

Entrance-Exit Interlocking

Installed on Missouri Pacific

At Kansas City, the Missouri Pacific has installed a modern all-relay electric interlocking including entrance-exit circuits and control machine. Direct-wire controls are used for the switches and signals in the vicinity of the tower, and coded line control for the more remote layouts. The track layout of this plant extends 11,000 ft. along the south side of the Missouri river, three main tracks being included throughout this 2 mi. between Troost avenue and Santa Fe street. The Missouri Pacific's Topping avenue yard is to the east of Troost avenue, and the Cypress yards and freight houses, as well as connection to yards of the Rock Island, the Union Pacific and the Frisco to the west and south, re-

spectively of Santa Fe street. The main tracks are owned by the Missouri Pacific, but trackage rights have been granted to the Rock Island throughout the entire plant.

No passenger trains are operated over the new interlocking, and the only road freight trains are those of the

Direct-wire control in tower area and coded line control for remote layouts in plant 11,000 ft. long involving 11 switches, 17 crossovers, 1 m.p.f., 3 derails and 40 home signals in heavy traffic zone

Missouri Pacific going from Topping avenue yards to the line to Atchison and Omaha which branches off to the north just west of Broadway tower, and through freight trains of the Rock Island which operate over the entire territory. For the most part, however, this new interlocking is used for switching operations to serve the produce yard and to make transfers between yards. In addition to the Missouri Pacific crews, transfer crews of 11 other railroads operate in this area including the Rock Island, Santa Fe, Frisco, Union Pacific, Burlington, Chicago Great Western, Kansas City Southern, Wabash, Katy, the Milwaukee and the G.M. & O.

Three Groups Included

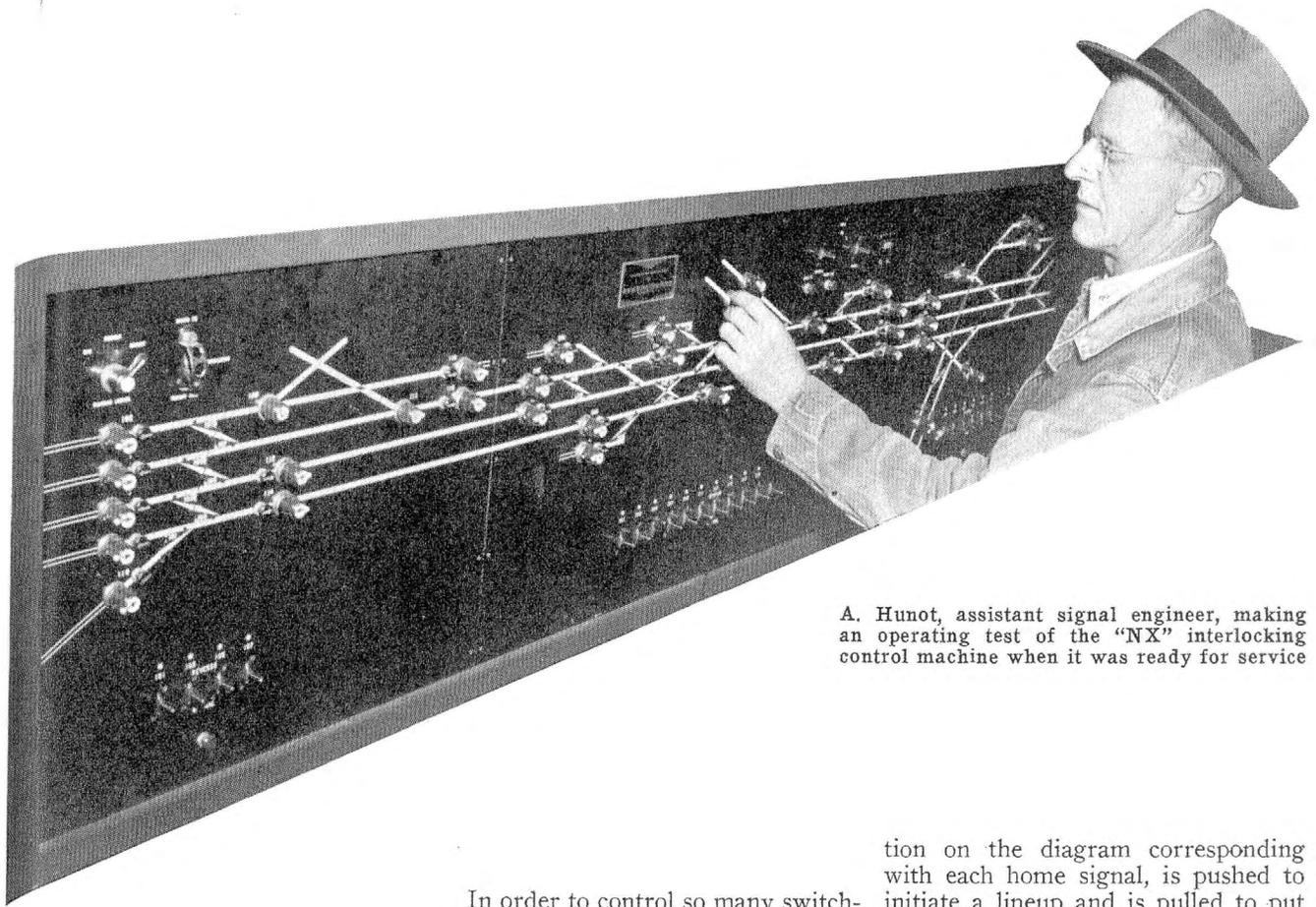
Previously, for 20 years, there was an electric interlocking at Broadway, which included certain switches and crossovers in the immediate vicinity of the tower. Throughout the years, the number of trains, switching and transfer movements through this area gradually increased. Normally, there are about 250 to 300 moves in 24 hr., with a maximum of up to about 400, with some of the operations being bunched during certain hours in the morning and evening. In order to handle the through Rock Island traffic with a minimum of delay and least interference to other movements, it was decided to replace the old unit-lever type interlocking with an all new electric interlocking extended to include not only the area in the vicinity of Broadway tower, but also the entire territory between Troost avenue and Santa Fe street, as shown in the accompanying plan. The layout, as a whole consists of three groups of interlocked switches and signals, at Santa Fe street, the group in the vicin-



