ELECTRIC TELEGRAPH BELL APPARATUS.

CHAPTER XXVI.

The French Telegraph Bell Instruments—Vibratory Bell Apparatuses—Use of Bells in Telegraph Offices.

THE FRENCH TELEGRAPH BELL INSTRUMENTS.

The greater part of the telegraphic stations are furnished with bells, which enable the different offices to call each other when the operator desired is not at the station, or to awake him in the night. They are indispensable at the railway stations, as the employés are not experts in telegraphing, having their services divided with the railway and the telegraph.

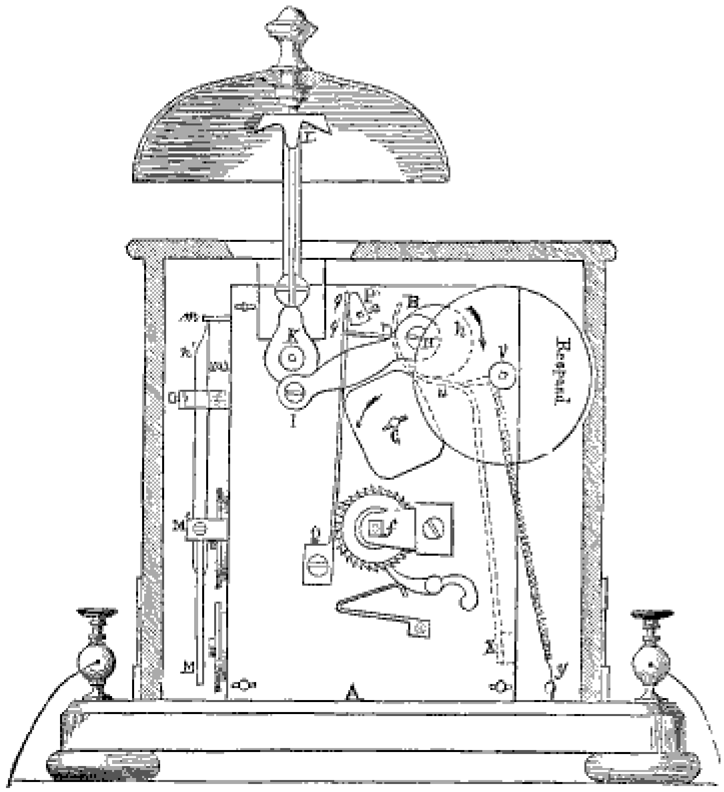
The bells are formed with a clockwork movement, by which a wheel, stopped by the armature of the electro-magnet, is disengaged at the moment when the current is sent by the operating or sending station. The rotation takes place for a longer or shorter time, and causes a hammer to oscillate, which strikes upon the bell.

The apparatus which is employed in the state telegraph office in France, is arranged in a case traversed by the hammer and the bell-rod.

Figs. 1, 2, and 3, gives three vertical projections, as seen in three different directions.

The clock movement is comprised between two vertical copper plates, A B and C D, fig. 3. The barrel F contains the large spring, which is wound up from the outside, by turning the axis *f* with a key. This barrel causes the two axes, G and *h*, in fig 5, to turn, of which the first connects in front of the plate A B, fig. 1, to the eccentric G, fig. 1, formed of a circle, cut by two parallels, and the second connects to a circle *h*, fig. 1, which gives motion to the lever-arm H I, and also a to-and-fro movement to the lower part I of a hammer, I K L, moveable around K. Behind the other plate, C D, as seen in fig. 2, is the electro-magnet E E, of which the wire is attached to two binding-posts, in connection with two exterior screw or binding posts.

Fig. 1.



