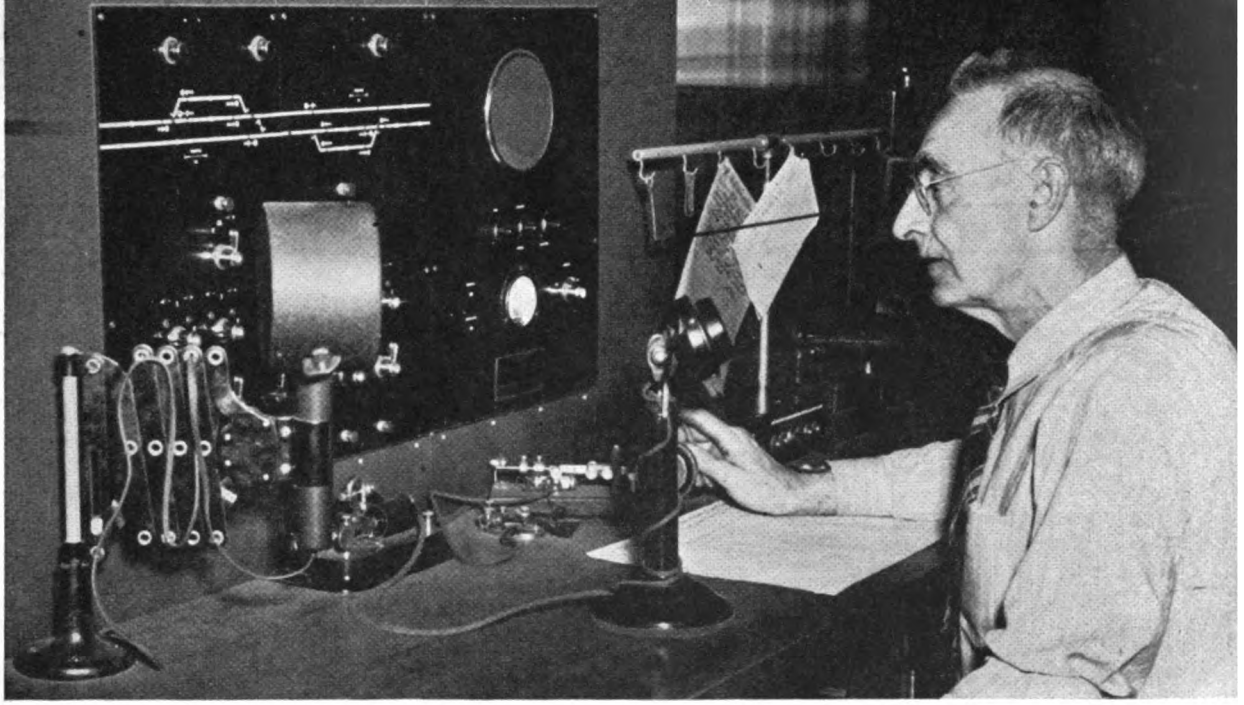

Control machine for Charlestown, located in station at Newton Falls

Remote Control on Baltimore & Ohio

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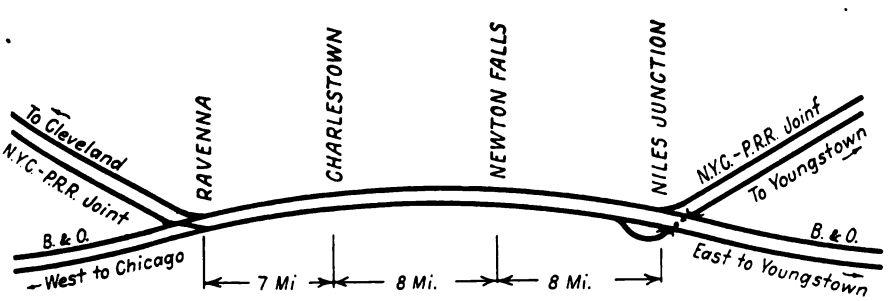
Power switches and signals at two sidings and a crossover reduce delays on double track handling 112 trains daily

