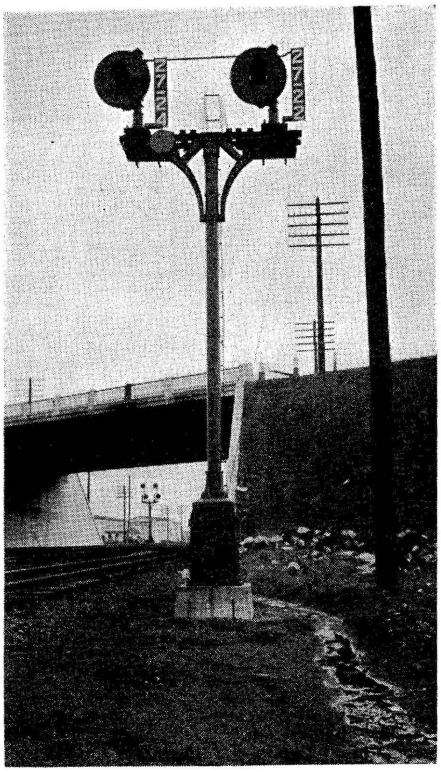


Westward signals on ascending grade using two-block aspects

New Automatic Signals Increase Track Capacity and Safety on the Erie

Train speeds increased and delays reduced by replacing semaphores with color-light signals using the two and three-block aspects

THE ERIE has installed new searchlight type automatic block signals to replace two-arm lower-quadrant semaphores on 11 miles of four-track road, between Ridgewood, N.J., and Suffern, this being a portion of the main-line division between Jersey City, N.J., and Port Jervis, N.Y.

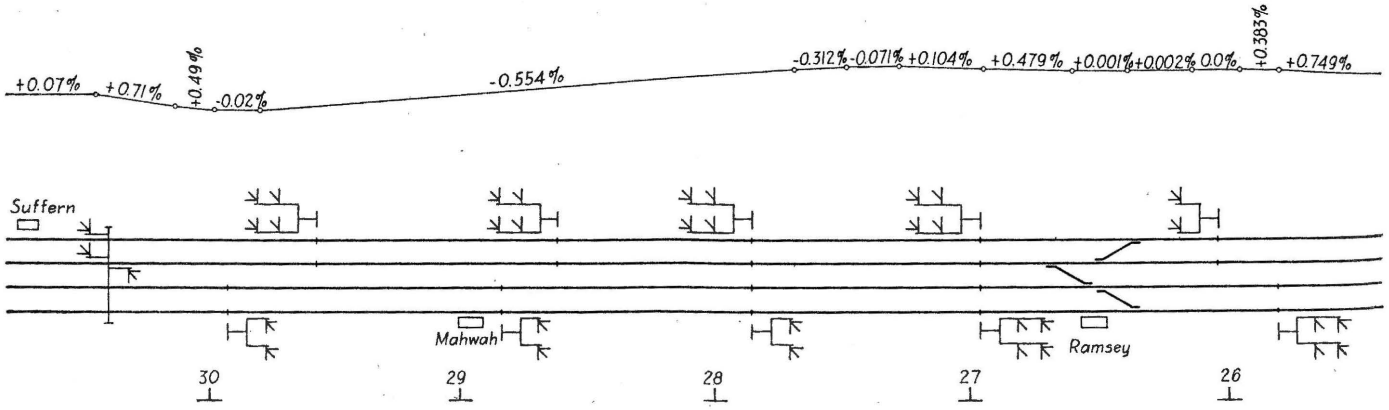
From the east end of this territory, at Ridgewood Junction, a double-track main line, used primarily by passenger trains, extends 20 miles by way of Paterson to Jersey City. A second double-track line, known as the Bergen County line, used principally for freight traffic, branches off at Ridgewood Junction and extends by way of Fairlawn and Garfield, joining the other main line at Rutherford Junction. From Ridgewood Junction westward to Suffern, 11 miles, the four-track line handles both the passenger and freight traffic, the freight trains being run on the two inner tracks and the passenger trains on the two outside tracks, right-hand running being in effect. The daily traffic in this territory consists of 56 through passenger and 24 through freight trains, in addition to 38 suburban passenger trains.

