Mr. Bain's Electric Printing Telegraph
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Mr. Bain's Electric Printing Telegraph.

The dispute between Professor Wheatstone and Mr. Bain, as to the legal and moral standing of each in the matter of electro-telegraphs, and electro-clocks, has already been noticed by us at some length. We have no intention of alluding to that dispute further, on the present occasion, than to remark that it has not deterred Mr. Bain from pursuing the subject. Having completed a telegraphic apparatus, he has profited by the liberality of the directors of the South Western Railway Company, to fix it on their line, and to exhibit it at the Nine Elms Station, to a great number of gentlemen interested in railways, and in the progress of science. The apparatus transmits signals to and from Wimbledon, a distance of *six miles;* its action, while we witnessed it, was extremely rapid, and very certain; every message (indicated by numbers,) was transmitted and returned correctly, the process of printing it going on in the meanwhile.

This important invention has some peculiarities which require to be separately noticed, before a correct idea of their joint effect can be obtained. 1st, it is now well known that if a metallic communication be made in one direction, between the distant parts of an electrical apparatus, water, or the moist earth, will serve safely for that in the other, or returning direction. Some part of the dispute before mentioned, referred to the priority of the discovery, or application, of this fact; and it turned out that neither of the present disputants was really the first who had observed it, although Mr. Bain certainly had re-discovered it. But the latter named gentleman has made another, and more important advance. In the former case the earth was merely found to be a safe medium for *transmitting* the electric fluid. He has now found that a considerable length of moist soil may be made to *generate* electricity enough to work a telegraph, by merely burying in the ground, or immersing in water, at two distant points, a sufficient surface of positive and negative metals, and connecting them by an insulated wire. In this manner is obtained the electrical power which controls Mr. Bain's telegraph. A copper plate being placed in water at London, and a corresponding zinc one at Wimbledon, the two being connected by a single copper wire, the artificial galvanic battery is entirely dispensed with. We may here add that Mr. Bain has found, that the greater the length of moist soil comprehended between the metallic surface, the more intense is the electric current obtained, although it is of less quantity. He finds also that this terrestrial electricity is very constant in its intensity. It is found that the telegraph can be worked with metal plates of only 4 square inches each, making 8 square inches of surface in each. The plates actually employed are each of one foot square.

Secondly, electro-telegraphs have chiefly hitherto been immediately actuated by the deflecting power of the galvanic current. If a needle, which freely vibrates on a centre, is placed in the middle of a coil formed of many convolutions of insulated wire, in such a manner as that it is parallel with the plane of the coil, and can vibrate freely, and if an electric current be directed along the wire, the needle will be deflected from its original position, and this deflection will take place to the right hand, or the left, just as the current may pass, in one direction, or the other, along the wire. A variety of contrivances have been employed for indicating, by the motion and direction thus given, to several needles, the message intended to be transmitted by the electric telegraph. The indication depended on the deflection of the needle by the immediate action of the galvanic force. In some, however, a weight was employed to move the machine, and the motion, thus obtained, was interrupted by bringing into action the parts wires connected with a corresponding apparatus at the end from which the signal was made. In Mr. Bain's new telegraph the machine is actuated by weights, but its motion is stopped by a detent, until interruption of the galvanic current is made to release it at the pleasure of the operator at the other station. The acting power is here not in the electric current, but in the weight, and the current is required to be only of the trifling energy necessary to move the controling detent under very small pressure.

Each telegraphic system on Mr. Bain's plan consists of the plates and single wire already described, and of two machines, exactly alike, one at each of the two stations, between which the communication is to be made. The machines themselves form part of the metallic connexion between the plates. So long as the electric current flows without interruption, the machinery is quiescent, being locked by the detent: but the instant the connexion is broken, the detent makes a slight rotation, by which the clock work is disengaged, and the signalizing commences. It is preferred, and with good reason, we think, to make the rest of the machinery—not its motion—depend on the continuance of the connexion, since any failure of the electrical apparatus is then instantly brought to notice by its putting the machine in action.

