forms a circuit on which a track relay is placed, contained in a suitable iron case. The movement of this relay is dependent on the flow or absence of current. As soon as the connecting wire becomes dead by reason of the train having short circuited the battery the armature of the relay drops. The movement of the armature breaks the signal circuit which is a separate but similar battery circuit, and the home signal rises to the stop position. In doing so this home signal opens a circuit breaker on the distant signal circuit and the lower signal arm rises to the caution position.

As soon as the train passes out of the block, current again flows through the full length of track circuit and energizes the relay, its armature picks up and thus closes the signal circuit, and this signal circuit, operating a valve on the pneumatic system, fills the cylinder under the home signal with air and pulls it down to clear. The circuit-breaker on the distant signal circuit is closed by the action of the home signal clearing and the distant would also clear but for the special arrangement of its circuit so that it may repeat the indication of the home signal next ahead. A wire from the distant signal circuit at block A runs to the circuit-breaker on home signal at block B, and as this long wire circuit has been broken by the rise of the home at B, the distant at A remains in the caution position until the home at B is cleared. It thus appears that the home at A is operated by its signal circuit controlled by the relay in the track circuit, but the distant at A has its circuit opened first by home signal circuit-breaker at A and when that is closed the distant signal circuit is still kept open by the operation of the circuit-breaker on the home at B.

ELECTRIC INTERLOCKING AT C ST. AND DEL. AVE., WASHINGTON, D. C.

By JAMES H. CORMICK

Among the things that are sure to attract the attention of the visitor at Washington immediately upon his arrival in that city are the small towers on the street corners in the vicinity of the new Union Station and the Capitol. These towers are each mounted on an artistic iron column with a granite base, with anchor bolts embedded in concrete, and they are specially designed to harmonize architecturally with their general surroundings. It will hardly seem possible to signalmen that one of these small octagonal towers, the greatest inside measurement of which is only 4 feet, can contain an all-electric interlocking machine of 10 levers, together with a switchboard and room for a man to operate them. Fig. 1 shows one of these towers.

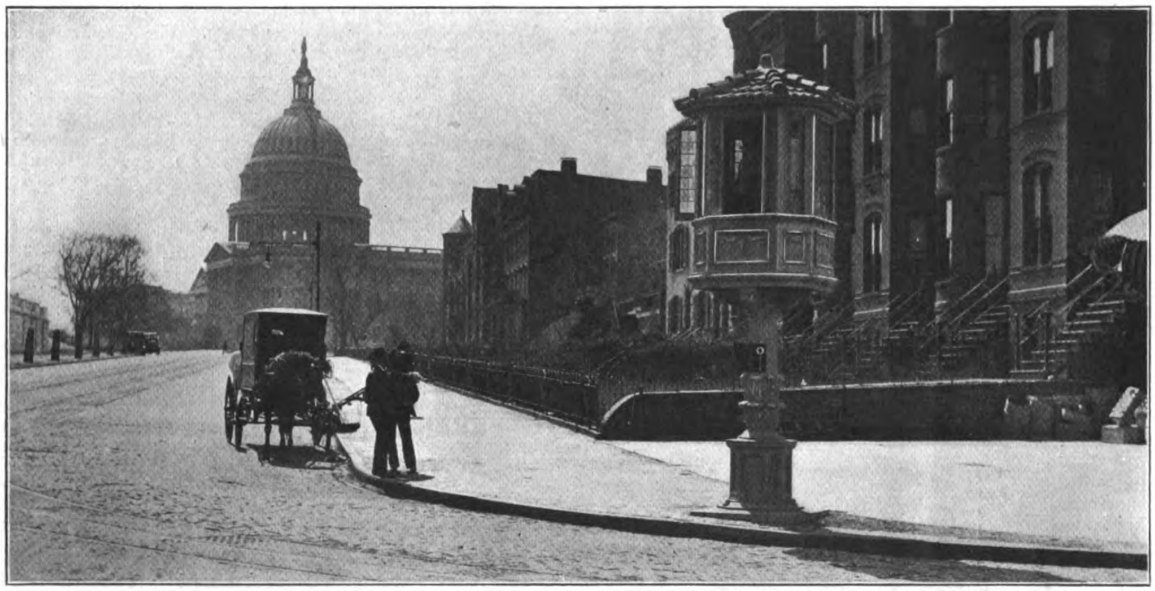

Fig. 1.

