

The one panel of the new interlocking machine controls the entire area

# All-Relay Interlocking on New Haven

At New Rochelle, N. Y., 16.6 mi. east of Grand Central Station in New York City, the New Haven has recently installed an electric interlocking, with all-relay controls, which replaces and consolidates the control of two previous interlockings about 2,500 ft. apart. One of the former plants, known as interlocking station No. 22, located 1,678 ft. west of the New Rochelle passenger station, was a General Railway Signal Company electric interlocking with 40 working levers, installed originally in 1910. The track layout at this plant includes a junction between the main route into Grand Central Station, and a second main route which extends via Hell Gate bridge over East river to Long Island, where connections are made with the Pennsylvania to freight

**Consolidates control of two extensive switch and crossover layouts, spaced about 2,500 ft. apart. Project includes modern direct-wire circuits**

yards and ferries as well as to the tunnels under the East river to the Pennsylvania station in New York City.

## Second Plant East of Depot

The second plant, known as interlocking station No. 23, located about 738 ft. east of the passenger depot, was a mechanical plant with electric levers for controlling signals. This

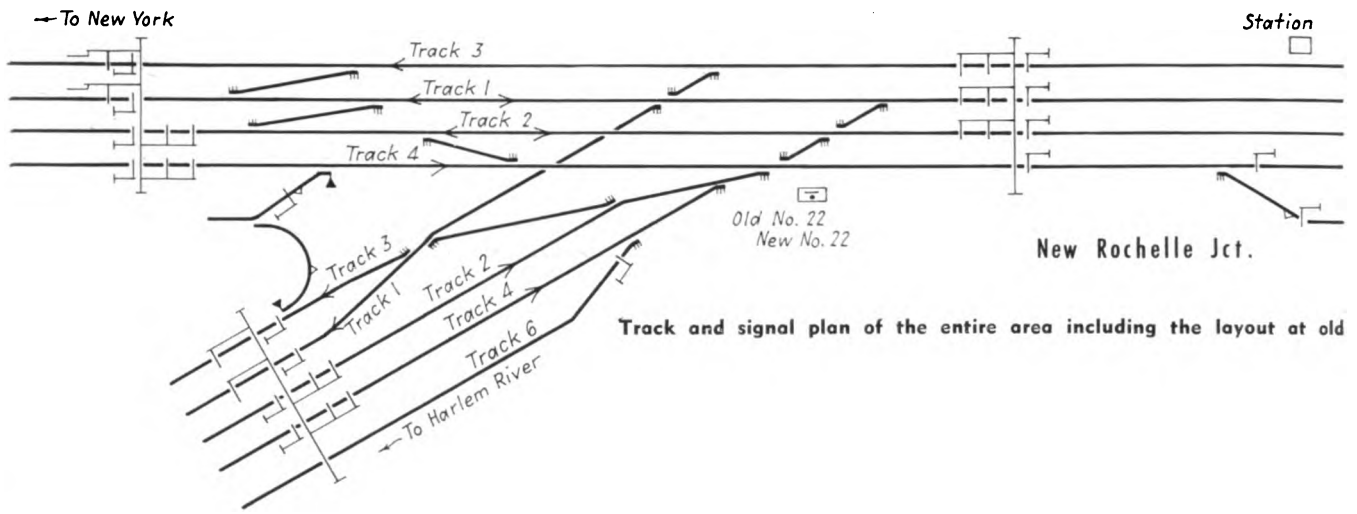
interlocking, originally installed in 1896, had been rebuilt several times, a new machine having been installed in 1921. This machine had 13 levers for operating 17 switches, 8 movable-point frogs, 8 levers for 17 F.P.L. and 2 bolt locks and 2 electric locks, and 14 levers for 16 signals. This No. 23 interlocking track layout included double-slips and switches used primarily to route trains to and from a small yard, used to terminate suburban trains and to serve local industries, freighthouses and coal yards.

## Layouts Simplified

The old interlockings were worn out and long past due for replacement, but the occasion to consolidate these interlockings into one new plant was brought about by a modernization of the track work, including the installation of new rail and the elimination of many of the previous movable-point frogs in favor of conventional crossovers. Therefore, rather than reconstruct the old interlockings to adapt them to the new track facilities, a new interlocking was installed. For example, in the limits



The new switch machines are the Model 5C



Track and signal plan of the entire area including the layout at old

of what was previously the old No. 23 interlocking, the track layout was simplified to six crossovers and 12 signals. At the previous No. 22 interlocking, changes were made in the track layout to eliminate one set of slips, add one crossover at the east end and two new crossovers, No. 21 and No. 23, at the west end, and move the home signals 600 ft. west to a location west of these new crossovers.

