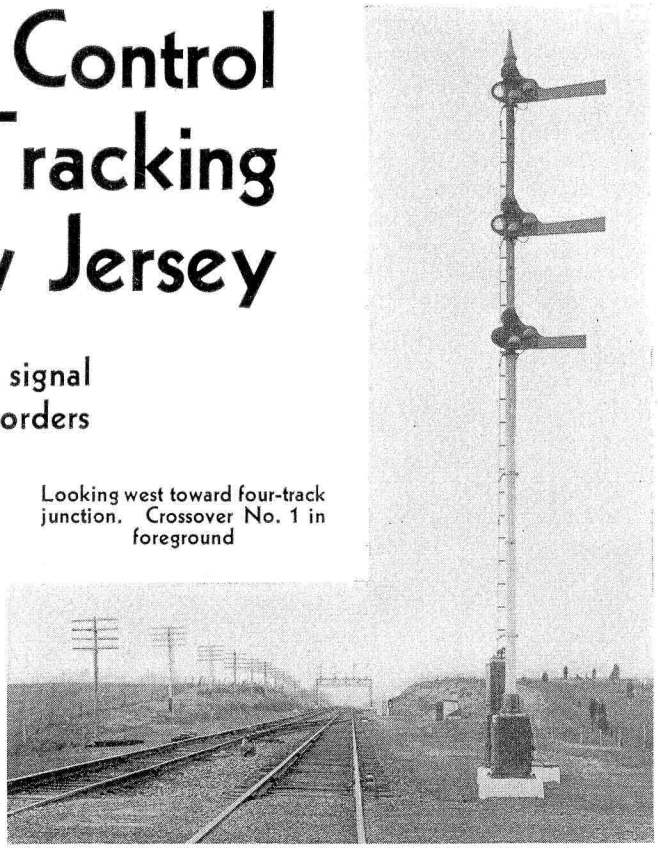
Railway Signaling

Centralized Traffic Control Postpones Four-Tracking on Central of New Jersey

Reversible traffic now handled by signal indication without written train orders

By Fred W. Bender

Signal Engineer, Central Railroad of New Jersey, Elizabeth, N. J.

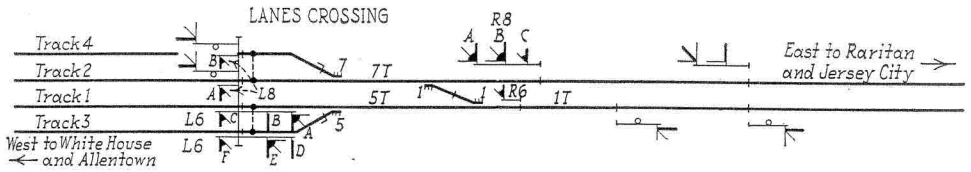


Looking west toward four-track junction. Crossover No. 1 in foreground

FROM Jersey City, N. J., to White House, a distance of approximately 45 miles, the Central division of the Central Railroad of New Jersey consists of four or more main tracks, with the exception of 4 miles of double track between Raritan and Lanes Crossing (North Branch). Since it would have been necessary to make long cuts and to rebuild several bridges in order to four-track this four-mile section, it was decided that the expenditure required was not justified. Therefore, a system of centralized traffic control has been devised which makes possible the indefinite postponement of four-tracking through this section.

The Central division, extending westward from Jersey City to Allentown, Pa., handles heavy suburban and through passenger traffic and there is a comparatively heavy freight business, consisting of tonnage and manifest trains. Two of the important passenger trains in this territory are the "Queen of the Valley," operating between New York and Harrisburg, Pa., and the "Bullet," providing fast service between Wilkes-Barre, Pa., and New York. Eastbound freight traffic consists mostly of coal and merchandise, each train, of approximately 100 cars, handling 8,150 tons. Westbound traffic includes merchandise and empty coal cars, each train consisting of about 100 cars, or 3,200 tons. Helper engines are frequently required to assist westbound tonnage trains on the heavy grade extending for 12 miles from White House up to Hampton on the top of Cushatunk mountain.

