CHAPTER VIII.

WALKER'S SEMAPHORE SYSTEM

118. FIG. 36 is an outside representation of the **semaphore instrument,** and Fig. 37 of that of the **keys** or **plungers** by which it is worked.

The arm to the left of the signal post is the "*block*" arm, and is coloured *red*. It is worked from, and is under the control of, the signalman at the *distant* station.

The arm to the right is coloured *white*, and is intended to represent the position of the "block" arm at the adjoining station. It is worked by the *outgoing current* of the station from which the block or clear signal is sent.

The *signalling keys* are usually fixed in the position represented in the figure, the upper key on being pressed inwards sending the block signal, and the lower key the clear signal.

Fig. 38 is a side, and Fig. 39, a rear-elevation representing the **internal arrangement** for working the red arm and ringing the bell. That for working the white arm is placed above this, and, except that its electrical arrangement is reversed, and that it is smaller, is in every way similar: there is, therefore, no necessity to represent it here, but it will be found in outline in the figure showing the electrical connection.

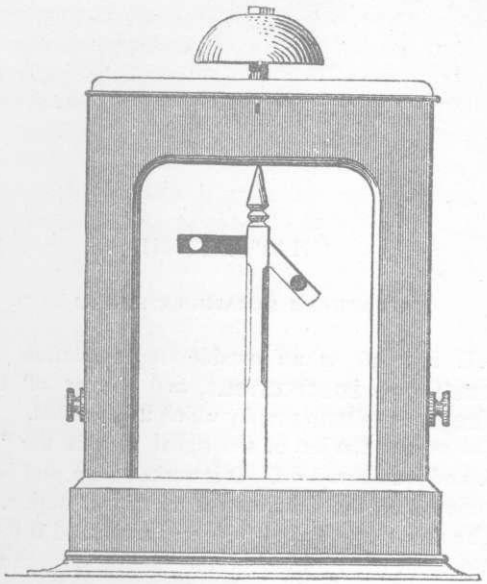


FIG. 36.

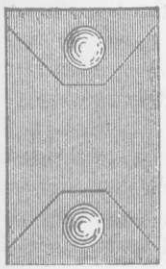


FIG. 37.

119. A A is an electro-magnet, of which C C are its cores. M an armature carrying the bell-hammer T; S is a spring the object of which is to carry M away from the cores C C′ on the cessation of the current. *m m′* are two bent steel permanent magnets, joined together by a piece of brass B, pivoted at its centre, and so fixed that their poles shall be within the magnetic field, and on either side of

the cores C C′. These cores are reduced in size outside the coils, from which they project some distance, and pass through the armature M, being covered at their extremities by wooden or ebonite guards G, G′. R is a small rigid rod fixed at right angles to B. The

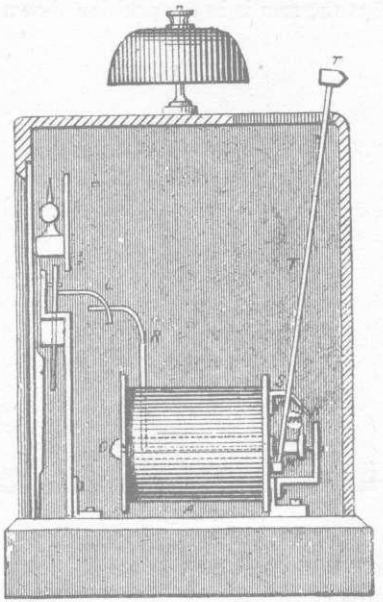


FIG. 38.

semaphore arm is so arranged that it shall, by its own weight, fall to the *clear* position. Affixed to it is a small wire bar L, bent to the shape shown in the figure. The tendency of the arm to fall to *clear* keeps this wire bar resting against R. To the rod T is fixed a small pin, K,

which prevents the movement of *m*, except when the armature is attracted to C, and so controls that of R, and consequently that of the arm.

120. If now we follow the action of a current passed through the coils, we shall have a clearer view of the objects, and of the action, of the several parts. Let it be assumed that the arm is in the position shown in Fig. 39,

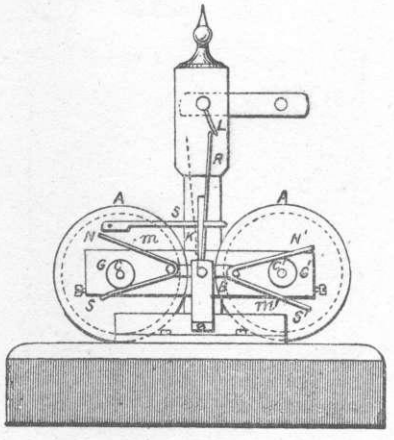
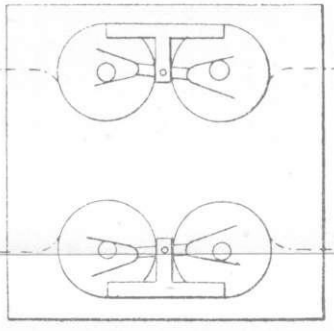