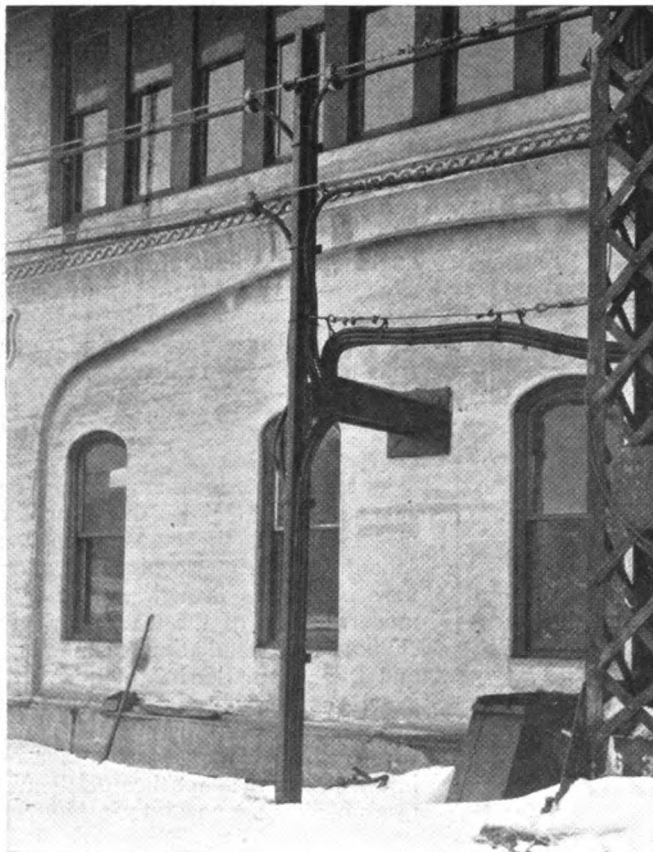
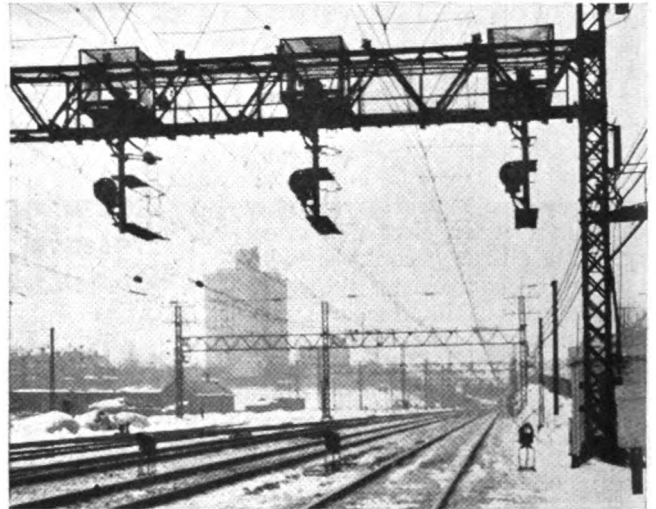
### All Controlled From One New Machine

In the new project, one all-relay type control machine in the tower at No. 22 now controls all the switches,

crossovers and signals throughout the two previous plants. This new machine has a panel 24 in. high and 80 in. long, as shown in one of the accompanying pictures. The illuminated

track diagram has lamps which indicate track occupancy. The machine has 19 switch levers to control 5 single switches, 13 crossovers and one combination of 2 movable-point frogs with

On the ground beneath each home signal there is a dwarf signal of the same number

