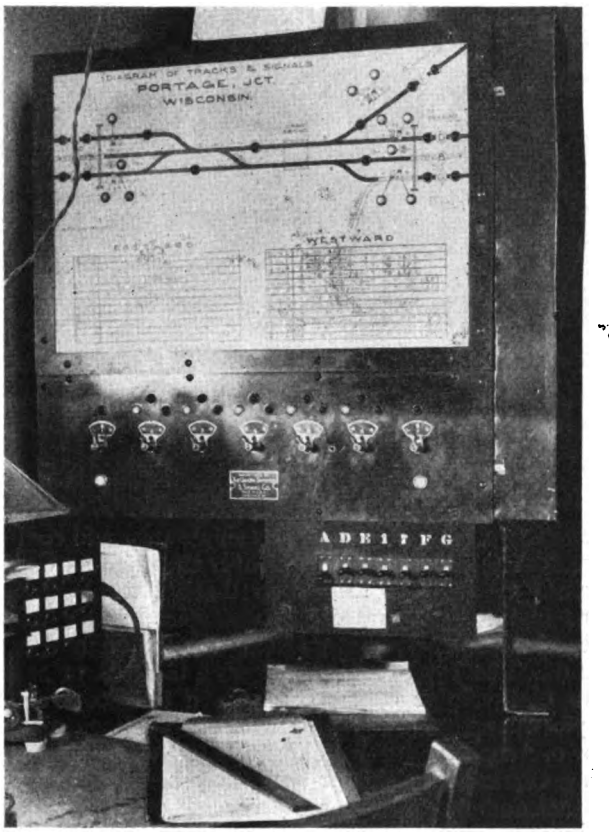
Remote Control for Interlocking Saves $6,000 Annually

Thirty-lever plant, including highway crossing protection, now handled by all-relay control with a seven-lever centralized type machine in station 1.2 miles away

IN 1907, the Chicago, Milwaukee, St. Paul & Pacific installed a 30 lever G. R. S. electric interlocking, known as C-90, at a point 1.2 miles east of Portage, Wis. This plant included the junction switch for the Northern division, a junction switch for the line to Madison, a yard entrance switch, and two crossovers, as well as protection for a swing drawbridge over a canal. Pneumatically-operated highway crossing gates for one crossing were also operated by the towerman at this plant.

In recent years the operation of commercial boat traffic through the canal has been abandoned and only on rare occasions, once or twice a year, is it necessary to open the draw for the passage of a dredge or a house-boat. Therefore, the railroad was permitted to remove the lift rails and connect the rails through. As the necessity for drawbridge protection was eliminated, there was no need for derails as the remainder of the plant consisted of junctions, crossovers and turnouts, no crossing being involved. A study of conditions showed that the control of the plant could therefore be simplified in a machine with only five levers for switches and two for signals, which brought the proposition into the field of remote control. As all trains operate through this plant without stopping and as the operator in the office at Portage is in touch with all such movements, the logical thing was to locate the new control machine in this Portage office and let the operator control it. The only remaining objection to the closing of the C-90 tower was the operation of the gates for the protection of the highway crossing in the plant. This problem was solved by replacing the gates with rotating disk Stop signals including flashing lights.

Under the new arrangement the switch machines and signals at C-90 are operated as before from the 110-volt storage battery, which consist of 55 cells of Exide 160 a.h. Manchester-plate battery, which has been in service for six years. The old mercury arc rectifier was replaced by a Union RP-81 rectifier, the normal floating charge being 0.6 amp., which maintains the battery at the proper voltage.

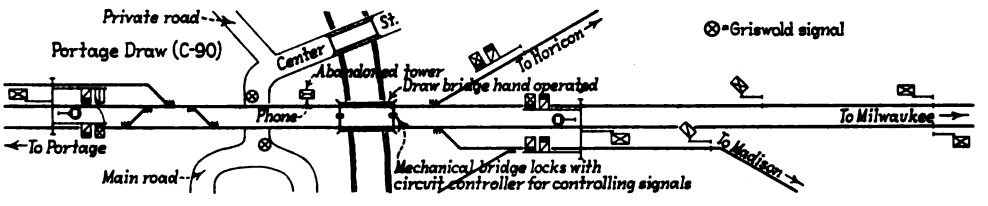


The control machine is of the centralized type

The Control Machine

Thus the C-90 plant continues to operate the same as before except for the fact that the old 30-lever interlocking machine in the tower has been eliminated and its function is now performed by a 7-lever Union C. T. C. type machine located 1.2 miles away in the Portage office. Five levers are used for the two crossovers and the three single switches. The signals are controlled selectively through the KR switch-repeater relays so that only two levers are required for the control of the 11 signals, one lever for the eastbound and one for the westbound track.

The switch levers operate to two positions, normal and reverse, with an opal indication light above the normal position, a green indication light over the reverse position, and a red light to show when the lever is in transit. The signal levers are normally on center and operate to the left for westbound movements, and to the right for eastbound movements. The fact that the signal has



Layout plan of remotely controlled plant

cleared is indicated by an opal light, the normal indication of the signals being indicated by a red light.

