

Semi-Automatic Interlocking

at a Crossing on the Alton



Alton home signal and derail location

AN UNUSUAL combination of manual and electric interlocking, in what is termed a semi-automatic interlocking plant, has recently been installed by the Alton at East Springfield, Ill. At this point the main freight line of the Wabash from Kansas City to Chicago and Detroit is crossed by a single-track industry and switching line of the Alton. Traffic on the Alton consists of six to eight switching movements, whereas the Wabash line is used by eight regular freight trains, two passenger trains and two or more switching movements daily.

Mechanical Plant Retired

At this crossing a 16-lever mechanical interlocking with detector bars had been in service for a long period of years and was, therefore, obsolete. Furthermore, a continuation of the expense incurred in operating and maintaining this interlocking was not justified. Therefore, the present arrangement of signaling and derail protection was devised and installed in recognition of the circumstances involved. Although a fully automatic interlocking could easily have been designed for this crossing, the necessity for this type of plant does not obtain.

Signals on the Wabash include fixed continuously-lighted approach signals displaying a yellow indication, and two-aspect home signals of the General Railway Signal Company Model-2A top-post semaphore type. The two home signals normally stand at "proceed," both displaying the "stop" aspect whenever any of the track circuits are occupied or the derails and locking arrangement on the Alton are other than normal.

However, the Alton home signals, which are G.R.S. Type-D two-aspect

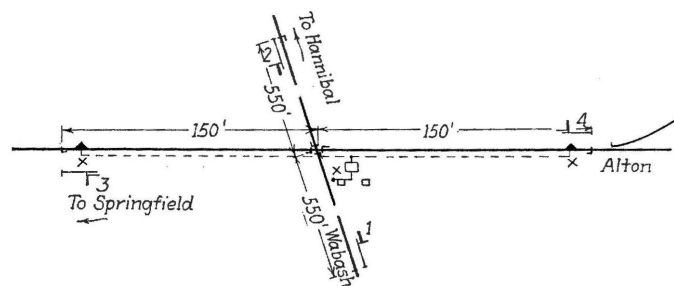
Signals normally clear for Wabash trains—
Manually-operated derails and electric
switch locks on opposing switching route

color-light units, are normally red. All signals are continuously lighted, there being no approach track circuits. Hayes derails at the Alton home signals, normally set against the Alton trains, protect trains on the opposing road. These derails are pipe-connected to a Union Style T-10 switch stand, set on a concrete foundation a few feet from the crossing frogs. In addition, Style SL-21 electric switch locks, controlled by the interlocking circuits, lock the operating mechanism of the switch stand in the full-normal and the full-reverse positions.

A switch circuit controller is operated by the pipe line at each derail,

for emergency release of the electric locks on the lever stand.

In using these facilities, the Alton trainmen are governed by instructions posted inside the release box. The procedure followed by the Alton in obtaining the line-up for use of the crossing is as follows: After making a careful observation to determine that no trains are approaching on the Wabash, Alton trainmen open the release box and operate the time release; this sets the Wabash signals at "stop" immediately. Following a two-minute interval, the trainmen are then free to unlock and operate the derail mechanism, which, when fully



Interlocking layout at the East Springfield crossing

and an additional circuit controller is attached to the switch-stand mechanism at the crossing for detecting the positions and adjustment of these functions.