The problem of getting all of the trains over this section of line without delays is seriously complicated by the fact that trains are "bunched," the preponderance of through trains, as well as suburban trains being inbound to Jersey City in the morning and outbound in the evening. For example, between 6:30 a.m. and 8:00 a.m., the eastbound traffic includes six through passenger, 6 suburban trains and two time freights.

Going west from Ridgewood Junction, the grade is ascending at a varying rate from 0.5 to 0.95 per cent for 6.5 miles, and then is descending at about 0.35 per cent for 4.5 miles into Suffern. The old two-position lower-quadrant semaphores were spaced for blocks ranging from 2,500 ft. on ascending grade to 4,900 ft. on descending grade; the distant signal arm was on the same mast as the signal arm governing the immediate approach. As train speeds and tonnages increased, this signaling arrangement was not entirely satisfactory.

New Signaling

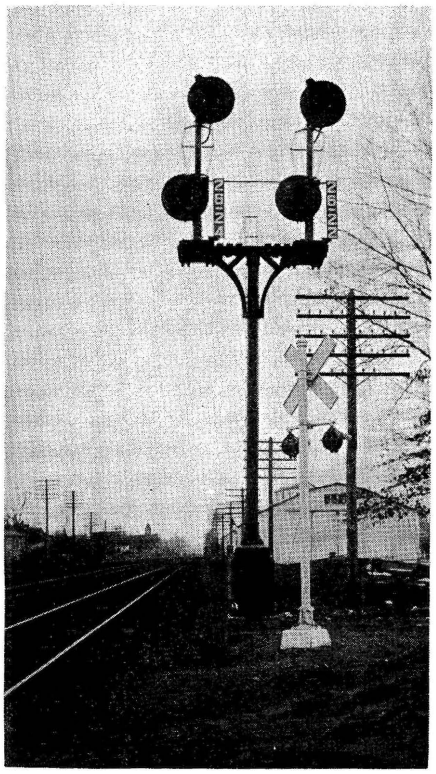
The solution to the problem was to provide four-aspect, three-block signaling on the descending grade, so as to permit higher train speeds and closer spacing of trains, with entire safety with reference to braking distances. In contrast, on the ascending grades proper braking distance and



Track and signal layout indicating grades

train spacing was provided by the use of three-aspect, two-block signaling.

Except in a few special instances, the signal locations were not moved, the block lengths remaining practically as they were. The important point, however, is that on the descending grades where the three-block signaling is used, the engineman can control the speed of his train to a much better advantage because he gets an approach-restricting indication at the second signal in the approach to one indicating "stop," and an approach indication at the first signal in approach to the signal indi-



Westward signal on descending grade using three-block aspects

cation "stop." Thus, a train can be kept moving at the highest possible speed consistent with safety, thereby reducing delays and eliminating the necessity for heavy brake applications in making short stops.

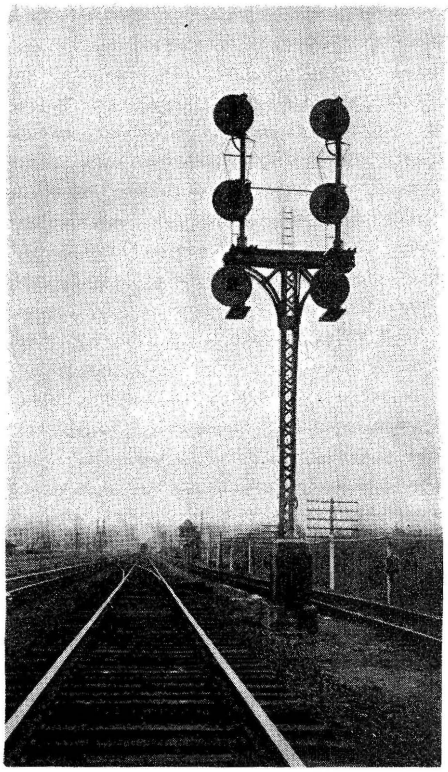
From another standpoint, the new signaling increases the track capacity because trains can now be spaced on the basis of braking distances on the ascending grade, and when they pass over the crest of the hill and accelerate while going down the grade, proper spacing is taken care of by the three-block indications.

