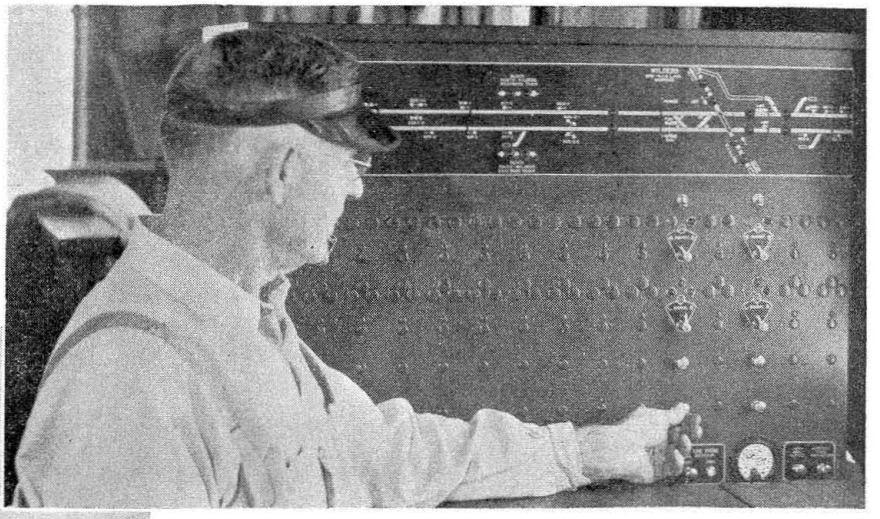
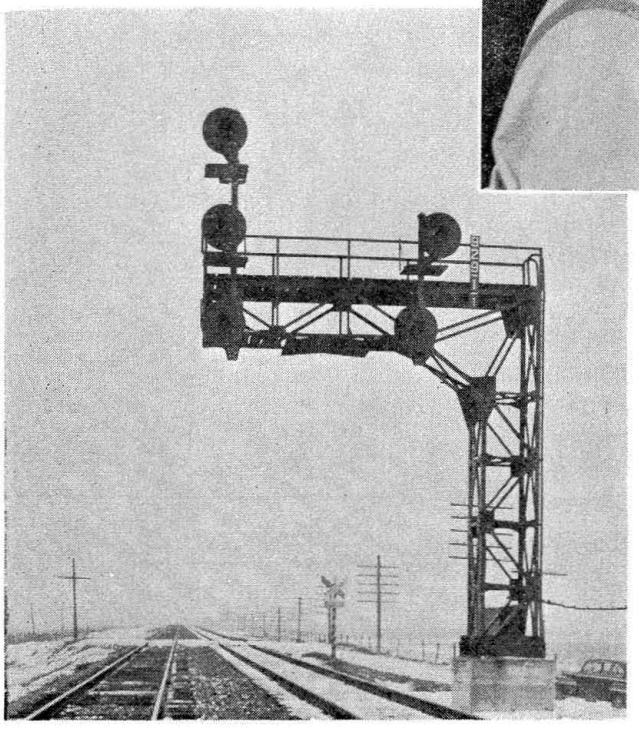


Right—Control machine in tower at Kouts, controls interlocking at Wilders and also signals for operation of trains of both directions on both tracks between Wilders and Kouts. Below—Westbound signals for both tracks at first intermediate, 9,850 ft. east of the home signal at Kouts

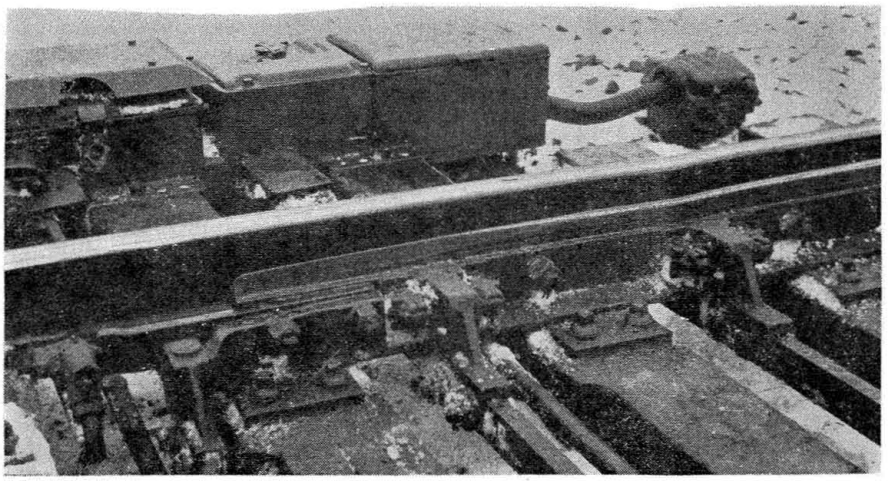


**Automatic interlocking circuits protect crossing with the Monon, Erie crossovers and signals as well as traffic locking being controlled from a tower seven miles away**

