

# AUTOMATIC CAB-SIGNALING.\*

## A DISCUSSION OF MODERN RAILWAY SAFETY DEVICES.

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Continued from Supplement No. 1694, page 390.

As already stated, Raven's system of cab signaling is electrical, and it is designed to collect indications by the rubbing of metallic brushes (Fig. 10) carried on the engine over metallic bars (Fig. 15) placed on the line. This method of collection is not essential to the system, since it is capable of being operated equally well without contact, by causing electro-magnets on the line to influence magnets on the engine. This method of collection is not now being put forward.

The system is one which uses visual and audible signals. The visual signals are (1) a small semaphore arm by which the "condition of line" signals are

either the signalman or the driver, and the subsequent continuance of the indications resulting from the natural operations until they are stopped or reversed by the action of the signalman.

Considering Fig. 9, and leaving, for the present, consideration of the line of bars out of the center of the

initial current passes through the bell relay  $C^1$  during the continuance of the short-circuiting of the brushes 1 and 2; the armature is attracted and breaks the circuit through the spring contact ( $e$ ). This contact forms part of the bell circuit, which itself is connected in shunt across the electro-magnet  $A^1$ . Hence when

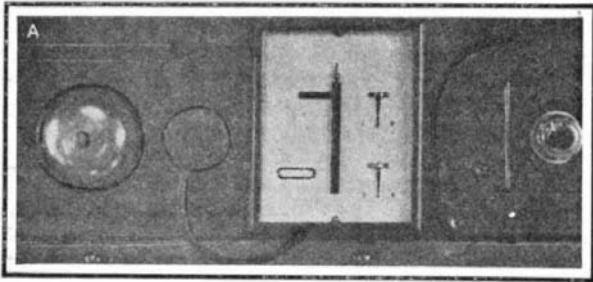


FIG. 8.—"WARNING" AND "ON" INDICATIONS (BELL RINGING).

given, and (2) two small pointers showing 1-2 and 3-4 respectively, which are the "route" indicators. The audible signals, which are of the nature of "call attention" signals, are given by a bell. Besides these indicators, the instrument carried on the engine includes a visual "failure" indicator, by which the condition of the apparatus can be gaged.

Figs. 6, 7, and 8 show several forms in which the indicator on the engine has been made, the circular form being the latest. Fig. 9 shows in diagrammatic form the complete equipment of engine and line circuits, the latter being for a 3-way diverging junction. Fig. 11 is a photograph of the back of the engine indicator with the cover removed to expose the apparatus.

The action of the apparatus is of the simplest possible character, the main principle being the invariable operation of the apparatus at certain points by the natural action of certain parts without the aid of

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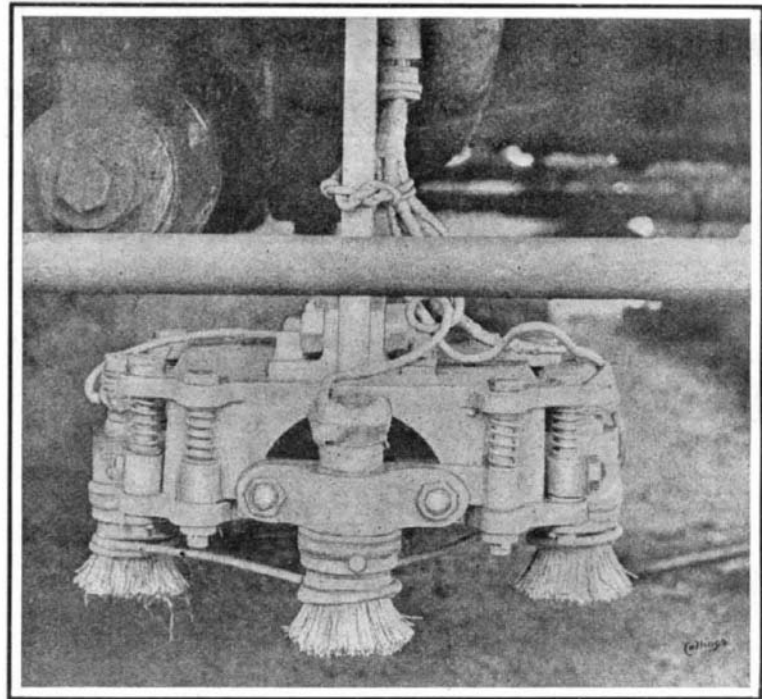


FIG. 10.—THE FOUR STEEL WIRE BRUSHES, SHOWING "FAILURE" INDICATOR CIRCUIT WIRE WRAPPED AROUND THEM.

space between the running rails, it will be found that the short-circuiting of brushes 1 and 2 on, say bar  $A$ , causes a current to pass through the main magnet,  $A^1$ , by which its armature is raised, putting the semaphore arm to "danger." At the same time the armature closes the circuit of the springs  $c, d$ , diverting the current direct back to the battery after passing through  $A^1$ . Hence the armature of the latter will remain attracted to the poles as long as may be necessary for the purposes of the apparatus.