FIG. 39.

and that it is desired to lower it to the "all clear" position. On the current passing through the coils A A, the cores C C′ become magnetised, M is attracted, and the bell sounded. Whilst M is thus attracted, the locking pin K is removed from the neighbourhood of *m*, and the bent magnets *m m′* are free to move. C has acquired a south polarity, and C′ a north polarity; the N arm of *m*, and the S arm of *m′* are consequently attracted, as the opposite arms of the same are repelled by C and C′ respectively.



STATION A.

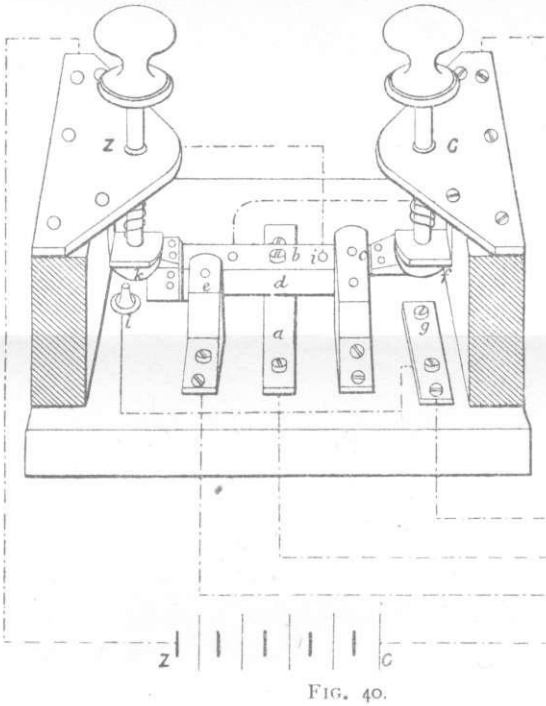


FIG. 40.

The rod R, moving with the brace-piece B, is carried over to the dotted position, and being followed by the projecting pin L, the arm falls to the all clear position. On the cessation of the current the armature falls back under the influence of the spring S, and the pin K, again locks *m*, at the all clear position.

An opposite current would attract the armature, causing the bell to be sounded, in precisely the same manner, but having induced an opposite polarity in the cores C C′, the position of the permanent magnets, *m m′*, would again be reversed, and the rod R, carrying with it the projecting pin *l*, would raise the arm to the danger position.

121. The **internal arrangement of the keys** is shown in perspective in Fig. 40. *b* is a flat spring, insulated at either end, fixed at its centre so that either extremity may be pressed down by its respective key or plunger. *d* is another spring pivoted at one end, and insulated at its other end, but operated by the lower plunger only. Each spring makes and breaks contact with the cocks *c* and *e* respectively. The plungers, retained in their position of rest by spiral springs, make contact on pressure at *l* and *g*.

122. Now, assuming that the signalman at **A** wishes to block station **B** he raises the red arm at **B**, and to do this he has to press the upper plunger. In doing so he carries the spring *b* away from its position of rest in contact with the cock *c*, disconnecting *e* and *d* from *b*—that is, disconnects his red arm coils from the line wire, and so throws them out of circuit for the time being. The disc *f*, at the same time, is brought into contact with the plate *g*, a positive current flows to *c*, through the plunger rod to *g*, and thence by the white arm coils, raising the white arm, and away to "earth"; the zinc pole of the

battery completing its circuit by way of the rod of the lower plunger, connection *i* of the spring *b*, plate *a*, and on to station **B**, where it enters at *a*, passes to spring *b*, contact *c*, spring *d*, contact *e*, thence to the coils, raising the red arm, and to "earth."

When **A** requires to lower his own white, and **B**'s red arm, he presses his *lower* plunger, which throws his red arm coils out of circuit by breaking the contact, between spring *d* and the cock *e;* and at the same time, by way of the disc *k*, connects the negative pole of the battery with *l*, passing the zinc current through the upper coils of his instrument (lowering his white arm) to earth; whilst the opposite pole of the battery forms its circuit by way of the plate *c*, contact *e*, spring *b*, terminal *a*, and passing along the line wire enters **B**'s lower coils (lowering his red arm) and passes to earth.

The plunger springs *b* and *d* are saved from overstraining by the collar of the plunger knobs banking against the brass plates c and z.

The semaphore instrument is simple and the working parts are massive and strong. If the small magnets *m m'* were influenced by induced, instead of permanent magnetism, there would probably be less liability to the reversal of signals from atmospheric electricity, although from the fact that a large gauge wire is employed for the coils, the possibility of this is in a measure reduced.