# Remote Control and Reverse Running *On the Erie*

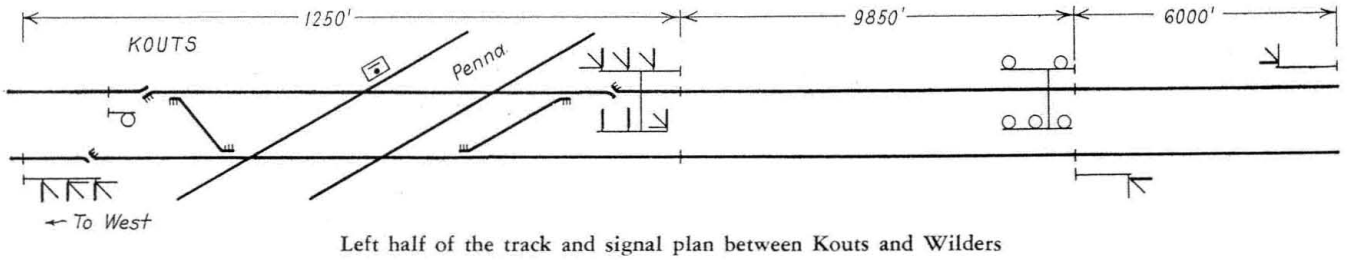
At Wilders, Ind., 63 miles east of Chicago, the Erie has replaced an electric interlocking with a combination automatic and remote-control interlocking, and the project includes either-direction signaling on both of the two main tracks for 7.4 miles. The interlocking layout includes two crossovers, between the Erie main tracks, and a crossing with a single track of the Chicago, Indianapolis & Louisville, otherwise known as the Monon. The old interlocking, installed in 1905, was an early Model-2 of the General Railway Signal Company. Although it had served well for 40 years, extensive repairs and replacements, including a new tower, were in order. Rather than build a new tower and provide a new interlocking machine, a decision was made to simplify the track layout, and provide all-relay circuits in which the crossovers and interlocking signals on the Erie are controlled remotely from a new panel machine at Kouts, 7.4 miles west, and the home signals on the Monon are controlled automatically, the same as in an automatic interlocking.

As part of the improvements, the main-track derails on both the Erie and the Monon were removed, and the Erie facing-point crossover, which was east of the crossing, was moved to a new location west of the crossing, as shown on the accompanying plan. The signaling on the Erie was rearranged, and reverse approach signals were installed on both tracks, which are equipped with traffic direction locking to run trains by signal indication, in both directions on both tracks between Wilders and Kouts. By this means, when there are two trains of the same direction being operated at different speeds, the faster one can be run around the slower, and yet keep both trains moving. For example, a westbound freight train can be crossed over at Wilders to run to Kouts on the normally eastward track, while a westbound passenger train, on the normally westward track, runs around the freight between Wilders and Kouts. Then at Kouts, the freight is crossed back to the west-



Switches are equipped with free-swiveling vertical rods including pins set vertically and designed to minimize "rolling" of points

ward track. Corresponding eastward moves can be made between Kouts and Wilders. This arrangement saves not only train time, but also the cost of constructing and maintaining a passing track. As a matter of fact, there is no passing track in this general vicinity, the nearest one being at North Judson, which is 6.9 miles east of Wilders, and the next nearest is at Crown Point, which is 18 miles west of Kouts.




Left half of the track and signal plan between Kouts and Wilders

### Traffic-Direction Locking

The signals for authorizing trains to operate in both directions on both tracks between Wilders and Kouts are all controlled from Kouts. The traffic-direction circuits, one for each track, are of the two-wire type with battery normally connected at Kouts and at Wilders. When a train is to be operated eastward, for example, contacts at Kouts are operated to connect an eastward traffic relay to the traffic direction line circuit for that track, and at the same time remove battery from that end of the circuit. The line wires are broken through contacts of all track relays on that track between Wilders and Kouts, therefore, traffic cannot be changed after a train has accepted a signal or entered a track circuit, until the train passes out of the station-to-station block.