The control machines for these interlocking plants are similar to the one recently installed in the Electric Interlocking Plant at the Jersey City Terminal, but differ in the following particulars: The track diagram is so arranged that when the indication comes in from the switch the movement is duplicated on the model board, electrically, instead of mechanically, as is the common practice. Miniature lamps mounted on the board indicate what signal is given in the streets.

Fig. 2 gives front and back views, and Fig. 3 a top view of the control machine. Inside the case and on top of the machine is placed the mechanical interlocking plate. Fastened to the top of this plate are the normal and reverse indication coils and the lock releasing coils. The armature of the switch indication coil engages a stop on the locking bars which are moved to the right or left when the switch lever is moved from right to left and vice versa. This stop occurs when the switch lever has made about ¾ of its movement; and when the switch on the ground is thrown, the indication comes in, the stop is released, and the stroke of the lever can then be completed. Referring to Fig. 3, it can be seen that by pressing a signal lever it will be moved inward, providing it is not locked by reason of another lever of a conflicting route being thrown. At the start of its stroke the contact at the circuit-breaker is broken and at the end of the stroke another is made and a latch on the armature drops and locks the signal lever in the reverse or

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clear position. This lever is worked against a compression spring and when the signal lever latch is lifted this spring returns the lever to its normal position.

The interlocking required here is different from that used in regular steam railway practice in that one green light is given for the car to proceed whether the switch lies to the right or to the left, while in steam practice one signal is given to proceed to the right and another to the left. This requires different interlocking for each position of the switch, this being accomplished by the swinging latch shown on levers Nos. 1, 3, and 5.

The signal consists of two electric lights, one red and one green. These lights are placed under a small hand-hold cast cover having slots through

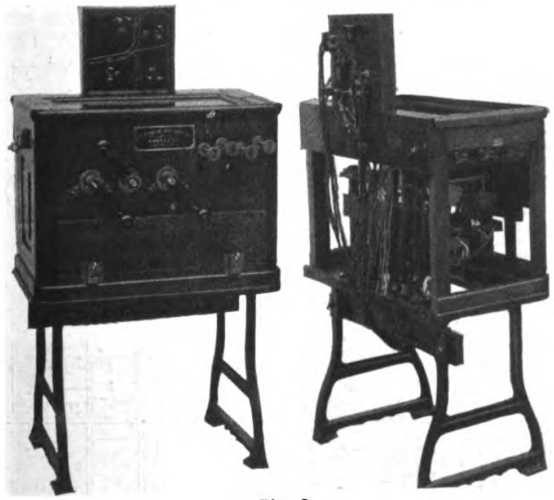

Fig. 2.

which the motorman can see the lights. These lights are enclosed in a watertight case and are protected by a heavy glass which in turn is protected by a network of metallic strips. One light only shows at a time, and the normal color which shows is red, so that the motorman must stop at the red light. Fig. 4 shows one of these covers as seen in the street.

The signal lock release which is placed in the

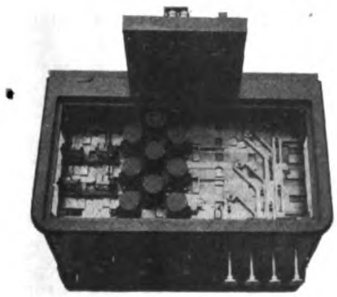

Fig. 3.

pavement is bolted to the slot rail for the plow of the car. Through the center of the box a lever is pivoted, one end projecting into the slot carrying the plow of the car. To the other end of this lever and insulated from it is fastened a brass collar. When the plow strikes the lever, contact is made between two phosphor bronze springs which are placed at one end of the box and are insulated from it, and this contact completes the circuit for the signal lock. The lever is returned to normal position by a heavy spring which is compressed against it. The plow on the car is used for making contact with the two rails beneath the pavement, from which the current for the motor of the car is obtained.

