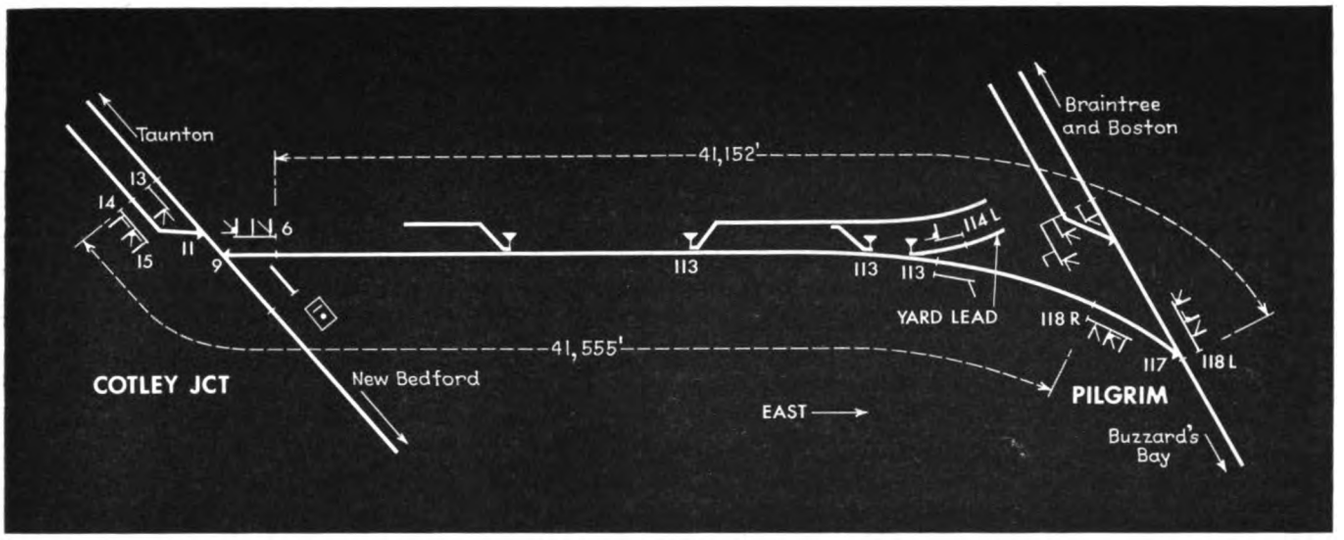
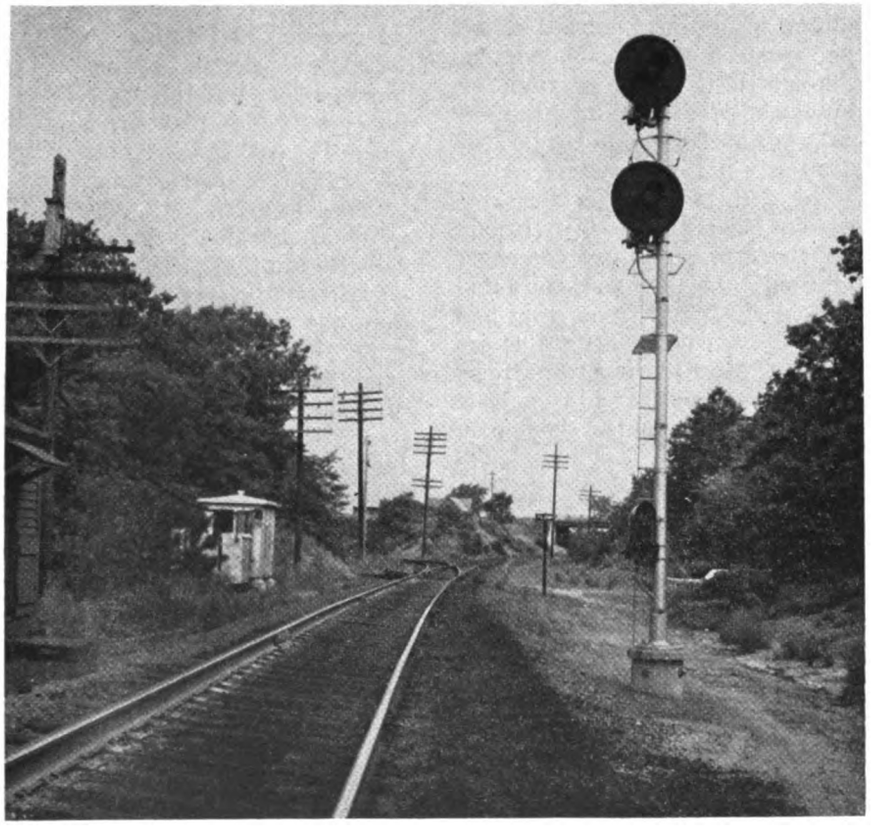