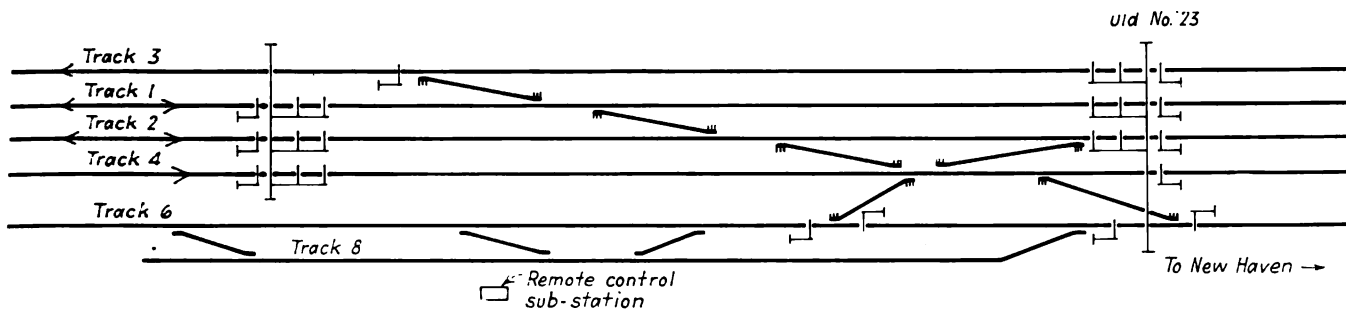


A special frame and support for cables at entrance to the No. 22 tower

1 single switch. There are 18 signal and lock levers below the switch levers; 15 levers control 24 signals, 2 levers control 2 signals and 2 locks and 1 lever controls a lock. Two traffic levers, at the right of the switch levers, control the direction of traffic on tracks 1 and 2 between New Rochelle and the next interlocking to the east.

### Signals and Switches

The signals on this new plant are the searchlight type. Those which govern train movements on high-speed routes are all high signals on overhead bridges. Each of these signals has two searchlight heads and both are capable of displaying red, yellow or green. On the ground, beneath each signal on a bridge, there is a dwarf signal of the same number, which normally displays purple, and can be controlled to display yellow as a "call-on" aspect or for a slow-speed



No. 22 and also the layout at what was previously interlocking No. 23

diverging route. Dwarf signals are also used on sidings and on secondary tracks.

The switch machines are the 110-volt d.c. type. Some of these machines which were in service previously are the Model-5A, and, as a part of the changeover, new controllers in cast-iron cases were added. The remainder of the switch machines are the Model-5C with the controller in the switch machine case.

The switch layouts are equipped with gage plates 1 in. by 7 in. Adjustable rail braces are used on three ties. On two ties the plates extend under the switch machines which fit between

two toe blocks on each plate. This maintains the position of the machine with respect to the rail. The new work includes the installation of Ramapo Ajax free-swivel No. 1 switch rods, which minimize rolling of the points.

### Direct-Wire Circuits

The tower at New Rochelle Junction, where the new interlocking control machine is located, is about 2,500 ft. from the relay house in the layout at the previous No. 23 plant. Direct wire control and indication circuits are used, and all practicable means were

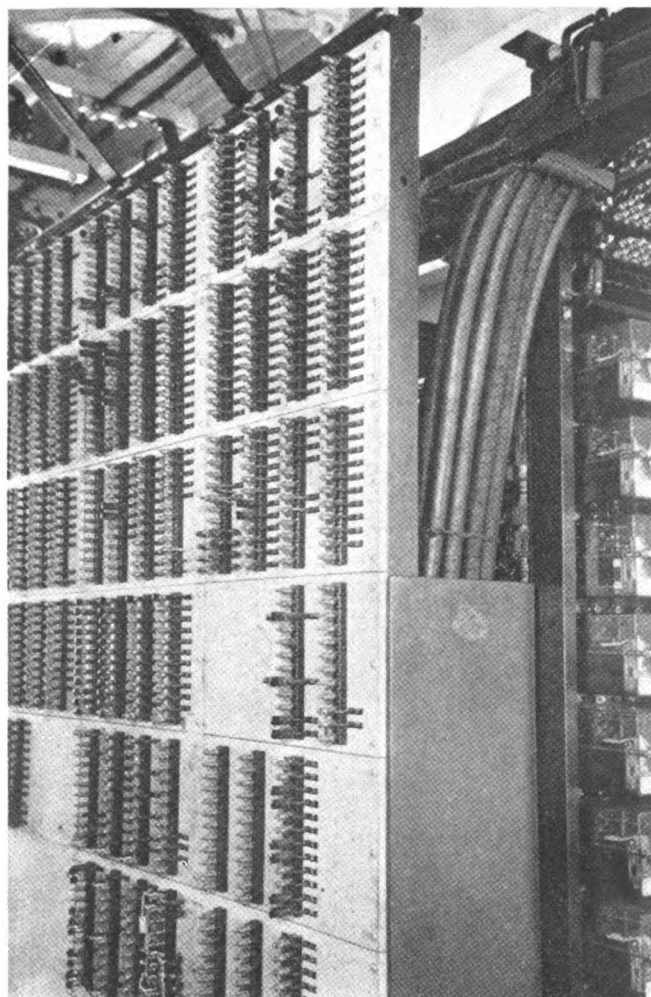
adopted to reduce the number of wires needed. The wires between the two plants are in two aerial cables each consisting of two No. 10 and 38 No. 14 conductors.