The east end of the four-mile bottle-neck section between Lanes Crossing and Raritan has been, and will continue to be, handled by an existing electro-pneumatic interlocking at Raritan. The west end, Lanes Crossing, was until recently handled by a temporary 16-lever electro-mechanical interlocking plant. However, because of the nature of the traffic and the physical characteristics, it was determined that more efficient and flexible train operation would result if Lanes Crossing were handled by a centralized traffic control machine located in the interlocking tower at White House. Through such an arrangement, the operator at White House tower would control each end of the 4.86 mile four-track section extending westward from Lanes Crossing, and he would have complete information concerning train movements, thus being able to provide for more flexible moves and to handle reverse-traffic moves on Track 2 by signal indication without the use of written train orders. Accordingly, an installation of the Union Switch & Signal Companys centralized traffic control was made by the railroad company's signal construction forces and was placed in service on September 22, 1930, at which time the use of the interlocking at North Branch was discontinued.



Track and signal plan showing the controlled functions

Control Machine

The control machine, located adjacent to the operator's table in WH tower (White House), is extremely compact and comprises three switch levers for handling the crossover and the two single switches at Lanes Crossing, and two signal levers for governing the moves in either direction at this junction point. Immediately below each signal lever is located the button for the operation of the call-on signal. The two signal levers control three 3-arm signals, two 1-arm signals and one dwarf signal, as indicated on the track diagram. In addition, there is space on the machine for one additional switch lever and two additional signal levers.

The machine carries on its panel complete and accurate information regarding all train movements and the conditions prevailing at all the locations. Whatever information is essential to the proper manipulation of the levers is plainly displayed before the operator. A track diagram at the top of the machine is equipped with spotlight indicators which show whether the track circuits are occupied. Above each switch lever and each signal lever are indication lamps which repeat the position of each switch and the indication of each signal. Normally, two lamps are illuminated on each panel; a switch indication lamp which displays an indication of the switch position, and a signal indication lamp which repeats the stop position of the signal. Also, signal indication lamps repeat the clear position of the L and R signals.

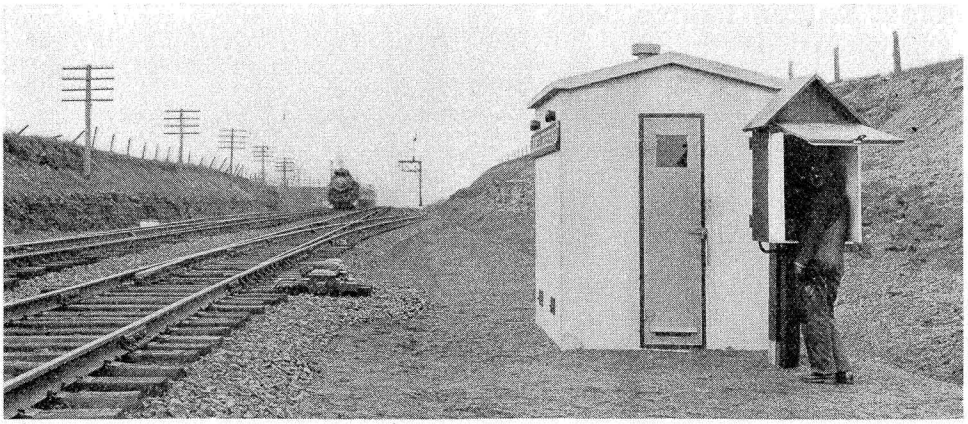
Because of an ascending grade for eastbound trains at Vanderveer's Cut, just east of Lanes Crossing in the automatic block signal territory, a "light" indicator has been provided on the machine panel to show when the track is unoccupied for a distance of four miles eastward, so that the towerman may keep additional tonnage trains moving if the track is clear.

The machine is equipped with a spot-light indicator to show when the control code is being transmitted and another spot-light shows that the indication code is coming in. Beneath these spot-light indicators the OS-bell cut-out switch and the control code knock-down switch are located. At the bottom of each panel is the button for sending out the code after the line-up has been made. The control machine is not equipped with an automatic train graph.

Operation of the System

Switch and signal levers are usually in the normal position, and the operator places them in a position corresponding to that which he desires the functions in the field to assume. Then he presses the starting button to initiate the transmission of the control code. The first step in the control code checks the line circuit; the second, third, fourth and eighth steps select the particular switch and signal; the fifth step controls the call-on feature; the sixth controls a switch-operating relay; and the seventh selects the direction in which signals shall clear or remain at stop.

