

Automatic Interlocking on the Wabash

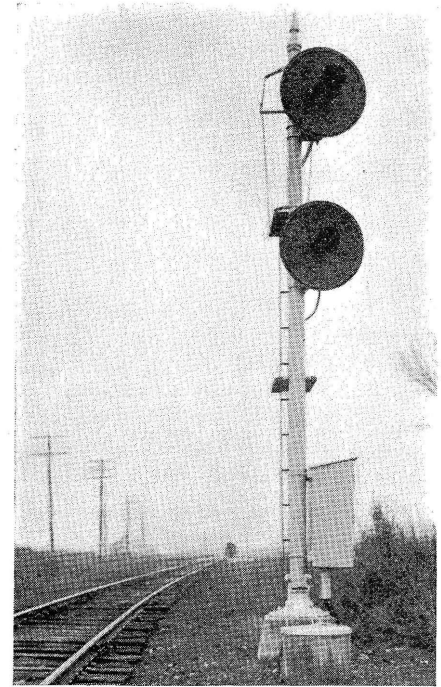
Mechanical plant replaced at crossing with the Milwaukee near Moravia, Iowa

AT MORAVIA, IOWA, where the Chicago, Milwaukee, St. Paul & Pacific crosses the Wabash, a mechanical interlocking, including 14 working levers, has been replaced with an automatic plant. The cost of the changeover was approximately \$7,792, the savings effected annually in operating expenses being \$3,245.

The track of the Milwaukee involved in this plant is a single-track line extending from Kansas City, Mo., to Savanna, Ill., with a connection at that point with the double-track to Chicago. The traffic includes six passenger trains and from four to six freight trains daily, the number of trains over the crossing on this road totaling 571 during the month of August. The track of the Wabash at this crossing is a single-track main line from Des Moines, Iowa, to Moberly, Mo., with connections to Kan-

pipe connections and the distant signals were operated by wire lines. Electric detector locking was provided for the crossing.

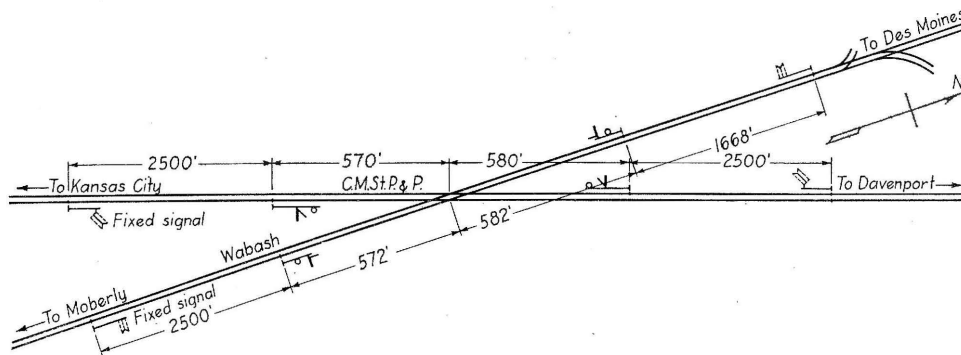
The two lines cross at an angle of approximately 13 deg. When the original interlocking was built, a rigid crossing frog was installed; however, due to excessive maintenance costs, a movable-point frog was installed in 1906. In view of modern improvements in the construction of frogs and the use of manganese steel as a wearing surface, it was decided that the use of a fixed crossing frog would now be satisfactory at this crossing. This decision permitted consideration to be given to the replacement of the mechanical plant with an automatic interlocking. The elimination of derails was found practicable, and in view of the fact that an automatic time recorder was proposed as a part



Southward home signal on the Wabash

operating to show either green for "proceed" or red for "stop."

The operative signals are the Union Switch & Signal Company's searchlight Type-H-2 equipped for operation on 10 volts d-c. The lamps are of the single-filament type, rated at



sas City, St. Louis, Chicago and Detroit. The traffic includes two passenger trains and from four to six freight trains daily, a total of 221 train movements having been made over the crossing by the Wabash during August.

The mechanical interlocking, installed at this crossing in 1901, included 14 working levers—four for derails, one for the movable-point crossing frogs, one for a facing-point lock, and eight for signals. The home signals were mechanically operated by

of the new equipment, the changeover was approved by the Iowa Board of Railroad Commissioners. The new plant was placed in service on July 14, 1934.

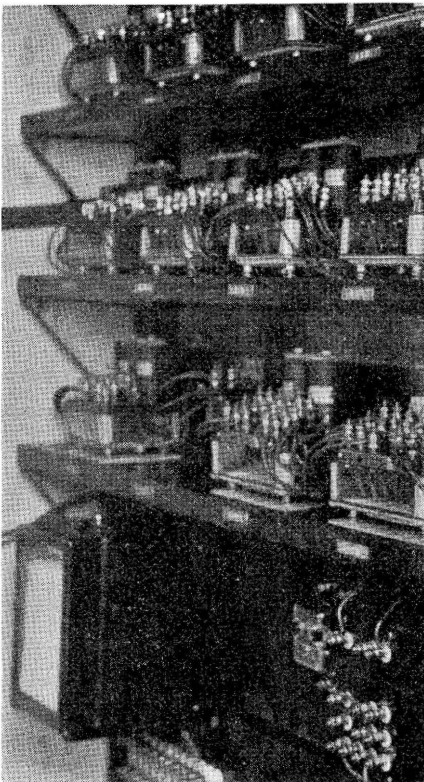
The home signals are located about 575 ft. from the crossing. Each home signal has two light units or "arms." On the Milwaukee home signals, the top unit is a fixed "red," the lower unit operating to show either white for "proceed" or red for "stop." On the Wabash home signals, the lower unit is a fixed "red," the upper unit

10 volts, 5 watts. Each fixed light unit consists of a Style HC-41 lamp body equipped with a 10-volt 5-watt lamp. The metal background and shield on these fixed units are the same as for the operative units, thus presenting the same general appearance. The old masts used for the mechanical home signals were used for the new light signals, the lower units being mounted 13 ft. above the level of the rail with a 5 ft. spacing to the center of the top unit. The distant signals are semaphores fixed in the

caution position, and each has a 3.5-volt 120-m.a. lamp, fed constantly from 8 cells of 500-a.h. Edison primary battery, connected 4 cells in series, two groups in multiple. Each track circuit is energized by a set of three Columbia 500-a.h. primary cells in multiple. The rail joints are bonded with stranded Copperweld bonds with $\frac{3}{8}$ -in. plugs.