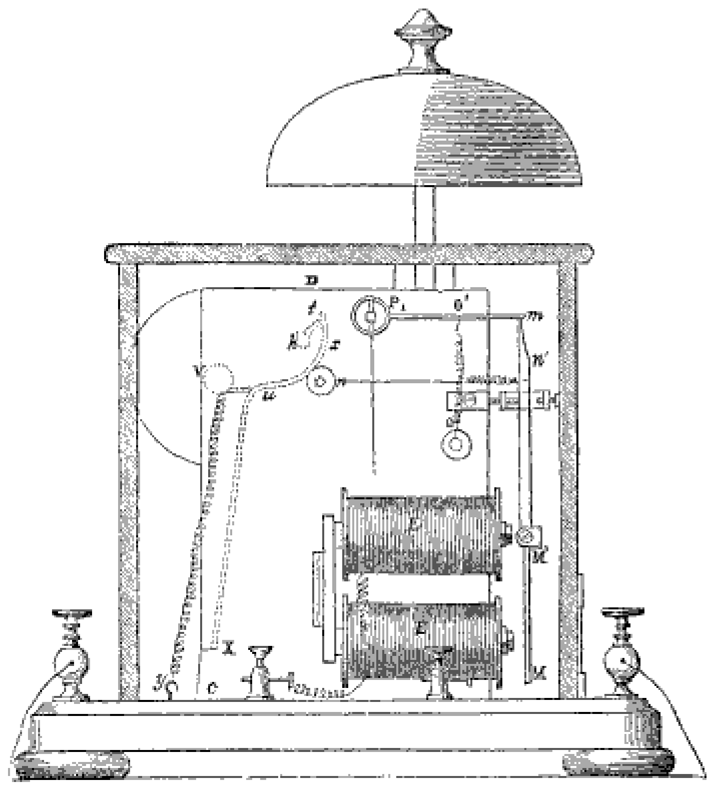
One of the screw posts connects with the line, by which the current is to arrive, and the other with the earth. The armature, M M′, is moveable around M′. Its rod, M′ *n′ m*, moves between two screws, limiting its course. The recoil-spring is tightened by means of the screw *n*. A little strip, P_1 O′ *m*, drawn down by the spring O O′, presses upon the upper part of the armature-rod, and descends when the armature is attracted by the electro-magnet.

The axis P_1, which traverses the two plates, is invariably fixed to the rod P_1 O′ *m*, and to the quoin P_1, fig. 1. It turns when the rod P^1 O′ *m*, fig. 2, descends. One of the sides of the quoin

P′, in a state of rest, is vertical, and presses against the spring Q, *q′ q*.

The circle *h*, fig. 1, which turns with the eccentric H, bears a little rod, which it moves on turning in the direction indicated by the arrow, and which hits against the portions *q′ q* of the spring Q *q q′*, which is wider at *q′ q* than Q *q′*.

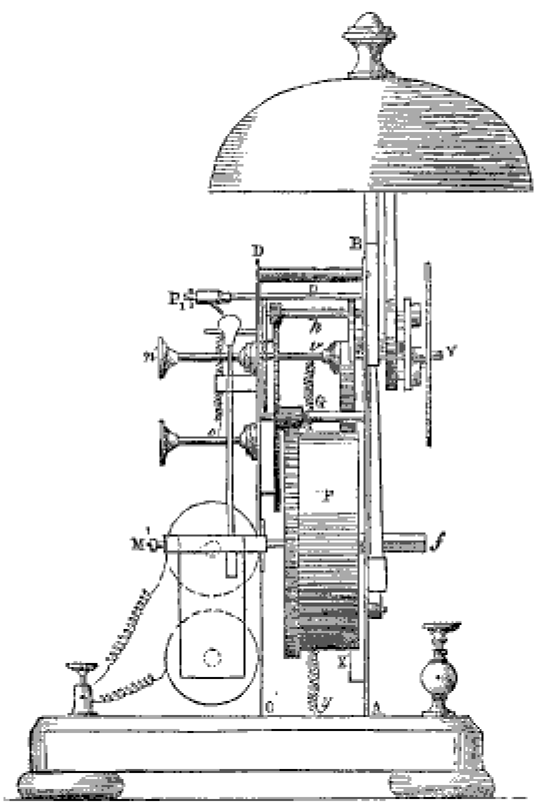
Fig. 2.



In the position of the figures, the rod *r* being stopped, the rotation of the axis *h* and G, in fig. 3, cannot take place. When a current arrives from one of the exterior screw or binding-posts, in traversing the wire of the electro-magnet, the armature M′ M, fig. 2, is attracted, and M′ *n′ m* withdraws a little, and the strip P_1 O′ *m*, descending under the action of the spring O′ O, fig. 2, causes the axis P, fig. 3, to turn a little. The quoin P′, fig. 1, inclines toward the left, and draws back the spring *q q′* Q. The rod *r* is not stopped, and the wheel *h*, fig. 1, turns as well as the eccentric G, fig. 1, of which the bent part engages with the spring

Q q' q, and keeps it drawn back during all the time required to make a half revolution. During the rotation, the eccentric H puts in motion the lever-arm H I, and the hammer, which strikes on the bell. As the quoin comes back to its vertical position, the spring, after it has ceased to be passed by the curvilinear part of G, stops the rod r again, and interrupts the movement of the hammer.

