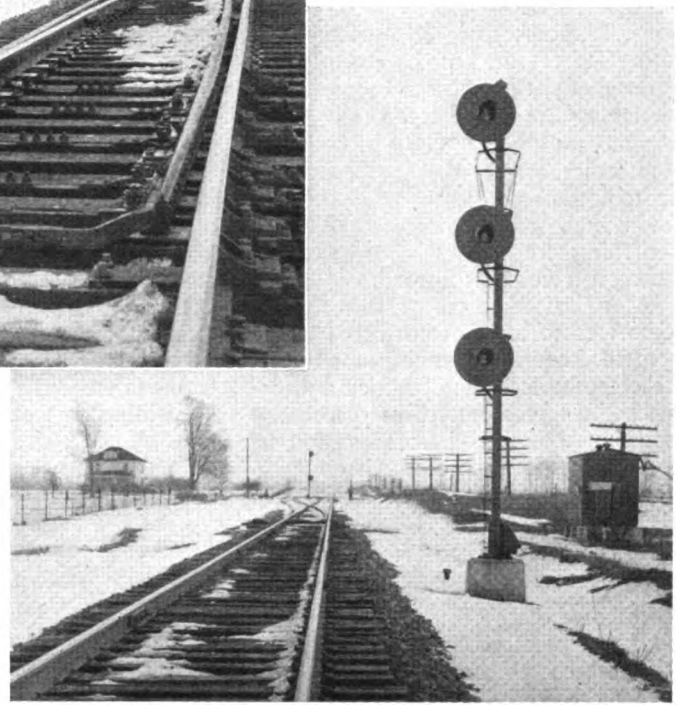
Left—Power switch at west end of Johnsons. Below — Semi-automatic signal 18L at Johnsons



Train time reduced on a single-track freight cut-off 28.6 miles long

Centralized Traffic Control on the Erie

On the through east and west route between New York and Chicago, the Erie Railroad has two lines between Pymatuning, Pa., and Leavittsburg, Ohio. One line, 39.6 miles long, extending via Sharon and Youngstown, is mostly double-track, equipped with automatic block signaling, and it handles all the passenger trains as well as certain freight trains which are routed through Youngstown to make connections with other roads, as well as to set out or pick up cars in the Youngstown industrial area. However, the through east and west freight trains, are operated between Pymatuning and Leavittsburg on a more direct single-track line via Latimer, which is only 28.6 miles long. On this line, centralized traffic control has been installed recently.

Character of the Line

For the most part, the line is on a rolling grade, with short ascending grades, ranging to approximately 1 per cent. From Latimer, the grade is ascending westward for three miles to the center of the siding at Johnsons, the maximum grade being 1.05 for approximately one mile. In the five miles west of Johnsons, the grade ascends eastward, with a maximum of 1 to 1.11 per cent for about two miles. Thus the siding at Johnsons lies over the crest of the grade. The line includes long sections of tangent with only five curves, the maximum being 1 deg., therefore, the curves are not a factor in determining the maximum permissable train speeds.

At Pymatuning, the east end of the territory being discussed, a mechanical interlocking, "GH," includes the switches, crossovers and signals in the junction layout. At Latimer, a mechanical interlocking, "MR," protects a crossing of the Erie with a north-and-south line of the New York Central. In the east part of North Warren, a mechanical interlocking, "WN," protects a crossing of the Erie with a double-track north-and-south line of the Pennsylvana. In Warren, another mechanical interlocking "BO," protects a crossing of the Erie with a single-track line of the Baltimore & Ohio.

At Leavittsburg, a mechanical interlocking, "SN," includes the signals and track layout of the junction of the two lines eastward to Pymatuning, as well as the main line west to Chicago, and the main line north to Cleveland. The control machine for the centralized traffic control between Leavittsburg and Pymatuning is located in the tower of the "SN" interlocking at Leavittsburg.

Manual Block Replaced by C.T.C.

This line handles about 16 through freight trains daily, and one way freight is operated each direction daily, except Sunday. In the industrial area in North Warren, switching crews are in operation 24 hours daily to set out and pick up cars in the various mills and factories. Three switch engines and crews are assigned to the first trick, two to the second, and two to the third.

Prior to the recent improvement program, no automatic signaling was in service on this territory, and train movements were authorized by manual block with block offices at "SN," "BO," Cortland, east end of Johnsons, Latimer, Burghill, Orangeville, and "GH." Yard limits were in effect throughout the various towns and switching areas. The through trains were required to operate under yard limit rules, prepared to stop short of switching moves being made on the main line. Means for advising the switching crews of the approach of through trains was limited.

