

which is constructed on the same principle, but there are two needles and two wires instead of one.

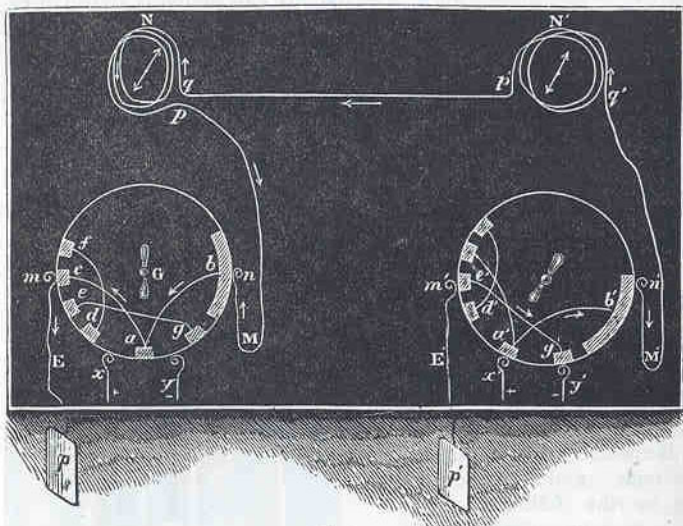


Fig. 801.

888. **Dial telegraphs.**—Of these many kinds exist. Figs. 803 and 804 represent a lecture-model of one form, constructed by Froment, and which will serve to illustrate the principle. It consists of two parts—the *key* for transmitting signals (fig. 803, and the *indicator* (fig. 804) for receiving them. The first apparatus is connected with a battery, Q, and the two apparatus are in communication by means of metal wires, one of which, AOD (fig. 803), goes from the departure to the arrival station, and the other, HKLI (fig. 804), from the arrival to the departure. In practice, the latter is replaced by the earth circuit. Each apparatus is furnished with a dial with 25 of the letters of the alphabet, on which a needle moves. The needle at the departure station is moved by hand, that of the arrival by electricity.

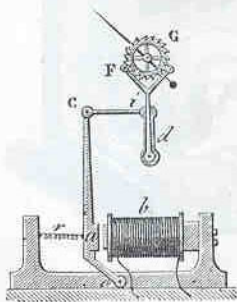


Fig. 802.

The path of the current and its effects are as follows: from the battery it passes through a copper wire, A (fig. 803), into a brass spring, N, which presses against a metal wheel, R, then by a second spring, M, into the wire O, which joins the other station. Thence the current passes into the bobbin of an electromagnet, *b*, not fully shown in fig. 804, but of which fig. 802 represents a section, showing the front of the apparatus. This electromagnet is fixed horizontally at one end, and at the other it attracts an armature of soft iron, *a*, which forms part of a bent lever, movable about its axis, *o*, while a spring, *r*, attracts the lever in the opposite direction.

When the current passes, the electromagnet attracts the lever *aC*, which by a rod, *i*, acts on a second lever, *d*, fixed to a horizontal axis, itself con-

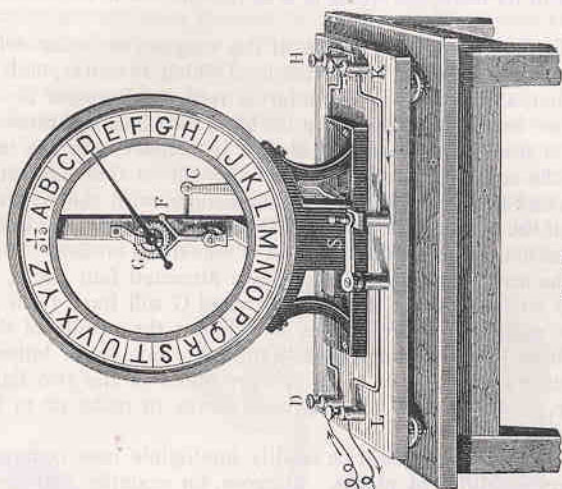


Fig. 804.

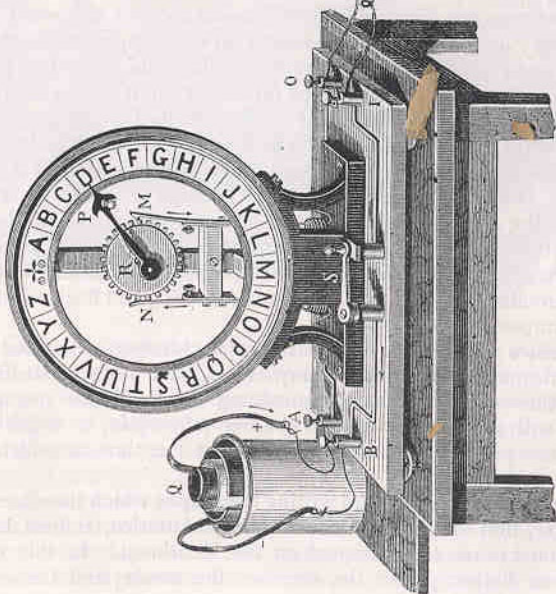


Fig. 805.

nected with a fork, *F*. When the current is broken the spring *r* draws the lever *aC*, and therewith all the connected pieces; a backward-and-forward

motion is produced, which is communicated to the fork F ; this transmits it to a toothed wheel, G, on the axis of which is the needle. From the arrangement of its teeth, the wheel G is always moved in the same direction by the fork.

To explain the intermittent action of the magnet, we must refer to fig. 803. The toothed wheel, R, has 26 teeth, of which 25 correspond to letters of the alphabet, and the last to the interval reserved between the letters Z and A. When holding the knob P in the hand the wheel R is turned, the end of the plate N from its curvature is always in contact with the teeth ; the plate M, on the contrary, terminates in a catch cut so that contact is alternately made and broken. Hence, the connections with the battery having been made, if the needle P is advanced through four letters, for example, the current passes four times in N and M, and is four times broken. The electromagnet of the arrival station will then have attracted four times, and have ceased to do so four times. Lastly, the wheel G will have turned by four teeth, and as each tooth corresponds to a letter, the needle of the arrival station will have passed through exactly the same number of letters as that of the departure station. The piece S, represented in the two figures, is a copper plate, movable on a hinge, which serves to make or to break the current at will.

From this explanation it will be readily intelligible how communications are made between different places. Suppose, for example, that the first apparatus being at London and the second at Brighton, there being metallic connection between the two towns, it is desired to send the word *signal* to the latter town : as the needles correspond on each apparatus to the interval retained between Z and A, the person sending the despatch moves the needle P to the letter S, where it stops for a very short time ; as the needle in Brighton accurately reproduces the motion of the London needle, it stops at the same letter, and the person who receives the despatch notes this letter. The one at London, always continuing to turn in the same direction, stops at the letter I, the second needle immediately stops at the same letter ; and continuing in the same manner with the letters G, N, A, L, all the word is soon transmitted to Brighton. The attention of the observer at the arrival station is attracted by means of an electric alarm. Each station must further be provided with the two apparatus (figs. 803 and 804), without which it would be impossible to answer.