Lamps on the track diagram at Kouts indicate that traffic direction is established in a certain direction and that the station-to-station block is occupied.

Intermediate signals are provided for both directions on both tracks so that these signals serve not only as interlocking distant signals, but also permit following moves under automatic block signal protection. These signals are equipped to display the Approach-Medium aspect when the home signal is displaying the Medium-Clear aspect for a diverging move over a crossover. This provision of the Approach-Medium aspects gives the enginemen advance information so that they can bring their trains up to and through the crossovers at the speeds for which they are designed. Whereas if only the Approach aspect were provided on the distant signals, the enginemen would be required to reduce speed at the distant signals, and approach the home signals prepared to stop.

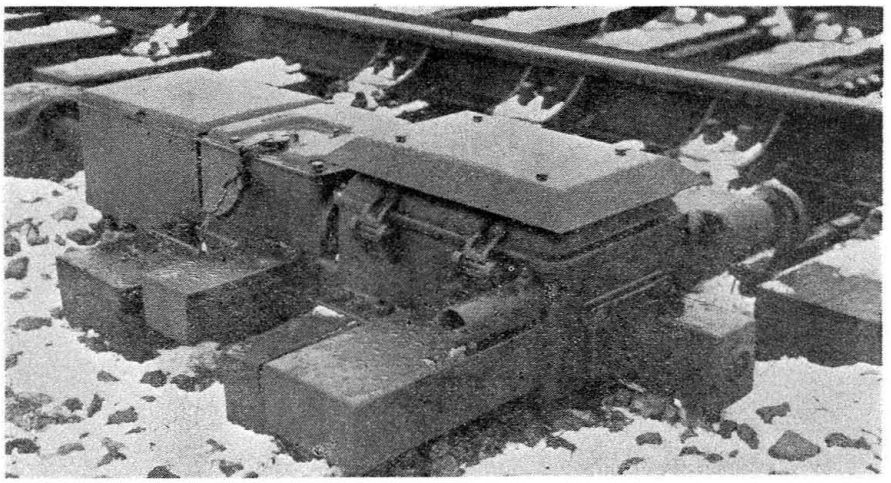
### Control of Erie Home Signals and Crossovers

The home signals and the crossovers on the Erie at Wilders interlocking are controlled remotely from a panel type machine in the tower at Kouts which is 7.4 miles west of Wilders. The controls are sent and indications are returned by the Union Switch & Signal Company type 504-B time code system using two No. 8 weatherproof copper line wires between Kouts and Wilders. This coding system has three field stations at Wilders, one station controls the two crossovers with return indication, the second station controls the home signals on the Erie, and the third station sends in the indications of the Monon signals.

A telephone circuit, operating at ordinary voice frequency, is superimposed on the code line circuit between Kouts and Wilders. One telephone is located in the tower at Kouts, a second at the first intermediate signal location, a third at the next intermediate location, and a fourth in the telephone booth in the instrument house near the crossing at Wilders. When the towerman wants to call any one at Wilders, he uses the coding system to light a call light on the track side of the instrument house at Wilders. When a man at any of the field telephones wants to call the towerman at Kouts, he removes the telephone receiver from its hook and presses a button located on the front of the telephone. This causes a tone signal to be placed on the code line, which actuates a voice-frequency relay at Kouts, and causes a bell to ring and a light to be lighted on the control machine panel which calls the towerman's attention to his telephone.

One of the accompanying pictures shows the panel of the new control machine at Kouts, which has an illuminated track diagram including the entire area from Kouts to Wilders as well as the interlocking at Wilders. There are two switch levers, one for each of the two crossovers at Wilders. The two signal levers, one for each Erie track, are normally on center and operate to the left to clear westward signals, or to the right to clear eastward signals.

