

Centralized Traffic Control

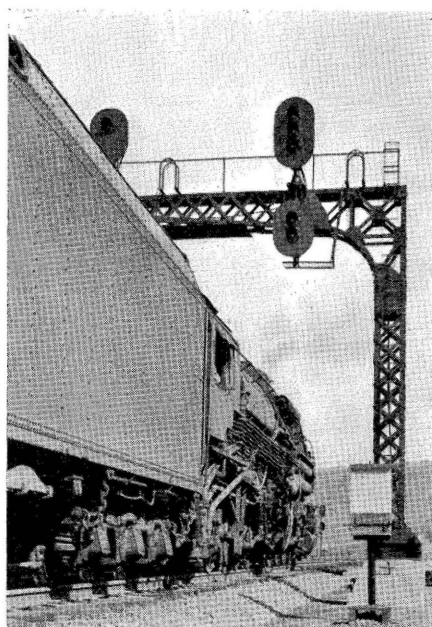
on the Chesapeake & Ohio

Installation at Clifton Forge, Va.
replaces one mechanical interlocking
and a remote control installation—
Main-line train movements expedited

THE CHESAPEAKE & OHIO recently installed a centralized traffic control system near Clifton Forge, Va., which covers a two-mile section of double-track main line, as well as switches and crossovers at the entrance of a yard and an outlying main-line crossover which is located about two miles west of the yard entrance; all trains in this territory are directed by signal indication.

A classification yard for eastbound freight cars is located at Clifton Forge, and eastbound freight trains leave the main line two miles west of Clifton Forge to enter the receiving yard. The grade is descending for eastward trains when approaching the entrance to the classification yard, and in order to control the speed of the trains entering the yard, all trains are brought to a stop before making the diverting movement into the yard.

Prior to the C.T.C. installation, a mechanical interlocking was maintained at the east end of the Steele center passing siding, which is located eight miles west of Clifton Forge and about midway between Clifton Forge and Covington, Steele being the next passing siding and open interlocking plant to the west of Clifton Forge. All eastward freight trains stop at Covington to turn down air retainers after descending the east slope of the Alleghany mountains, and this delay, together with that experienced in entering Clifton Forge yard, results in an average time of one hour and twenty minutes from arrival at Covington to clearing the main line at Clifton Forge. Eastward tonnage



Eastward home signals at HY

freight trains which arrived at Covington less than one hour ahead of eastward passenger and other superior trains were, therefore, held at Covington on account of the fact that the center passing siding at Steele was not long enough to accommodate such a train.

After a study of operating conditions to determine the most economical means of eliminating these excessive delays, it was decided to install a main-line crossover about two miles west of the entrance to the Clifton Forge classification yard, and by a slight rearrangement of the switches and crossovers at the yard

entrance, as indicated on the track layout, provision was made, through the agency of the C.T.C. system, for diverting eastward passenger and other superior trains through the new main-line crossover, via the westward main track, around freight trains occupying the eastward main track while entering the classification yard.

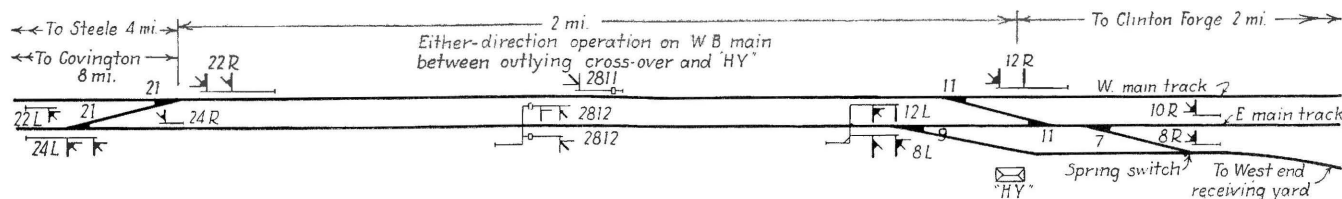
The power-operated switch machines and signals at the west end of the classification yard and the outlying crossover, as well as the signals for directing train movements in either direction on the normally westward main track, are all controlled as a part of the C.T.C. installation.

