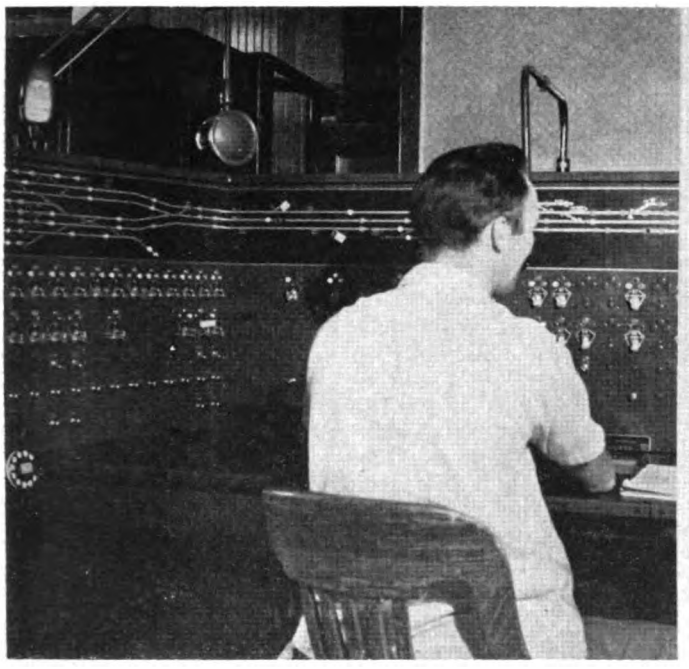
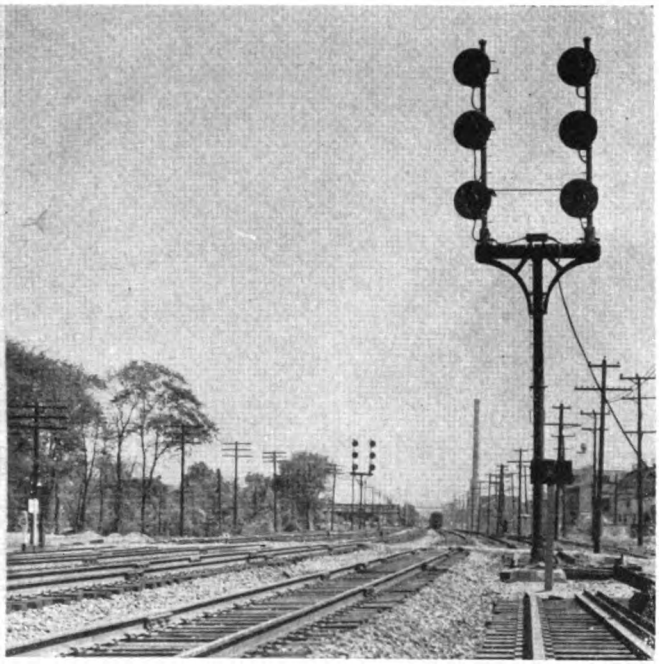


THIS MACHINE at "FM" also controls "MR", "K" and "WE"



SIGNAL AT "K" was set over in line with track to be removed

C.T.C. Enables P. & L.E.

To Remove Fourth Main Track

Project includes control of four interlocking layouts and signaling for train movements both ways on middle track, with single-direction running on other two tracks

SAVINGS in track maintenance and operating expenses, with adequate track capacity, have been accomplished on the Pittsburgh & Lake Erie by removing the fourth main track, and signaling the middle track both ways on 12 mi between West Economy, Pa., and "FM" which is 6 mi west of Pittsburgh station. This territory handles 18 P&LE passenger trains and 16 Baltimore & Ohio passenger trains daily, as well as about 22 P&LE freights and 14 B&O freights. Switching moves are underway most of the time to serve industries and steel mills. At "FM" a connection is made with the Pittsburgh, Chartiers & Youghiogheny, which is a single-track, main line extending 10.5 mi to coal mines. At "MR" connection is made with the Montour Railroad, a single-track line extending 45 mi to coal mines. Loaded cars from these connections are taken to McKees Rocks yard to be made up in trains. Thus this territory handles numerous trains and switching operations, totaling 82 to 95 daily.