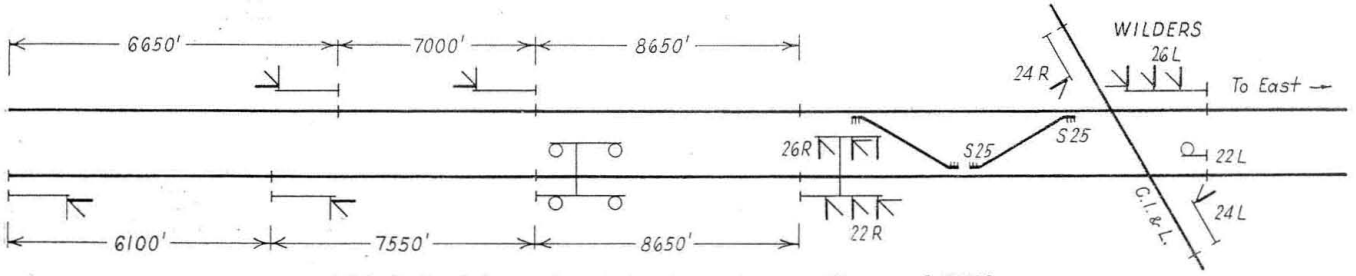
Referring for example to the west-



Right—A picture of one of the switch machines illustrating the special iron cover mounted on the top of the circuit controller compartment to provide air space as a means of preventing condensation of moisture on the contacts

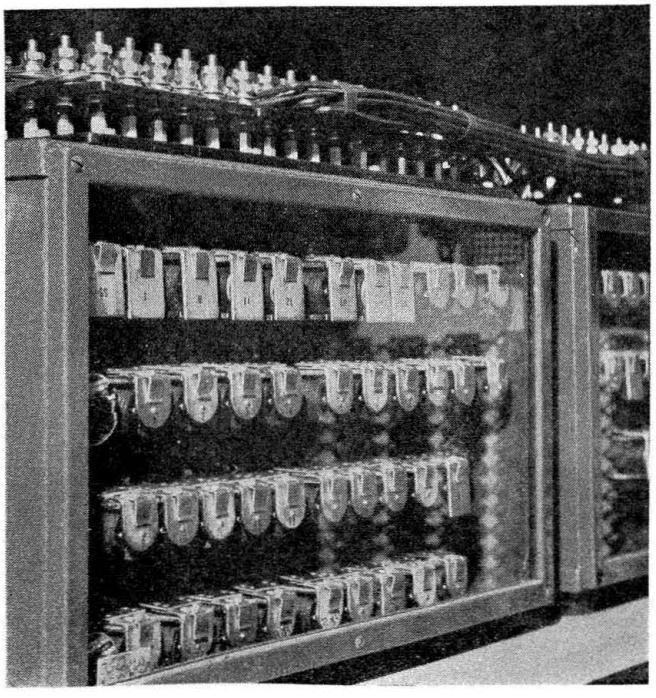
ward home signal 26L on the Erie at Wilders. The top "arm" 26LA governs over the straight track route. The second "arm" 26LB governs over crossover 25 reversed. The bottom arm 26LC is a Restricting signal which is for closing up following trains in an occupied block. In order for 26LC to display a proceed aspect, either the top arm or the second arm must previously have been cleared for a preceding train which is still occupying the block, and also the towerman must position the levers as well as pull a special "call-on" button before pushing the code sending button to send out the code control.

The four new switch machines on the crossovers at Wilders are the Union Switch & Signal Company, Model M-2 with motors rated at 24 volts d.c. Each of these machines is equipped with a special sheet-metal air-space cover over the controller compartment. The purpose of this extra cover is to prevent condensation of moisture in the controller case when hot water is discharged from passing locomotives. This special cover is attached by four machine screws which pass through pipe spacers about 2 in. long thus providing about 2-in. air space between this special cover and the cover of the controller case.