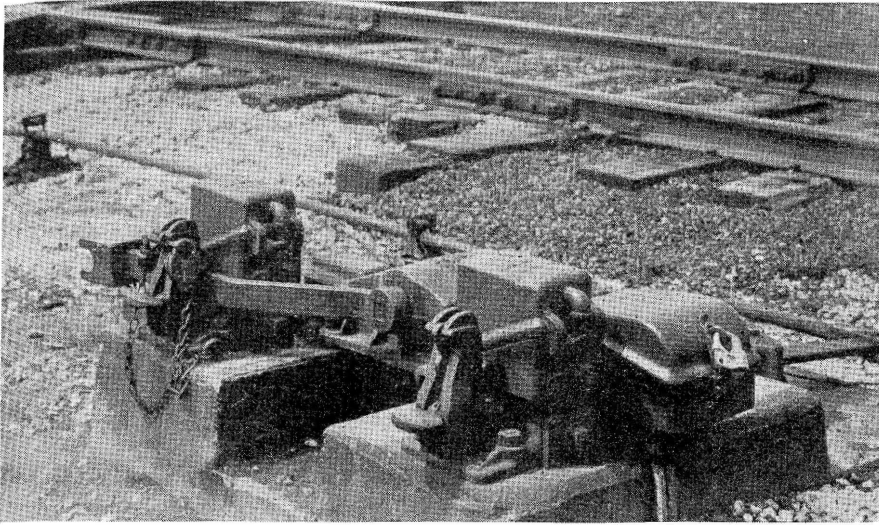
Method of Train Operation

At the crossing, time-release equipment has been provided by means of which the Alton trainmen release the route normally set up for the Wabash. The release equipment, which is mounted in a box locked with standard switch padlocks, includes a clockwork time-release set at two minutes, an emergency pushbutton for release of the Alton line-up in the event of abnormal operations, and a double-pole double-throw sealed knife switch

reversed and latched, changes the Alton signals to the "proceed" aspect. After the train is clear of the home signal limits, the derail operating lever is restored to the normal position and locked.

If after operating the time-release, the electric lock on the operating lever fails to release, the seal on the emergency knife switch is broken and the switch thrown. This completes a circuit which releases the electric locking mechanism, and the train using the crossing must be protected by flagging. The knife switch must then be returned to normal and a failure report is made.

If a Wabash train should encounter a "stop" signal at the plant for no apparent reason other than the



Electrically-locked switch mechanism through which both derrails are operated

crossing being in use, a full stop is made and a trainman operates the pushbutton release at the crossing to void an Alton line-up that may have been left unused. The pushbutton affects two stick-relay circuits that enter into the control combination.

An important factor in the successful operation of this plant is the continuous record of train movements maintained by a 10-pen graphic time-recorder. One pen is actuated through each of the four track relays, two GP relays that repeat the zero position of the Wabash home signals, two route stick relays, the HR relay for Alton signals, and the emergency knife-switch lock release, respectively. Thus, an accurate record of the operation of the principal functions of the plant is available, the operating rules can be more easily enforced, and any faulty operation can be detected by study of the record tape.

This recording instrument is housed in a special case and is mounted on a $\frac{3}{4}$ -in. sponge rubber kneeling mat, which effectively eliminates shock due to vibration. A 50-watt lamp is used in this case in severe weather to keep the ink in the pens from freezing. A small quantity of alcohol is also used in the ink for this purpose, with success.

Control Circuits

The two track circuits on the Alton are polarized, the switch circuit controllers at the Hayes derrails acting as polarity changers. In addition to the train-shunt and polarity control of the track relays, the circuit controllers are adjusted to complete the track circuits only with the full-normal or full-reverse position of the derrails, and by this means they preclude a "proceed" aspect being given with the derrails in a cocked or intermediate position.

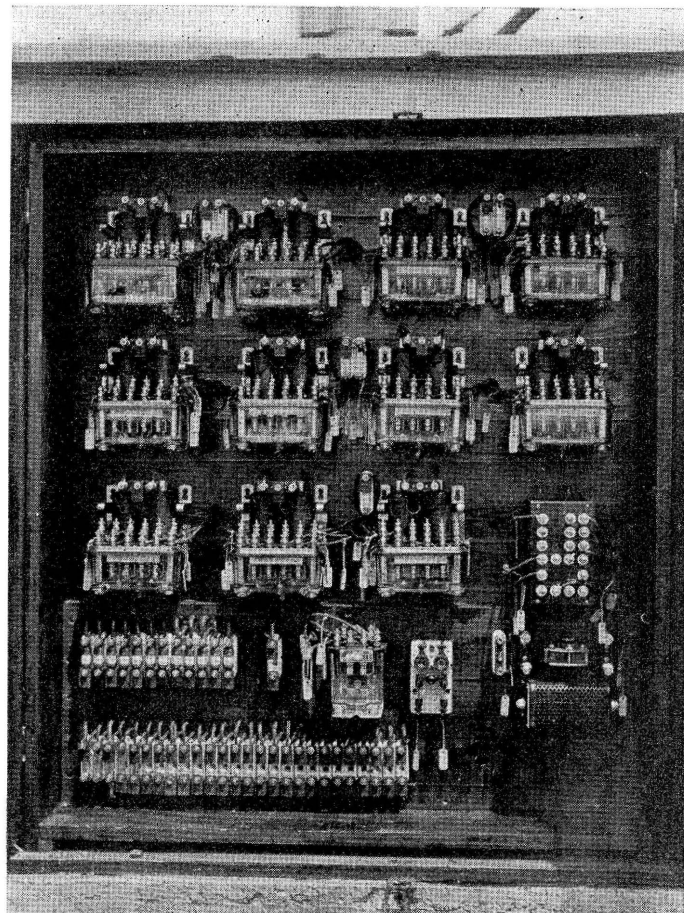
Normal front and polar track-relay contacts in series are used to select the HR relay controlling the Wabash signals; the neutral track relays on the Wabash are, of course, also included in the control of 1-2 HR. Normal front and reverse polar contacts of the Alton track relays and front contacts of the Wabash track relays are included in the HR circuit controlling the Alton home signals.

