B. & O.

Eastbound passenger train crossing over movable-point-frog No. 24A at "BY".

AT an important main-line junction point on its Baltimore Terminal division, in Baltimore, Md., the Baltimore & Ohio has recently placed in service a modern all-relay electric interlocking. The new plant replaces a mechanical interlocking, originally placed in service in 1880, and which had reached the point of being uneconomical and impractical to maintain and repair. Heavier rail installed in recent years made the turnouts difficult to operate mechanically, especially under ice and snow conditions.

Location

The new interlocking is located at Bailey, 0.7 mi. west of Camden Station, in Baltimore, on the B. & O.'s main line between Philadelphia and Washington. As shown on the accompanying track and signal layout, the main line forms a junction at Bailey with a double-track line extending to Locust Point, the location of the B. & O.'s tidewater marine freight terminal and grain elevators. A double-track wye connects the main line with the Locust Point line.

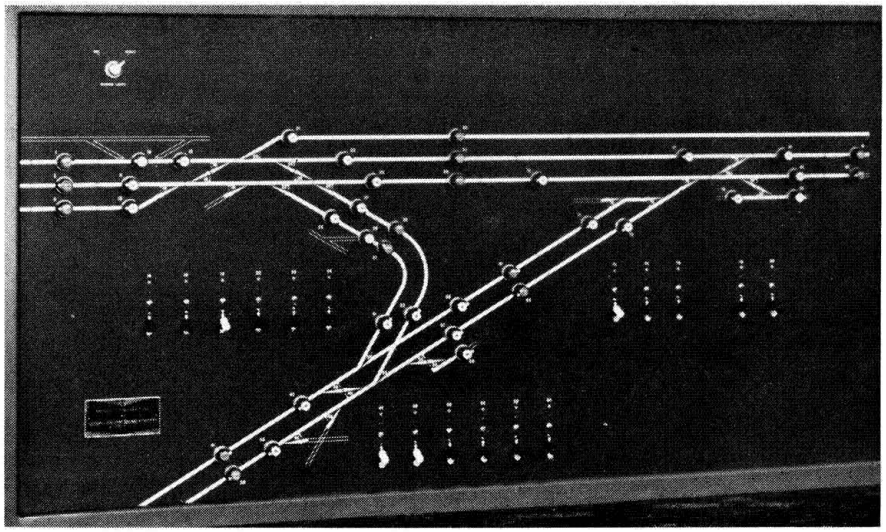
This plant handles 9 scheduled through passenger trains and 16 through freight trains in each direction daily via the main line. In addition, 3 through and 12 local scheduled passenger trains originate in Baltimore for points west. The equipment for these trains is turned on the wye, handled to and from the car washer and switched. Steam and Diesel locomotives are handled via the wye to and from the engine terminal at Riverside, on the Locust Point line, the latter tracks handling about 60 train engine movements every 24 hours. Also, there are numerous freight switching movements through and in the vicinity of the Bailey plant. This heavy traffic is being handled much more efficiently by the new relay-type power interlocking than was possible with the mechanical plant.

As part of the project, and for improved operation, the rigid-frog crossing at the junction was replaced with movable-point frog No. 24A. Crossover No. 80 between the eastbound main track and adjacent siding, formerly hand operated, was interlocked. Otherwise, the layout of the new plant is the same as the old layout.

The power switches and crossovers include No. 16 and No. 10 turnouts with 24 and 16-ft. 6-in. points, respectively. The switch machines are the Model 5C, designed for operation on 110 volts d.c., all switches being equipped with swivel-type front rods. The signals are the B. & O.'s standard color-position-light type.

Control Machine

The track and signal layout includes 9 single power switches, 4 crossovers, 1 movable-point frog, 10 electric switch locks on hand-throw derails and switches, and 23 high and dwarf home signals, all of which are controlled from a new panel-type control machine. The new ma-



The new control machine at Bailey is of panel-type construction

Installs All-Relay Plant

Modern electric interlocking replaces mechanical plant at important junction point and multiple-track wye in Baltimore, Md.

chine is located in "BY" tower near the junction, and which formerly housed the old mechanical machine. The new machine includes a track diagram of the plant with signal, lock, traffic and switch levers, together with associated indication lamps and magnetic switch-point indicators.

The signal levers are in the track diagrams and are of the push-pull-turn type with self-contained light-type indicators. The switch and lock levers are located adjacent to the function controlled and are the toggle type, with black handles for switches and white handles for locks. There are two lamps normally dark above each switch lever. A red lamp, when lighted, indicates that switch locking is in effect, and an amber lamp, when lighted, indicates that the switch is out of correspondence with the lever.