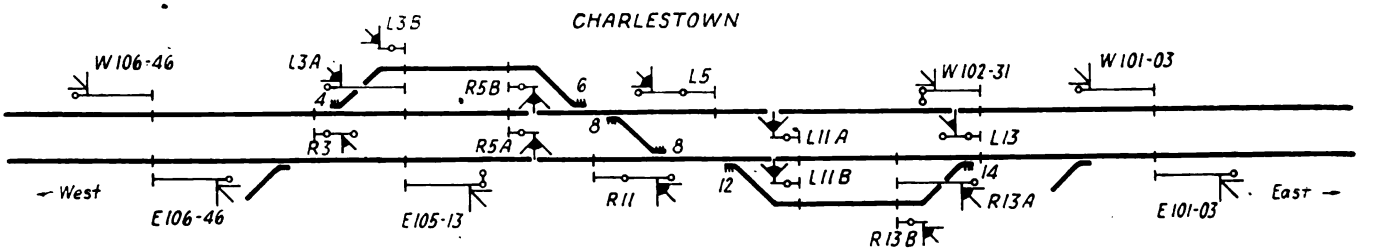
THE 23 miles of double-track main line between Niles Junction, Ohio, and Ravenna, on the Baltimore & Ohio route between Pittsburgh and Chicago, is used also by trains of the Pennsylvania and the New York Central. The average daily traffic totals 112 trains, including 62 of B. & O., 40 of the Pennsylvania, and 10 of the New York Central. This territory is equipped with automatic block signaling for single-direction right-hand running. Interlockings, including junction switches, crossovers and sidings, are in service at Niles Junction and at Ravenna. Also, at Newton Falls, 8 miles west of Niles Junction, there is an interlocking including two crossovers and two sidings. Between Newton Falls and Ravenna, 15 miles, there was no interlocking.

Observation of train movements and an analysis of the train sheets showed that some trains were being delayed on account of the long station-to-station block, 15 miles between Newton Falls and Ravenna. For example, if an eastbound freight train was approaching Ravenna about 20 to 25 minutes ahead of a following passenger train, there would not be time for the freight to go to Newton Falls, 15 miles, ahead of the passenger, and, therefore, the freight would be put in the siding at Ravenna to wait for the passenger. As a result the freight would lose 25 to 30 minutes. Similarly, a westbound freight would be put in the siding at Newton Falls if it did not have time to go to Ravenna ahead of a following train.

For a number of years, two sidings and a crossover had been in service at Charlestown, which is about half way between Newton Falls and Ravenna, but these switches were operated by hand-throw stands, and, therefore, considerable delay was incurred when stopping a long freight train to permit a trainman to open a siding switch for the train to enter, and also further time was lost when placing the switch normal and boarding the train after it was out on the main line again. As a matter of fact, an eastward train, for example, could depart from the interlocked siding at Ravenna and get all the way over to Newton Falls, 15 miles, just about as soon as if it