Four main tracks had been in service for many years on this territory, all the way from Pittsburgh to Wampum, 41 mi. The two tracks on the north side were signaled for westbound trains, and the two tracks on the south were signaled for eastbound trains. Visualizing the use of centralized traffic control, not only for the consolidated control of interlockings, but also for train movements both ways on one or more tracks of multiple track, the P&LE management decided to make an installation including:

1. Removal of the fourth main track on 12 mi. between West Economy and "FM".
2. Installation of signaling for train movements both ways on the middle track and also both ways on each of the two outside tracks between "MR" and "K," 1.7 mi.
3. Consolidation of control of interlockings into one CTC machine for the entire territory.
4. To replace manual crossing gates with automatically controlled gates at six crossings with streets in Coraopolis, Pa.

Benefits are Worthwhile

On the track removed, the rail was 131 lb. R.E. A.A.R. section. Practically all of this rail is being used for replacements elsewhere on the railroad, thus avoiding purchase of that much new rail. About 65 per cent of the ties are being re-used. The annual reduction in track maintenance expenses and operating costs due to removal of one main track is estimated at $4,000 per mile of track removed. Other savings in operating expenses, including reductions in number of interlocking control points, total about $120,000 annually. The project as a whole will pay for itself in about 5 years.

Experience in the months since this project was com-

ONE TRACK WAS removed through layout at "WE"

pleted has proved that train and switching moves are being handled just as well as before; in fact, switching and transfer moves are encountering less delay. Based on this experience, study is now being given to removal of one or more main tracks on additional mileage on this railroad.

Interlocking Controls Consolidated

At "FM" there was an 88-lever electric interlocking machine in service since 1919, which included six single switches, 13 crossovers and 19 home signals. When removing the fourth track west from "FM", changes were made in this interlocking to remove three switches, three crossovers and four signals. New switch machines, or modern ones which had been in service only a few years, were installed throughout the interlocking, and searchlight signals were installed for all home signals. An entirely new system of wiring and circuits were installed, based on modern, all-relay controls. A new CTC type machine was installed in this tower to control not only this interlocking, but also the CTC territory including other interlockings to be explained later.

At "MR", where connection is made with the Montour Railroad, the P&LE formerly had a 40-lever mechanical interlocking including two single switches, 7 crossovers and 12 home signals. When removing the fourth main track, the old mechanical interlocking was removed. New electric switch machines and searchlight home signals were installed, the home signal limits being extended west to include two new crossovers—No. 59 and No. 61. On Track No. 4, now the westward main, there was, at "K", a hand-throw switch that connected to a spur leading to industries on the north side of the tracks. As part of the new project an electric switch machine and searchlight home signals were installed at this switch.

The junction of the west end of the new three-track with the four-track on west is at "WE" which is an entirely new track layout including 1 single switch, 4 crossovers and 7 home signals. Electric switch machines and searchlight home signals were installed here. The work at "WE" and also at "K" and "MR", included completely new systems of local controls, connected to line coding apparatus for remote control from the CTC machine at "FM" tower.

The new signaling includes high home signals and intermediate signals for train movements both ways on the middle main track, and also for train movements both ways on all three tracks between "MR" and "K", 1.7 mi. Also, electric locks were installed on 6 hand-throw main track switches leading to spurs. On a hand-throw, bolt-locked crossover between the middle track and the westbound track near South Heights, an electric lock was installed on the bolt-lock lever. A similar arrangement was installed on a crossover between the middle track and the eastward track. The electric locks are controlled by levers in the CTC control machine at "FM".