The control code is really a composite code. If the levers are not moved, pressing the starting button once will extinguish the lights on that particular panel; pressing it the second time will bring in the actual indications of conditions in the field, thus enabling the operator to verify the field conditions without operating the station functions. In case the switch fails to complete its movement, a thermal cut-out, on the switch machine, operates, de-energizing the switch-control relay, and opening the motor circuit. The indication lamps go out when a control code is sent, and if they do not re-light within a reasonable time, the operator knows the functions have not assumed the new position. This may be checked by sending a repeat code, and if the switch has failed, a new code can be sent to restore it to its former position.



"The Bullet" approaching the four-track junction

Any combination of the two particular functions is controlled by the sending of but one control code, and the indication code that comes in will display the indication of that group, thus telling the operator that the functions have assumed their new positions. There has been an average of 725 codes in each 24 hours, the maximum number of "control" codes being 105, and the minimum 81, or an average of 93 "control" codes per day.

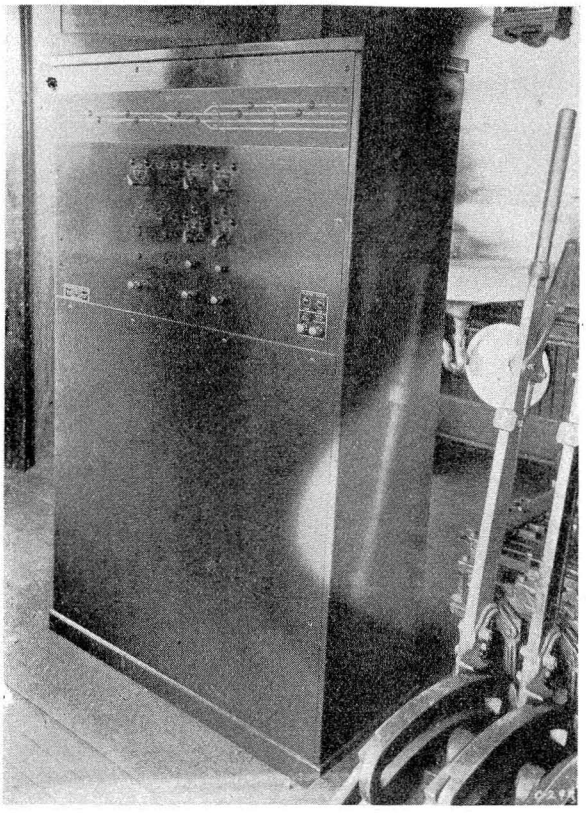
Time-release relays of the DT-10 type, having four front and four back contacts, as well as check contacts, are used in the circuits to provide for a time interval in connection with a change of route. For example, if a signal has been cleared for a route and the operator desires to change the route, these relays automatically set up a time interval after the signal has been placed at stop, thereby preventing a change of route until after the required time has elapsed.

Either-Direction Operation on Track No. 2

After the installation of centralized traffic control, a rule was put into effect, on November 25, 1930, authorizing reverse operation on track *2* between WH tower and Lanes Crossing. This rule reads as follows: "Trains will run against the current of traffic by block signals whose indications will supersede time-table superiority and will take the place of train orders."

Under normal operating conditions, tracks *1* and *3* are used by eastbound, and tracks *2* and *4* by westbound, trains. The operation of eastbound trains against traffic on track *2* was provided for by the use of a traffic-control lever, No. 31, located in the mechanical machine at White

House. Indication lights on the panel-board back of the mechanical machines are used to indicate the occupancy of track *2* between White House and Lanes Crossing. The lights provide an indication as to the direction in which a train may be moving on this track. When the track is not occupied, the indication lights are burning.



Close-up of the control machine in WH tower

However, if a train should be proceeding in one direction or the other, the corresponding light will be extinguished, indicating to the towerman that he cannot reverse traffic.

Less than 3 sec. are required to send out the control code and to receive the indication code. Only 6½ sec. are needed for the movement of a single switch, and 9 sec. for the movement of both switches in a crossover. Thus, a complete change of line-up requires a maximum of 12 sec. from the time the operator presses the starting button until he receives the return indication that the switch or switches are over, locked, and the signal clear. This time is shortened to less than 4 sec. if only the clearing of a signal is involved in the change.