Besides passing through  $A^1$  and the brushes, the

the armature of  $A$  is raised, the current from the engine battery tends to divide, part passing by  $A^1$  and part by the bell. The connections, however, are such that current only passes to the bell when  $C^1$  is unenergized, and this condition only obtains when the brushes 1 and 2 are not short-circuited. When the brushes are on a metallic bar, say  $A$ , therefore, the bell is silent, but as soon as they pass off the bars it commences to ring.

In addition to passing through the electromagnets  $A^1$  and  $C^1$ , as described, the current to the brush 1

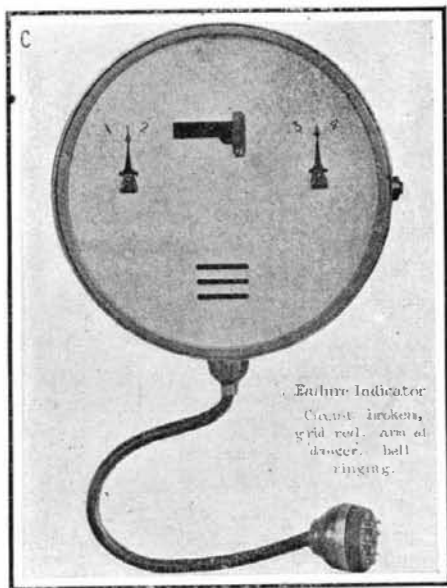


FIG. 6.—THE FAILURE INDICATOR ON THE ENGINE.

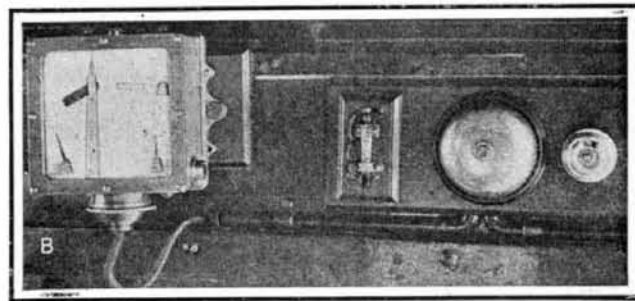


FIG. 7.—"OFF" AND "ROUTE" INDICATIONS.

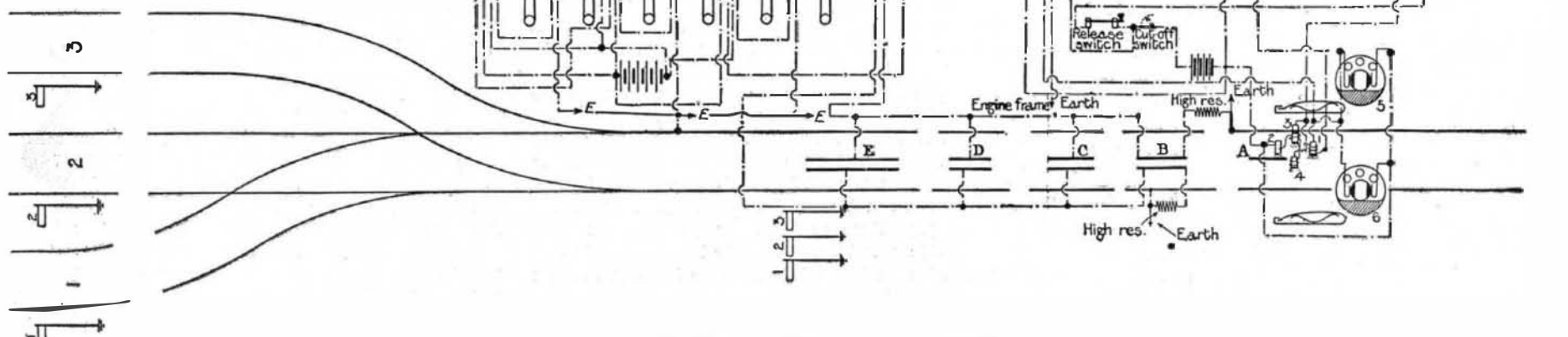


FIG. 9.—DIAGRAM OF ENGINE AND LINE CIRCUITS.  
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passes through the springs  $c^1 d^1$ , and  $c^2 d^2$ , each pair of which is normally in contact. These springs are opened by the raising of the armatures of  $D^1$  and  $D^2$ , respectively. Opening the circuit of either  $c^1 d^1$  or  $c^2 d^2$  obviously releases the armature of  $A^1$ , and, as a consequence, stops the ringing of the bell and lowers the semaphore arm.