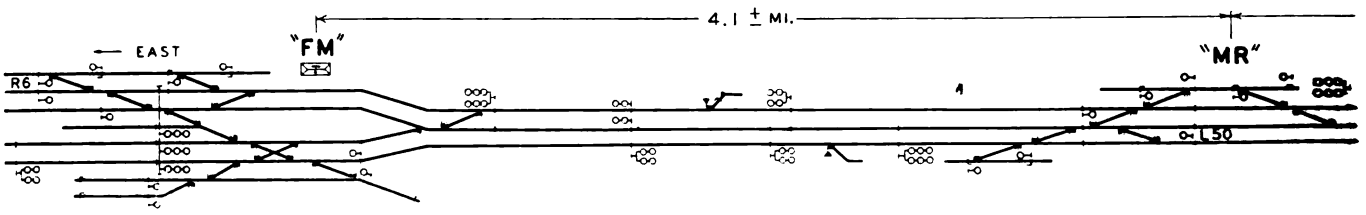
Exit Lamps on Diagram

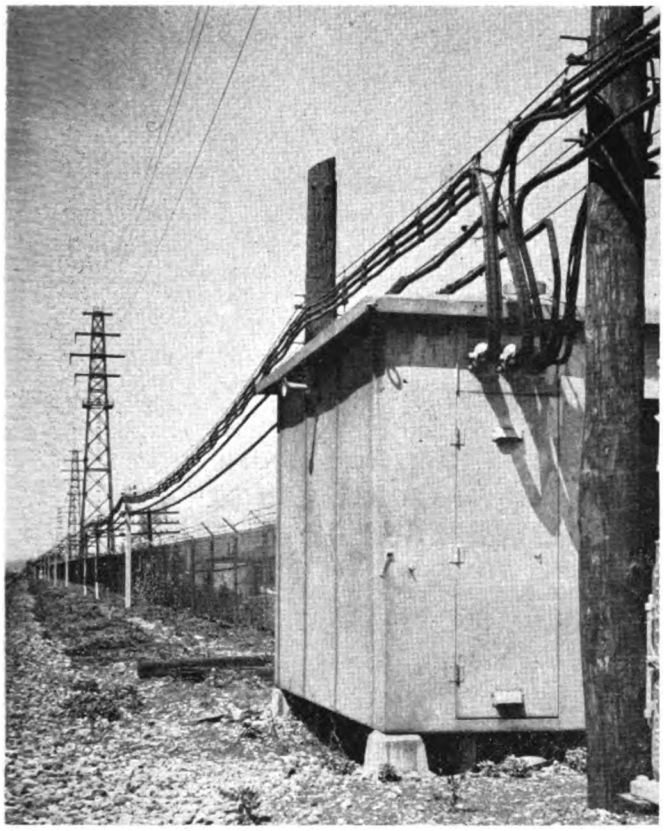
Signal levers normally stand in the center position. Such a lever is thrown to the left to set up control for an eastward signal, or to the right for a westward signal, then the control code is sent out by pushing the code sending button. To clear the call-on aspect on a signal, the lever is positioned and the call-on toggle below the lever is thrown before pushing the code sending button.

Above the center of each switch lever is a red indication lamp which is lighted when electric locking is in effect to prevent operation of the switch even if the lever is thrown. The panel of the CTC control machine has a track diagram of the entire territory. In the portions of this diagram that represent interlockings, additional indication lamps, known as "Exit" lamps, are located at places corresponding with home signal limits on each track. Such a lamp, when lighted, indicates the exit of the route for which the switches are lined. On the face of the lens is a black arrow pointing in the direction of the exit. After controlling the switches for a line up and positioning the signal lever, the leverman looks at the lighted "Exit" lamp to be sure that he has lined up the route intended, before he pushes the code sending button to send out the control to clear the signal. This avoids delays that would be required to let the time locking run down, if he cleared a signal and locked a route other than the route intended. The position of each switch is indicated by "N" and "R" lamps over the corresponding positions of the lever.

