Rock Island Completes 33-Lever Electric Interlocker

Plant in Chicago terminal relieves five switchtenders—Storage battery used for track circuits—Special circuits for dwarf signals

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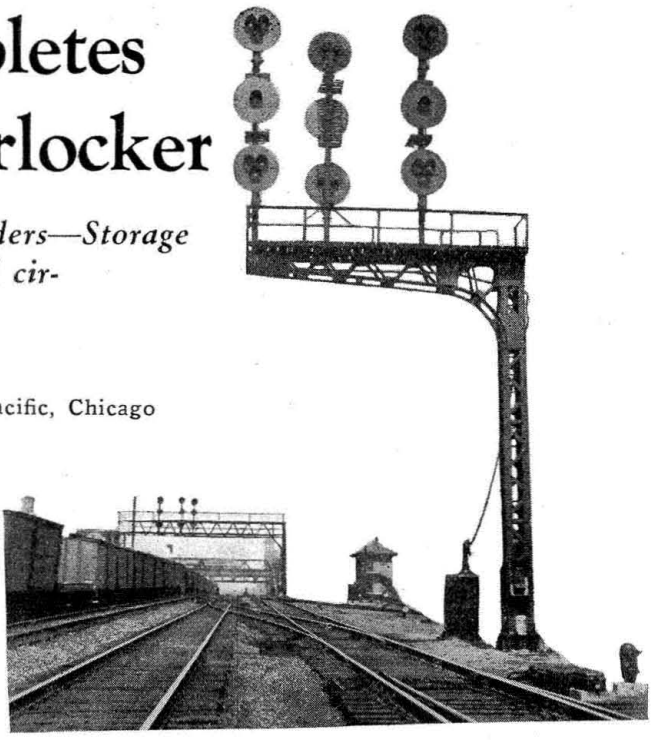


Root street plant from south
Northbound home signals

TO facilitate the handling of traffic in the busy Rock Island-New York Central joint terminal zone in Chicago (LaSalle street station to 63rd street), the Chicago, Rock Island & Pacific has installed a 33-lever Union Type-F electric interlocker at Root street (41st street). The construction of this interlocking is a part of the program already authorized for additional signaling on the joint terminal zone. In this jointly used zone, tracks three and four are signaled for one way operation and tracks two and five, normally freight mains, are signaled for either-direction operation, providing additional main tracks on which parallel inbound moves may be made during the morning rush suburban period; outbound during the evening period or at any other time that passenger traffic congestion warrants their use.

This multiple-track operation increased the importance of each hand-operated switch or crossover in this highly congested zone, and in the interest of proper control of operation, it became necessary to place all movements to or from the mains under the control of the levermen at the several interlocking plants in this terminal zone.

Because of this method of operation, several infrequently used crossovers were removed and the two main line crossovers, located near the entrance to the Rock Island coach yards, were relocated to a point where they could be operated by the 45th street interlocking. Remote-controlled electric locks were installed at the remaining switches, operated from the nearest interlocking plant.

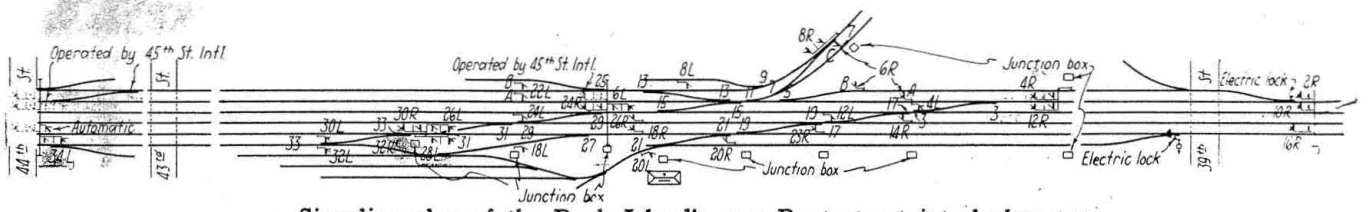
The Root street interlocking operates 10 crossovers and 5 switches formerly handled by two sets of switch tenders. Besides the through moves, traffic at this point comprises the movement of New York Central coach and equipment trains in and out of the coach yards, and all movements of stock trains to and from the double track connection with the Chicago Junction line to the Chicago stockyards. The installation of this interlocking released five switch tenders and provided safer and quicker operation for the heavy movement of trains across the four main tracks.