Right half of the track and signal plan between Kouts and Wilders

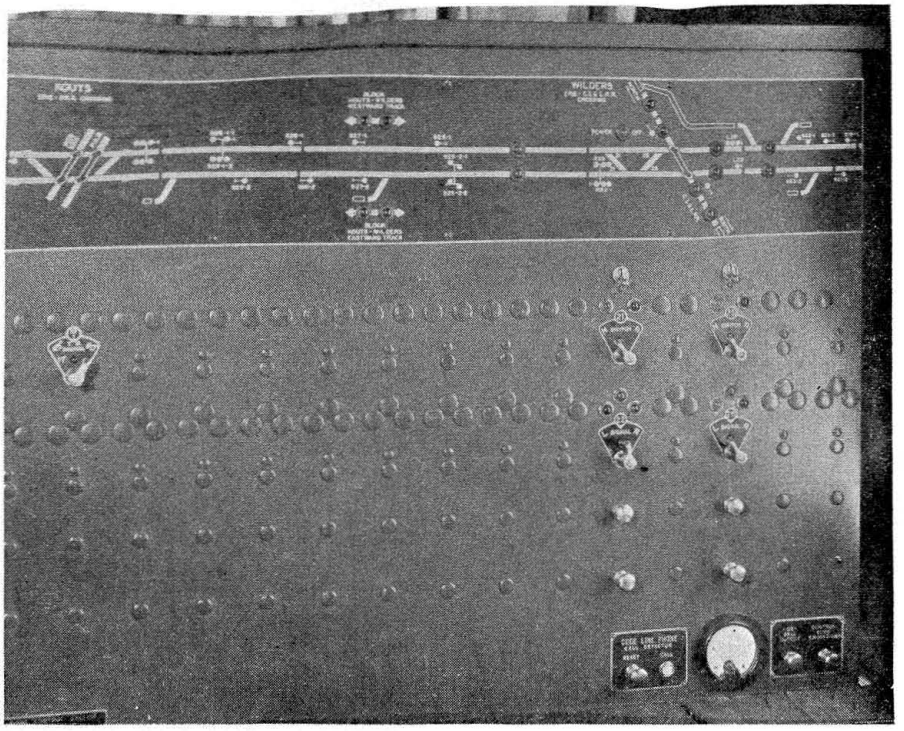
As shown in one of the accompanying pictures, Racor Type M and MF clips, with vertical pins to prevent rolling of the switch points, are used on the front rod and the first two tie rods.



Close-up view of line coding equipment in house at Wilders

### The Automatic Part of the Wilders Plant

The interlocking between the home signals on the C.I.&L. and the home signals on the Erie is all automatic, the same as at an automatic interlocking at any crossing of two railroads. The automatic interlocking circuits are based on the stick relay scheme similar to the Signal Section, A.A.R. standard practice. This is a branch line of the C.I.&L. which has only one local freight each way daily except Sunday. In consideration of this light traffic, the automatic controls on the C.I.&L. are short. As shown on the diagram, the distant signals are fixed blades. In approach to northward home signal 24L there is a track circuit 250 ft. long, and in approach to southward home signal 24R, a track circuit 230 ft. long. The approach end of each of these track circuits is marked by a wayside sign reading "Circuit." If a C.I.&L. train has switching to do, the



The control machine at Kouts includes an illuminating track diagram of the entire territory

train does not pass its "Circuit" sign and, therefore, does not affect the automatic controls to hold out the trains on the Erie. When a C.I.&L. train is ready to pass over the crossing, the front truck or more of the locomotive is pulled past the respective "Circuit" sign onto the short 250-ft. circuit. This shunts the track circuit, and actuates the automatic interlocking circuits so that if no home signal on the Erie is cleared, then the C.I.&L. signal will clear. On account of the short length of the C.I.&L. circuits, 230 ft. and 250 ft., a train making a movement directly through the plant must stop on the short circuit, or reduce to very low speed, prepared to stop at the home signal.

### No Directional Release

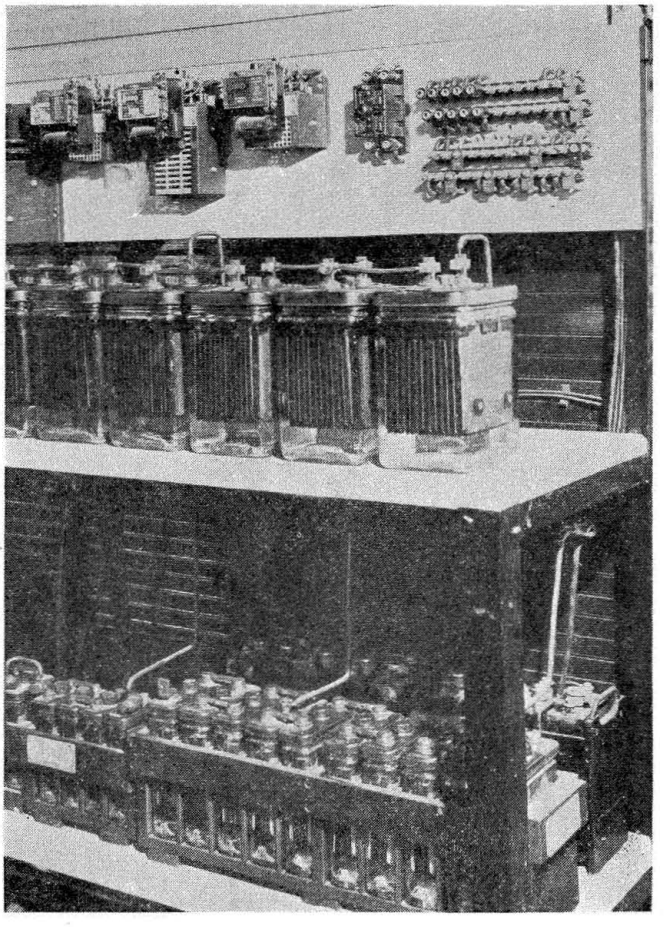
When a home signal on the C.I.&L. has been cleared automatically, no interlocking signal on the Erie can clear until the C.I.&L. train has passed through the home signal limits. In this manner, no directional release features are required, thus simplifying the circuits. The possible delay to Erie trains is not important because of the short circuits, 250 ft., and because of the few trains on the Monon.