Having provided these new facilities at the entrance of Clifton Forge yard, the passing siding at Steele was not essential. Therefore, the 24-lever electro-mechanical interlocking at the east end of Steele center passing siding was removed, as was also the remotely-controlled power switch and signals at the west end of this siding.

Changes Made at West End of Yard

The former track layout at the west end of the classification yard consisted of a turnout in the eastward main track and a trailing point No. 10 main-line crossover. The switches were hand operated by yard switchmen, the layout having been formerly interlocked, but the interlocking, with the exception of the two-story brick tower, was discontinued several years ago.

The main-line crossover was changed to a No. 16 type so as to per-



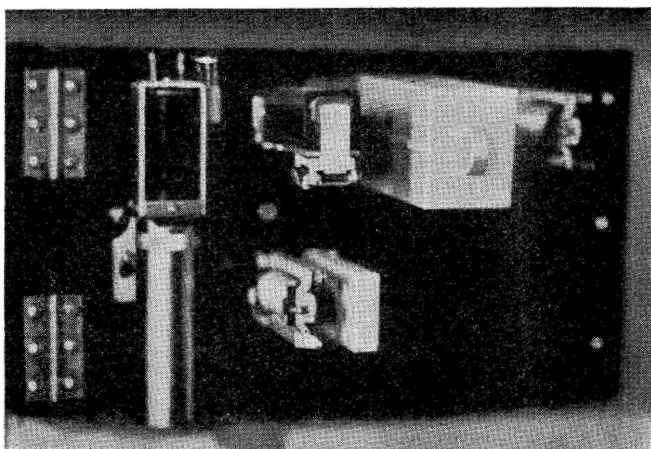
Track and signal plan of C.T.C. territory at Clifton Forge, Va.

mit medium speed for the movement of diverted trains, and the yard lead was extended west so as to provide for parallel movements of eastward trains pulling into the yard while main line trains are operating through the crossover from the westward to the eastward main track. In view of the fact that switch 13 at the east end of the crossover, between the eastward main track and yard track, is used for a selection of routes at infrequent intervals, this switch was equipped with a spring mechanism, but electrically-operated power machines were provided for the other four switches.

Signal Aspects and C.T.C. Equipment

The signals throughout the C.T.C. territory are of the standard color-light type. All signals for high-speed main line operation are mounted on either ground masts or cantilever bridges so that each signal is located immediately to the right of the track governed. High signals are provided for either direction of operation over the westward track between the west end of the yard and the outlying crossover layout. High signals, governing over two or more routes, have a second arm using two aspects. Color-light dwarf signals, with three aspects, are used to control slow-speed reverse movements.

The C.T.C. control machine, in the dispatcher's office at Clifton Forge, has five levers for the control of switches, and five levers for the control of signals, each lever being provided with indicating lamps. An il-



The dash-pot relay is mounted at the left

luminated track and signal diagram is mounted on the control machine above the levers. One red indication lamp, mounted below the track diagram, is used to show the dispatcher that a-c. power is feeding on the busses at both field stations. If the lamp is lighted this is an indication of a power interruption, and the

signal maintainer is notified at once.

The time-code system of control is used, all functions being controlled and indications returned by codes transmitted over a single line circuit of two wires. The wire runs within the dispatcher's office are in metal conduit, using threadless fittings. The office coding equipment and office battery are located in an enclosed cabinet.