Signal Mounting and Aspects

The new searchlight-type color-light signals were installed on the existing double-pole bracket masts, formerly used for the semaphores. Each mast is located to the right of the two tracks governed, the signal on the field side being for the passenger track and the other signal being for the freight track, the two signals on the bracket being 7 ft. apart. Where the three-aspect, two-block signaling is used, one searchlight unit, giving three aspects, red, yellow, and green, is mounted on the left side of a short stub on the bracket, so as to bring the center of the lenses 25 ft. above the level of the rail. Where the four-aspect, three-block signaling is in effect, a pole 9 ft. 8 in. high is used on the bracket; the top signal unit is mounted at the right of the pole 6 ft. above the lower one, which is to the left of the pole. The aspects for the three-block territory are according to the standard code, being red over red, staggered, for "stop and proceed," yellow over red for "approach," yellow over green for "approach medium," and green over red for "clear." This system of aspects not only allows adequate stopping distance with minimum spacing between following trains, but affords the engineman of a freight train adequate warning to control the speed of his train in conformance with the conditions ahead, so that he can keep his train moving with safety and yet eliminate unnecessary stops.

Check on Lamp Failures

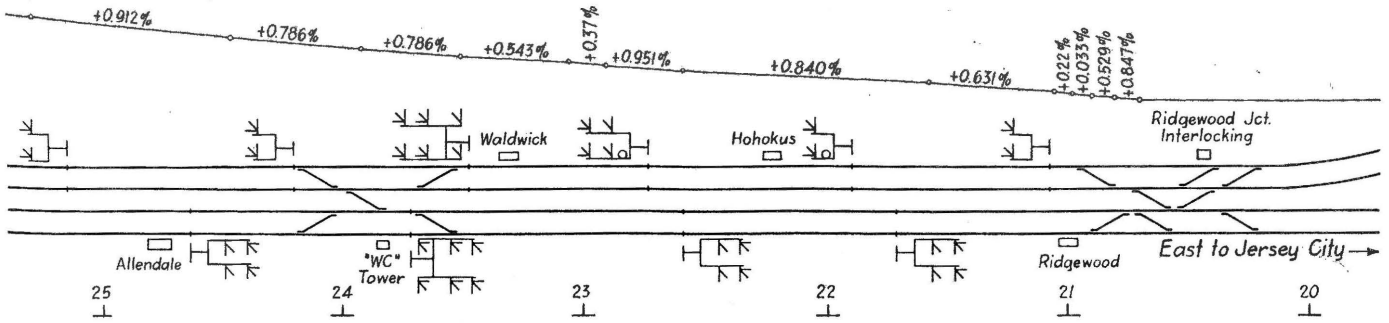
Each signal is equipped with an 8-volt lamp which has two filaments, one rated at 13 watts and the other



Eastward home signals at Ridgewood Junction

at 3.5 watts. The lamps are normally fed at 7.2 volts in order to lengthen the life. The signal lamps are on approach control, being lighted when a train is approaching, as well as during the time the block governed by the signal is occupied. The foreman of maintainers makes a check of the traffic to determine the average number of burning hours for each signal and establishes the date of replacement of the lamp so as to give about 2,000 burning hours. With this procedure, the lamps are, with rare exception, replaced before the main filament burns out, but even if the main filament does burn out the secondary filament gives an indication strong enough to permit the enginemen to pick up the indication.