Currents passing through  $D^1$  are collected from the line by the brush 2, currents passing through  $D^2$  are collected from the line by one or the other of the brushes 3 and 4.

Between the poles of  $D^1$  and  $D^2$  are placed magnetized needles  $n$ ,  $n^1$ , pivoted to turn under the polarity of the poles when the electromagnets are energized. The spindles carry the pointers, shown in Fig. 6. Each spindle also carries a small metal sector, slotted as shown by Figs. 9 and 11, in which rides a small metallic loop, pivoted at the other end. The passage of a current through, say,  $D^1$  deflects the needle to one side, and the loop drops into a recess at the end of the slot, and locks the needle and pointer on the front of the instrument in the deflected position. At the same time this occurs the lifting of the armature of  $D^1$  breaks the contact  $c^1 d^1$ , and lowers the semaphore arm, and stops the bell as already stated.

The engine carries, in addition to the apparatus described, two rotary switches, of which further details are shown in Figs. 12 and 13. Each switch consists of a cast-steel wheel free to rotate, the spindle of which carries a two-part commutator, on which bear two springs. The wheel is weighted so as to take up a normal position. In this position the springs bearing on the commutator are insulated from each other, but when the wheel is rotated they are connected through the commutator. The springs are connected with the brushes 1 and 2, respectively, and each rotary switch, when turned from its normal position, connects the brushes in the same way as the latter are connected when on the bar A, or any subsequent bar of those shown in Fig. 9.

The rotary switches 5 and 6 run over fixed bars on the line side of the general form shown on the diagram, and of which more detail is shown by Fig. 14. These bars are fixed in close proximity to the bar A, as shown by Fig. 15. Hence the rotary switches are only actuated at or near the bar A.

(To be concluded.)

#### SPAIN FEELS THE NEED OF FORESTS.

A SUGGESTION by Spanish manufacturers that Spain plant forests for pulpwood and follow Italy's example by planting quick growing species has been reported to this government by Consul-General Ridgely, of Barcelona. Spain is waking to the necessity of growing her own timber. Nearly all civilized countries are moving in that direction because it is coming to be understood that countries which do not grow their own timber must go without it for a few decades.

It has been customary to cite Spain and China as examples of the distressing results which follow forest destruction. Spain is as large as Pennsylvania, Delaware, Maryland, West Virginia, Virginia, and North Carolina, but its forests have only three-fourths the extent of West Virginia's alone, and much of them are scrub thickets of a very poor kind.

hammers, pulverize rocks and make little patches of soil for gardens.

At the present time Spain's most valuable forest product is cork. The annual cut is 30,000 tons, but the cork forests are going, as other forests went, and for the same reason—want of care. Enterprising Spaniards are just now trying to supply their

