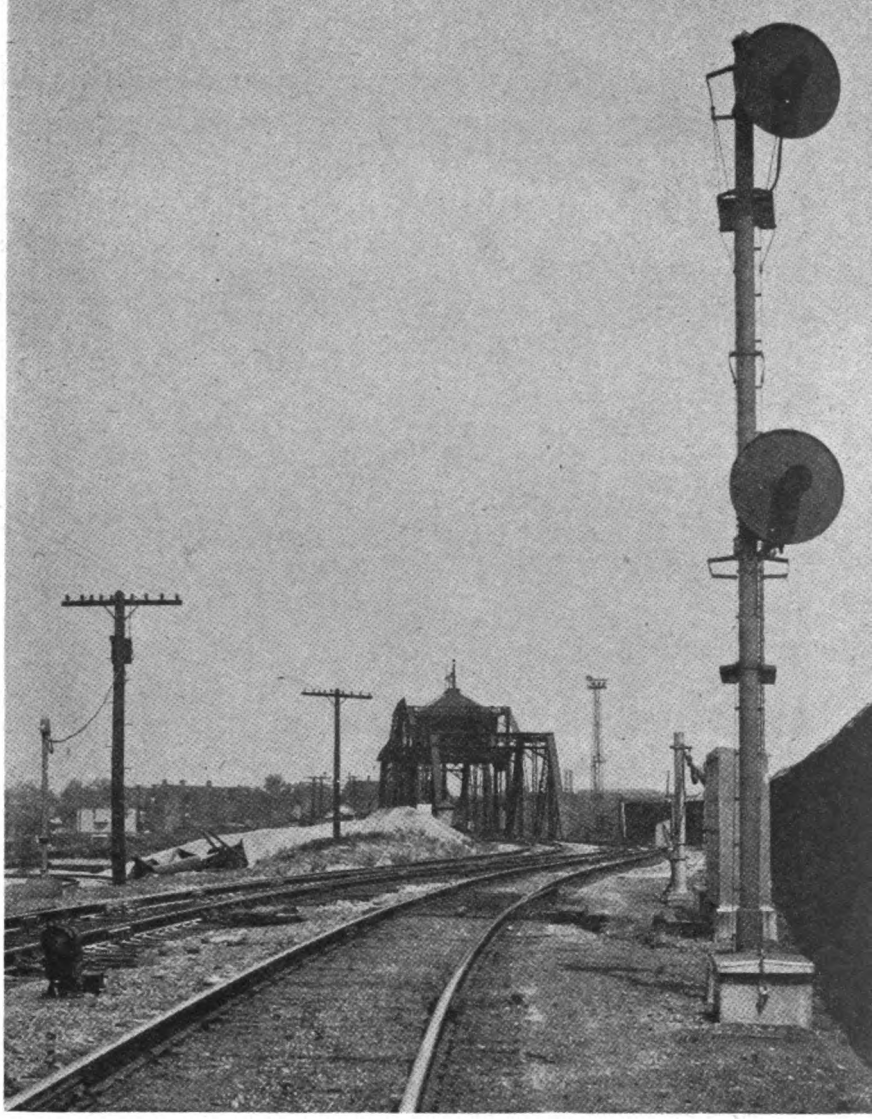


Signals 13L and 1L on the E. J. & E. at South Chicago. Center-pivot bridge over the Calumet river and cross-over 10 are shown in the background

Drawbridge Interlocking

on the Elgin, Joliet & Eastern

Modern all-relay plant includes coded line equipment as a means of reducing the number of wires between the movable span and the shore piers.