The signals are the searchlight type dwarfs



Dual-control electric switch machine



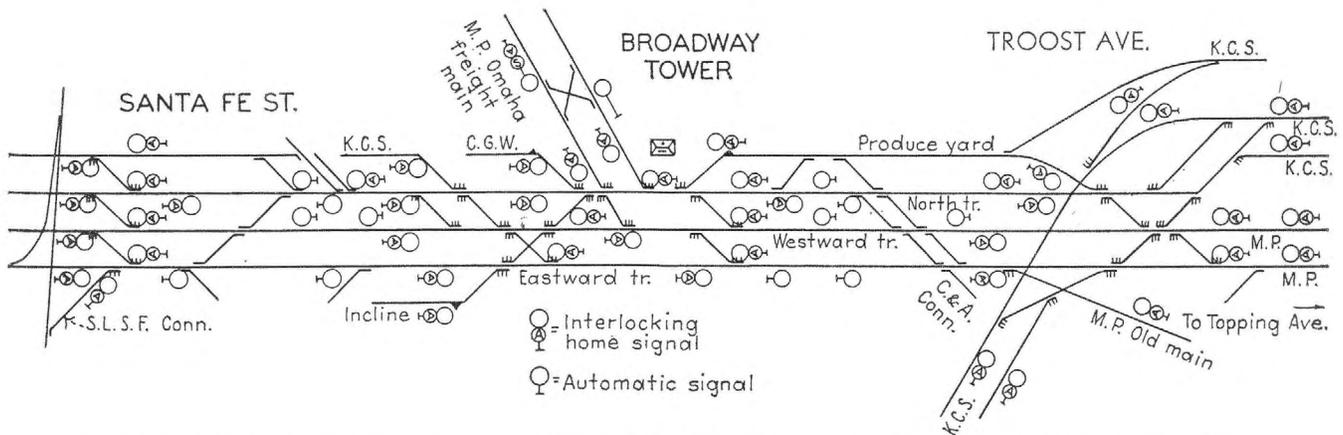
A. Hunot, assistant signal engineer, making an operating test of the "NX" interlocking control machine when it was ready for service