The interlocking tower is 15 ft. by 34 ft. in size and two stories high, with an English basement, making it the equivalent of a three-story building. The building is constructed of brick, with a tile roof, concrete being used for the floors of the first story, basement and basement walls. An exterior stairway, located at one end of the tower, is built entirely of steel, the treads and platforms being constructed of safety treads. The interlocking machine, power board, telephones and loud speaker phones are located in the upper story, while the relay cabinets, storage battery, rectifiers and maintainers' office are on the first floor. The English basement provides a large space for storage of stock material, maintainers' work shop, and the hot water heating plant.

Type of Machine and Control

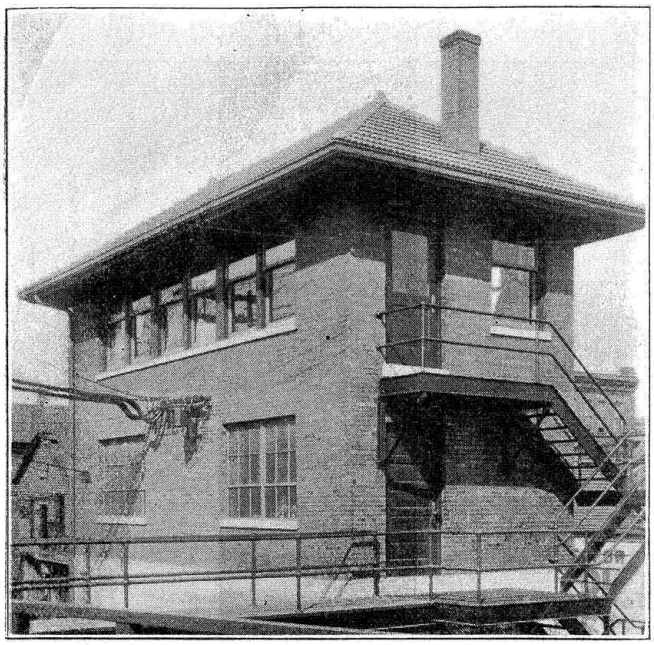
A Union Switch & Signal Company interlocking machine Type-F was installed, having 33 working levers and two spare spaces for the operation of the 10 crossovers, 5 single switches and 43 signals. Each switch lever is equipped with two separate indication magnets, that is, normal and reverse, one electric detector lock magnet and a lever light operating in multiple with the detector lock through a latch contact.

Signal levers are also equipped with lever lights in multiple with the indication time locking circuit, controlled by latch contacts. Circuits are arranged in such a way that when the signal lever is reversed the lamp will light up and immediately go out again if the signal operates to the clear position. In case



Signaling plan of the Rock Island's new Root street interlocker

the signal does not clear, the lamp will continue to burn, indicating to towermen that the signal has not responded to the reversal of the lever. The signal lever light also conveys to levermen an indication that a signal, which was in the proceed position, has changed to the stop indication after a train has entered the block over which the signal governs.



Exterior of Root street tower—Note stairway

The normal position of a switch lever is at the left and is operated to the right for the reversal of a switch. One lever is used for the operation of a single switch or both ends of a crossover. Signal levers are normally in the center or vertical position and operate to the right or left from center. With this method of signal lever operation and the type of control circuit used, it is possible to control all opposing or converging route signals by the one lever, except where the track arrangement permits parallel movements. With this scheme of operation, the number of signal levers is reduced to a minimum, permitting the use of a smaller interlocking machine. Each signal lever controlling the high-speed signals is equipped with a stick push button for operation of the slow-speed signals, when a follow-up movement is being made. For diverging routes, reversal of the lever only is all that is required.

An illuminated track diagram was installed having lights normally extinguished for each track circuit in the plant limits, and the approach track annunciator. The diagram cabinet was made large enough to permit mounting all of the clockwork releases on the lower portion.