A logical solution of these problems was to install centralized traffic control, including semi-automatic signals, the indications of which authorize train movements, thus dispensing with the manual block operation as well as the train orders. Also by providing intermediate automatic block signals, following trains can be operated safely at maximum permissible speeds, and with minimum spacing, thus increasing the capacity of the track as well as reducing the running time of the trains. Within the first ten days after the C.T.C. was in service, the through freight trains were running through this 28.6 miles with an appreciable saving in time.

Passing Track Layouts

On this territory, only two passing tracks are used in the regular operation of through freight trains. The west switch of the passing track at Leavittsburg is included in the "SN" mechanical interlocking. At the east end of this siding, a spring switch was installed as a part of the C.T.C. project.

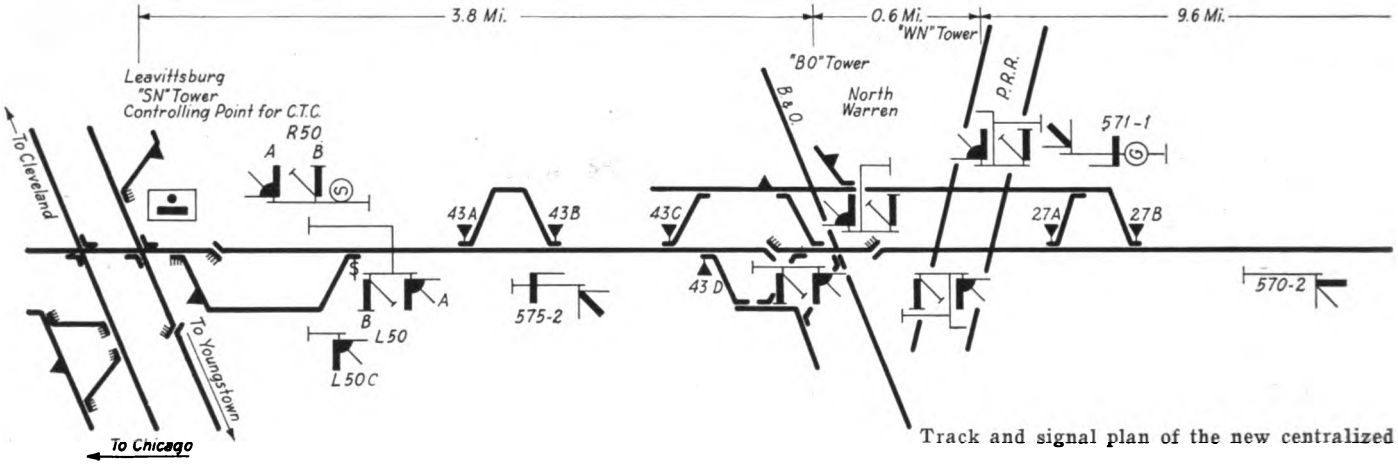
In the previous arrangement at Johnsons, crossovers were in service between the siding and the main line, at a point about midway of the length of the siding. This arrangement was provided so that two different trains could use the siding. As a part of the recent program, the crossovers were removed, and the siding as a whole was lengthened to a total of about 8,200 ft. so that the siding will hold two trains of average length. New No. 20 turnouts, with 30-ft. points were installed, and power switch machines were provided.

Semi-Automatic Signaling

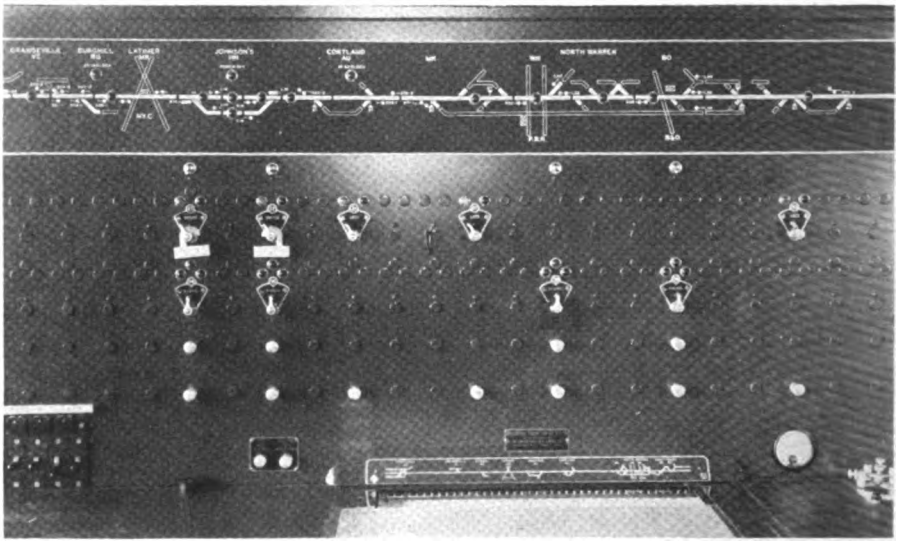
On this installation all the signals including semi-automatic, automatic block and interlocking home signals, are of the searchlight type. At each end of the siding at Johnsons, where the power switch machines are used, a complete arrangement of semi-automatic signals is provided to direct trains to enter the siding, depart from the siding or continue on the main line. A track circuit was installed on the passing track, and is used not only for the control of the signals governing moves to this track, but also the track circuit is used to control an indication on the C.T.C. machine to repeat occupancy of this siding.