ity of the tower at Broadway and the group in the vicinity of Troost avenue. This entire layout includes 40 home signals and 49 electric switch machines on 3 derails, 10 single switches, 17 crossovers and one combined m.p.f. with single switch. The plant includes protection for the railroad crossing at grade with the Kansas City Southern at Troost avenue. In addition, automatic block protection is provided in both directions on the north track and with the current of traffic on the two south tracks, between Broadway and Troost avenue and between Broadway and Santa Fe street.

In order to control so many switches and signals over an area two miles long, involving numerous train movements, it was decided that the new plant should be controlled by the entrance-exit system, in which the switches and signals for an entire route can be controlled merely by pushing an entrance knob and an exit button on the machine. The control machine, as shown in one of the accompanying pictures, consists of a panel 18½ in. high and 81 in. long. On this panel the tracks are represented by white lines, and switches and crossovers are represented by movable segments which are electrically operated to show the route lined. An entrance knob, located at the posi-

tion on the diagram corresponding with each home signal, is pushed to initiate a lineup and is pulled to put the signal to stop.

When the towerman has been informed that a train or a transfer cut is ready to use a route, he manipulates the machine as follows. First he pushes the knob representing the home signal at which the train is to enter; then he pushes the button representing the exit from the home signal limits. The switches and crossovers which are not already in the position called for, are operated simultaneously so that the track lineup is completed within a few seconds. With 24-volts on the motor, a switch will operate in about 7 sec. When setting up a route involving 11 switch machines, they were all over and locked in 9 sec. When the switch-



Track and signal plan of the entire plant between Santa Fe street and Troost avenue controlled from Broadway

es are lined, the signal clears, and is indicated in the face of the knob representing the home signal by an arrow indicating green and pointing in the direction in which the signal governs.

Includes Electric Locking

Adjacent to the track symbol for each switch, there is a small red lamp which is lighted to indicate that electric locking is in effect as applied to that switch. Approach locking is provided on routes approaching the interlocked groups of switches and time locking is used on other routes leading from non-track circuited spurs, or where full approach track circuits are not available. Trains occupying track circuits on any portion of the installation are indicated by small opal lamps in the corresponding sections of the track diagram on the panel.

After a train departs from home signal limits, the signal will not again clear automatically, and, therefore, if there is a following train to use the

same route, the operator must again push the buttons.

If a route which has been lined up is to be "taken away," the operator pulls the entrance knob which sets the signal to "Stop" and initiates the time or approach locking.

Individual Control of Switches

In the area at the lower part of the panel, there are rows of small toggle-type levers, each of which is for the individual control of a switch or crossover, when a maintainer is making tests or adjustments on the corresponding switch or crossover. Above each of these levers there is a small opal lamp which is lighted while the corresponding switch machine is in operation. In other words, this lamp is lighted during the period while the switch is out of correspondence with the control established either by NX or the test lever. If one of these lamps stays lighted, this indicates to the towerman that the switch has not com-

pleted its operation to correspond with the controls.

The switches and signals near the tower at Broadway are controlled by direct-wire circuits, but coded line circuits are used between the tower and the outlying layouts. One two-wire circuit handles the outgoing control codes from the tower to Troost avenue and to Santa Fe street. Separate two-wire indication circuits extend to Troost avenue and to Santa Fe street. A control or indication cycle takes from 4 to 4½ seconds.

At Santa Fe street one cycle is required for switch and signal controls and two cycles for indications, while at Troost avenue, three cycles are required for switch and signal controls and three cycles for switch and signal indications; however, the circuits are so arranged that if the switches are in the desired position, transmission of switch control cycles and switch indication cycles are eliminated.