Special Features of Signal Controls

All high-speed home signals are of the three-color light type. The slow-speed signals are two-color light. Where the three-unit aspect is required a one-color light is added in the middle. By referring to the track layout, it will be noted that dwarf signals are two-position for back-up movements on a one-direction track or yard lead, but for tracks *2* and *5* it was necessary to use three-position dwarf signals for switching purposes as well as main-line movements. In the case of dwarf *30L*, there was not sufficient space to permit the installation of a high signal. The use of dwarf signals, such as *18R* and *23R*, which are located between the high-speed signals *16R* and *30R*, made it necessary to design special control circuits which operate as follows:

The clear or caution indication of signal *16R* checks the reverse position of levers *18* and *23*, all track circuits and the normal position of all switches, as it would if dwarfs were not there; so that the high-speed signal can be used only for straight track movements. The three signals in the route will give the same indication at any one time, that is, yellow or green, depending on the position of the next signal in advance.

For a diverging route through switch *21* or *27*, the train is advanced by means of slow-speed signal *16R* and the dwarf signals in the caution position. The 90-deg. indication of these dwarfs are track circuit controlled, but the 45-deg. position is non-automatic. The red lens is placed in the upper position of a two-color dwarf, but in the three-color signal the arrangement is green at the top, red at the middle, and yellow at the bottom. This method places the red lens at a height where it is less liable to be obscured.

Switch Operation and Indication

With this type of an interlocking, the switch machine operating current is not carried out on the control wires, since their function is simply to operate the Type-F circuit controller which operates on the principle of a polarized relay. This permits the use of smaller wire for the switch controls. A pair of high-voltage bus-mains using large wires is run from the tower to each end of the plant, from which each switch receives energy for its operation, thereby insuring full voltage at the motor.

Interior of tower with illuminated track diagram over machine

The control of each switch is by means of a two-wire circuit between the lever and the Type-F controller at the switch. The lever contact arrangement,

being a pole-changer, causes the "F" controller to operate, when the change in polarity is made, on account of the switch lever being placed normal or reverse.

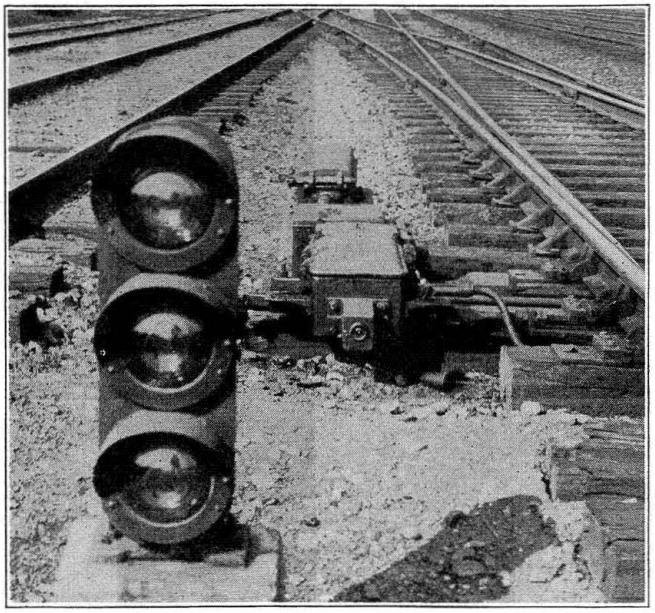
The indication that a switch has responded to the movement of a switch lever is also effected by means of a polarized circuit. Two separate wires are run from each switch to a special polar relay in the tower, having four neutral and four polar contacts. In this case the pole-changing contacts are at the switch, and operate only after the switch machine has completed the movement of the switch points and locked them in place. The lever indication lock magnets are controlled locally through this polarized relay in the tower.

The "SS" control scheme for signals was installed, whereby there is a continuous control of each signal by the switches, both facing and trailing point, in the route over which a signal governs. This is accomplished by breaking the signal control circuit through the "KR" switch indication relays for all switches over which the train movement is to be made. Indication-time locking was used on all signal levers and release-route locking on all switches.

Power and Battery Supply

A 440-volt, three-phase, 60-cycle power cable is run through this territory for the control of all signaling between 63rd street and 25th street. Power is obtained normally from the Rock Island shops at 47th street, but in an emergency, city power is available at the 45th street interlocking, where it can be cut in manually.