Telephone System of Interest

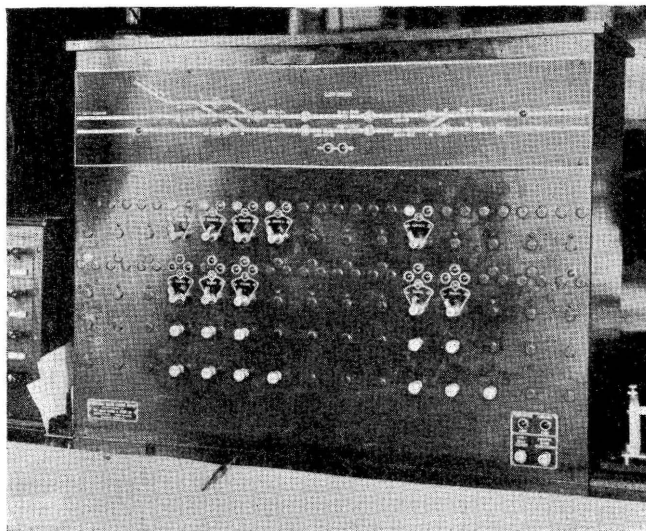
In the Clifton Forge territory, a telephone is located in each of the instrument houses to be used by the maintainer when it is necessary to communicate with the dispatcher, and one is also located at each home interlocking signal and at all outlying

switches for the use of trainmen when it is necessary for them to call the dispatcher. These telephones are connected on the station-to-station block telephone line, on which code ringing is employed, and in order to eliminate the objection of having a bell ring in the dispatcher's office for all calls for other stations, a means

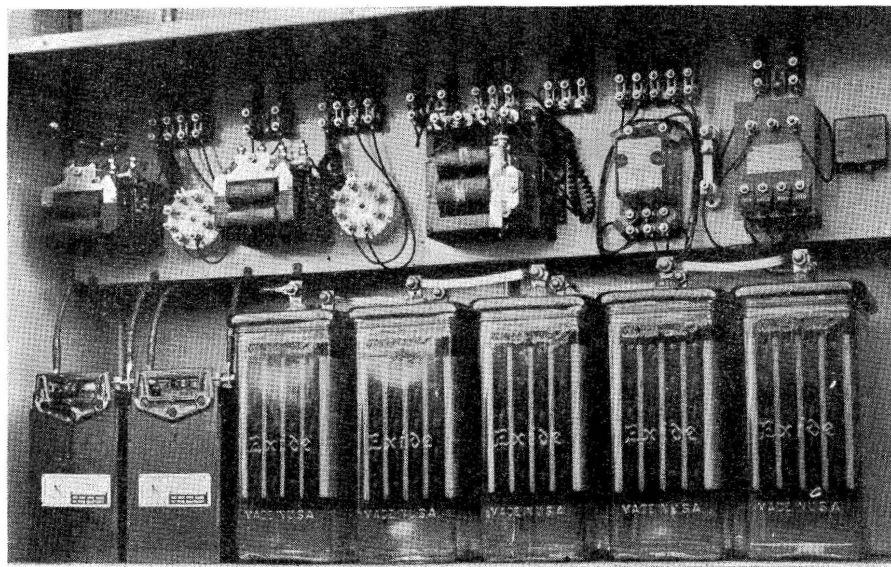
was devised whereby the dispatcher is selected only when desired. A Western Electric dash-pot relay, in the dispatcher's office, is adjusted to operate in five seconds. The short and long rings will not permit this relay to complete its operation. However, when a conductor or a maintainer on the Clifton Forge territory wants to call the dispatcher he turns the crank for a period of about six seconds which permits the 5-second relay to operate, and, through a circuit completed by the dash-pot relay, a lamp on the C.T.C. machine is lighted and stays lighted until the dispatcher inserts a plug in the jack box to connect his telephone to the block line. An answer-back indication to the party doing the ringing is obtained by the feeling of a decided "drag" on the handle of the telephone generator which occurs at the time the dash-pot relay picks up, thus indicating that the dispatcher has been selected, and further ringing is thereby obviated until the dispatcher has had an opportunity to plug in on the block line and answer the call.

