

C.T.C. Installed on the Baltimore & Ohio

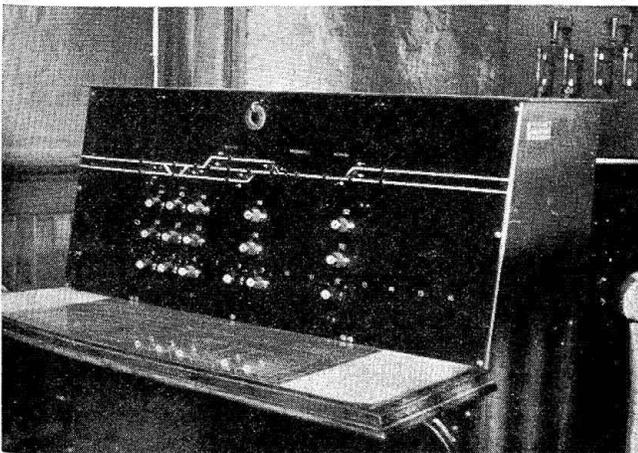
Interlocking and block office at the two ends of double track are replaced—Train movements facilitated

THE Baltimore & Ohio has installed centralized traffic control between Fairpoint, Ohio, and Maynard on the Wheeling division, extending between Wheeling, W. Va., and Cleveland, Ohio. This line is a succession of single-and-double-track sections. One section of single track, 3.7 miles long, extends between Maynard and Fairpoint, second tracking in this territory having been postponed on account of the large expenditures it would have required, since this section, which traverses a mountainous territory, includes numerous curves and one tunnel 475 ft. long. Passenger traffic on this line is limited to one passenger train each way daily. A large percentage of the freight handled on this line is coal moving from the fields in West Virginia and southern Ohio, northward to ports on Lake Erie and westward to Chicago and beyond. The number of trains varies, depending on the coal traffic, from 12 to as many as 40 freight trains being operated daily. As helper engines are required for northbound tonnage trains, the operation of light engines increases the number of southbound movements.

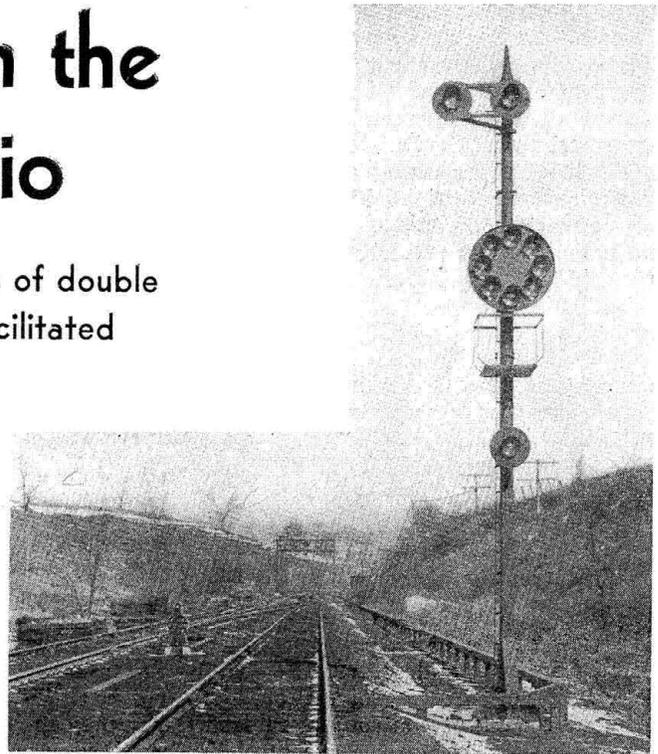
Old Layout Included Interlocking

Under the previous arrangement, this section of single track was operated as a manual block. An office was maintained at Maynard with an operator on duty at all hours to operate the end-of-double-track switch and handle train orders. At Fairpoint, there was an 18-lever electric interlocking which included the end-of-double-track, certain crossovers and siding switches, the old track layout at Fairpoint being shown in one of the diagrams. As there are several coal mines in this territory, a mine-run train is operated out of Fairpoint, thus requiring considerable switching at that point, which blocked the old passing siding for extended periods.

In order to permit run-around movements on the sec-

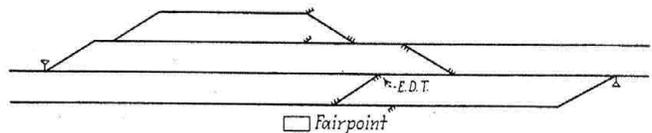


The control machine is in the Fairpoint office



View of west-end cross overs with signal 44E in foreground

tion of double track just north of Fairpoint it was desirable to provide a set of two crossovers about a mile north of that station and to extend the second track and the passing track 3,561 ft. east of the station. It was considered impracticable to reconstruct the old electric interlocking to adapt it to the extended track layout. Consideration, therefore, was given to the use of centralized traffic control, an especial advantage of using c.t.c. for the Fairpoint layout being that the new system could be arranged to include also the end-of-double-track



Layout of interlocking formerly in service at Fairpoint

at Maynard, thus permitting the elimination of the block office at that point. A further advantage to be secured by c.t.c. was the increased safety of train operation and the increased track capacity of the single track. After giving consideration to all of these factors, it was decided to change the track layout at Fairpoint as previously explained, and to install c.t.c. extending from Maynard to the west crossovers at Fairpoint, the project to include A.P.B. automatic signaling on the single track.