All tracks between interlocked goups within interlocking limits are arranged for train operation in either direction. Traffic locking is established on such tracks by the operation of directional traffic levers in the track diagram, before signals can be cleared for train movements. This protective feature eliminates misrouting of trains and simplifies the circuits to some extent. Reversal of traffic with the intermediate track circuit unoccupied can be made without time delay. When the track circuit is occupied, a predetermined time interval must elapse before reversal of the traffic lever is effective. This feature is necessary for certain switching movements.

Control of Signals

Signals are normally cleared by positioning all switch and traffic levers for the desired route and pushing the signal control lever. An indicator lamp in the signal lever will first show red, changing to white after all switches in the route have completed their movement and the signal has cleared. The signal is automatically put to Stop upon acceptance by a train and occupancy of the first track circuit, or may be put to Stop manually by pulling the lever, in which case time and approach locking are effective.

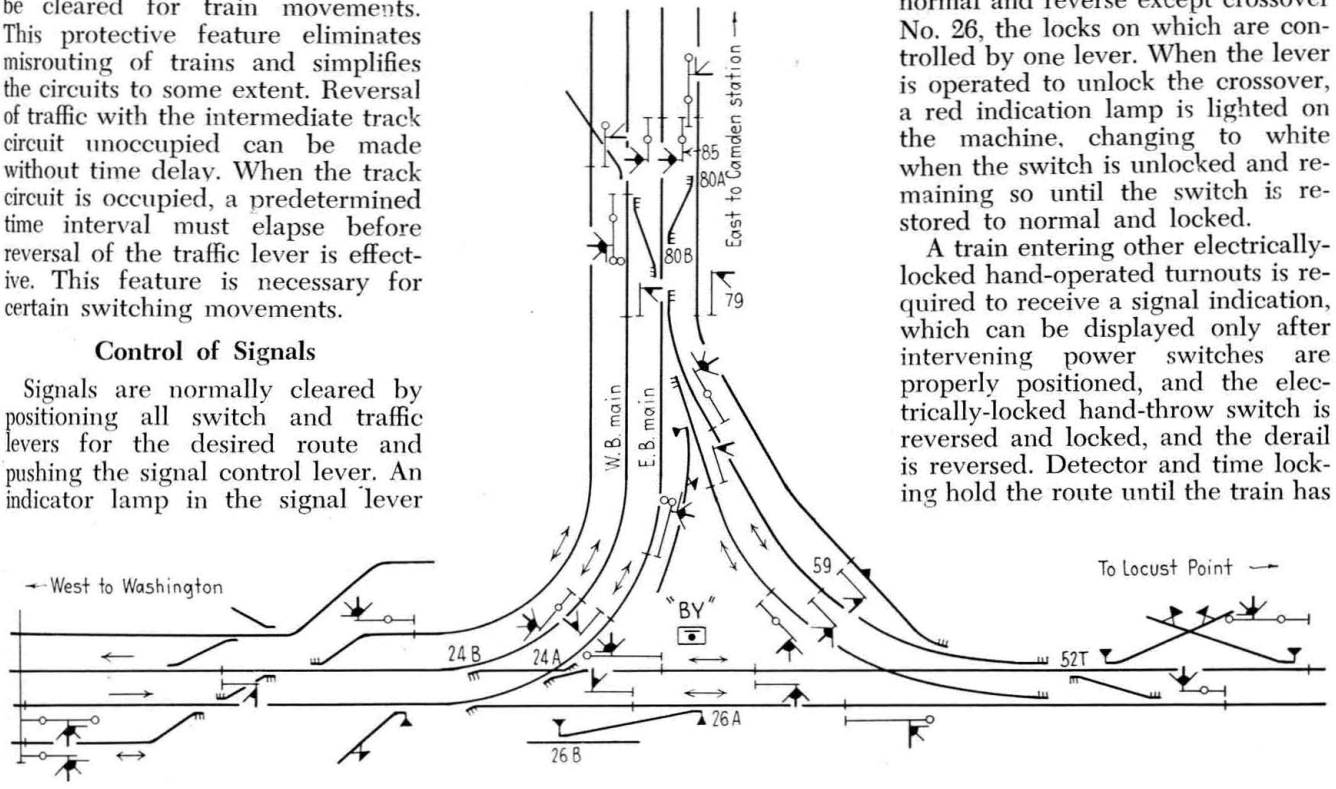
If it is desired to clear a signal with the first track circuit occupied, the signal lever must first be turned then pushed to display the restrictive indication. The signal, when cleared under this condition, will, due to features inherent in the circuits, automatically return to Stop if the first track circuit in advance of the signal becomes unoccupied before it is accepted. The signal lever must then be turned back to normal, and when the signal is to be cleared again, the lever is pushed in the usual manner as first described.