In addition to all of the track relays, the control of relay 1-2 HR on

the Wabash is checked through a route-stick relay, the clockwork time-release normal and the normal switch-lever lock. Therefore, any unauthorized energization of the lever lock, failure of the time-release to run down to normal, or improper operation of the route control circuits automatically de-energizes the relay, causing the semaphore signals to assume the restrictive aspect. The control of relay 3-4 HR is also further checked through the zero repeaters of the opposing semaphore signals and a second route stick relay. The positive battery feed to both of the HR circuits passes through the sealed emergency lock-releasing switch so that all signals indicate "stop" when it is being resorted to. The two route stick relays, previously referred to, are controlled through contacts on the route releasing and selecting equipment so that the proper circuit set-up will be in force under the various conditions of operation.

Power Supply and Relay Equipment

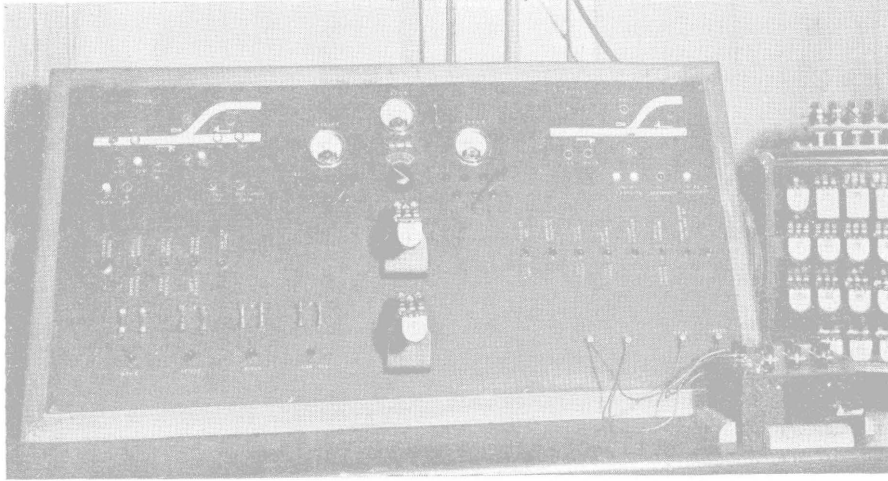
All of the track circuits and the normally-lighted approach signals on the Wabash are supplied by Edison 500-a.h. primary batteries. The two lighting sets have four cells each, (Continued on page 372)



Type-K wall-mounted relays in housing at the crossing

cells are used for other purposes. Each switch-operating set consists of 13 cells of storage battery, 90-a.h. capacity, and each line and local signal stand-by consists of 5 cells of storage battery of varying capacity, as required. All cells are on floating charge through copper-oxide rectifiers.

The signals on this installation are of the vertical color-light type, using



A special panel is provided for testing C.T.C. code equipment

8 $\frac{3}{8}$ -in. lenses and 10-volt, 18-watt lamps. The switch machines are the Model-M and M-2 low-voltage type for operation on 20 volts d-c. and are equipped with point detectors.