The two indications of a switch position are handled by a polar relay and a neutral relay controlled over one wire and common. Each switch is controlled to two positions by a polar circuit, using one wire and connection to common. After the switch is over and locked, the circuit is opened, and the wire back to the tower is used to handle a signal-clear indication.

A route-check network for the remote group is included with the cir-



Plug-in relays in racks



Terminal board in main tower



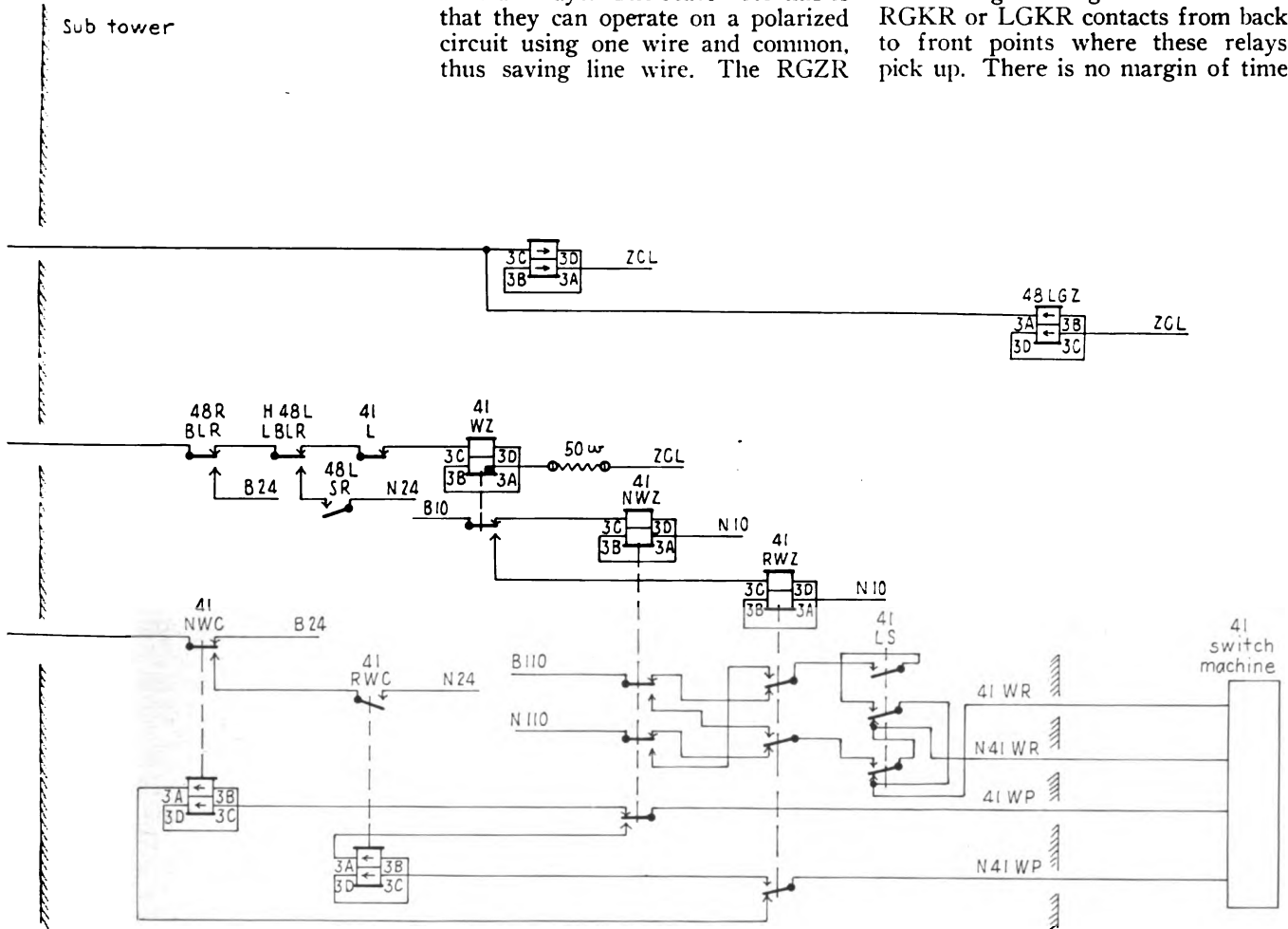
tact RC to negative battery N24.

