CHAPTER XI.

PREECE'S SINGLE WIRE SYSTEM.

134. THE switch (§ 112), bell key (§ 114), and practically the same bell (§ 113) as is used in Mr. Preece's three-wire system are also employed in this. The semaphore (block) signal is, however, in this instance combined with the bell, the two being inclosed in one case, as shown in Fig. 64. The upper portion of the instrument is devoted to the bell arrangement, the indication of which is similar in its object to that of the three-wire system. The lower portion is the "block" signal.

135. The **main features of the system** are—the assimilation of the electrical to the outdoor or line system of signals; the record of the condition of the signal at the distant station; and the **impossibility of the all clear signal being recorded without the concurrent** action of the signalmen at both ends of the section.

136. The semaphore arm is worked from an induced magnet. The switch is employed as a commutator for reversing the battery current, and so arranging the current to produce the danger or "all clear" signal. The bell-key is that by which the indicating instruments are directly operated.

137. A A^1 (Figs. 65, 66) are electro-magnetic coils; B is the armature, fitted with a locking pin C and a spring E. F is a contact screw employed, in connection with the spring E, to operate the local circuit which serves the bell. P is a screw by which the tension of the spring

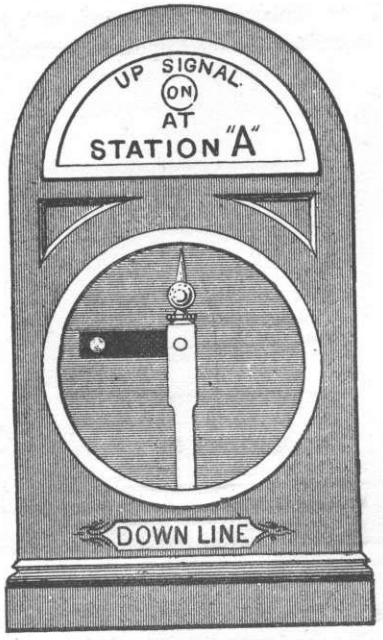

FIG. 64.

resting upon it may be regulated at pleasure, so as to insure a ready action on the part of the armature B. The work which this armature has to do is to lock or unlock the induced magnet which actuates the arm, and to open and close the bell circuit.

I is a small spindle, pivoted at Z Z^1, carrying at one end a soft iron needle G, so arranged that its lower extremity shall be free to move between the cores of the electro magnets; whilst its upper portion shall work in close proximity to the north pole of a permanent magnet H, more clearly shown in Fig. 67, whose south pole is bifurcated, one limb being connected with each of the cores of the coils. To the opposite extremity of the rod

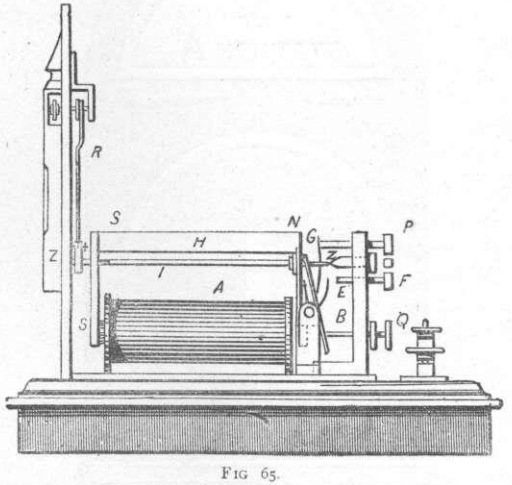

FIG 65.

I is attached a crank T (Fig. 68) which works within a slot R^1 forming the lower portion of the rod R, pivoted upon t[illegible]snail-piece K, to which is also fixed the signal arm O. As a counterpoise to the arm, a small adjusting weight is arranged on that side of the spindle I opposite to the crank T.