When crossover No. 80 is in its normal position, dwarf signals 79 and 85 can be controlled to display Restricting simultaneously, accomplished by first pushing signal lever 85 and then pushing signal lever 79. Switch engines can thus drill back and forth on the siding without further attention of the towerman. An arrangement is provided whereby signal 59 can be made non-stick to facilitate switching. This is done by first turning and then pushing the signal lever, causing the signal to display Restricting whether or not track circuit 52T is occupied.

Electric Switch Locks

All hand-throw switches and derails in interlocking limits are equipped with electric switch locks. Model-9A pedestal-type locks are applied on switches which are locked normal and reverse. Model-10 keeper-type locks are used on derails and switches which are locked normal only. All switches are locked normal and reverse except crossover No. 26, the locks on which are controlled by one lever. When the lever is operated to unlock the crossover, a red indication lamp is lighted on the machine, changing to white when the switch is unlocked and remaining so until the switch is restored to normal and locked.

A train entering other electrically-locked hand-operated turnouts is required to receive a signal indication, which can be displayed only after intervening power switches are properly positioned, and the electrically-locked hand-throw switch is reversed and locked, and the derail is reversed. Detector and time locking hold the route until the train has



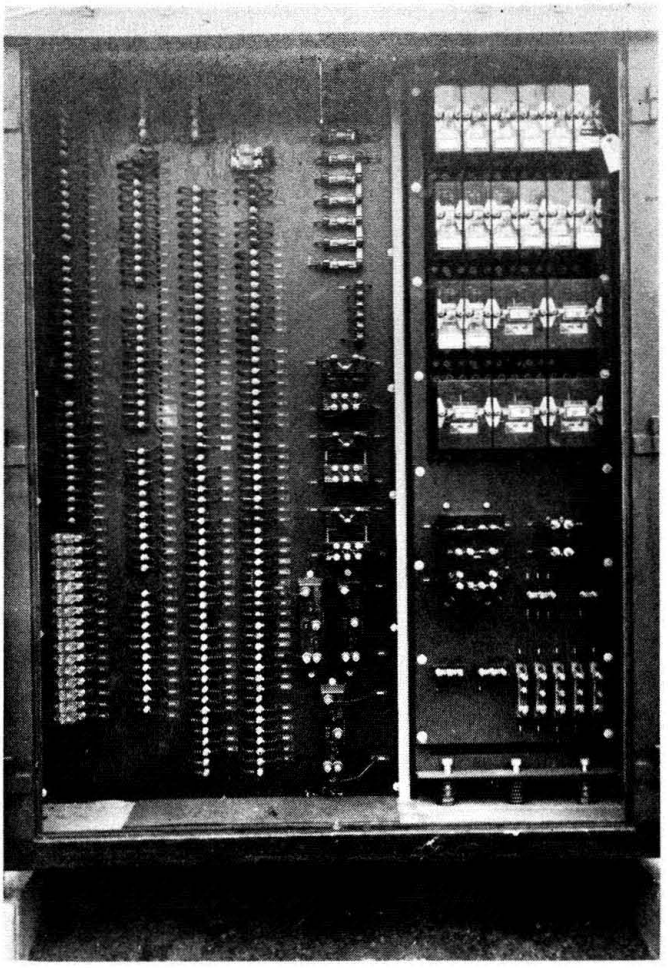
Layout of tracks and signals at the new interlocking in Baltimore, Md.

moved beyond the clearance point.