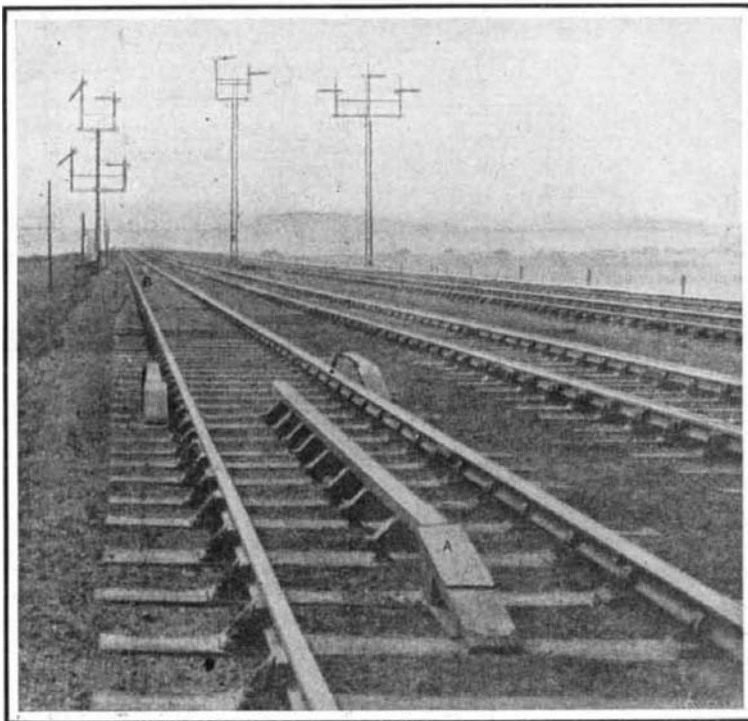


FIG. 15.—BAR A IN CENTER OF TRACK WITH SPRING BARS OUTSIDE TRACK JUST IN ADVANCE. BAR B IN CENTER OF TRACK 600 YARDS BEYOND A. "DISTANT" SIGNALS (IN DUPLICATE) "OFF" FOR ROUTE. LENGTH OF BARS A, B, C, D (SEE FIG. 9) 30 FEET. LENGTH OF BAR E, 60 FEET.

The country's population is believed not to exceed one-third of what it once was, or what it might be again. Much of the denuded land is absolutely barren, with the red rock laid bare where agriculture once flourished. Hills, whose rounded forms indicate they once supported forests, are bald and dry now and without inhabitants. In some localities peasants, with

country with home-made paper, but pulpwood is not to be had except by importing it. The home cut is only 2,500 tons a year—about what a single American pulp company would use in three days.

Foresters say that there is no reason why Spain might not do what France, her next neighbor on the north, has done, cover her barren places with for-

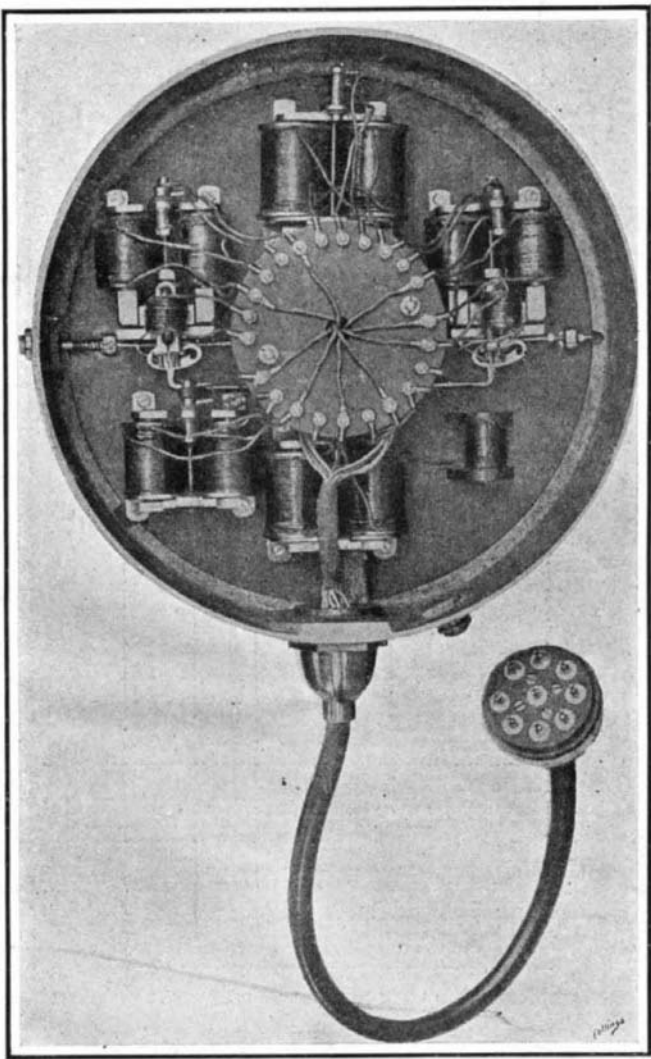


FIG. 11.—BACK OF CIRCULAR TYPE OF INDICATOR WITH COVER REMOVED.