Fig. 3.



It remains now to be shown how the quoin comes back to the vertical position. Its axis, P, bears a rod which is seen in fig. 3, between the copper plate C D, and the large wheel, the axis of which is G. At the extremities of one diameter of the wheel are fixed two points, and when the wheel turns, these points press upon the rod and turn the axis, P, which raises the strip, P_1 o' m, fig. 2, and the quoin, P′, fig. 1.

If the current has ceased to pass, the armature is brought back o its position; the strip, P_1 m, presses again on the upper part of the armature M′ N′ *m*, fig. 2, and the movement is stopped. If, on the contrary, the current passes, the rod is lowered again, and the play of the bell apparatus continues. Thus, when a single emission of current is produced, the bell apparatus continues to go while the wheel, G, is making a half revolution.

There are frequently several bell apparatuses in the stations, as the employés are not always present when required, and it is important that there should be some indication by which the station making the call could be known to the operator when he returns to the service. To this end, a disk is fixed, upon which is written the word *answer*. The part of the disk which bears this word, is inclined, and when the bell rings, it raises itself quickly and places itself in front of a little window cut in the case. This arrangement is thus described: This disk is fixed on an axis, *v*, fig. 1, to the middle of which a spiral spring, *v y*, is attached. The spring, *v y*, tends to make the disk turn and raise up the writing on it. The movement of this axis is stopped by a point, *u*, which the bent spring X *x*, fig. 2, holds. The axis *h* is formed with a little arm *h″ t*, fig. 2. When that wheel moves, the arm draws back the spring X *x*, which releases the point *u* and the disk rises rapidly. It is lowered on the outside by means of a little key.

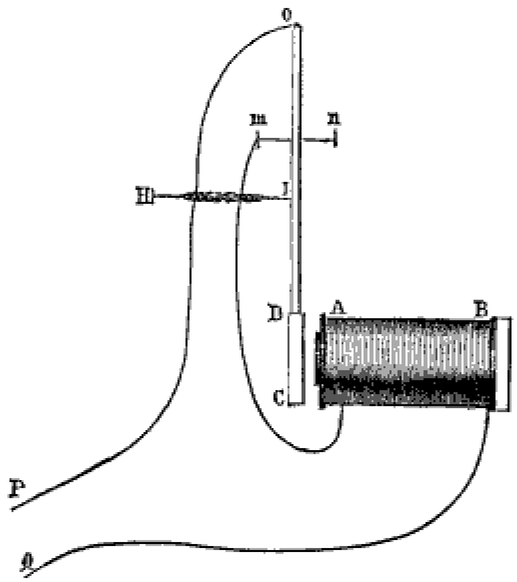
VIBRATORY BELL APPARATUS.

The preceding bell apparatus is expensive and quite complicated. It must be wound up whenever the spring has executed its action, which is quite an inconvenience when it is to be intrusted to the care of inferior agents in the service of the railway companies, such as the guards, workmen, &c.

I will now give a description of a new bell system, which offers great advantages on account of its simplicity.

Let there be an electro magnet, A B, fig. 4, and an armature, C D, with its lever arm, D O, moveable on the point, O. The rod, O D, touches alternately two screws, *m* and *n*. The rod, O D, is in communication with the wire, O P; the point, *m*, with the wire of the electro-magnet, of which the other extremity reaches to Q. When the two extremities, P and Q, are placed in an electric circuit, the current traverses the wire of the electro-magnet and the armature, C D, is attracted. The rod at the same instant is withdrawn from the screw, *m*, and breaks the circuit. The horseshoe core of the electro-magnet ceases to be a magnet, and the armature C D, yielding to the action of the recoil spring, I H, returns to its normal position. The circuit is again closed, and the movement taking place again, a series of vibrations are produced.

Fig. 4.