Testing Equipment

A special test set for conducting complete checks of the coding equipment was built by the signal construction forces, and is in use in the second story of the brick tower at the west end of the classification yard where the maintainer and maintenance foreman perform these tests periodically. Power for operation of the test set is obtained from the buss terminals in the instrument housing on the lower floor. The set as illustrated in the photograph consists primarily of a $\frac{1}{4}$ -in. ebony panel on which are mounted two type L-1 relays, and two groups of indication lamps and toggle switches; one group is associated with the office coding equipment and the other with the field coding equipment.

A standard cycle recorder shown in the foreground is used for measuring the length of the various open and closed line impulses. An ammeter indicates the current in the line which is established when the office line coding unit and field line coding storage unit are connected to the test set through a circuit which places their respective "R" relays in series, and by means of jacks and plugs the voltages for the office and field sta-

tions are varied so as to obtain the proper amount of current in the line. The working voltages for both the office and field stations are indicated on the miniature voltmeters located to the right and left of the ammeter at the top of the test panel.

The circuits are so arranged, through the various toggle switches and indication lamps, as to provide for operating the office and field code

units in the same manner as they are required to operate in actual service, and any irregularity in their operation, which would require adjustment of the relay contacts or other repairs, is detected by the lack of response of the indication lamps on the test panel to the codes which are established by manipulation of the toggle switches.

Test clips are used for connecting the external wires from the test set to the terminals of the code units under test, so as to permit of readily changing the connections from one unit to another or for varying the connections on the units for different station selections, thus permitting complete check of each and every unit so as to maintain them in condition for use interchangeably with all units throughout the entire installation.

This installation was planned and installed by signal forces of the Chesapeake & Ohio.

Alton Interlocking

(Continued from page 357)

lamps being rated at 3.5 volts, 0.120 amp.

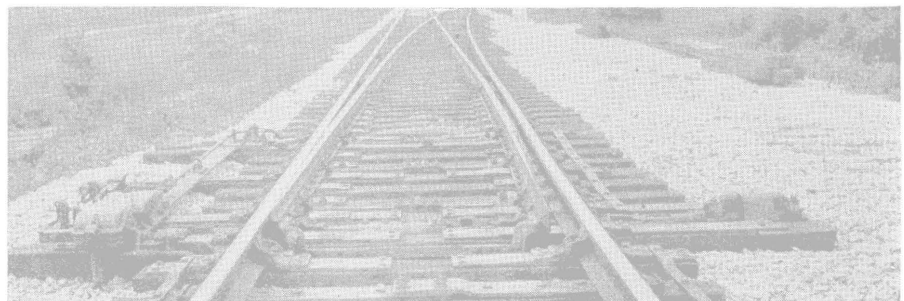
The centrally-located control circuits at the crossing and the continuously burning color-light signals on the Alton are supplied by an Exide Type-EMGO-9 160-a.h. battery of six cells which is on floating charge.

All of the relay equipment is of the General Railway Signal Company Type-K, the various instruments being housed in a wooden case at the crossing. The control circuits from the crossing to the home signals on the Wabash are of open construction on the Western Union line, with No. 10, 40 percent conductivity Copperweld wire. No. 6 solid double-braid weather-proof copper wire is used to feed the lights of these signals from the transformer at the crossing the main storage battery serving as a stand-by.

Lighting circuits from the crossing to the Alton home signals are run in Okonite four-conductor No. 12 parkway cable having a lead sheath and steel tape. Track-circuit leads are of No. 8A single-conductor Okonite parkway cable. Bond wires are of the cable type, furnished by the American Steel & Wire Company.

The advantages of the new interlocking equipment over the former arrangement are obvious. In addition to increased safety of operation through the use of modern track circuits in lieu of detector bars and modern electric locking and relay equipment, the operating and maintenance expense will be reduced. On the basis of the former annual operating cost of \$5,728, the cost of the new interlocking layout will be returned after approximately one year of operation.

The circuits and plans for this installation were prepared by the signal department of the Alton in cooperation with the signal department of the Wabash, the field work being done by the Alton company forces.



Spring switch with facing-point lock on the Wabash near Kansas City, Mo.