138. Magnetism is induced in G, and in the cores of the coils A A^1, by the permanent magnet H. A positive

current passed through these coils would first attract the armature B, which would set free G, and complete the local circuit. G would then be drawn over to A^1, which

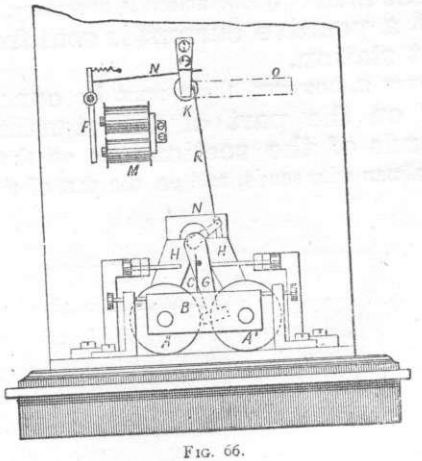

FIG. 66.

action would revolve the spindle I, and, raising the rod R, place the arm at *danger*. L (Fig. 68) is a small detent

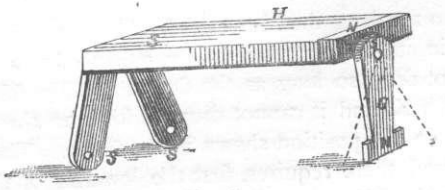

FIG. 67.

which rises with the arm until it drops over the shoulder of the snail-piece K, when it locks the arm to the danger

position. F is an armature having fixed to it, at right angles, a rod N, which when at rest is free of L, but which, on a current passing through M, and F becoming attracted, is raised sufficiently to lift L free of K. **To raise the arm** only one action is necessary, viz : that by which **a positive current is sent from the distant station.**

To lower it, however, there must be **concurrent action on the part of the signalmen at both ends of the section;** *i.e.* on the part of the signalman who sends, and on the part of the signal-

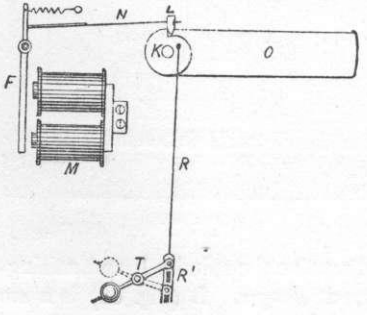

FIG. 68.

man who receives, the *clear* signal. The semaphore arm is kept in its danger position by either of two causes. It cannot drop so long as the detent L (Fig. 68) interlocks with K, and it cannot drop so long as the rod R remains in the position shown in the figure. The arm, once raised then, requires, first the lowering of the rod, and then the letting up of L. Suppose now a negative current is sent from the distant station. It will pass through the semaphore coils, actuate the relay, and, carrying G over to A, will bring the crank T to the dotted

position shown in Fig. 68. The arm still remains at *danger*, held in that position by L. Only one step towards lowering it has been attained.

The second step is consequent upon the action of the signalman to whom the "all clear" signal has been sent. This "all clear" signal is accompanied by a specified number of beats on the bell. It is these beats on the bell which tell the man, that, so far as the distant station is concerned, the section between them is clear. It remains for the receiver of the signal to **acknowledge** it. This he does by pressing his bell-key and so sending a current to the distant station. Tracing this current by Fig. 69 we shall find it enter the instrument from the switch at number 4 terminal; thence it will pass by the plate of the instrument to the coils M, and to the bell-key by terminal number 3; whence, on the lever O of the bell-key being placed in contact with P, it passes to line, and so on to the distant station. In passing through the coils M (Fig. 68) the armature F will be attracted, and L raised, when the arm O, being deprived of its support, will fall to the *all clear* position. The outgoing current passes through the discharging coils M only at such times as the crank T is in the dotted position. At other times the coils M are short-circuited by means of a spring affixed to the spindle I for that purpose. **It is only when the "all clear" signal has been received from the distant station that the arrangement admits of the arm being lowered,** and this is then effected by the next signal sent in acknowledgment of it.