Each of the station entering signals has three "units." The top unit is for through moves on the main track. Display of the Medium Approach aspect, red-over-yellow-over-red, Rule 286, indicates that the switch is reversed for a train to enter the siding, and that the siding is unoccupied. In this instance, the distant signal displays the yellow-over-green aspect, Rule 282A, which indicates that a train is to approach the next signal at medium speed. This use of signal aspects provides complete information for a train to be brought up to and through the No. 20 turnout at the speed for which it is designed. If only the Approach aspect were given on the distant signal, in such instances, an engineman would, according to rule be required to reduce to medium speed at the distance signal, and approach the station-entering signal prepared to stop.

If an eastbound train, for example, is occupying a part of the siding at Johnsons, the westward signal cannot be controlled to display an aspect to head an opposing train into the siding. This protection is secured by a two-wire, traffic locking circuit, which is normally de-energized, with batteries



Track and signal plan of the new centralized



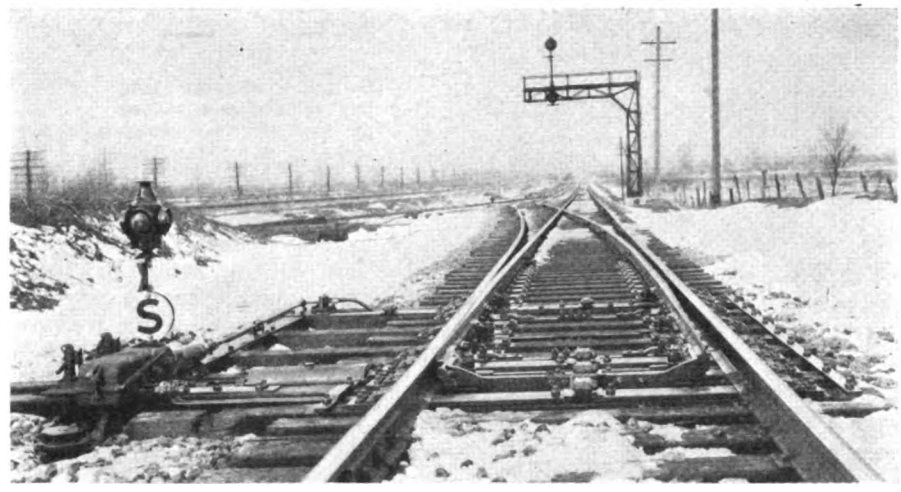
The control machine includes an automatic train graph

at the two ends connected in multiple. Rectifiers are provided to prevent discharge of the batteries if one has a higher potential than the other.

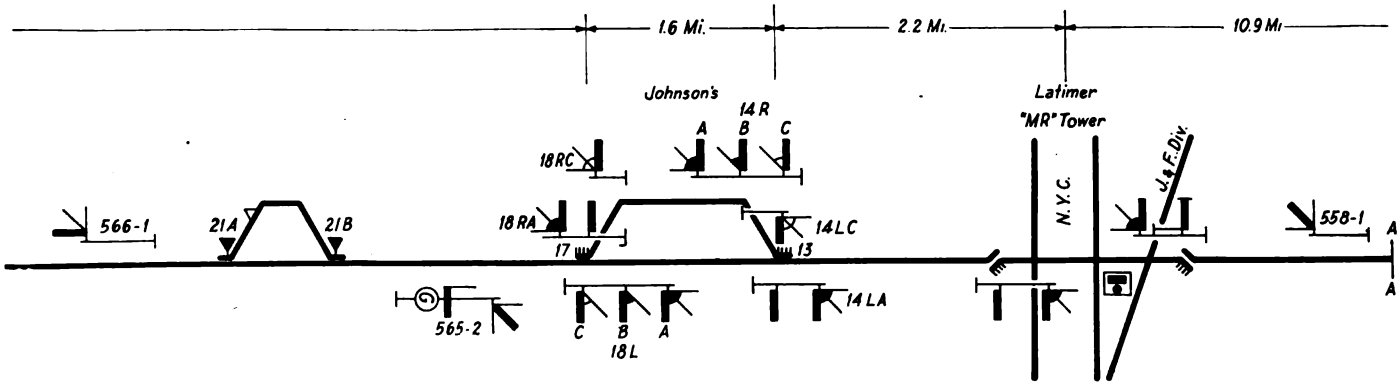
On a station entering signal, an aspect of red-over-red-over-yellow, Restricting, Rule 290, indicates that the switch is reversed for a train to enter the siding, but that the train is to proceed prepared to stop short of another train on the siding. In this instance, the distant signal displays the Approach aspect just the same as it would if the station-entering signal were displaying the Stop aspect. The two units on the distant signals are staggered, the top one being to the right of the mast and the lower one to the left. This staggered arrangement distinguishes such a two-"arm" signal as an automatic, in contrast with an absolute signal on which the units are in a vertical row.