Release of four electric locks on hand-throw switches is by series overlay electronic track circuits

Remote Control Saves Money

Savings up to $12,500 per year are being realized by the New Haven Railroad since they have installed a type of signal control, whereby slow codes are sent through the rails to determine occupancy of a block. If clear, signals at either one end or the other can be cleared to direct a train to enter the block



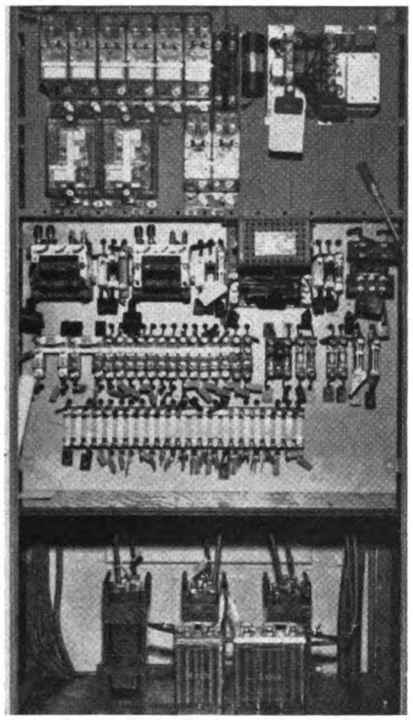
Looking toward junction at Pilgrim, signal 118L at right. Extreme left of picture is cabin where Middleboro South operator came when OSing trains from connection

AN 8-MILE SECTION OF THE NEW HAVEN, formerly operated as manual block, has been converted to remote control. The line is an important single-track connection between the Taunton-New Bedford, Mass., line and the Boston-Braintree-Buzzards Bay line. The latter handles heavy commuter traffic during June-August for Boston residents who have summer homes on Buzzards Bay. The connection handles trains from Providence and New York to the Cape.

This single-track line leaves the Taunton-New Bedford line at Cotley Junction interlocking, the signals and power switch being locally controlled. Eight miles east, the connection joins the Boston-Braintree-Buzzards Bay line at Pilgrim, three-quarters of a mile south of Middleboro South. The power switch and associated signals at Pilgrim comprise one of the CTC controlled layouts in the New Haven's 40-mile long CTC territory extending from Braintree to Buzzards Bay, controlled from the office in Boston, 10 miles north of Braintree and placed in service in 1954. Pilgrim is located about midway between Braintree and Buzzards Bay, and is the junction point where some trains leave and enter the CTC territory to and from Cotley, via an 8-mile connecting line.

The problem heretofore was to

Maintenance Foreman L. W. Davidson (left) and Signal Supervisor C. Westberg look at Trakode (slow coding principle) equipment in Pilgrim instrument case



Instrument case at lock location

"OS" trains in and off this connecting line at the CTC location at Pilgrim. This installation solved the problem without necessity of extending the CTC down the connecting line, and was accomplished without the necessity of using line wires to provide the positive blocking required.

Prior to the new installation of code control through the rails, this 8-mile connection was operated as manual block. This required coordinated action by the interlocking operator at Cotley Jct., agent-operator at Middleboro South, and CTC dispatcher at Boston. The Cotley Jct. leverman can visually check trains in and out.

But at the east end of the connection Pilgrim is three-quarters of a mile from Middleboro South station. To check eastbound trains leaving the connection, the Middleboro operator had to go to Pilgrim. The visual check was necessary for him to report the rear markers assuring that no cars were left on the connection line. The operator also had to be at Pilgrim to handle train orders or clearance cards for westbound trains entering the connection. Once off the connection at Pilgrim the train is in CTC territory. By requiring an operator at Pilgrim when trains entered or left the connection necessitated the railroad to have an operator on duty at Middleboro during the second and third tricks, as well as the agent-operator on the first trick.

The daily traffic over this connection consists of five freight trains each way and two passenger trains each way. On weekends, and particularly during June, July and August, extra passenger trains are operated. Most of these extra trains handle passengers to and from New York who have summer homes on the Cape.

Code Control Produces Economies

One of the problems on this line is to check that the eight miles between Cotley Jct. and Pilgrim is clear before a train is allowed to enter the connection. Prior to the new code control, any such check was obtained by the visual "inspection" at each end of the line when trains left the connection. This, of course, did not provide rail protection.