Thus it can be seen that the 41WZR and 41CWZR are in correspondence with one another. 41LKR is held energized during the reversal, and is deenergized only if 48GKSR is energized or the field relay contacts in the circuit open up. The series relays are designed for operation on 12 volts.

of the right and left signal indication relays RGKR and LGKR. Whenever the GKS is picked up by the RC or stuck up because of a cleared signal, further manipulation of the switch lever can produce no results.

The signal control relays, RGZR and LGZR, for clearing signals governing train movements to the right and to the left, respectively, are biased neutral relays. The reason for this is that they can operate on a polarized circuit using one wire and common, thus saving line wire. The RGZR

lay is deenergized. The transmission of the signal indication over the WZ-GK wire is essentially the same as the transmission of the signal control over the GZ wire. Again a polarized circuit is used to control the two biased neutral relays, RGKR and LGKR in the control office, B24 or N24 being connected to the wire through RBLR and LBLR. The GKSR is made slow in releasing to bridge the shift in the RGKR or LGKR contacts from back to front points where these relays pick up. There is no margin of time



To compensate for lack of line resistance and to avoid excessive current flow in the ZCL wire, a 50-ohm rheostat is inserted in series with the 41CWZR and the 41WZR.

As previously stated, the one important addition to the unit-wire circuits is to prevent a signal control from getting out to the field unless the switch lever and its CWZR relay are in correspondence.

The route check relay RC is a standard neutral relay. It is normally deenergized. It picks up whenever the signal lever is pulled off and the switch control relay CWZ is in correspondence with the switch control lever. Once picked up, the RC is stuck up through its own front contact and the signal lever contact. After the RC picks up, the signal indication stick relay GKS picks up through a front of the RC and the back contacts

and LGZR are direct repeaters of their corresponding RC relays.

The signal indication relays, RGKR and LGKR, are energized when the corresponding signal clears and the associated red repeater of that signal is deenergized. The GKR is a biased neutral relay so that the two relays can be connected to one line wire on a polarized circuit, thus saving line wire. In addition to lighting the signal indication lamps on the control panel, these relays transfer the stick circuit of the GKSR from the control office to the field. Before the RGZR or LGZR can be energized, it is imperative that the switch lever and the CWZ be in correspondence. Under normal conditions this insures that the WZR in the field has responded to the switch call.

A short interval elapses before the signal clears and the red repeater re-

quired between the manipulation of the switch lever and the signal lever. These two operations can be simultaneous.

### Switch, Track and Lock Indication Circuits

The switch indications (normal and reverse) are taken over the NWCR or RWCR and one line wire to pole change a magnetic stick PWKR and energize a neutral WKR. With the NWCR energized, the PWKR is in the normal position. The switch normal indication is taken over the PWKR normal and the WKR energized. The switch reversed indication is taken over the PWKR reverse and the WKR energized.

The switch-correspondence relays, NWC and RWC, are biased neutral  
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N. C. The railroad forces: (1) plowed in the 248 mi. of underground cable for the carrier and C.T.C. circuit; (2) installed the switch machines; (3) placed the insulated joints; (4) installed the concrete signal foundations and the concrete houses; (5) installed all carrier equipment for the communication circuits, this including all the wiring in all concrete houses; (6) made changes and additions at interlockings and (7) installed the dispatcher's control machine and all equipment at Savannah office. The Union Switch & Signal Company furnished all the signaling apparatus including the C.T.C. line carrier equipment, and this company, in its factory, installed the wiring and apparatus in the sheet-metal houses, as well as in the cases for distant signals and cut sections.

