 10, of the same year, 6 pounds of tailings yielded gold at the rate of 9 ounces 4 pennyweights, to the tun. One pound of gem sand, from New South Wales, contained gold equivalent to 49 ounces 15 pennyweights to the tun; and the banks, for which the test was made, have certified to the accuracy of the figures. A sample of pannings showed a proportion of 515 ounces 14 pennyweights to the tun; but we think the large figure shows that the case was an exceptional one.

A valuable part of the new discoveries is the production of a rotatory machine, to be used for new ores wherein the gold exists in the proportion of at least one ounce to the tun. Half a pound of the saccharate, costing fifty cents, is sufficient for the treatment of a tun of ore. The Melbourne *Leader* rightly says that, if these experiences be indications of the average conditions of ores and washings when thrown aside after treatment by ordinary methods, gold mining is about "to commence a second infancy."

Our miners in the West will, no doubt, soon give their experiences with saccharate of mercury, and a new impulse to a most important industry will be the result.

EFFECT OF CORPORATION EMPLOYMENT ON WORKMEN.

In passing various points in our city where gangs of workmen are employed upon public works, and witnessing the indolent, timeserving manner in which their labor is performed, we have been led to consider the effect of this kind of employment upon the workmen themselves. There is no doubt that its influence is hurtful to the moral character of the men, and that as "a little leaven leaveneth the whole lump," the demoralizing effect extends more or less through the entire class of those who get their living by the labor of their hands.

In the first place these city employés are obliged to serve a set of political masters, who, so long as the men vote right (that is, in support of the party in power), will not scrutinize too closely the quality or quantity of their work. The men, knowing this, not only slight their work, but "soldier" as much as possible. The proportion of citizens in any community whose standard of honesty is high enough to impel them faithfully to labor the entire time they are paid for, without watching, is not large. Time is so indefinite a thing to the majority of mankind, that its waste has always been a source of regret to thinking minds. Many a man who would shrink from purloining a dollar, will yet rob his employer of hours of service, and take his weekly wages without a qualm of conscience.

We believe that a total change, wherever practicable, from the system of employment by the day, week, month, or year, to that of payment for the amount of work accomplished, commonly called "piecework," would result in a marked elevation in the moral tone of the community at large; and that while those who labor would ultimately earn more than they do at present, employers could in many cases conduct their business with greater profit.

We have in mind an instance in which a business was changed from a barely living concern into a money-making enterprise by the adoption of this system under a carefully considered scale of prices; and though the workmen at first loudly protested against the change, and were with difficulty prevailed upon to accept it, they have earned so much more by piecework than they did previously, that none of them would now return from choice to the old system.

There is another effect produced by this system of "piecework" worthy of notice. There is less of the feeling of abjectness on the part of the employed. They are not so strictly confined to hours, in coming to and going from work. If a man chances, from unavoidable circumstances, to be a trifle late in the morning, he, if disposed, may apply himself more vigorously, or stay a little later at night and recover the loss. If he does not feel well, he can favor himself a little without fear that the "boss" will be at his heels with a reprimand. He feels more manly and independent, and holds his head higher.

In city employment we find the extreme reverse of all this. The men, feeling themselves the slaves of a political ring, avail themselves of every opportunity to rob the taxpayers of service. They get into a morally unhealthy state—so much so that they will not tolerate among them a man who tries to do a fair day's work. There have been instances of men being assailed by vituperative language, for honest service, and even of personal assault upon such as felt impelled to disregard warnings of this kind.

The only remedy for this state of things we can at present suggest, is the performance of all city work by contract, so far as is practicable. This in connection with the principle of paying men by the contractor according to the amount of work accomplished whenever it is possible to do so, would in a great measure put an end to timeserving, and at once elevate the character of the employés.

LIGHTNING RODS.

The hypothesis that the phenomena of electricity depend upon the existence of positive and negative imponderable fluids has served a purpose in speaking and writing upon the subject. In the absence of positive knowledge, it is perhaps as well to speak of this mysterious force as a fluid, and as such we shall deal with it in the present article. In this view, a conducting rod may be compared to a viaduct over or through which the current passes. Whether *over* or *through* has been a question upon which theorists have widely differed, and the question is of no practical importance whatever as bearing upon the construction of lightning rods. The law that the resistances of conductors vary as the areas of their cross sections is, however, well established, and it follows that the capacities of rods to harmlessly conduct away lightning discharges are—if made of the same materials—as their cross sections. The shape of a rod, if of uniform size throughout its length, does not affect its conducting power.

The question as to how large the rods ought to be, and at what distance apart they ought to be placed, involves a definite knowledge of the maximum amount of electricity that is ever discharged to or from the earth at any one point, an amount obviously indeterminate. To guide us, therefore, upon this point, we have only the results of accumulated experience. This has shown that comparative safety can be secured by rods one inch in diameter, having a metallic connection with the moist earth equal in area to that of the surface protected, and that rods having the above dimensions and the above metallic connections with the earth, may be relied upon to shield, from disruptive discharges, circular areas of roof having radii equal to twice the hight the conductors are elevated above the structures to which they are attached.

It must also be borne in mind that the metal work upon the surfaces of buildings should be connected with the principal conductor, by rods of ample size, and further, that the