The reason for the NH installing the code control is simply a matter of straight economics. By doing so, they can provide broken rail protection, check that the block is clear before a train can enter, and by having the remote control of the codes from the Boston CTC dispatcher, the operators at Middleboro on second and third trick are no longer needed. Thus with the code control, there is no need for anyone to go to Pilgrim to issue clearance cards, train orders, or check trains as they leave the connection.

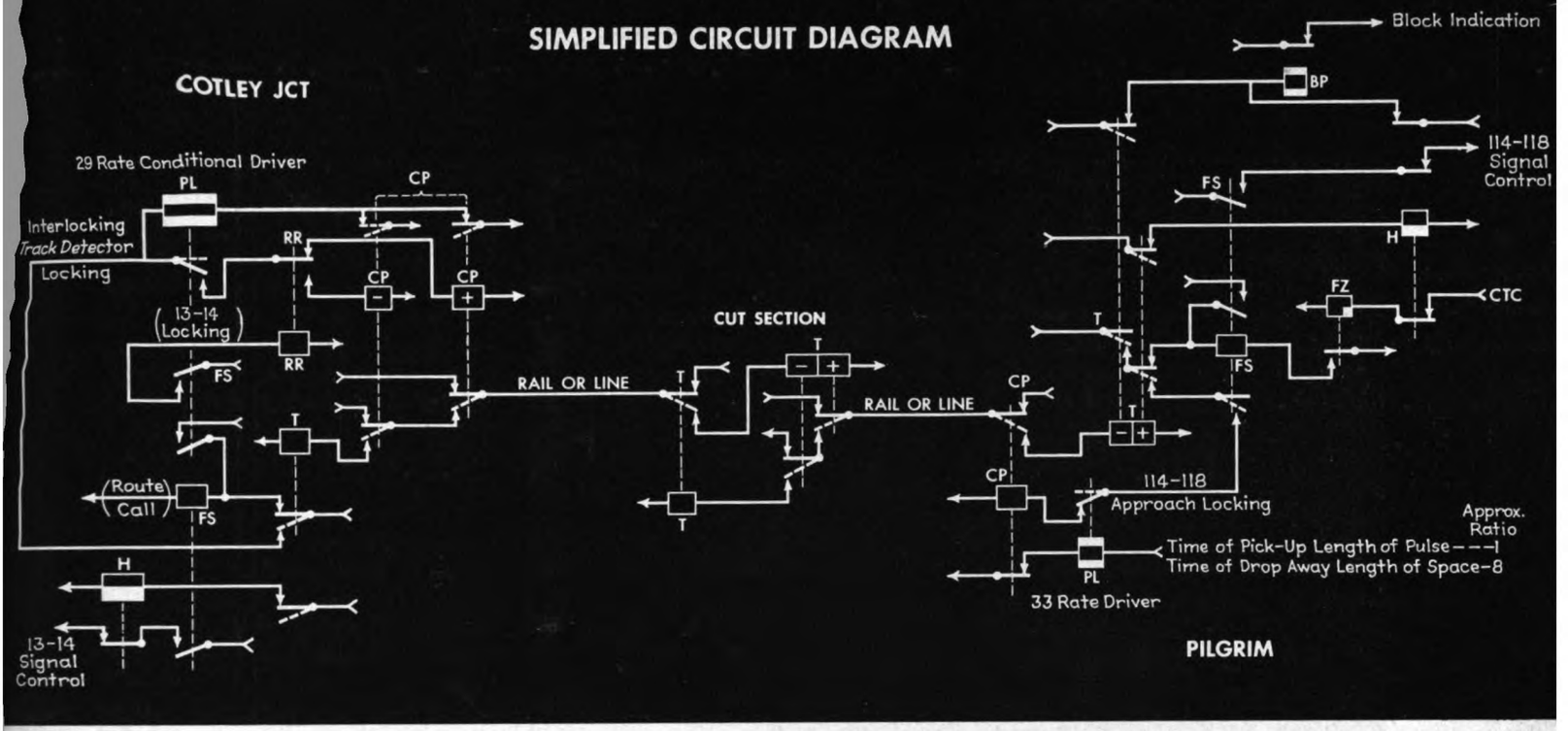
To provide this "inspection" of the line, that is, to check that the block is clear, GRS Trakode was installed. Briefly, the system operates as follows: The Boston CTC dispatcher has a traffic lever and a signal to control the codes to check that the block is clear, and set up controls to clear signals into the connection. If, for example, the Boston dispatcher wants to route a train westward over the connection to Cotley Jct., he so advises the Cotley Jct. operator and positions his traffic lever for westbound traffic. This causes the Trakode system to cut off the positive coded pulses at Pilgrim and prevents the clearing of a signal at Cotley Jct. Positive pulses from Cotley Jct. must be received at Pilgrim to clear a westbound signal. Absence of a block light on the dispatcher's panel tells him that the block is clear. He can then reverse switch 117 at Pilgrim, and clear signal 118L to red over green over red.