Map of the territory from Niles Junction to Ravenna



Track and signal layout at Charlestown

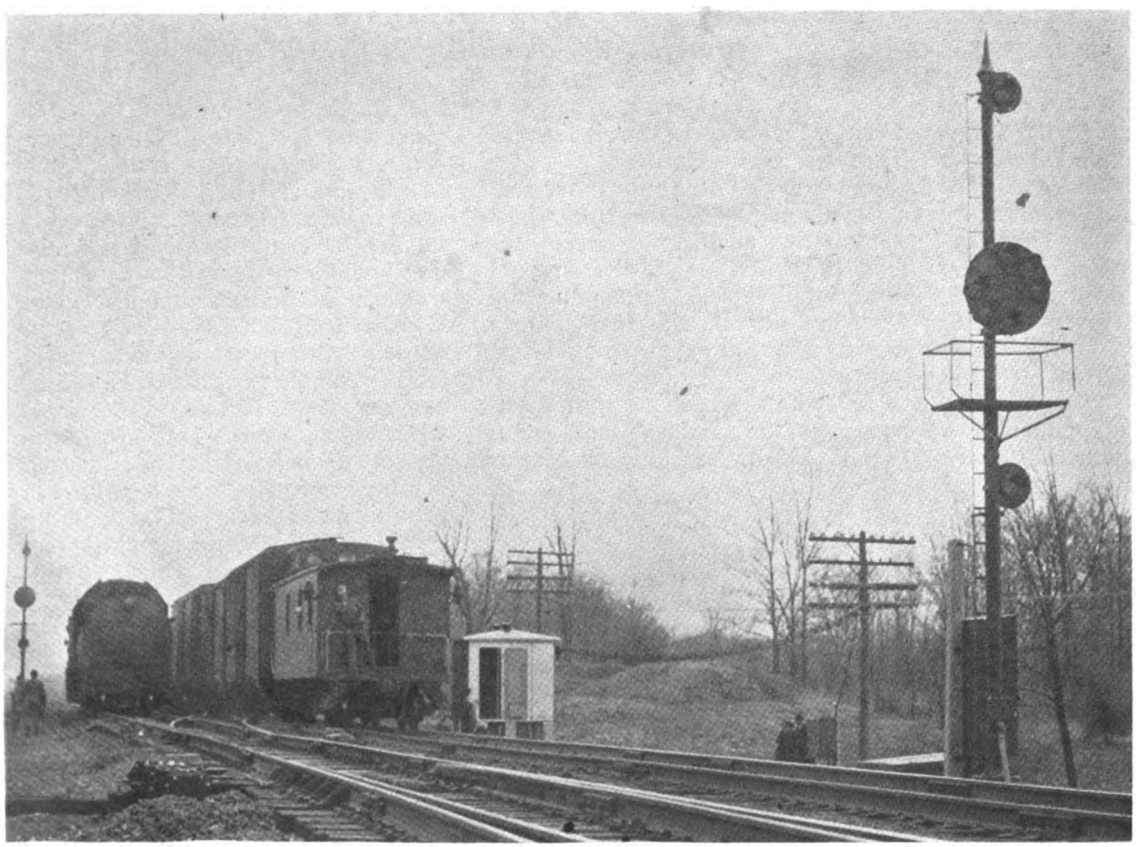
were put in the siding at Charlestown and had to work its way out of the hand-throw switch. As a result, the Charlestown sidings were not used except in instances when the sidings at Ravenna and Newton Falls were occupied.

The logical solution was to install power switch machines and signals at the crossover and siding switches at Charlestown, so that train movements could be made into or out of the sidings as well as through the crossover, without making stops to handle the switches. These new interlocking facilities at Charlestown are controlled remotely from a panel type machine in the office at Newton Falls, 8 miles east of Charlestown. This new control machine has 5 levers to control 4 single switches and 1 crossover, and 4 signal levers to control 12 signals. The track-occupancy lamps on this panel indicate occupancy of all sections of the main track and also the sidings. Between this office and the interlocking at Charlestown, the controls and indications are transmitted by the General Railway Signal Company Type-K, Class-M, 10-step time code, using two No. 10 AWG hard-drawn weatherproof copper line wires.

The sidings at Charlestown are equipped with track circuits, so that the signals governing trains entering the sidings can be controlled on the basis of track occupancy, thus saving time. For example, with the westward siding unoccupied, and the switch No. 6 reversed for a westbound train to enter, signal L5 can be controlled to display the Medium-Approach aspect and, at the same time, signal W102-31 displays the Approach Medium aspect. Therefore, an approaching train can be brought up to and through the No. 16 turnout at the speed for which it is designed, with knowledge that the siding is unoccupied. If the siding was not equipped with track circuits, the best aspect that could be given on signal L5 would be Medium Permissive, and the engineman would have to enter the siding at restricted speed, prepared to stop short of a train or obstruction on the siding. Thus the signaling, as installed at Charlestown, saves several minutes for a long freight train when entering a siding. If the westward siding is occupied by a westbound train, and a second westbound train is to be directed to pull into the siding behind the first train, signal L5 can be controlled to display the Stop-and-Proceed aspect.