Another important feature of this installation is that if both filaments in the top unit of a double-unit signal burn out, a normally-energized relay



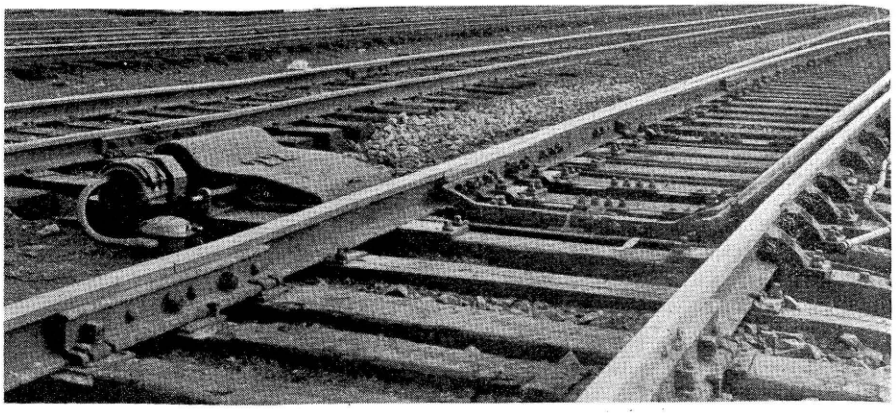
and use of two- and three-block aspects

in series with this filament will be released and, by means of circuits controlled by this relay, the lower unit will display red. Therefore, if the lamps burn out, there is no chance that the signal will display a less restrictive indication. For example, if the aspect were yellow over green, and the lamp in the upper unit burned out, this would leave a single green in the lower unit, except for the fact that the light-out relay operation would change the lower unit to the red aspect.

Each signal is controlled by a separate two-wire circuit, no common wire being used. The DP-21 type slow-acting polar relay with the retained-neutral feature is used on the line control so as to avoid flashes of the red when changing from yellow to green or vice versa. The light-out relays are the ANL-2 type, rated at 0.18-ohms resistance, and the approach-lighting relays are 50-ohm Hall type, in series with the DP-21 relay or in some cases with the searchlight signal.

A VT-10 reactor is used in series with the 8-volt, 13 plus 3.5-watt lamp in the lower unit of the two unit signals to insure the same voltage across the lamp terminals as obtains across the terminals of the lamp in the upper unit, due to the ANL-2 relay being in series with the lamp filament of this unit.

The instrument cases are wired with No. 9 single-conductor solid-copper (braid only no tape) insulated wire, so that the wires stay in place and present a neat appearance, as shown in the illustration. Bakelite-based terminals are used. The arresters are the Everett Raco type with a Raco high-static Type-B unit connected across each set of line arresters or track connections.



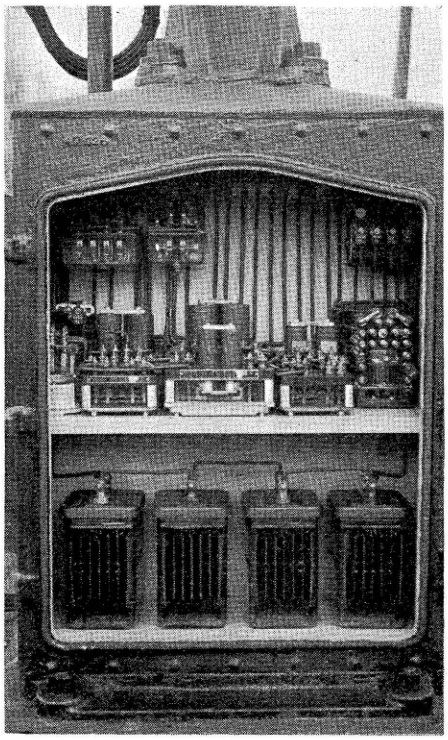
The switch layouts were rebuilt

Power Supply System

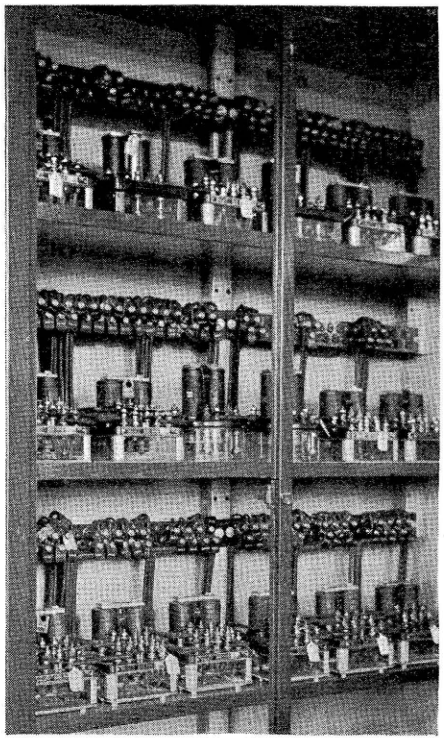
The a-c. floating system of power supply is used on this installation, the line distribution voltage being 110, and run on two No. 6 hard-drawn copper wires with weather-proof covering, which were previously used as a cycle-charge line in the old system. A 110-volt line is practical in this instance because connections to existing feeds were available at several stations. In order to distinguish the 110-volt wires, they are run on amber-colored glass insulators.