The contractor, the R. H. Bouligay, Inc.: (1) assembled and erected the signals; (2) set the sheet-metal houses and cases; (3) dug in the underground cable for track connections and runs from instrument houses to switches and signals; (4) installed bootlegs; (5) installed the battery boxes at cut sections; (6) installed primary batteries and storage batteries; (7) connected the wires in cables in the houses, cases and switch machines; (8) set the electric locks on hand-throw switches; and (9) did the painting. The project as a whole was under the jurisdiction of J. R. DePriest, Superintendent Communications and Signals. J. E. Barker was General Signal Construction Supervisor. The signal and communications engineering force, under the direction of Mr. DePriest, planned and supervised the installation of the carrier apparatus. The principal items of signaling equipment on this project were furnished by the Union Switch & Signal Company.

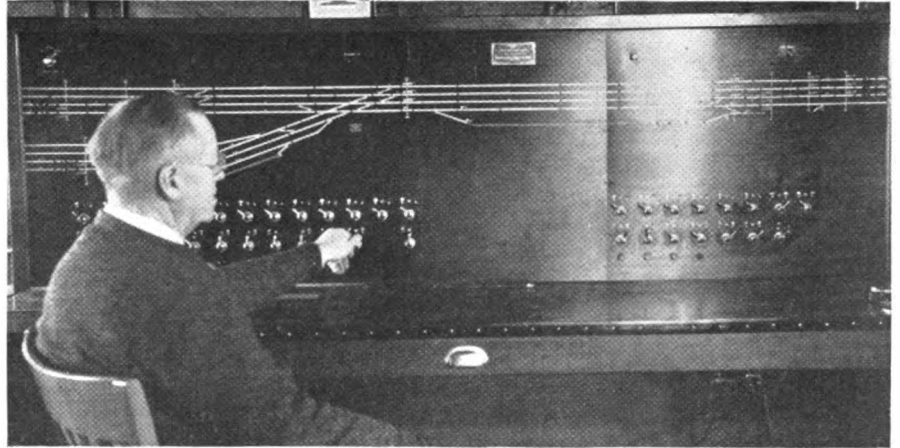
## New Haven Interlocking

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relays which check correspondence between the WZ relays and the position of the point detector in the switch machine. If the NWZR is energized, the RWZR deenergized and the switch points are normal then the NWCR is energized. If the RWZR is energized, the NWZR deenergized and the switch points reversed then the RWCR is energized. Nineteen track indications from the remote group are sent in by using bias neutral

at the former layout of interlocking No. 23 is designated as the remote station. All the relays in the new project are the quick-detachable plug-in type, which makes it practicable to replace a defective relay quickly and without a chance for making a mistake in wire connections. These considerations are important at this plant because of the heavy traffic, totaling about 265 train movements daily. The traffic is heavy westbound into New York in the morning, and heavy out-bound in the evening.

At the No. 22 tower the relays,



The new control machine is in tower at interlocking No. 22

relays, ten line wires and separate commons to split batteries. These new direct-wire circuits are an adaptation of typicals which were developed by engineers of the General Railway Signal Company.

### Relays, Racks and Housings

In the new project the old tower at interlocking No. 22 retains the designation No. 22, and the remote layout

about 476 in number, are mounted on panels on the ground floor of the buildings. These panels are arranged as the three walls of a room with the relays on the outside and the wiring and cables on the inside. One of the accompanying views shows this wiring. At the remote station the relays and batteries are in a new one-story brick building, 8.5 ft. by 23 ft., inside, located south of the track and about midway of the layout. About 260 relays are in this house.

The wiring in the relay racks and the tower is No. 16 flexible with 3/16-in. insulation of Okolite and a 1/64-in. covering of red Okoprene. The 110-volt d.c. circuit from the battery in the tower or remote housing to the switch machines is No. 6. The track circuit connections are No. 6 to Raco bootleg outlets with 3/8-in. 37-conductor stranded to plugs in the rail. The aerial cable from interlocking station No. 22 to the remote station includes two cables each consisting of two No. 10 and 38 No. 14 conductors.

This new interlocking was planned and installed by New Haven forces, the relays, switch machines and interlocking control machine being furnished by the General Railway Signal Company. The batteries were furnished by Exide and the insulated wire and cables by Okonite.



Rock Island uses crane on car to erect signals