There are 57 cells of storage battery in the tower for operation of the switches. In addition there are two sets of line battery of five cells each, for operation of line circuits originating at the tower, lever lights, illuminated track diagram lights, lever locks and the remote-controlled switch locks. Junction boxes with large double-door instrument cases were used for the

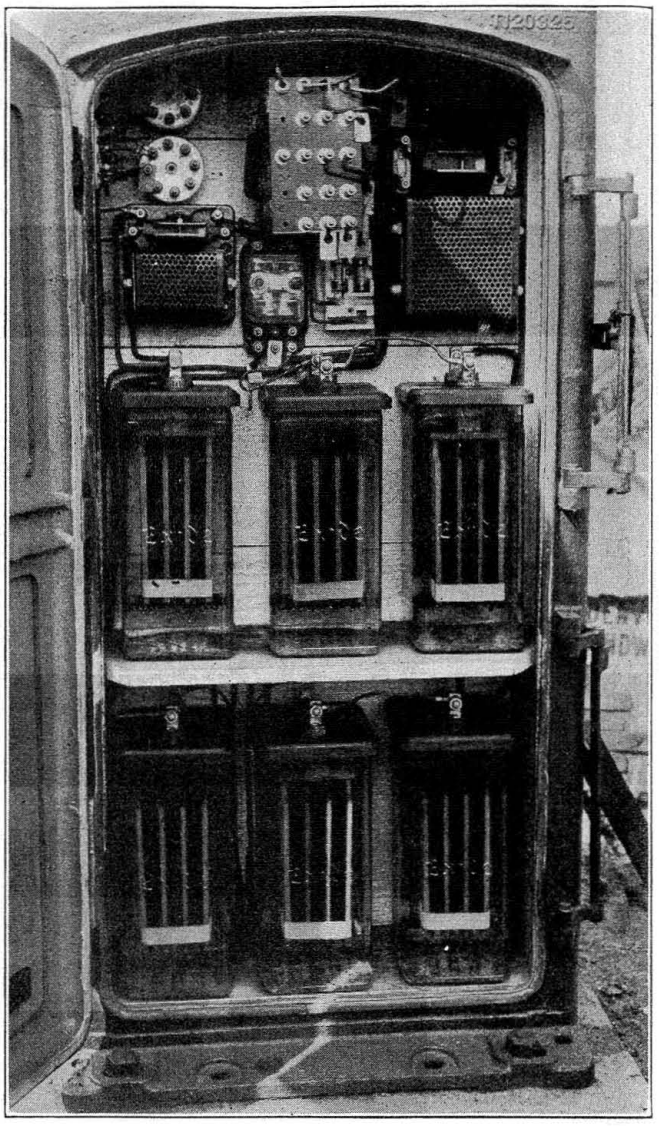


One of the three-position dwarf signals

several groups of functions shown in the illustration. Storage batteries, transformers, rectifiers, and relays for each group were housed in the same case.

The storage batteries are the Exide chloride accumulator Type-EMGO-7, in sealed glass jars, having 120 amp.-hr. capacity, the same size being used throughout the plant. The rectifiers for the floating charge of the battery are the "Union" copper-oxide type, Style-RP20 for the plant battery, Style-RX21 for the line battery and Style-RX10 for the track battery.

The transformers located in the junction cases operate direct from the 440-volt power line and have four secondaries, one for the five-cell charging circuit, two for one-cell charging, while the fourth furnishes



Storage battery and charging equipment at one of the signal locations

power for the signal lamps. The signal lights are normally operated by a-c., but at each junction case there is a five-cell set of storage batteries serving as a reserve, transfer being made by means of a two-point a-c. relay. When the power supply fails, all line circuits originating at a junction box obtain energy from this same battery.

Storage batteries are used for the track circuits, one cell feeding two or three of the track circuits, selected so that the same cell will not be operating parallel sections on adjacent tracks or two circuits on the same track. Separate resistance units are inserted in each track wire lead.

Two Types of Wire Distribution Used

For the south end of the plant it was necessary to use underground armored cable for all circuits.

Several leads of 10-conductor No. 14 were used for line circuits and switch controls. Through leads of two-conductor No. 9 were installed for the alternating-current power, the high-voltage battery bus, and the low-voltage common.