The dead section over the crossing is more than 35 ft. long and, therefore, trap circuit arrangements were installed so that if a train accepts a signal, and enters the home signal limits, it must pass on through the home signal limits in order to release the plant. If a switching move is made in a way that the trap circuit is not released, then a release must be effected by a trainman placing his switch padlock key in a controller and turning it. This key controller is equipped with two switch key operated contacts, one for the C.I.&L. and the other for the Erie, and is located in the telephone booth. Before using the key controller, the trainman or conductor must telephone to the man in charge of the control machine at Kouts, and tell him of the circumstances. The man at Kouts knows that the plant is tied up because the track indication lamps on his machine remain lighted. The man at Kouts asks the man at Wilders whether the crossing is occupied, and, if not, he tells him to use the key release.

The instrument house at Wilders includes an Esterline-Angus automatic graphic recorder with 15 pens which makes a record of the clearing of the home signals and the track occupancy of approach sections as well as the home signal limits. The paper moves 1½ in. per hour, and the roll is 90 ft. long, which is enough for 30 days.

### Sectional Concrete House

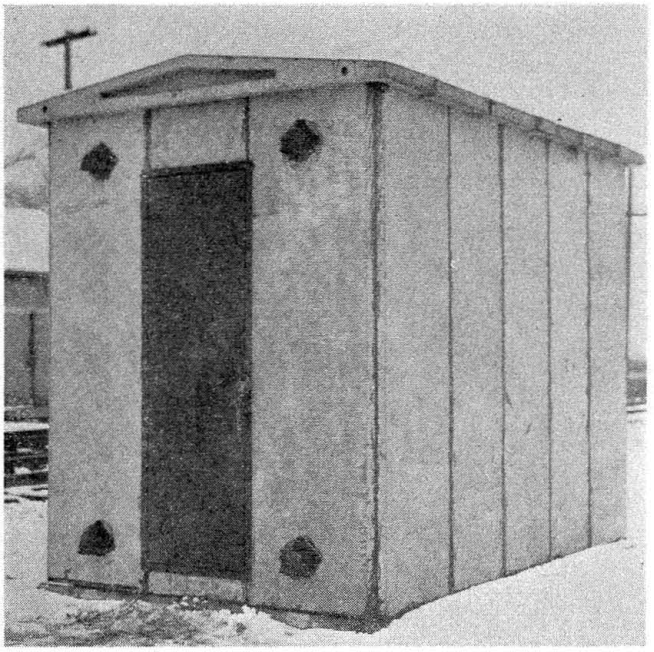
At Wilders, there is a 6-ft. by 10-ft. concrete instrument house. The floor, walls and roof of this house are made up of portable sections which were



Storage battery and rectifier in the control station at Kouts

assembled at the final location to make the building shown in one of the accompanying pictures. The joints between the sections are sealed with waterproof compound. The sections for this house were furnished by the Permacrete Company, Columbus, Ohio, the house being erected at Wilders by signal department forces of the Erie.

At the outlying signal locations, the instrument cases are of the sheet-metal type, with doors on the front, and removable panels at the rear to give access to the wire space behind the plywood mounting board. An interesting item is that these cases are mounted on cast-iron pedestal type foundations. The advantages are the ease of installing these foundations and the 100 per cent salvage when moving the cases.