139. Fig. 69 shows the electrical arrangement of a complete set of instruments for working the up and down traffic of one end of a section. As already mentioned, the switch is here employed as a commutator to reverse

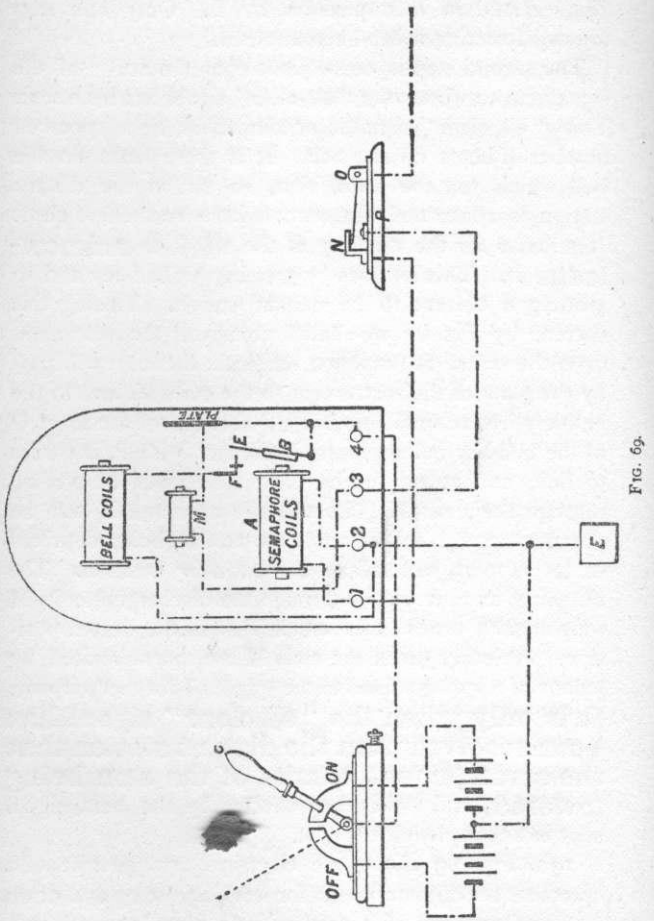

FIG. 69.

the battery current, the **danger** signal being produced by a positive, and the **all clear** signal by a negative current. The bell-key is the instrument by which all currents are transmitted to the distant station.

140. To send a danger signal the lever of the switch is placed at ON. Then on pressing the bell-key we bring its lever O, into contact with the lower stud P, and a current flows from the copper pole of the battery

to the ON segment of the switch—
„ the lever C of „
„ terminal 4 of block instrument,
„ the plate of „
„ discharging coils M,
„ terminal 3 of block instrument,
„ lower stud P of bell-key,
„ lever O of „
„ line;

and arriving at the distant station it enters at lever O of bell-key, and passes

to upper stud N of the same,
„ terminal 1 of block instrument,
through the semaphore coils A,
to terminal 2,
„ earth.

The opposite pole of the battery—the zinc—is direct to earth.

In passing through the coils A the current attracts B; G (Fig. 66) is set free and passes over to A^1, the rod R is raised, and the arm O placed at "danger."

The attraction of B to the coils A A^1, brings E into contact with F, and so completes the local circuit, one set of the sending batteries being brought into use, viz., that with which the lever of the switch is in circuit.

Assuming it to be with the ON (copper) set, a copper current will flow

to the ON segment of switch,—
„ lever C,
„ No. 4 terminal,
„ armature B,
„ spring E,
„ screw F,
„ bell-coils,
(the bell will be sounded and the index carried over to, or if already there, retained at, ON—causing the inscription on the face of the bell to read { SIGNAL ON AT STATION A }—
„ terminal 2,
„ earth.

Thus a *block* or *danger* signal has been sent from—say—station A to station B. At the latter station the arm has been raised and **locked at danger**; the bell has been sounded, and the bell indicator recorded the position of the arm at station A. If it were required to sound the bell any number of times, it would be for station A to press his bell-key a corresponding number of times; a current would follow the course just traced for each pressure. As regards the indicating portions of the instrument no change would take place, the only effect produced would be to confirm these in their positions and to sound the bell.

But now let the switch-handle, A, be reversed and placed at OFF, and let the bell-key at the distant station be again pressed. We shall then have a zinc or negative current flowing from station A to station B. It will follow the same course, and will attract the armature

B, as did the positive current; but here we find a change. The induced magnet G (Fig. 66) is now attracted to A: the negative current has polarized A A^1 in an opposite manner to that produced by the positive current last sent, and G is now repelled by A^1 and attracted by A. In passing to A, it lowers the crank T, but it does not lower the arm itself, which is held by the interlocking detent L, and **only on the acknowledgment** of the signal announced by the bell will the arm fall to the **all clear** position.