The illuminated track diagram, which forms a part of the machine, has a light to repeat the occupancy of each

View looking east through the plant

track circuit, and a light for each signal which is illuminated when the corresponding signal is clear. The entire machine is 30 in. by 30 in. by 8 in.

The Control Circuit

An 18-volt d-c. circuit, over a single wire and common, extends from each switch lever over the line to a G. R. S. Type-R polar relay located in the old tower at C-90. This circuit is operated from a split battery to give polarity change, the battery being located at the Portage station. The Type-R relay controls a G. R. S. polar relay with high-voltage contacts, which in turn controls two Taylor-type relays equipped with high-voltage magnetic blowout contacts for handling the 110-volt switch operating current, one Taylor-type relay being used for the normal and the other for the reverse operation of each switch. Thus these relays perform the function for which the levers of the old machine were used.

The indication of each switch is obtained by a KR relay which is controlled by a separate 12-volt circuit breaking through contacts in a switch circuit controller connected to the plunger-lock detector and also the point detector on the switch machine.

Likewise an 18-volt circuit extends over a single wire and common from each signal lever to a Model-12 Union polar relay at the C-90 tower. This circuit is also fed from the split battery to obtain polar operation. The selection of each signal relay is carried through the polar relay, controlled by the lever, and then through the various KR switch-repeater relays for the respective route being lined up. The local operating 110-volt circuit for the signal breaks through the signal control relay.

The track circuits approaching the plant are operated on alternating current while the track circuits within the home signal limits of the plant are normally fed by an RT-10 track rectifier with a primary battery reserve cut in through a power-off relay when there is an a-c. interruption. A 220-ohm resistance is connected across the primary battery to keep it active. The track circuits are bonded with Ohio Brass welded bonds, and No. 9 single-conductor solid Kerite track cable is used for rail connections.

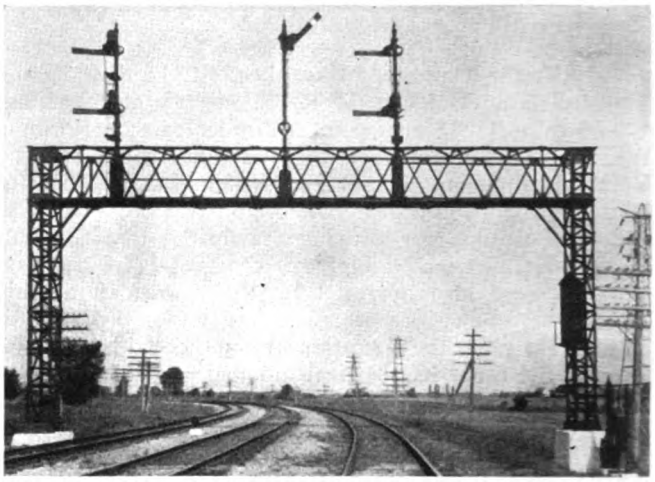
The track circuit indications for the two track circuits within the home signal limits are obtained by direct single-wire-and-common control through the track relays, the approach annunciators are controlled the same way excepting that the approach on the Northern division and the westbound main line are combined over one line circuit and is accomplished by a polar relay at the control station and two slow-acting relays at the field station.

When the switch machine is operating, a red light appears above the lever, this control being accomplished by means of a neutral relay in series with the WR relay which is the switch control relay, when the switch is in operation the neutral relay remains de-energized for the reason that there is not enough current to pick it up until the switch machine has completed its movement and resistance is cut out, thus increasing the current in the line circuit and picking up the neutral relay which cuts out the red light and cuts in the R or N light as the case may be.

The signal indication light is obtained by a circuit which feeds through the lock relay for the respective signals and then selects to the proper signal light on the diagram by the position of the lever itself.

The crossing gates were replaced by signals of the improved Griswold flashing-light type with the rotating Stop disk. These signals are operated on 12 volts d-c. obtained from a 6-cell lead storage battery provided for this purpose. Floodlights on these signals are operated on 110-volt 25-watt a-c. controlled by an Anderson electric time switch.

The operation of the crossing signals is controlled automatically through the track circuits. That section of the control circuit for the track circuits outside the home



View of eastward home signal looking west—
Note yard indicator at right

signal limit is by-passed when the home signals are in the Stop position, thus eliminating unnecessary operation of the signals when a route is not lined up for a train to pass over the highway crossing, as well as eliminating false operation if the power is cut off the a-c. track circuits outside of the home-signal limits.

Yard Indicator

Under the former operation the towerman informed the engineman of each westbound freight train as to which yard track he was to pull into; therefore, some means had to be provided to perform this function. An illuminated type of yard track indication with numbers from 1 to 12 was mounted on the west signal bridge facing east. The yardmaster controls the operation of this indicator by means of a dialing device which, operating over a two-wire circuit, controls a Union code-selecting relay to illuminate the corresponding numeral in the track indicator.

From the control office a 21-conductor No. 14 Kerite aerial cable extends for 3,000 ft. through the station and yard area, this cable being suspended from a Copperweld 5/16 messenger with Raco cable straps spaced 18 in. From the end of this cable the circuits extend in open line construction to the plant, using No. 10 d.b.w.p. copper wire. Within the plant, made aerial cables are used, together with parkway cable to the functions.