The electro-magnetic apparatus, which is employed solely to actuate the detent, is constructed as follows:—A light vertical spindle carries a brass bar, on each extremity of which is fixed, by the middle of its length, a semi-circular magnet, the ends of the two magnets nearly touching each other, and the magnets themselves nearly completing a circle, of which the spindle is the centre. Two insulated wooden bobbins, affixed to the frame of the machine, are bored out large enough, longitudinally, to admit the magnets to pass through them without touching, and they carry the coils of wire which form part of the electric route. They are placed longitudinally to the magnets, and so that the ends of the latter meet within their central cavities. When the electric current is made to pass along these coils, the magnets, with their spindle, are made to rotate through a small arc in one direction; as soon as the current is interrupted, the power of these coils ceases, and a constant magnet, placed at a little distance, brings back the electro-magnets, and their spindles, to their original position. A protuberance on that spindle fulfils the office of detent, being cut on one side nearly to its centre; the extremity of a long light arm, which is carried by one of the last arbors of the clock-work, and, therefore, revolves rapidly, rests on this protuberance when it is in one position, and passes by its flat side when in the other.

Each machine consists of three parts, that which gives motion to a hand like that of a clock; that which, on the pointing out of a telegraphed figure, strikes a bell; and that which prints the figure. Supposing now the machine to be set agoing, by having made the necessary electrical disposition for releasing the detent, we observe, first, that the hand rotates in front of a dial, its point passing by the nine digits, a cipher, a large dot, a vacant space, and its starting place, any figure, by breaking the electrical connexion, its part of the machine stops, the striking part begins to go, and soon strikes a spring bell, and the printing apparatus acts so as to leave an impression of the figure, at which the machine was arrested, on a piece of paper wound round a revolving cylinder on the left of the machine. This is repeated for any figure, or any number of them, which may have been desired. When the communication is closed, the same is done with the dot, or period. After waiting, perhaps, half a minute, the machine begins to go again, apparently of its own accord, but really by the action of the assistant at Wimbledon, and the same figures are repeated by the hand stopping at each of them, and printing it, and sounding the bell also as before. The same interruption of the electric current, which stops the machine at one station, stops also at the same instant that at the other; and as the hands of the two machines are originally set together, and afterwards revolved at the same speed, it is obvious that the figure at which one is stopped, will be pointed out at the same instant by the other. The printing is effected by types projecting radially from the periphery of a wheel. The types are so disposed on the periphery, and the wheel is so geared to the machinery which carries the hand, that when a given figure is pointed out on the dial, the same is presented by the wheel to the paper. The type wheel is pressed forward to imprint the figure on the paper.

The two machines, we have said, are exactly alike. The velocity of their rotation is regulated by small governors, like those used in steam engines, and it is necessary that the machines should pretty exactly agree in this respect. If, however, any error of this, or any other, kind should occur, so that the two machines do not point to the same figure at the same time, it is instantly discovered by the following contrivance: The machine, if left to itself, would stop at any one of the figures, or spaces; it goes only so long as the attendant keeps in due order the requisite metallic circuit. But to this there is one exception, that of the vacant space which we spoke of as forming part of the circle in which the figures are disposed; here the machine would not stop of itself. Now if the two machines arrive at this space at the same time, they will both pass over it without stopping; but if one of them points to this space, while the other points to a figure, a stop will there take place, by virtue of the action of the latter machine, and the attendant at the other then instantly perceives, by the improper stoppage on the vacant space, that the instruments do not agree. It is obviously easy to ascertain what is the figure to which the hand of each machine should point, to correspond with the other, since it will readily be seen what figure the hand of one machine passes over without spontaneously stopping, when left to itself.

This novel and highly ingenious telegraph seemed to us to act with perfect correctness in its construction, and the methods devised for its use. Most effectual precautions seem to have been taken against the undetected continuance of error. We understand that a telegraph of this kind has been at work satisfactorily for the last eighteen months. The importance of the physical discovery, on which its peculiar action and its details, will necessarily command the attention of the railway world. It is remarkable for simplicity; this, however, distinguishes not so much the mechanical parts, which are always in sight, and subject to ready comprehension, and easy repair, as the electrical connexion; here a single wire suffices, and a failure, if it were to happen, would be known to belong to that one wire, precluding the delay, vexation, and uncertainty which are occasioned by a like misfortune to one of the many wires required by other electrical telegraphs. Its comparative cheapness, and its facility of management, are important recommendations; but a still greater, we think, is the uniformity of its action, depending, as it does, not on batteries, whose power is constantly varying, but on the electricity of the earth itself. We congratulate Mr. Bain on this successful exhibition of the results of his long-continued labors, and we earnestly trust that neither pirates nor professors will again annoy him.

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