Each main line station-departure signal has a second "arm" consisting of a red lamp unit which is lighted in combination with the red, yellow or green in the upper unit to designate the signal as an absolute Stop signal, Rule 292.

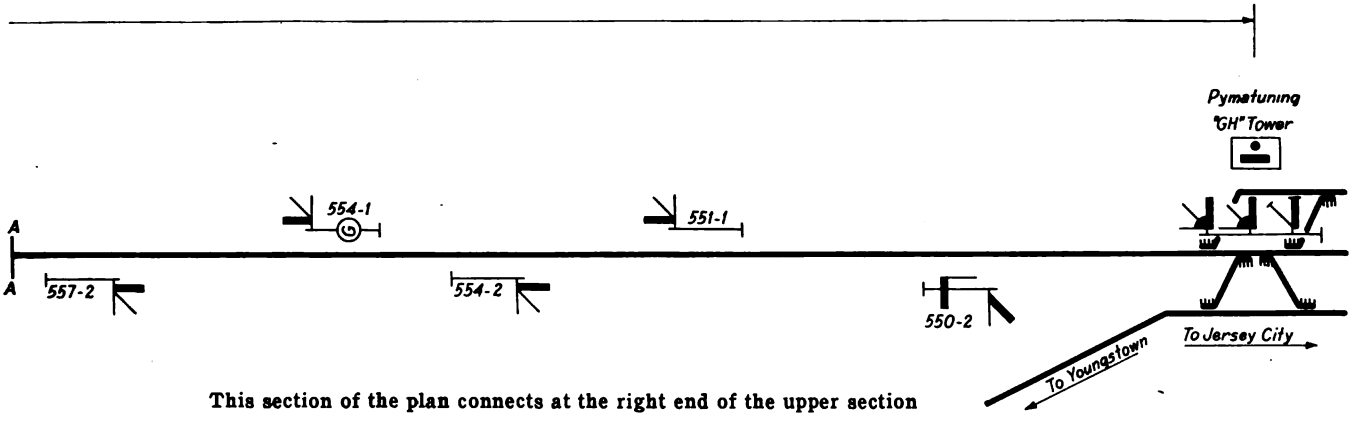
The leave-siding signals are three-aspect dwarfs. The normal aspect is purple which indicates Stop, Rule 292. When lined for a train to depart, and with only one automatic block unoccupied, the yellow aspect is displayed; but if two or more automatic blocks are unoccupied, the green aspect is displayed. This use of the green aspect saves train time, because, if a green aspect is displayed; when the rear of the train clears the turnout, the train can be accelerated to maximum permissible speed promptly, without waiting until the engineman can see the next signal.



A spring switch at the east end of the siding at Leavittsburg



traffic control territory between Leavittsburg and Pymatuning



This section of the plan connects at the right end of the upper section

Take Siding at Spring Switch

The westward station-entering signal at the east end of the siding at Leavittsburg is a two unit searchlight signal with a "take siding" indicator attached to the mast below the second unit. This siding indicator is a lamp unit with a 15-in. frosted cover glass which when illuminated displays a large letter "S" on a black background.

When a westbound train is to enter the siding the operator codes a westward take-siding control which causes the take-siding indicator to display an illuminated letter "S" and timetable instructions require the train to stop at this signal and throw the switch to the reverse position. After which the take-siding indicator is automatically extinguished and the restricted speed signal is displayed for movement to the siding.

If an eastward train on the Leavittsburg siding is to be directed to depart, the leave-siding dwarf is