The instrument house at Wilders is constructed of reinforced concrete sections assembled on the job

### New Wires and Cables

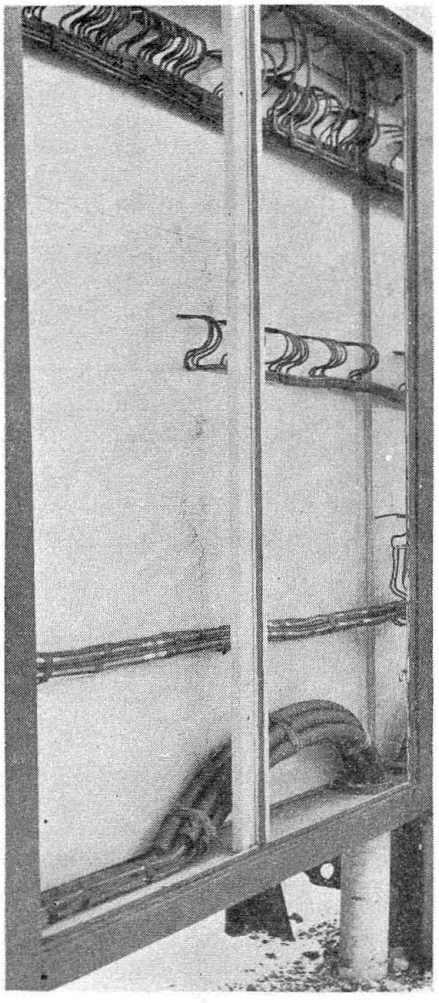
As a part of the new improvements, new insulated wires and cables, furnished by the Okonite Company, were installed throughout. The 24-volt d.c. leads from the batteries to the switch motors are No. 6. The control circuits to the switches and signals are No. 14. The track connections are No. 9. This underground cable is made up with protection which includes steel tape but no lead sheath.

At the relay cases, for example, the underground cable is brought up through sections of Johns-Manville asbestos pipe which extends from below the ground line up into the case, as shown in one of the views. The voids around the cable are filled with sand and the top is closed with sealing compound so that field mice or insects cannot enter. The outer covering of the cable extends on into the case, being ended and sealed on a slope downward, thus helping to prevent moisture from creeping through the end of the covering into the cable.

In the instrument houses and in the relay cases, the wires to the terminal posts on the relays are No. 9 solid with 3/64-in. Okolite insulation and a 1/64-in. Okoprene jacket, and with no tape or braid. This use of solid wire, which is a standard on the Erie, results in neat appearance, as shown in the pictures.

### Power Supply

At Wilders, at Kouts, and at the new intermediate signal locations, commercial a.c. power has been made available to feed rectifiers for charging storage batteries. As shown in the picture of the board in the house at Wilders, the rectifiers are the selenium type furnished by Fansteel. An interesting item is the use of capacitors at the different signal locations which are fed from a 440-volt a.c. 60-cycle power line. The capacitors are installed in the concrete house at Wilders, and are on the upper center portion of the terminal board. To secure full benefit of the capacitors they were installed on the secondary, or 110-volt, side of the power transformers at the individual locations. Their use allowed smaller sizes of power transformers to be used, improved the power load factor by decreasing the copper loss, and improved the voltage at the signal locations. The capacitors were made by the General Electric Company.



View of wiring space compartment on rear of a sheet-metal instrument case at one of the new intermediate signal locations

The battery for operating the four switch machines at Wilders consists of twelve 120-a.h. storage cells. This battery also serves to feed the code line apparatus. Eight cells of the same type battery at Kouts feeds the code line apparatus, as well as local circuits. Also at Kouts there is a set of 14 cells of 9.2-a.h. battery to feed the code line circuit. A set of 6 cells of 20-a.h. battery feeds the traffic direction circuit. At the new intermediate signal location there is a set of six cells of 240-a.h. battery. All these batteries are the lead storage type furnished by Gould. At Wilders, each track circuit is fed from a cell of Edison B6H storage battery, and on the automatic territory between Wilders and Kouts, the track circuits are each fed from a set of 3 cells of Edison 500-a.h. primary battery. At each semaphore automatic signal there is a set of 18 cells of Edison 500-a.h. primary battery.

This interlocking and signaling project was planned and constructed by signal department forces of the Erie, under the jurisdiction of the signal engineer. The major items of new equipment were furnished by the Union Switch & Signal Company.