By referring to Fig. 5 the switch throwing mechanism may be seen. The device is actuated by a solenoid and, by means of a reversing cam plate, movement is given to the switch first in one direction and then in the other.

The wiring diagram is shown in Fig. 6. The

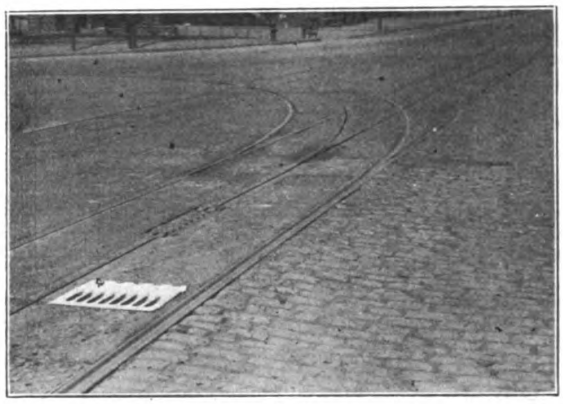

Fig. 4.

switch operating circuit may be traced out as follows:

Taking Switch No. 1 and Lever No. 1 on the machine in the tower, if it is desired to throw switch No. 1 from normal to reverse, lever No. 1 must be rotated towards the right, closing circuit through the contacts at "A." This circuit takes energy from the 600 volt trolley feed, through the knife switch, then through ten 10-ohm resistance

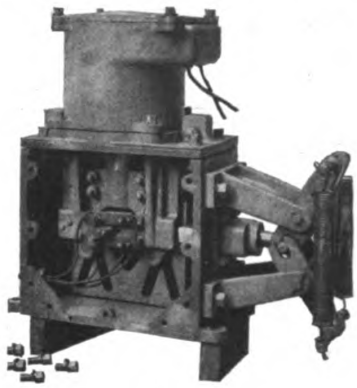

Fig. 5.

units in multiple, and a fuse, to quick switch "A" on the machine, through wire "C" to solenoid No. 1 in the switch throwing mechanism. When about two-thirds of its stroke are completed, the handle is locked by the latch of the reverse indication magnet "R" catching in the notch and this indication plunger is released at the end of the stroke of the switch throwing mechanism.

The indication circuit is as follows: For the re-

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verse movement energy is taken from the 600-volt line, through two 500 ohm resistances and through wire I to machine; both indication magnets are tapped on this wire, the reverse indication coil being in series with the coil on the model board. To continue the circuit we have wire R from the reverse indication magnet to contact K on circuit controller in switch mechanism. On return to normal the indication would come in over wire N from circuit contact in switch mechanism to normal indication magnet.

The control circuits of the solenoids are broken through a quick break magnetic blow-out switch. The signal circuit is taken from the 600-volt line