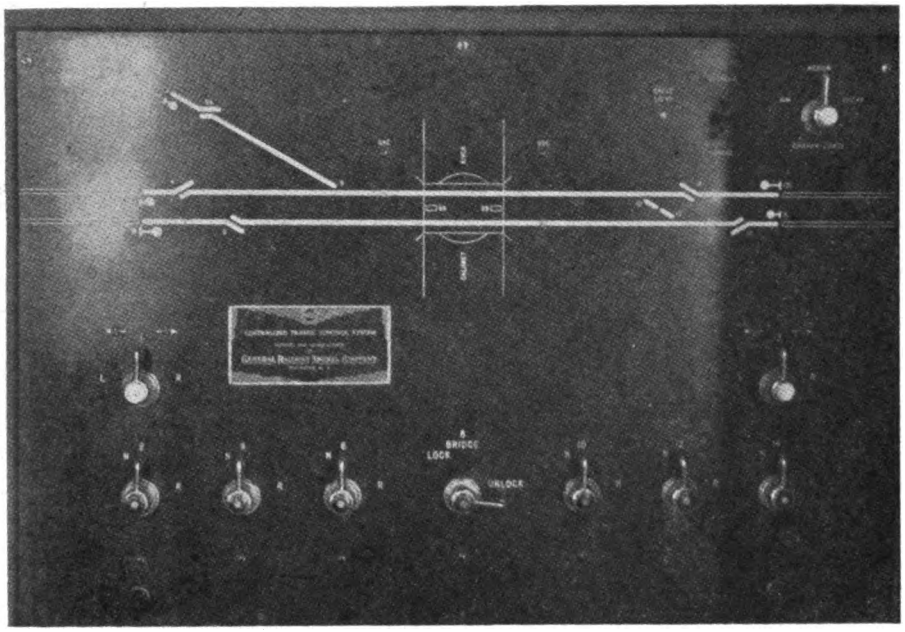
THE Elgin, Joliet & Eastern has installed an all-relay electric interlocking, controlled by a panel-type machine, on a double-track drawbridge over the Calumet River near 92nd Street in South Chicago, Ill. A novel feature of this installation, as applying to drawbridge interlocking, is the use of code line control equipment as a means of minimizing the number of wires to be extended between the movable section of the bridge and the shore piers.

This bridge over the Calumet River is located just east of a yard which serves the Carnegie-Illinois steel works of the United States Steel Corporation. From the bridge, the railroad extends east about 12 miles to Gary, Ind., where a connection is made with a yard on the main line of the E.J. & E. The movements over the Calumet River drawbridge include numerous switching operations in and out of the yard, and about 24 transfer runs daily between the Carnegie-Illinois yard and the yard at Gary. During the summer season the bridge must be opened numerous times each day to allow boats to pass.

The bridge is the swing type with the pivot at the center. The small cabin which houses the interlocking control machine, as well as the controllers for operating the bridge, is at the middle of the bridge at track level, being on bracket supports extending from the north side of the bridge. The new interlocking includes 4 levers for controlling 4 derails, 1 lever for 1 crossover, 1 lever for a switch and a derail, 1 lever for a bridge lock and 2 levers for 5 signals.

The panel of the interlocking machine is 15 in. high and 24 in. wide. The illuminated track and signal diagram includes lamps which indicate occupancy of corresponding sections of the track. Below the diagram are the two signal levers, and at the bottom are the seven levers which control switches, derails and the bridge lock.

On the bridge deck at each end of the swing span there is a switch machine which operates not only the Stiles bridge circuit controller but also the rail sleeves which are pushed in alongside each rail end to lock the rails in proper alignment with the ends on the shores. The full normal posi-



The control machine is in a cabin on the bridge

tion of each rail sleeve is checked on the shore end by a plunger which is connected to a conventional switch circuit controller on the deck on the shore. The two switch machines on the bridge deck are controlled by the one lever which is marked "bridge lock."

Indication Lamps

Above the lines representing the tracks on the diagram there are two red lamps, 8AE at the left of the symbol for the bridge and 8BE at the right of this symbol. Each of these lamps is lighted when the rail wedges and Stiles bridge circuit couplers on the corresponding ends of the movable span are in the full normal position.

In the face of the barrel of each of the lock, switch and derail levers, there is a small white lamp which is lighted during the time the lever is out of correspondence with the lock, the switch or the derail controlled. Such a lamp is lighted each time a lever is thrown, and if the machine does not operate and lock up as it should, the lamp stays lighted, as an indication to the leverman.

Under each of the seven lock, switch and derail levers there is a small red lamp which is lighted during the time that electric locking is in effect to prevent operation, even if the lever were thrown.

Near the lower edge of the control panel there are two push-buttons, one at the left under signal lever 1, and the other at the right under signal lever 13. When lining up a route for a train, the switch and derail levers, as well as the signal lever, are positioned as required, but no controls go out until the push-button under the signal lever is pressed. In this respect the operation is similar to that on a C.T.C. installation. If the maintainer wants a certain switch or derail to be operated separately, without clearing a signal, when he is making tests, the switch lever is thrown and then either of the signal buttons is pushed.

In the face of the barrel of each signal lever there is a green lamp which is lighted when the signal being controlled displays a proceed aspect. Under normal operation, when a train accepts and passes a signal, the aspect changes to red automatically, and the green lamp in the face of the lever is extinguished. Then the towerman should return the lever to its normal position. If he neglects to do so, however, the signal will not again clear after the train has gone. In such an instance, if he wants to clear the signal for another train he must return the lever to its normal position, then reverse it again and push the code-starting button.