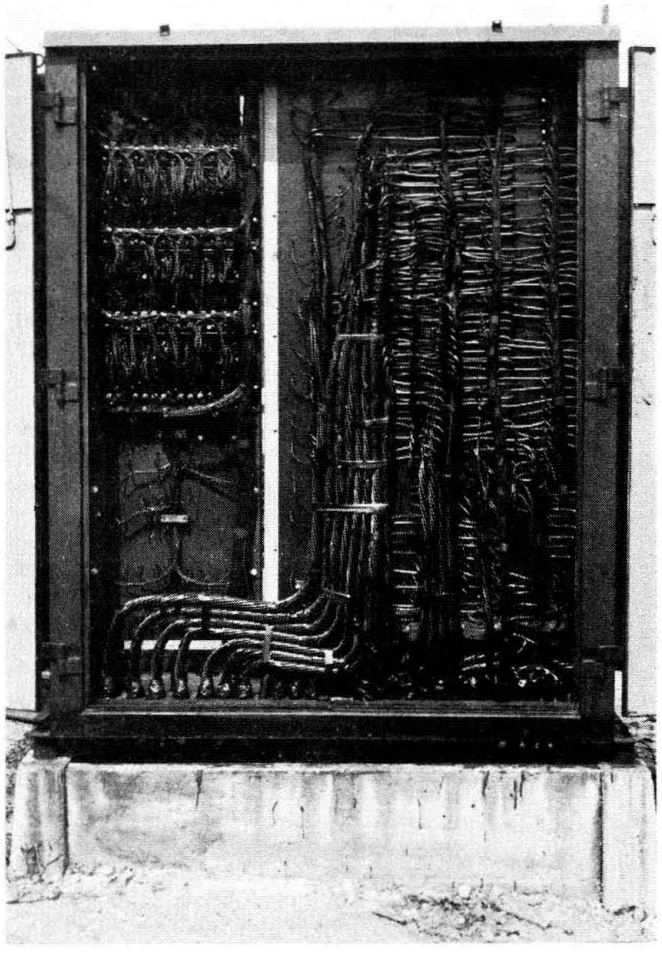
Before a train can leave an electrically-locked hand-operated turnout, the operator must position all power switches to the desired route before he can give an unlock on the hand-operated switch. Upon giving the unlock, the power switches are route locked until the movement is completed. Upon receiving the unlock at the switch, the crew reverses and locks the switch, then reverses the derail. The derail can be restored to normal as soon as the rear of train has passed over it, but the switch is held locked in the reverse position and cannot be restored to normal until the rear of the train has passed beyond the opposing signal. When the lock lever is reversed, an amber indication lamp is displayed on the machine until the switch and derail have been reversed and the switch locked. When the route or detector locking is effective to prevent unlocking the switch, a red indication lamp is displayed on machine.

Plug-In Relays

All relays at the tower and additional relays in the field are the Type-B plug-in relays. As a fire-protection measure, all vital relays, storage battery and other apparatus at the tower are located nearby in a welded sheet-steel bungalow. Field equipment is mounted in similar bungalows or steel instrument cases of varying sizes.



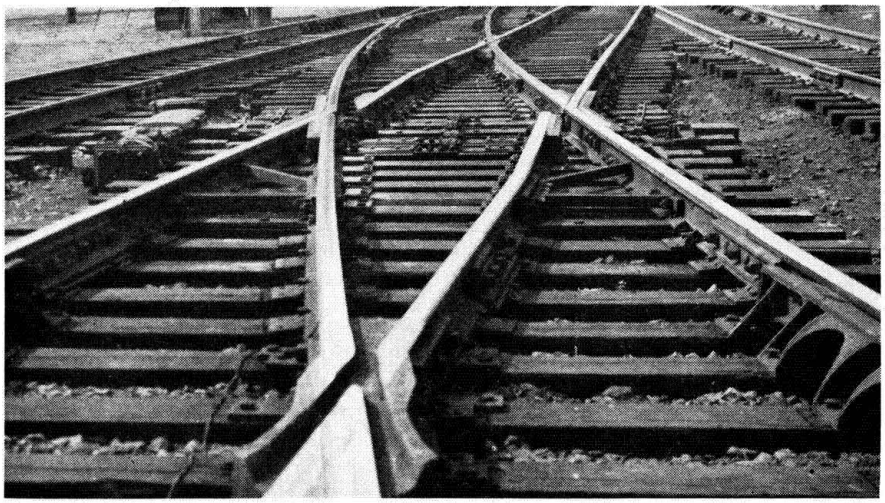
Plug-in type relays in instrumen case at Bailey interlocking



Rear of instrument case showing the wiring. Note foundation and method of mounting the case thereon

The instrument cases are mounted on precast concrete foundations, furnished by the Permacrete Products Corporation. The bottom of each instrument case is held 2½ in. above the foundation by the use of four cast-iron washers over the anchor bolts. This permits painting the under side of the cases. Underground cables entering the steel instrument cases are protected from the bottom of the case to 18 in. below the ground line by steel conduit.