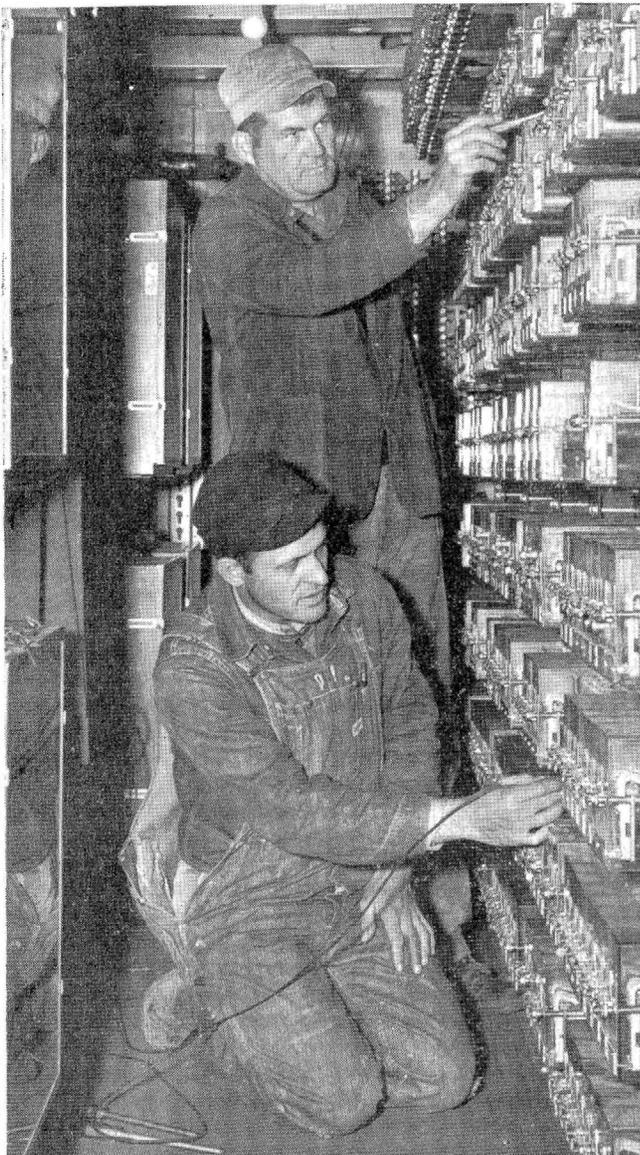
Instrument Housing

At Broadway, the relays and coding equipment are in an 8-ft. by 18-ft. sheet-metal house near the old tower building; at Troost avenue in an 8-ft. by 16-ft. house; and at Santa Fe street in an 8-ft. by 12-ft. house. As shown in one of the pictures, the relays in these houses are modern plug-in types, while at the intermediate signal locations, wall-type relays are used. The switch machines in the vicinity of Broadway are operated from three banks of 120-a.h. storage battery, one located at the tower, one at the east group of switches and one at the west group of switches. A similar battery is located at Santa Fe street to operate the switches at that location, and two sets are used at Troost avenue. Each track circuit is operated by a 60-a.h. storage battery and the local battery for operation of the NX and coded apparatus at Broadway consists of two sets of 12 cells of 120-a.h., connected in parallel. These are Exide lead batteries.

Jeep Trench Digger

In the vicinity of Broadway, the right-of-way is underlaid with solid rock, and, therefore, the main cables are run on aerial messengers. Elsewhere the cables are buried in trenches. A special trench digging machine, built into a Jeep, was used to dig these trenches, 10 in. wide and 30 in. deep.

This new installation was installed by railroad forces, under the jurisdiction of L. S. Werthmuller, signal engineer, R. M. Spillman was in charge of field work, and R. J. Shaw and P. Pugh were foremen. The major items of signal equipment were furnished by the General Railway Signal Co.



Al Kohlberg and Otis Zaleuke, signalmen testing new plug-in type relay in houses