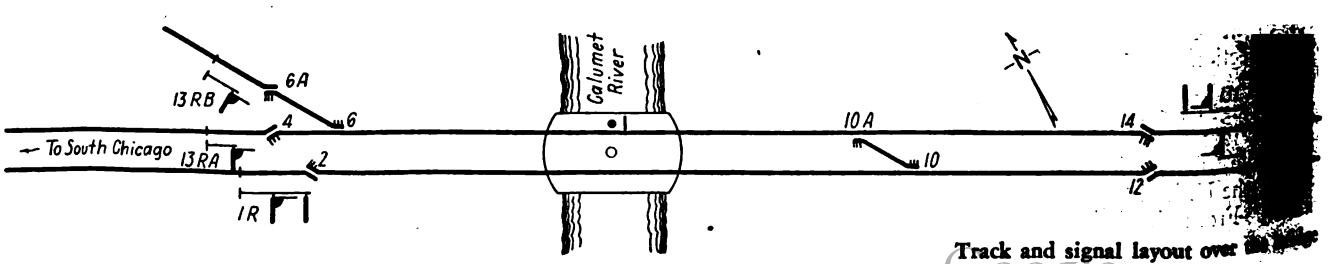
If a proceed aspect being displayed on a signal is to be "taken away," the towerman returns the lever to its normal position and presses the code-starting button. This sends out a code to cause the signal aspect to change to red, and also this action starts an automatic time-element relay which requires three minutes for operation. During this interval, time locking is in effect to prevent operation of switches, derails or other signals involved in that route.

Signaling Aspects

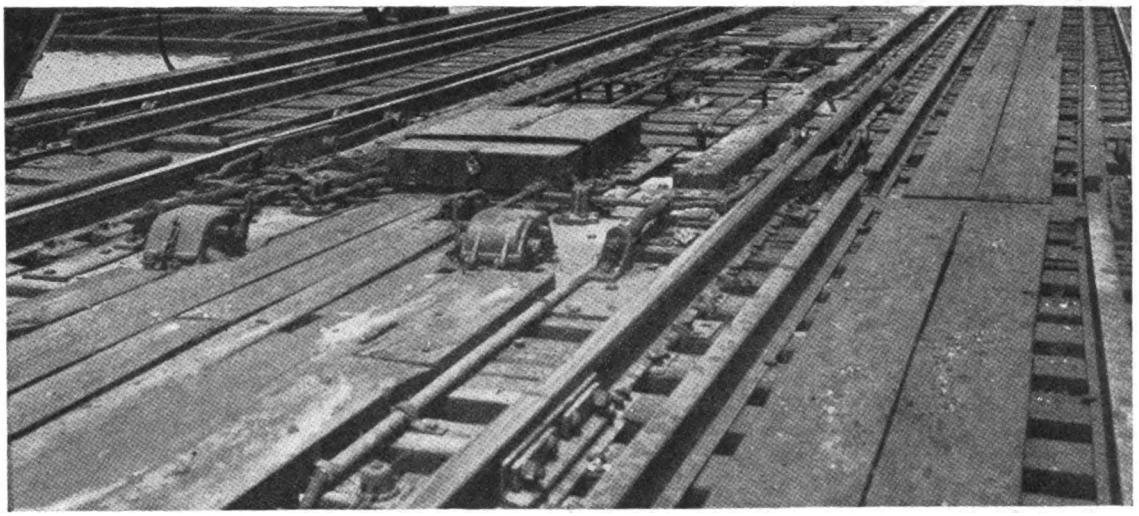
As all the traffic over this bridge consists of switching moves and transfer cuts, the speeds are limited. Accordingly the signals were equipped to display "Slow Clear", Rule 287, as the best aspect, and the indication reads "proceed at slow speed, not to exceed 10 m.p.h. within interlocking limits." On a dwarf signal this aspect is a single green. On a high signal this aspect is red in a top arm over green in a bottom arm which is spaced 10 ft. below the top arm. Thus the bottom arm is in the location of a third arm if a second one were used. Each dwarf consists of a type SA searchlight signal which displays red normally and can be controlled to display green. Each high signal consists of a fixed red unit as the top arm and a searchlight signal for the lower arm, arranged to display red normally and can be controlled to display green.

Model 5C Switch Machines

The switch machines are the Model 5C with 24-volt d.c. motors. The overload relay and the switch controller relay are mounted in the cast-iron case of each switch machine. The circuits going to switch machines extend on wires from a case to terminals in a cast-iron junction box on a concrete foundation near the switch machine. From terminals in such a box, flexible insulated wires extend through a section of discarded air hose, to the switch machine. This practice minimizes the number of wire breaks which may be caused by vibration. The switch layouts are well constructed, with adjustable rail braces on 1-in. by 8-in. insulated gage plates.