One advantage of using 110-volt distribution is that the power wires can be brought into the instrument case and no line transformers are required. The two 110-volt wires terminate in the case in a Raco porcelain-enclosed type of fused disconnect switch which is so constructed that when the cover is removed, the circuit is broken and the fuses, which are attached to the cover, are readily accessible. The fuses used are rated at five amperes. The transformer relays are of the ANL-40 type and the rectifiers are of the RT-10 type. At each signal location a set of four 13-plate lead storage cells is used for the line control circuits and as a stand-by for the signal lamps. One nickel-iron-

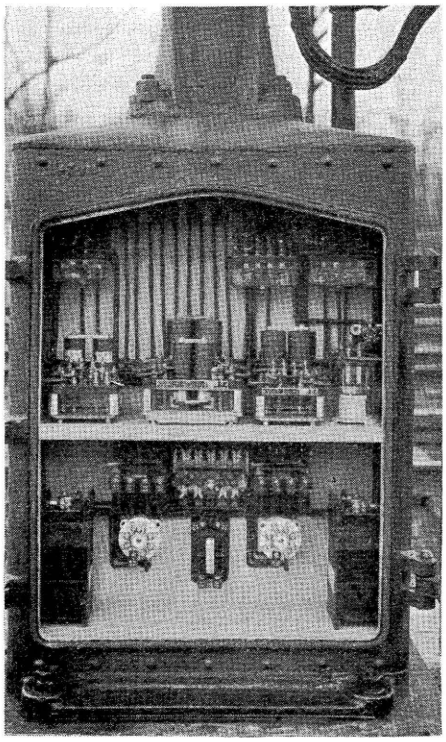
(Continued on page 304)



Instrument and battery case at signal location



New instrument case in tower at Ridgewood Jct.



Track batteries are located in lower shelf

home signal, and a trainman proceeds to the switch stand at the crossing. He observes the indicators, and, if no Southern Pacific train is approaching, he opens the electric-lock door; this closes a circuit breaker on the electric lock and picks up the electric-lock stick relay which causes the Southern Pacific signals to indicate "stop." The lock lever can then be operated.

If an approaching train is in the approach circuit, opening the lock door will not put the Southern Pacific signals at "stop" but will retain them at "stop" after the train has cleared the interlocking limits, and then the lock can be operated.

If a train is switching within the approach circuit, then after the lock door is opened the hand release has to be operated to put the Southern Pacific signals at "stop." After an interval of four minutes the signals on the Western Pacific will change to "proceed."

When his train has passed over the plant and out of the home signal limits, the trainman places the lever of the stand at normal and operates the lever in the lock to return the plunger through the lock rod. A cam on the inner side of the door prevents closing the door unless the lock handle has been returned to the normal position, which is with the knob toward the right. He then puts padlocks on the stand, the electric-lock case, and the time-release case. The plant is then returned fully to the normal position, and he is free to catch his train and depart.

In view of the fact that all of the Western Pacific train operations over this plant are switching moves, no serious delays have been introduced, and furthermore, as all of the switching is handled by one or two crews, the trainmen soon learned to handle the new arrangement satisfactorily. The mechanical interlocking has been left in place for the present with the thought that it may be necessary to return it to service when traffic increases to normal. The annual saving accruing is approximately 2.5 times the cost of the changes.

This special arrangement was designed and installed by signal forces of the Southern Pacific.