The c.t.c. project includes eight high signals, four dwarf signals and eight power switch machines, located at the two ends of double track, at the two ends of the passing track and at the west end crossovers. The automatic signaling includes four high signals between Maynard and Fairpoint, as well as two high signals for the distant signals at each end of the project. All of the signals are of the Baltimore & Ohio standard color-position-light type.

Arrangement of the C.T.C.

The new c.t.c. control machine located in the office at Fairpoint was furnished by the General Railway Signal

are used and the switch adjustments are of the Bossert type. The point detectors are adjusted to a $\frac{1}{8}$ -in. opening.

The a-c. floating system of power supply is used on this installation. Alternating current is purchased at Fairpoint and fed out through a switchboard in each direction on the two line wires of No. 4 copper wire with weather-proof covering. This switchboard is equipped with a General Electric overload and underload circuit breaker, an ammeter with an 0-15-amp. scale and a voltmeter with a 0-750-volt scale. The normal load is about 2 amp. at 460 volts. Separate double-pole single-throw switches are provided to feed the line in each direction.

At each signal or switch location, there is a G. R. S. line transformer, the capacity varying from 50 v.a. to 250 v.a., depending on the load. Each transformer is protected by G.E. arresters connected to a $\frac{3}{4}$ in. by 10 ft. Copperweld ground rod. The maximum resistance of each ground connection is 15 ohms. The signals are normally lighted from the a-c. supply through approach lighting circuits, and in case of a failure of the a-c. supply the feed is cut over to the batteries.



Interior of sheet-metal instrument house at the west crossovers

At each location where there is a power switch, a battery of 12 cells of EMGO-7 Exide storage battery of 120-a.h. capacity is provided for the switches and the signals. At the intermediate signal locations, 6 cells of EMGO-5, 80-a.h. capacity Exide battery are used for the signals and control circuits. One cell of EMGO-7 120-a.h. capacity is used for each track circuit. At the control office 12 cells of EMGO-7 battery are used for the local requirements of the c.t.c. system. All rail joints are bonded with gas-welded bonds.

All line control circuits are carried in a cable made up of No. 14 conductors with $\frac{5}{64}$ -in. insulation, with tape and braid on each conductor and with a braided covering over all. The number of conductors in each

section of the cable ranges from 19 to 30, about 20 per cent being spares with a minimum of 4 spare conductors. A 30-conductor cable extends from Fairpoint to the end of double track and a 19-conductor aerial cable from there to Maynard. This cable is suspended from a $\frac{3}{8}$ -in. stranded Copperweld messenger wire, using C-W. "never-slip" rings.

At each switch layout, a welded sheet-metal house, lined with Celotex, is provided for housing all the relays, batteries, rectifiers, etc. The relays are the shelf type, mounted on springs. Incoming line wires terminate on Western Railroad Supply Company's triple-path neon arresters, mounted on a board near the floor in the end of the house.

Various other terminals, resistors and knife-switches are located just above. All jumpers between terminals, arresters and relay posts are No. 16 insulated flexible wire, except for switch operating circuits which were all No. 9. These houses were all wired with the apparatus in place at the works of the General Railway Signal Company.

Special Control Features of Automatic Signaling

A few special features are embodied in the A.P.B. signaling circuits. Each line circuit for signal control is a loop circuit with double control. Each HD (Home and Distant) control circuit passes through a back contact of the second opposing home signal's HD relay—considering a signal at the same location as the first opposing signal—to provide that all opposing signals must be at stop before a leaving signal can clear.

Each signal is arranged to display at least four indications; viz: "Stop," "Stop and Proceed," "Approach" and "Clear." The indications "Stop and Proceed," "Approach" or "Clear" cannot be displayed unless the opposing signal protecting that block is at "Stop." A "Stop and Proceed" signal cannot be displayed unless the block is occupied by a train moving in the same direction.

A northward train entering the signal-track section at Maynard—upon passing the head-block signal—sets that signal at "Stop," and also causes energization of a directional relay. When the rear of a train has passed the end-of-double-track switch at Maynard, the dispatcher may send out a new control which causes the display of a "Stop and Proceed" head-block signal, which will be accepted as such by a following train.

A train passing one of the intermediate automatic block signals causes energization of a direction relay which holds the marker lamp lighted in combination with two red lamps. This "Stop and Proceed" indication is accepted as such by a following train. Briefly, a "Stop and Proceed" indication, whether at a home signal or an automatic block signal, is displayed only when the block is occupied by a train moving in the same direction and is observed the same as in double-track territory.

Standard approach, time, route and indication locking is provided for protection against the movement of switches when it is unsafe for a switch to be moved. In addition to the telephones located in the booths in the steel houses, telephones are located conveniently to all hand-operated switches.

The apparatus for the signaling as well as for the centralized traffic control on this installation was furnished by the General Railway Signal Company. The plans were developed in the office of the signal engineer of the Baltimore & Ohio, and the construction was handled by the Baltimore & Ohio Signal construction forces under the direction of the signal engineer and under the supervision of the engineer maintenance of way.