Track and signal layout over

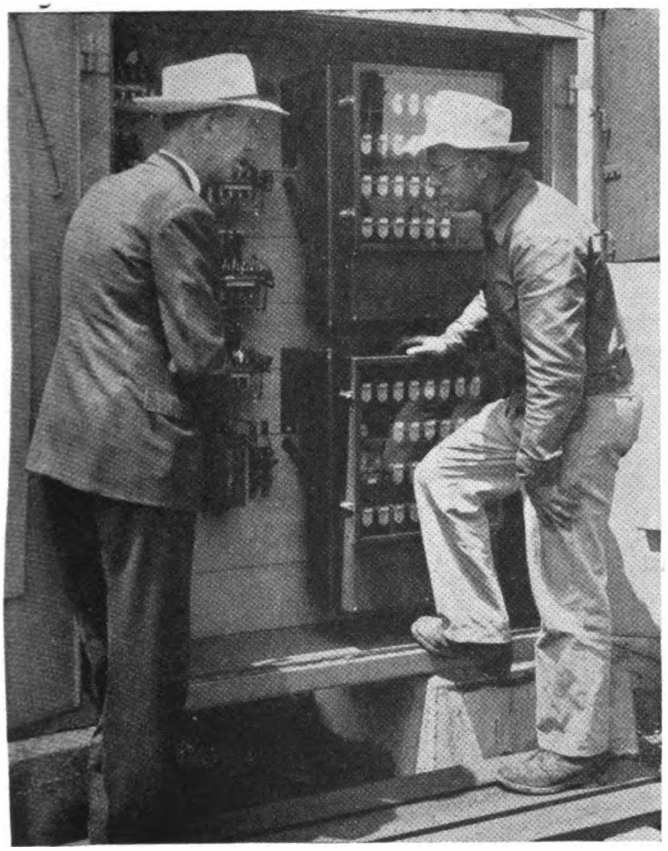


Rail-lock and bridge-coupler circuit-controller equipment at one end of bridge. Power switch machine for operation of this equipment is in background

As previously mentioned, the control machine is on the movable span of the bridge. The control of all the signals, derails and switches on the shores, as well as the return of indications to the control machines, are accomplished by the code control system using only two wires from the machine each direct to the home signals on the shores. This code system is the General Railway Signal Company type K class M. The office equipment on the bridge includes a stepper unit, to make up codes and send them out, and an application unit which receives the incoming indication codes and lights the indication lamps on the machine. In this installation there are two field stations, one at the signal location on each shore. Each field station includes a stepper unit and an application unit.

The circuits from the swing span to the shores are extended through bridge-coupler circuit controllers made by the T. Geo. Stiles Company. The movable section of each of these controllers is on its respective end of the swing span, being operated by the same switch machine that operates the rail sleeves for that end of the bridge. Each of these controllers has 24 contacts, but only 21 are needed. Two of the contacts are those used for the two-wired coded circuit mentioned previously. Each one of four contacts carry through the track circuits on the four rails. Twenty one wires are for 16 circuits. Other circuits which extend on contacts through these controllers are those for indicators, locks, switch repeaters and the 110-volt a.c. power.

On the bridge, the relays and line coding equipment are located in the same house with the machinery for operating the bridge. At the locations on the shore, the relays and code equipment are in sheet-metal cases set on concrete foundations, as shown in one of the pictures. The batteries are in concrete boxes.



W. E. Elliott, signal supervisor (left), and A. O. Edson, foreman (right), inspect coding equipment at field station at home signal location ashore

Cables, Wiring and The Storage Battery

The underground cable-runs from the ends of the bridge to the instrument cases or junction boxes and signals are in 5-in. Orangeburg fibre conduit, which is laid with a wall of about 4 in. of concrete poured under, around and over it. The control circuits are on No. 14 wire and the 24-volt d.c. circuit for feeding the switch machines is on No. 6 wire.

The two switch machines on the bridge are operated from a set of 12 cells of 60-a.h. storage battery. A similar set on each shore operates the switch machines. On the bridge and at each field station there is a set of 5 cells of storage battery to feed local circuits. The code line is fed by 30 cells of BTMP-3 storage battery. Each track circuit is fed by one cell of 80-a.h. storage battery. These batteries were furnished by Exide. The switch batteries and local batteries are charged by Balkite rectifiers and the code line battery by a G.R.S. copper oxide rectifier.

This interlocking was installed by forces of the Elgin, Joliet & Eastern, Arthur O. Edson being foreman in charge of the construction crew, under the direction of W. E. Elliott, signal supervisor, and W. K. Waltz, signal engineer. Carl V. Wajnarowski is maintainer. The major items of interlocking equipment were furnished by the General Railway Signal Company.