The signals for directing trains to depart from sidings in the normal direction, such as signal L3B, are equipped to display the conventional aspects of Stop, Medium-Approach and Medium-Clear,, and can be controlled to display a Stop-and-Proceed aspect to let a train on the siding follow a train in an occupied block.

Sheet-metal houses were installed at the crossover and at the two outlying passing track switches to house the relays, line coding equipment and batteries. The switch machines are the low-voltage type for operation on 24 volts d.c. At each field station, there is a set of 14 cells of 200-a.h. lead storage battery which is used as a whole to operate the switch machines and to feed the line coding equipment. Another set of six cells of 80-a.h.



A freight train meeting light engine at Charlestown. Signal R11 is at right

Westbound train passing westward distant signal W102-31

battery feeds the standard relay circuits. Each track circuit is fed by one cell of 120-a.h. battery. All batteries are the lead type furnished by Exide. General Railway Signal Company copper-oxide rectifiers are used throughout for charging the storage batteries. In the instrument houses, the relays, other than the code equipment, are the type K, shelf type with spring mountings to absorb vibration. The shelves and back boards are made of plywood, ¾ in. thick and 12 in. wide.

Since this project was placed in service there have been numerous instances in which trains have saved considerable time. For example, if a westbound freight train is approaching Newton Falls a few minutes ahead of a passenger train, the freight is run on over to Charlestown to take siding rather than putting it into the siding at Newton Falls. Thus the freight train saves 20 to 25 minutes. Similarly an eastbound freight train approaching Ravenna can be advanced to Charlestown on close time ahead of a passenger train rather than holding the freight at Ravenna. With more than 50 trains each way daily, there are numerous such instances in which the new remote control interlocking not only saves time for a particular freight train, but also makes the whole operation more flexible.

This interlocking was planned and installed by signal forces of the Baltimore & Ohio, the principal items of interlocking equipment being furnished by the General Railway Signal Company.

Leave-Siding Signal Recommended by I.C.C.

On November 24, 1946, a side collision occurred between two freight trains on the Southern at Pine Knot, Ky., and the following information is abstracted from a report by the Interstate Commerce Commission. Pine Knot is on double - track territory equipped with automatic block signaling. Northbound freight train Second 54 took siding at Pine Knot to let northbound passenger train No. 16 pass. The north end of the siding is connected to the northward main track by a spring switch. A rule, with reference to trains departing from sidings, reads: "At spring switches * * * the spring switch must be thrown for the siding and after waiting three minutes the train or engine will proceed to the frog when the switch will be thrown and locked for the main track and the movement completed." This rule, evidently, was not obeyed in the instance being discussed.

According to the statements in the I.C.C. report, passenger train No. 16 passed Pine Knot about 1:25 p.m., and about 1:32 p.m. the freight train Second 54 proceeded north on the siding, entered the turnout and stopped with the front end of the locomotive 186 ft. north of the clearance point so that the locomotive was fouling the main track, and was struck by northbound freight train Third 54. Northbound freight train Third 54 was following the passenger train No. 16, and this Third 54 had received an Approach aspect on signal 198.0 which is 2.98 miles south of the point of accident, and when approaching signal 197.0, which is 1.01 mile south of the point of accident, the aspect changed from Approach to Clear. From statements in the I.C.C. report, it is to be concluded that Second 54 fouled the main track after Third 54 passed signal 197.0. The fireman of Third 54 reported that he saw stop signals being given by hand when about 400 ft. from the north switch, and he called a warning to the engineman and jumped. The engineer was fatally injured in the accident.

The I.C.C. report concludes: "Had a signal been provided governing movements from siding to main track, a definite indication would have been given that a following train was closely approaching and that it was not safe for the train on the siding to foul or to enter the main track.

"It is recommended that the Southern install automatic signals to govern movements from sidings to main tracks on its lines where an automatic block-signal system is in use."