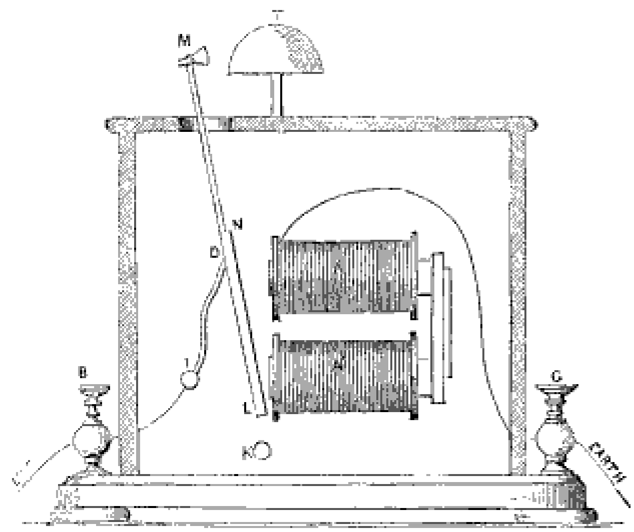


This apparatus, in the French service, is called a *trembler.* The width of the vibration is extremely small, when the current passes quickly on and off the electro-magnet; but if there be added to the screw *m* a small spring, which may press slightly upon the armature, at the moment when it withdraws from the rod, the movement becomes much stronger.

The bell apparatus, fig. 5, is contained in a box, the outside casing of which is seen. The bell T is placed over the box; the armature L N is terminated at the upper part by a little hammer M; it is moveable around the point K by means of a spring, which draws it from the electro-magnet A A′, and serves in the place of a recoil-spring.

Another spring, I D, presses upon the rod for a moment, when the armature is attracted by the electro-magnet. The fixed point I of the spring I D is connected to the exterior screw-post B and the point K, by means of the wire of the electro-magnet to the screw-post C. The movement of the bell apparatus is produced as has been above shown. All the time the current is coming over the line, the hammer strikes a continuous series of blows upon the bell; it produces a sort of rolling sound, which lasts as long as the screw-post B is in connection with the battery. Mr. Blavier thinks this bell apparatus a useful appendage to the Morse Telegraph, the sound of which can

Fig. 5.



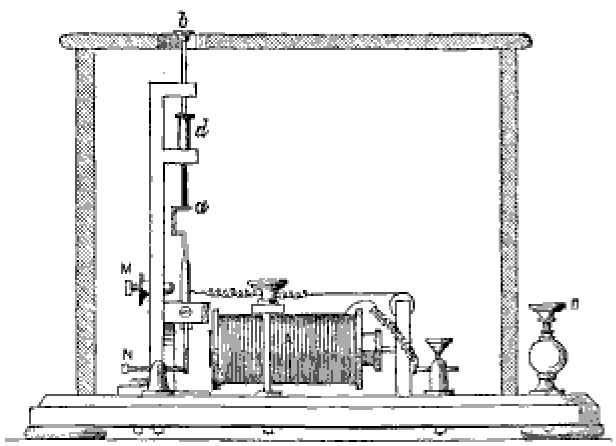
be distinguished, when given in adjusted time, to indicate the dots and dashes of the alphabet. The force
upon the bell depends upon the power of the el
the attraction of the armature.

USE OF BELLS IN TELEGRAPH OFFI

In telegraph stations, where many lines centre, a special bell apparatus for each line is very common in Europe, in order that the operator may recognize the call of the respective stations on his line. A single bell apparatus suffices, if there is placed upon the circuit of each wire a relay, similar to that of the Morse apparatus. All these relays being furnished with an appendage, indicating the one which has been traversed by the current, closes the circuit of a local battery, and sets in motion the bell apparatus. This relay, fig. 6, comprises an electro-magnet A, and an armature, which, in a state of rest, touches the screw N, and when it is attracted, it touches the screw M. This screw M connects with one pole of the local battery, and the armature connects with the other pole, by means of the electro-magnet.

When the current is coming over the line, and traversing the electro-magnet A, the armature being attracted, makes the current of the local battery pass into the bell apparatus, and at the same instant disengages the rod *a b*, which rises under the action of the spring *d*.

Fig. 6.



All the relays may be arranged in a single box, in order to save room. A single local battery being necessary, all the screws, such as M, communicate together, as well as all the armatures. Above each of them is written the name of the station with which it is in connection. For these bell apparatuses, relays must be employed, because they require a very considerable development of magnetic force, in order to produce a sufficient sound to be distinguishable.

In America, bells are wholly unnecessary on the Morse Electro-Magnetic Telegraph lines. They are serviceable on the House, Hughes, Barnes, and other printing apparatuses. On electro-chemical telegraph lines, bells are indispensably necessary. The ordinary relay magnet produces a sound, which, to the expert, is intelligible. On the German lines, sometimes bells are employed.