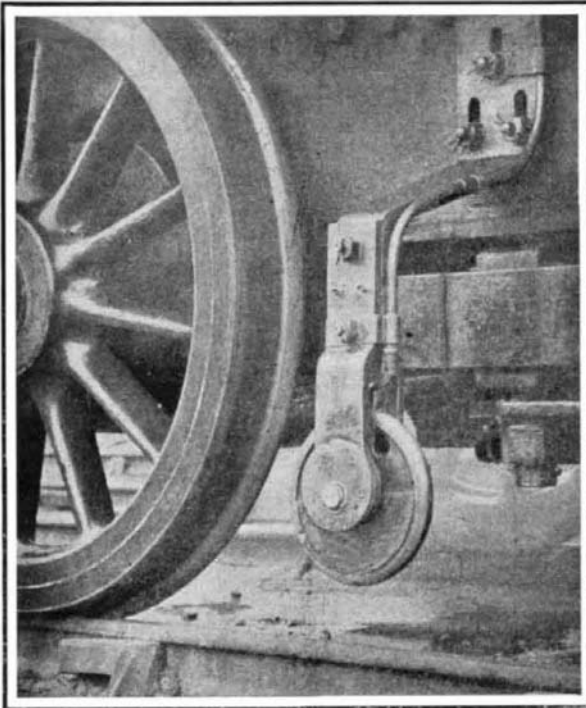


FIG. 12.—ROTARY SWITCH FIXED ON ENGINE BOGIE, SHOWING SERRATED PLATE FOR CONVENIENCE OF ADJUSTMENT.

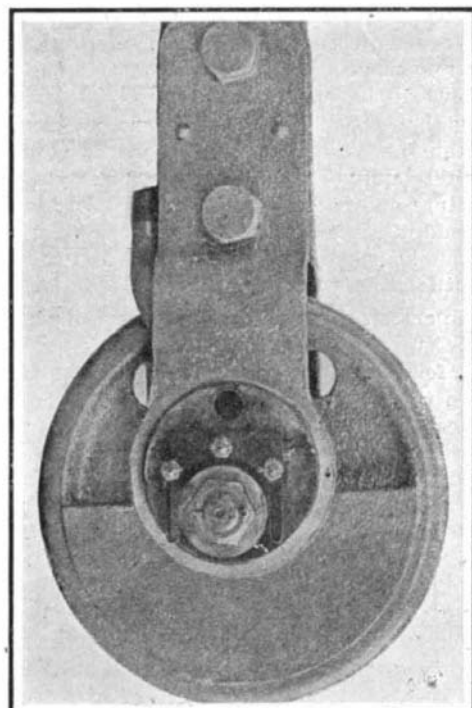


FIG. 13.—ROTARY SWITCH WITH COVER REMOVED, SHOWING COMMUTATOR AND SPRINGS.

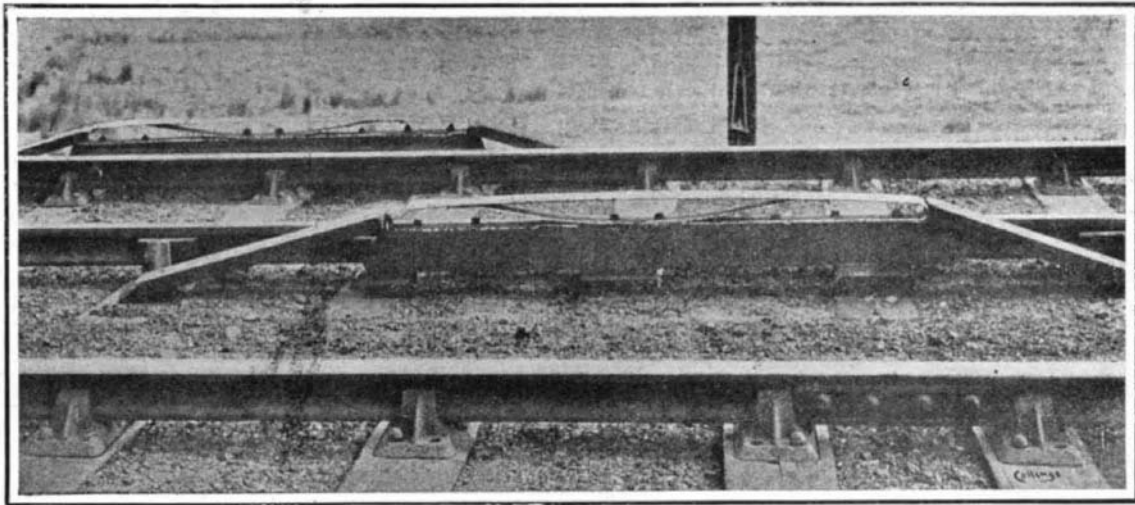


FIG. 14.—SPRING OR YIELDING BARS, WITH RAMPS. LENGTH OF BARS, 6 FEET.

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