When the Cotley Jct. operator calls Boston to request controls for an eastbound train over the connection, the dispatcher positions his traffic lever for eastward traffic over the connection. This will set up code action to allow the Cotley Jct. operator to clear signals 13 and 14 over switch 9 reversed. This will prevent the dispatcher from clearing signal 118L over switch 117 reversed. Checking the block clear also means that switches 113 are locked.

How Code Control Functions

First we shall describe how the Trakode operates with the block clear, which is the normal condition.

The system, under the super-



vision of the Boston dispatcher, is normally clear as far as the block between the control points is concerned. It is based on code rates selected so that one pulse originating at Pilgrim goes to Cotley Jct. and returns to Pilgrim before the next pulse is transmitted. By following energy through the back of the track relay at Pilgrim marked (Start Study) to the CP, a pulse of a length determined by the pick-up time of the PL relay will be sent west and repeated through the cut section to the track relay at Cotley Jct., which when it picks, will drop the PL relay (if it is already up in an independent attempt to send a code east). At the completion of the first pulse, the track relay at Cotley falls and picks up the CP to send a return pulse east of a length determined by the pick-up time of the PL relay.

This return pulse is repeated through the cut section and pulses the track relay at Pilgrim which, when it falls, conditions the CP for a second pulse to the west, when the PL relay falls. This PL relay has been held up by condensers and resistors for a period of time greater than the cascade of relays in one round trip of the original pulse. It is the release time of the PL relay that determines the space between pulses. A few pulses at 33 rate sent from Pilgrim to Cotley Jct. and back will pick up the H relays on both ends which are used in the signal circuits.

When a route is called for at Cotley Jct. the FS relay picks up on the last pulse to the west and drops the RR relay, which cuts off a positive return pulse and initiates a negative pulse for block detection at Pilgrim. This prevents the pick-up of the FS at Pilgrim on an attempt to reverse traffic, and the system now is transmitting pulses to the west for the signal control, and negative pulses to the east for block detection. This condition continues until the signal at Cotley Jct. is accepted and the detector track cuts off the eastward negative pulses indicating block occupied.

Control for a Westbound Train

To clear signal at Pilgrim, the dispatcher at Boston reverses the traffic lever when the H relay is up and changes the position of the magnetic stick FZ relay. If the positive coding has not been stopped at Cotley Jct. by a route call, the FS relay at Pilgrim will pick up on the next eastward pulse and stop the action of the Pilgrim CP, which in turn cuts westward codes from the track and establishes the Cotley CP and PL into a driver at 29 rate to maintain the H at Pilgrim. The FS and H are used in westward signal controls.

Track Circuit 8,000 Ft Long

The Trakode is fed through the rails except where it is put on line wires to go around four automatic highway crossing protection installations. Where 110 a.c. is available, Edison B4H storage cells feed the track circuits, one cell per circuit. Where a.c. is not available, two cells of Edison 1,000-a.h. primary battery are used in series-multiple. At cut sections, six cells of 1,000-a.h. primary battery are used series-multiple where no a.c. is available. The resistor at the battery end of each circuit is adjusted so that 6 amp are fed into each track circuit. Raco bootlegs are used with a No. 9 stranded copper Spearhead track wire. Railhead bonds by Ohio Brass Co. and American Steel & Wire Co. are used throughout.

Four hand-throw switches on this 8-mile connection have Model 9B electric locks. The release for these locks from the main track is by a series overlay electronic track circuit. The three hand-throw switches at Middleboro can be released by the CTC dispatcher for a man "inside" desiring to come out on the mainline. The control to release is fed into the rail down to the lock location by Trakode. The two switches at the yard lead are 75 ft apart, and therefore one series overlay track circuit can serve for the release of both electric locks. The 10 volts necessary for the series overlay circuits are provided by five cells of CME5 Exide storage battery. At locations where no a.c. is available, 16 cells of Edison 500-a.h. primary battery are provided.

Engineering and the signal equipment were furnished by the General Railway Signal Co. Railroad forces under the jurisdiction of W. A. Ford, Chief Signal Officer, retired, and his successor, Edgar B. Walkup, Signal Engineer, performed the installation work.