North of the tower the type of construction used is what might be termed as loose wire cable, supported by a copperweld messenger and cable clips. With this type of cable it is not necessary to have complete plans drawn in order to determine the correct number and sizes of wire, as is required when a manufactured cable is used. For example, there are 125 No. 14 wires running north from the tower junction pole, this amount reducing in number at each junction box, thus avoiding the necessity of running various sizes of cables.

Cross-lead wires from a junction box to a switch, a signal or a track connection are underground armored cable. Number 14 wire is used for all circuits except the 110-volt switch feeds and the track connections, which are No. 9. All the cables to a switch are terminated in the Type-F controller, and the one centrally located in a group of switches serves as a distributing point for the high-voltage battery wire and battery "low."

The type of track circuit bootleg used by the Rock Island is simple and inexpensive. It consists of a piece of two-inch galvanized iron pipe, length two feet six inches, with the bottom end split and flared out four ways to form a base. A soldered joint is made connecting the bootleg wire to the cable wire, taped and pulled back into pipe, which is then filled with petroleum asphaltum. To prevent grounding of the wire on the pipe, a wood plug with a hole in the center for the wire, is driven in the top of the pipe while the sealing compound is warm.

Signal and Train Control Hearing Ends

Railroad representatives contend that issuance of further orders be withheld to permit exercise of individual judgment

WASHINGTON, D. C.

THE hearing before Division 6 of the Interstate Commerce Commission in connection with its investigation of the adequacy of existing installations of automatic block signals and automatic train-control devices was brought to a close on April 30 after representatives of most of the 168 respondent railroads had urged the commission not to issue orders requiring any further installations at this time.

The large increase in fatalities at highway grade crossings was emphasized by a large proportion of those who testified as presenting a problem requiring large expenditures by the railroads, in contrast with the remarkable improvement that has been brought about in recent years in the safety of train operation. Also the large capital expenditures for general improvements were described as tending to promote safety and the commission was asked to leave the managements free to distribute the expenditure of the available funds in the ways which in their judgment would produce the best results.

While many roads indicated their intention of extending their installations of automatic block signals or to experiment further with the use of cab signals, and many said that the automatic train control devices they had installed have been satisfactory, the opinion was generally expressed that there are more pressing needs for the use of the money available in other directions, and several testified that greater results per dollar of expenditure could be obtained by extending their signal installations rather than automatic train-control.

At the conclusion of the hearing R. H. Aishton, chairman of the executive committee of the Association of Railway Executives, presented a statement calling attention to the great progress in safety made during the past eight years, culminating in 1927 in the best record ever established, and recommending that the issuance of any additional formal orders requiring the installation of automatic train-control or other forms of safety appliances be withheld at this time, so as to permit the managements to exercise their own judgment in determining what expenditures can be made that will attain the highest degree of safety. An abstract of Mr. Aishton's statement follows:

"Despite the hundreds of millions of persons who ride on the railroads each year, only 10 were killed in train accidents in 1927, a new low record for any one year and a decrease of 69 under 1926. An improvement in safety among employees was also reported in 1927.

"When it is taken into consideration that during the past eight years freight speed between terminals increased 19 per cent, freight car miles per day increased 20 per cent, and gross ton-miles per freight train-hour increased 47.5 per cent, the results obtained in safety to those using the service, or employed in the operation of trains are a growing indication that the efforts of the railways in directing expenditures to those things which will produce the greatest measure of safety have been productive of a commendable result, and need no further justification as to their having been made in directions best promoting the public interest."

Mr. Aishton told the commission that in the past eight years the railroads have expended $323,701,000 of new capital for safety purposes, of which, all except $22,395,000 have been expended voluntarily by the individual managements and without orders from the commission, for various safety devices such as automatic and other signals, interlocking plants, crossing signals, highway grade separation, and the extension of automatic train control beyond the two orders that have already been issued by the commission. Mr. Aishton explained that the $22,395,000 represented the cost of automatic train control devices installed by the various railroads in response to the orders of the Interstate Commerce Commission.

"This statement of capital expenditures," he continued, "is limited to the period January 1, 1920, to January 1, 1928, and therefore does not take into consideration similar capital expenditures for installations prior to 1920. The figures so far presented take account only of the capital cost of physical installations, and have no reference to annual charges for operation, maintenance, and retirements. Annual expenditures for

*For a report of earlier sessions of this hearing see *Railway Signaling* for May, page 177.