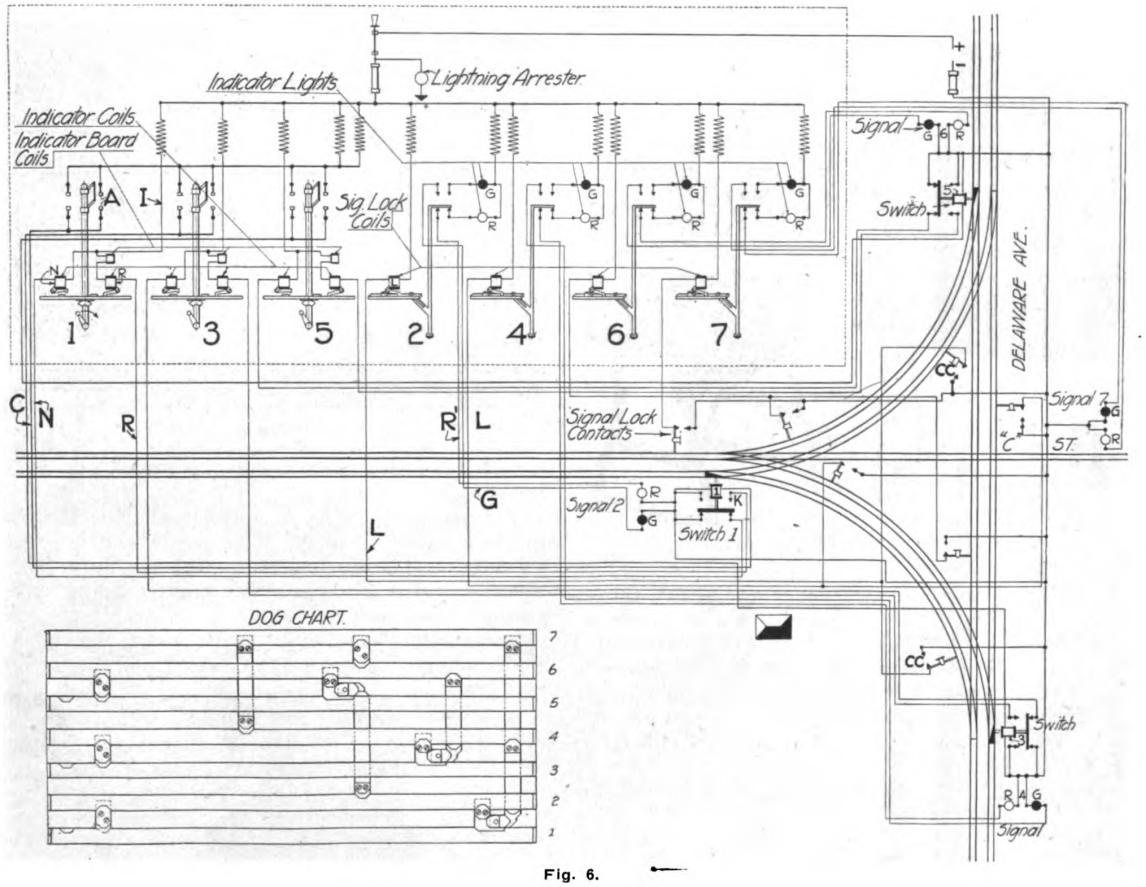

Fig. 6.

through 1,250 ohms resistance, and a common connection to both lamps on the model board. Take signal No. 2: The red light being on, the circuit will continue through R^1 to R signal on the street to common. With the pushing in of the lever the green light comes on, cutting off the red light, the circuit being completed through wire G to signal G to common. The lock release circuit is taken through 500-ohm resistance units, through L lock magnet, then through wire L to circuit controller CC to common.

Knife switches, resistance units and fuses are mounted on a 2-in. slate panel in the tower.

Among the advantages of this system are:

1st—It keeps out of the streets and off the sidewalks two, three and four sets of switch boxes, switch irons, brooms, umbrellas and temporary shanties, and puts in their places a small, artistic, and unobstructive column and neat tower.

2nd—It takes the flagman out of the street, where he is more or less in the way of passing vehicles and cars.

3rd—It allows quicker moving of the cars, as in cases where the interlocking admits, two, three or four cars can be sent on to the crossings at once by the towerman, through the operation of the levers, whereas a flagman would be required to wave to each car separately.

4th—It is safe, as the interlocking prevents the towerman's making a mistake whereas the flagman may signal forward two or more cars which may collide or the motorman may mistake the flagman's signal and cause an accident.

5th—Two men are enabled to do the work that heretofore required eight men.

This system was installed for the Capital Traction Co. and Anacostia & Potomac River Railroad Co. The installation was manufactured by the American Automatic Switch Co. It was designed by Chief Engineer Roy V. Collins, and installed under the supervision of the engineers of this company. This is probably the most complete and up-to-date equipment yet placed on street railway lines.

The towers are located as follows: No. 1 at "C" Street and Delaware Ave., N. W.; No. 2, East of Plaza, Union Station; No. 3, West of Plaza, Union Station; No. 4, North Capitol Street and Massachusetts Ave.; No. 5, First and B Streets, N. E.

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