The control and power-supply wires are run on the signal crossarm of the T. & T. pole line. The two code-control line wires are No. 8 copper with weatherproof covering and are supported on Pyrex glass insulators. The 440-volt a-c. power distribution line is on two No. 6 copper wires, with weatherproof covering supported on porcelain insulators. The signal control circuits are No. 10 copper-covered steel line wires with weatherproof covering.

At each location the code line is equipped with neon-argon arresters located in a box on the line pole, and for further protection type 60-AP arresters, located in the instrument houses, are also connected to this line. An air-cooled line transformer is used



The C.T.C. machine is in the dispatcher's office



Rectifiers and battery at typical signal location

at each signal location to reduce the voltage from 440 to 110 volts, and in the instrument cases lighting transformers are used to further reduce the voltage for signal lamps. The rectifiers for charging batteries are operated from the 110-volt a-c. busses.

At the west end of the classification yard the old two-story brick tower was used as an instrument housing. At the outlying crossover

concrete floor sloping to the center where a 4-in. brass bell-type drain was installed. The house was then constructed, using 2-in. by 4-in. studs and 1-in. by 8-in. shiplap siding and roof. The exterior and roof were covered with heavy gage corrugated galvanized sheet iron. As a means of reducing fire hazard, the studs were set so that the sheet-iron siding fits closely to the concrete foundation. The door is of steel construction with ventilator openings in the lower panel. Mounted in the cone of the roof is an 8-in. exhaust ventilator.

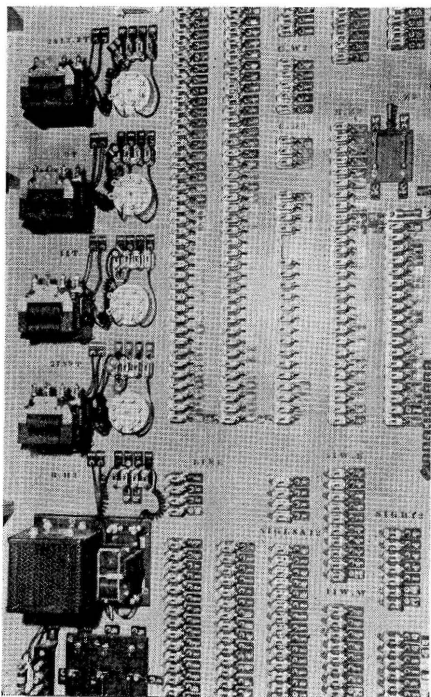
In order to allow space for a man to get behind the relay racks in the house, the racks on the rear and two sides of the house are set out 19 in. from the wall. The racks are built up solid from the floor to the ceiling of 1-in. boards bolted to $\frac{3}{4}$ -in. by 2-in. by 2-in. angle-iron uprights. All incoming cables and wires are brought into this outer compartment, and the wires are run through small holes to bakelite-based terminals which are mounted on the rear wall of the house. Distributing wires from the terminals to the various instruments are run back through the wall, thence through porcelain bridle rings in the wire way to a point where they again pass through holes to the binding posts on the instruments. In this way all the wiring runs are out of sight, and yet there is adequate space behind the board to install or inspect the wiring.

All the terminals, arresters, limiting resistances, fuses, etc., are mounted on the rear wall of the house. Track and line circuits are equipped with Turret type shunt arresters. A 5-ohm adjustable resistor is used for the track circuits and a 3.5-ohm adjustable resistor is used for the signal lamp circuits. All bat-

tery connections to the code units are fused with 10-amp. fuses.