Traffic Levers

The middle track is signaled for train movements either way. Applying for this middle track there is





AERIAL CABLE leads to instrument house at "WE"

a traffic lever for the section from "FM" to "MR" and likewise a traffic lever for the section "MR" to "WE." To line up for an eastward move on the middle track from "MR" to "FM", the corresponding traffic lever is thrown to the left. On the line representing this section of track there are two blue lamps; one with an arrow pointing east and the other with an arrow pointing west. When a traffic line up is set up, the corresponding blue lamp stays lighted. Having established such a traffic direction line up, it cannot be changed until the entire section of track from interlocking to interlocking is unoccupied.

In some instances it may be desired to clear a restrictive signal for a train or engine movement to a track in which the direction of traffic is always opposite to that desired for the proposed move. In such instances, the signal lever is positioned as usual, then the "Block" button for that signal lever is pushed before pushing the code sending button. The "Block" push button, where necessary, is located below the code sending button for the opposing signal.

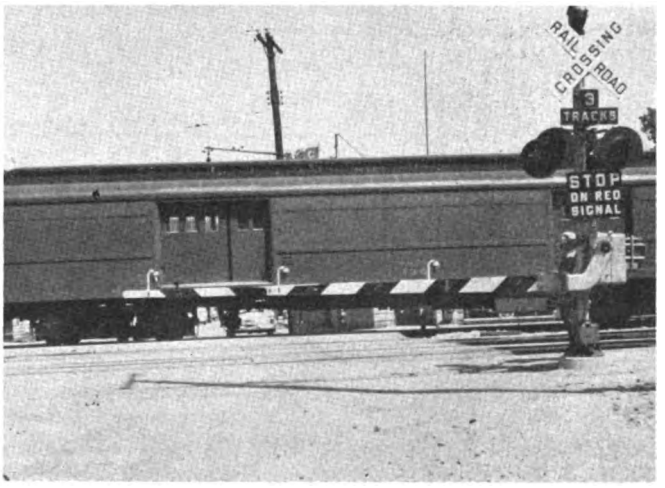
Flashing-Red Aspect

At two locations where a regular practice is for trains to stop on a main track with traffic direction control, while the locomotive sets out or picks up cars on another track, the flashing-red aspect is used to direct the locomotive (with or without cars) to back down on the rear portion of its train, this move being into the block occupied by the rear part of the train, and in the direction opposite to the established direction of traffic for that block. Signal R-6 at "FM" and Signal L-50 at "MR" are equipped to display this flashing-red aspect, when so controlled.

To clear Signal R-6 at "FM" for final movement of engine back against the rear portion of its train standing on No. 3 main track west of "FM" after having made a set-off, the operator must first observe that the track indication light is lighted, indicating the release track circuit at Signal R-6 is occupied, lever 6 should then be placed in the "R" position, block push button 2-W is then depressed momentarily, after which the code sending button should be depressed. After Signal R-6 has cleared to the "Flashing-Red" aspect, the red light over the lever will be extinguished, and the amber light in the "R" position will be lighted and flashed. After the train passes Signal R-6, the flashing amber indication light will be extinguished and the red indication light will be lighted. Signal Lever 6 should then be returned to its normal position. Traffic Lever 37 should remain in the "L" position when "Flashing-Red" aspect is to be displayed on Signal R-6 for a movement against the current of traffic to No. 3 Track.

Automatic Gates at Six Crossings

In Coraopolis, 6 crossings, Broadway, Mulberry, Mill, Main, Watt and Thorn streets were previously protected by automatic warning bells and crossing watchmen. In addition, at Mill street, manually-operated pneumatic gates were in service. As part of the signal construction program, new automatically controlled



AUTOMATIC GATES replace crossing watchmen

short-arm gates with flashing-light signals and warning bells were installed at these crossings.

This signalling project was planned and constructed by P&LE forces under the direction of E. F. Brown, Signal Engineer, the major items of new signaling equipment being furnished by the Union Switch & Signal Division of Westinghouse Air Brake Company.