Instrument House Away from Track

The relays, battery and other equipment at the central location are placed in a concrete house near the crossing, but set 60 ft. away from the track to reduce the chance of its being damaged in case of a derailment or accident at the crossing. The inside measurements of this house are 4 ft. 8 in. by 6 ft., and it is 8 ft. 8 in. high. The two 1-ft. by 1-ft. windows are protected by an outside guard



Relays, transformers and the time-recorder in the relay house

made of heavy screen such as used in the head end of a locomotive. The door frame and the door are made of sheet steel. The instrument rack along the east wall is 6 ft. long. The uprights are 2-in. by 2-in. angle iron, and the $1\frac{1}{2}$ -in. by 8-in. wooden shelves and back boards are supported by strap-iron brackets attached to the uprights. The rack is set out from the rear wall about 6 in. to allow space for wires. The incoming wires are brought in to porcelain-based ter-

minals on a board at the bottom of the rack. Each No. 14 flexible jumper, from these terminals to the relays, is run through a $\frac{1}{2}$ -in. hole in the board, up behind the rack and out again through holes in the boards behind the shelves, to the terminal post on the relay. The instruments, of Union manufacture, are DN-11 1500-ohm or 400-ohm slow-acting relays for the track repeaters and sticks, and DN-11 4-ohm relays for track circuits. All of the relays are equipped with shock-absorbing springs. The control of the automatic interlocking is based on the stick-relay system similar to the Signal Section A.R.A. standard, using one-stick-relay for each of the two roads.

An Esterline-Angus time recorder, equipped with 10 pens, is mounted near the bottom of the rack. The chart is driven by a clockwork mechanism which runs eight days with one winding, the chart traveling 3 in. per hour so that one roll of paper will last 15 days. The record made by each pen is shown in the table.

Pen Number	Record
1.....	E.B. approach on the Wabash
2.....	E.B. Wabash home signal
3.....	Wabash track circuit in home signal limits
4.....	W.B. Wabash home signal
5.....	W.B. approach on the Wabash
6.....	W.B. approach on the Milwaukee
7.....	W.B. Milwaukee home signal
8.....	Milwaukee track circuit in home signal limits
9.....	E.B. Milwaukee home signal
10.....	E.B. approach on the Milwaukee.

This record is of considerable value to the maintenance forces as it records certain failures and improper operation. It keeps a continuous check on the train crews to see that they properly obey the indications and instructions for operating over the plant, besides furnishing conclusive evidence for an investigation should a controversy arise. The train speeds are limited to 20 m.p.h. until the engine or first car has passed over the crossing, after which the speed may be again increased.

In case a train on an opposing road is occupying one of the approach sections, or if a track circuit is out of order, a release can be effected by a trainman operating the clockwork time release for his respective road. These two time releases are mounted on separate compartments in a wooden case attached to the track side of the instrument house.

A 110-volt a-c. supply circuit was extended from the Wabash station to

the plant, on a line circuit using No. 8 weather-proof copper wire. This circuit is brought in on an aerial cable to the instrument house and taken through an enclosed two-pole switch with fuses, to a W-10 Union transformer. Two secondaries of this transformer normally supply the feed for the home signal lamps and for the RX-21 Union rectifier, which charges the central battery consisting of five Gould Plante Type-NPE-407 lead storage cells, 120-a.h. capacity, at an 8 hour rate, the normal charge being 240 m.a. Five-ohm resistance units or 10-amp. fuses, depending on the load, are used in the feed from this battery to the bus for feeding various circuits. The signal lamps are normally fed from the transformer, an ANL-30 power-off relay being used to switch this lamp feed to the storage battery in case of a power outage. The signal lamps are on approach control normally as well as when they are fed from the battery. The energy consumed by this entire plant totaled 13 kw. h. during August and 14 kw.h. during September.

Underground Cables Protected

The wiring between the instrument house and the home signals is in underground cable without metal armor. This cable was laid in trenches 24-in. deep and was surrounded by sand or loam. In order to prevent track forces or other railroad employes from digging into the cable, each line of the main runs is marked every 50 to 100 ft. with a small metal sign reading "CABLE." The connections to the rails are run in single-conductor No. 9 AWG underground cable, also without metal armor. At the rail the cable is brought up through a Union pipe pedestal outlet, a stranded plug-type bond extending to the rail.

The concrete instrument house weighs about 10,000 lb., and as no crane was available to unload and set it, the signal forces had to devise some means of doing so. Cross-ties were piled up crisscross to form a support for a pair of old rails to extend from the car to the location on which the house was to be set. A framework was constructed to fit the house and to hold a pair of skids which fit over the two rails. The house was then jacked up, the rails were slid under, and the house was pushed along the greased rails to its final location. A set of blocks and tackle was used as a safety precaution to limit the speed at which the house could move. However, there proved to be no occasion to hold it back.

This automatic interlocking was designed and installed by the signal forces of the Wabash.