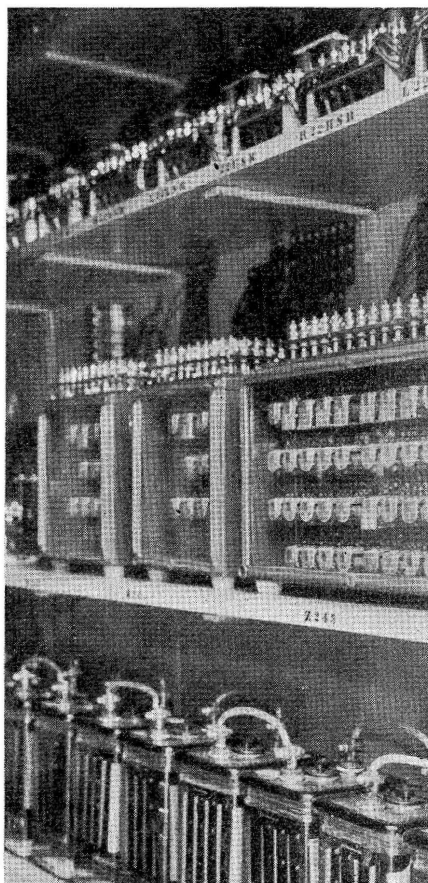
The TH-10 thermal relays, for effecting the time and approach locking, are mounted at the left, and the track, line, and local relays are arranged in standard grouping, all relays being placed on shelves.

The a-c. floating system of power supply is used on this installation, using a 440-volt power distribution line. One nickel-iron storage cell is used for each track circuit and lead



The terminals are mounted on a panel at the rear wall of the house

location a C. & O. standard sheet-metal house was constructed to house the instruments. This house was constructed by signal forces, and the outside dimensions are 8 by 10 ft. In building the relay house a concrete foundation was first made, with a



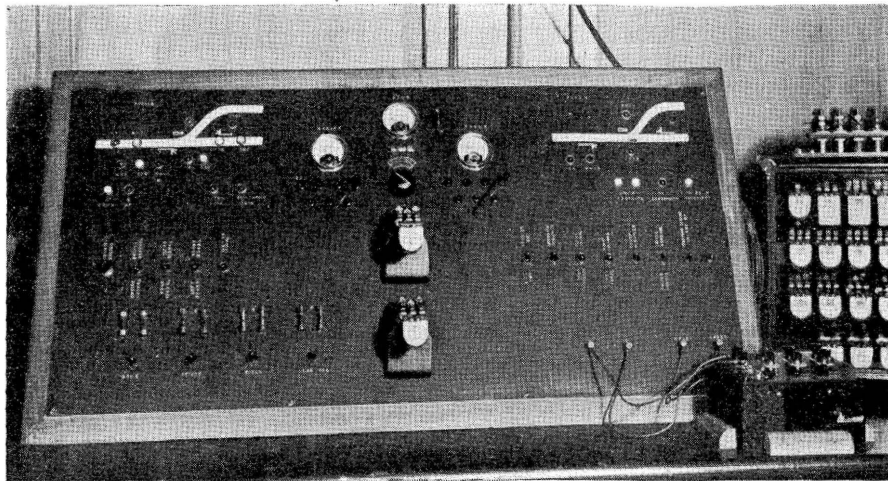
Interior of instrument house

cells are used for other purposes. Each switch-operating set consists of 13 cells of storage battery, 90-a.h. capacity, and each line and local signal stand-by consists of 5 cells of storage battery of varying capacity, as required. All cells are on floating charge through copper-oxide rectifiers.

The signals on this installation are of the vertical color-light type, using

tions are varied so as to obtain the proper amount of current in the line. The working voltages for both the office and field stations are indicated on the miniature voltmeters located to the right and left of the ammeter at the top of the test panel.

The circuits are so arranged, through the various toggle switches and indication lamps, as to provide for operating the office and field code



A special panel is provided for testing C.T.C. code equipment

8 $\frac{3}{8}$ -in. lenses and 10-volt, 18-watt lamps. The switch machines are the Model-M and M-2 low-voltage type for operation on 20 volts d-c. and are equipped with point detectors.