Automatics on the Erie

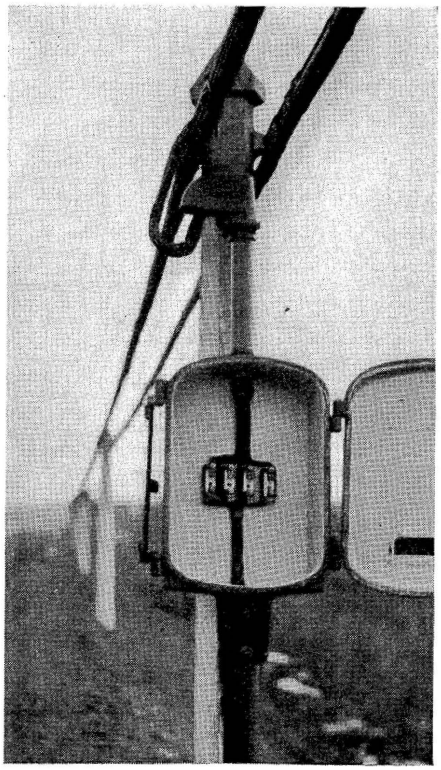
(Continued from page 302)

alkaline Type-B6H storage cell is used on each track circuit, and an Everett-RV5 resistance is used in series with each track feed. The maintainer reads the voltage on each storage battery cell each week and the gravity reading is taken every three months, and recorded on a card, provided in each case for the purpose.

The line wire for the control circuits is No. 10 hard-drawn copper, with weather-proof covering, run on glass insulators. The cables at signal locations are made up of single-conductor No. 14 insulated wires using Raco cable straps. Parkway cable is used for underground runs, the runs to the rails being single-conductor No. 9 parkway made up with two wraps of steel tape but with no lead. At the rail, this cable is brought up through a Raco bootleg outlet and is connected to a 32-strand copper cable, which is clamped in the top of the bootleg and extends to a ⅜-in. plug in the rail. The rail joints on this installation are bonded with stranded steel bonds with copper core, applied by welding, both the Tiger-weld and the OBalloy types being used.

Reconstruction of Interlocking

As a part of the signaling improvements, the 48-lever electric interlocking at Ridgewood Junction was modernized. This plant was installed in 1907, using a General Railway Signal Company Model-2 interlocking machine, semaphore signals and Model-2 d-c. switch machines with the dynamic indication. The entire plant was overhauled as a part of the recent reconstruction program. The interlocking machine was reconditioned, the interior wiring being replaced, using bakelite-based terminals on the board. A separate common wire was extended to each switch machine, individual cross-protection relays being installed.



Aerial cables are run on concrete posts

The indication circuits for the switch machines were revised to use a KR switch-repeater relay to repeat the positions of each switch. The tower wiring was replaced, and new sheet-metal relay cabinets were located on the ground floor of the tower. The terminal boards in these cases are made of bakelite, holes being provided in which terminal posts are placed as required. The wiring between the interlocking machine and the relay case is run in a chase made up of ¼-in. Transite insulating board bolted to angle iron.

The new outside wiring over the plant is in made-up cable run on concrete cable posts, using a Copperweld stranded messenger with Raco cable straps. The completed cable is painted with Victolac to protect the insulation and braid. The cable wires are No. 14 copper with 5/64-in. Kerite insulation.

The design and construction work of this signal and interlocking program was handled by the signal department forces of the Erie Railroad, signals, relays, etc. being furnished by the Union Switch & Signal Company.

N. Y. C. Interlocking

(Continued from page 297)

transformer were carefully insulated. A G.R.S. Type-W power-off relay is also in this instrument case. The bond wires are of the DS-1 type, furnished by the American Steel & Wire Company. Trenchlay cable is used for track connections.

At the new switch location No. 25 at the crossing, the pipe-connection for the switch-operated derail has been fitted on to the main operating rod of the switch, rather than from the switch machine directly.

The recent extension of the South Bend interlocking was carried out by the signal forces of the New York Central, as was the original installation, from plans prepared in the office of the signal engineer. Train crews using the crossing facilities which have supplanted the mechanical interlocking are being given more expeditious switch and signal service from the all-electric interlocking machine located some distance away, than was formerly possible with a separate plant.