The switches and crossover at Lanes Crossing are operated by Union Style M-20 dual-control switch movements, equipped with point detectors. These movements operate 100-lb. switch points, but these will be changed to 130-lb. points when the rail needs renewing.

Construction Details

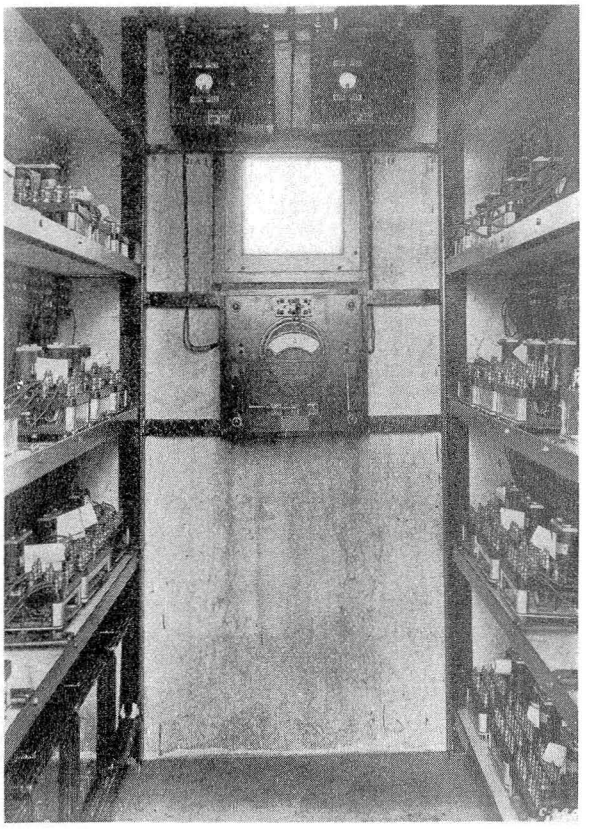
Stone ballast is used throughout. Track circuits No. *1, 5* and *7,* each fed by four Edison Type-502 500-a.h. primary cells in multiple, are employed for governing train movements to and from the four tracks. Track circuit No. *1* is 750 ft. long and uses a 2-ohm relay and a 0.3-ohm current-limiting resistor; No. *5* and *7* are 1,200 ft. long and 1,250 ft. long, respectively, and each uses a 4-ohm quick-acting relay and a 0.2-ohm resistor.

At Lanes Crossing there is now a Massey concrete house for the control apparatus. Immediately in front of the house is the telephone booth, housing the telephone which is used for communication directly with the operator at White House. A telephone is located also at the eastward signal bridge, while still another telephone is located at the westward signal location.

Only three line wires are required for transmitting the control code to and returning the indications from all of the functions at Lanes Crossing. These wires are No. 10 Copperweld, having 40 per cent conductivity, with triple-braid insulation. All local circuits are in Okonite lead-steel underground cable. In accordance with standard practice on this road, no trunking was used, which practice permits the right-of-way to be kept in a neat and clean condition, at the same time giving freedom from troubles incident to breakage, fire, rats, etc.

A 220-volt transmission line extends from White House to Lanes Crossing, a distance of approximately 4.5 miles, the wires being carried on the signal cross-arm. At Lanes Crossing, where the voltage is stepped down to 110 volts, two Union copper-oxide RP-21 rectifiers are used to keep the batteries on a-c. floating charge.

The battery for the code equipment and switch operation consists of 18 Edison B6H storage cells, while nine Edison A6 storage cells are used on the line circuits. These batteries are housed in a special wood-lined concrete battery box located back of the concrete relay house.



Interior of concrete relay house at Lanes Crossing

At WH tower, the battery for the code equipment and No. 31 traffic-lever lock-relay consists of 18 Edison B6H cells, and 20 Edison B2H storage cells constitute the line battery, both sets being on a-c. floating charge through Union copper-oxide rectifiers.

Ground connections are made to C. N. J. standard Copperweld ¾ in. by 9 ft. ground rods. Lightning arresters across the coding wires are Neon vacuum type. A Brach ground detector, located in the concrete house at Lanes Crossing, is used in testing for all possible grounds.