An automatic ground-detecting circuit of the coded type lights lamps on the machine and in the instrument bungalow adjacent to the tower if a ground should occur on any circuit operated by the low-voltage tower batterey. Lamps remain lighted until the ground is cleared by the maintainer. Power for the interlocking is received at 110 volts a.c. The battery for operating power switches consist of 55 cells of Gould five-plate lead-acid storage battery, rated at 80 ah. At each bungalow in the field, there



Movable-point-frog No. 24A at Bailey interlocking

are one or more batteries consisting of six cells of 80-ah. lead type on floating charge, for operation of low-voltage circuits and signal lighting. Track circuits are of the conventional a.c. type. Line circuits are protected by Raco Clearview lightning arresters.

The rail through the plant is bonded with Cadweld rail-head type bonds. Frog and switches are bonded with American Steel & Wire Company stranded duplex bonds with ⅜-in. plugs.

To facilitate placing the plant in service, the power switch machines were temporarily operated from the mechanical interlocking machine. After the signals, relays and other equipment were wired and ready for service, the change over was performed one group at a time under traffic with no delay to trains.

This project was carried out by the regular signal construction forces of the B. & O., under the direction of A. S. Hunt, chief engineer-communications and signals, and under the immediate jurisdiction of W. W. Welsh, signal engineer. The major items of interlocking and signaling equipment were furnished by the General Railway Signal Company.

Western Pacific Signaling

(Continued from page 289)

station - to - station block to the switch, with the padlock out and with the time-element elapsed, the lock is released.

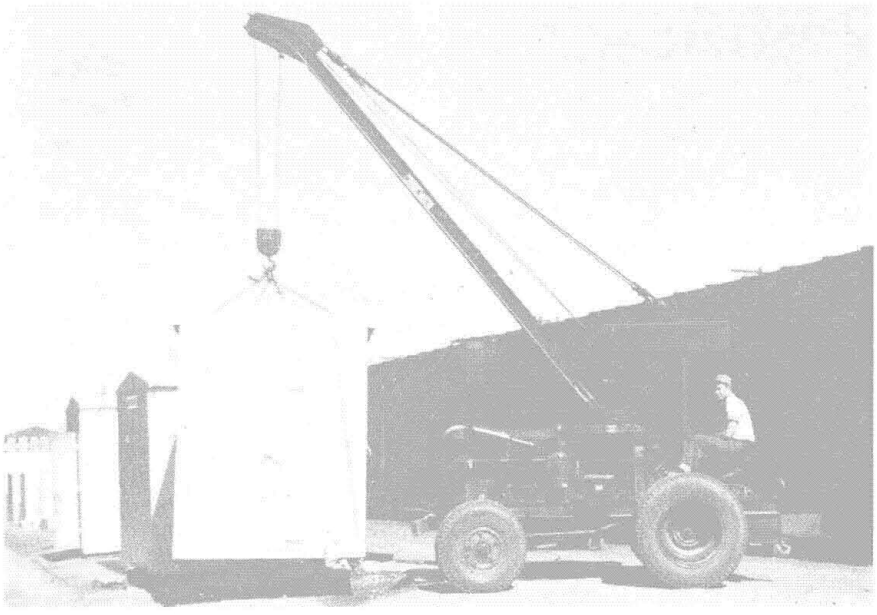
The use of time delay in the release of the lock was necessary to insure that an unauthorized release could not take place during the clear-out period after an eastward train movement in the block, when steady energy would be projected eastward in the block for the purpose of restoring the RFSR relay to normal. The time delay for moving from the main track to the spur track is 18 seconds and from spur track to the main track is approximately 1 minute under normal conditions. Conventional d.c. track circuits are used in the approach control section for highway crossing protection. The coded track circuits are taken around these approach sections on two No. 9 copper wires on the pole line. The maximum allowable resistance for such a line jump is 30 ohms.

Control Machine Circuits

An interesting development in connection with the use of reversible coded track is the use of additional circuiting in the control machine. In the foregoing, reference was made to sending code to the west end of the block to position the eastbound signal control relay at that point, and then sending code to the east end of that block to reverse the traffic relay for the purpose of changing steady energy to coded energy in the block. A link circuit was required to cause code to be sent to both ends of the block in this instance, since only one end of the block would normally be associated with given panel. Transmitting a control code to the east end of the block by the operation of the control start button for the west end of the block was necessary for the single step involved to reverse the traffic relay, but was neither required nor desired for any other function at the east station in connection with this operation.

Lever-Repeater Relays

Of particular importance was the possibility of an unintentional change in the condition of a signal at the east station due to a lever being out of position at the time the joint control codes went out. To overcome this condition, signal-lever-repeater relays were installed in the control machine. The pickup of this relay is necessary before a code can be transmitted to the field



A portable power crane mounted on a tractor which has rubber tires is used to handle switch machines, instrument houses and other heavy materials