Testing Equipment

A special test set for conducting complete checks of the coding equipment was built by the signal construction forces, and is in use in the second story of the brick tower at the west end of the classification yard where the maintainer and maintenance foreman perform these tests periodically. Power for operation of the test set is obtained from the buss terminals in the instrument housing on the lower floor. The set as illustrated in the photograph consists primarily of a $\frac{1}{4}$ -in. ebony panel on which are mounted two type L-1 relays, and two groups of indication lamps and toggle switches; one group is associated with the office coding equipment and the other with the field coding equipment.

A standard cycle recorder shown in the foreground is used for measuring the length of the various open and closed line impulses. An ammeter indicates the current in the line which is established when the office line coding unit and field line coding storage unit are connected to the test set through a circuit which places their respective "R" relays in series, and by means of jacks and plugs the voltages for the office and field sta-

units in the same manner as they are required to operate in actual service, and any irregularity in their operation, which would require adjustment of the relay contacts or other repairs, is detected by the lack of response of the indication lamps on the test panel to the codes which are established by manipulation of the toggle switches.

Test clips are used for connecting the external wires from the test set to the terminals of the code units under test, so as to permit of readily changing the connections from one unit to another or for varying the connections on the units for different station selections, thus permitting complete check of each and every unit so as to maintain them in condition for use interchangeably with all units throughout the entire installation.

This installation was planned and installed by signal forces of the Chesapeake & Ohio.

Alton Interlocking

(Continued from page 357)

lamps being rated at 3.5 volts, 0.120 amp.

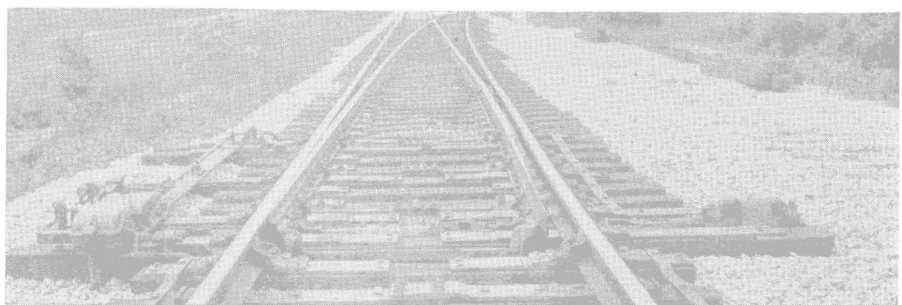
The centrally-located control circuits at the crossing and the continuously burning color-light signals on the Alton are supplied by an Exide Type-EMGO-9 160-a.h. battery of six cells which is on floating charge.

All of the relay equipment is of the General Railway Signal Company Type-K, the various instruments being housed in a wooden case at the crossing. The control circuits from the crossing to the home signals on the Wabash are of open construction on the Western Union line, with No. 10, 40 percent conductivity Copperweld wire. No. 6 solid double-braid weather-proof copper wire is used to feed the lights of these signals from the transformer at the crossing the main storage battery serving as a stand-by.

Lighting circuits from the crossing to the Alton home signals are run in Okonite four-conductor No. 12 parkway cable having a lead sheath and steel tape. Track-circuit leads are of No. 8A single-conductor Okonite parkway cable. Bond wires are of the cable type, furnished by the American Steel & Wire Company.

The advantages of the new interlocking equipment over the former arrangement are obvious. In addition to increased safety of operation through the use of modern track circuits in lieu of detector bars and modern electric locking and relay equipment, the operating and maintenance expense will be reduced. On the basis of the former annual operating cost of \$5,728, the cost of the new interlocking layout will be returned after approximately one year of operation.

The circuits and plans for this installation were prepared by the signal department of the Alton in co-operation with the signal department of the Wabash, the field work being done by the Alton company forces.



Spring switch with facing-point lock on the Wabash near Kansas City, Mo.