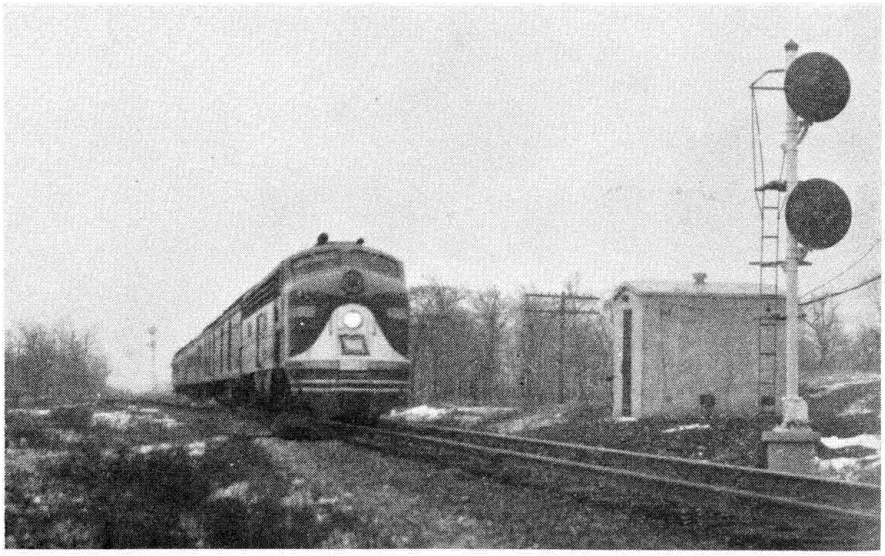


Diesel-electric powered passenger train at the end of a typical passing track. Bungalow, station entering signal at right

C. T. C. on The Wabash

Wabash makes installation on 42 mi. of single track and 1 mi. of double track between Montpelier, Ohio, and New Haven, Ind., on the outskirts of Fort Wayne

THE Wabash Railroad has installed C.T.C. on 42 mi. of single track and 1 mi. of double track between Montpelier, Ohio, and New Haven, Ind., 6 mi. east of Fort Wayne, the control machine for which is located at division headquarters in Montpelier. As a result, over-all operating efficiency has been increased considerably, compared with previous train-order and time-table operation with automatic block protection.

With reference to the accompanying map, Fig. 1, the territory involved is on the First district of the Wabash's Montpelier division, which is part of the road's main line from Buffalo and Detroit to Fort Wayne, St. Louis, Kansas City, Omaha and Des Moines. Double track is in service from Detroit to Montpelier, a yard location, thence for about 1.5 mi. west to a junction point known as Pergo, where the road's main line to Chicago diverges. Single track extends from Pergo to New Haven, 42 mi., and double track from New Haven through Fort Wayne. In the 42-mi. single-track section between Pergo and New Haven, which traverses generally rolling country with light grades and few curves, there are three interlockings—one at Butler, Ind., 18 mi. west of Montpelier, maintained by the New York Central at a double-track crossing of that road; another at St. Joe, 8 mi. west of Butler, maintained by the Baltimore & Ohio at a double-track crossing of that road; and the third at New Haven, which is the end of C.T.C. territory, end of double track from Fort Wayne, a junction point with another line of the Wabash to Toledo, and a crossing with a single-track line of the Nickel Plate.

Of special interest is the New Haven interlocking, where both the Nickel Plate and Wabash have supervisory C.T.C. contol. Thus, for Wa-

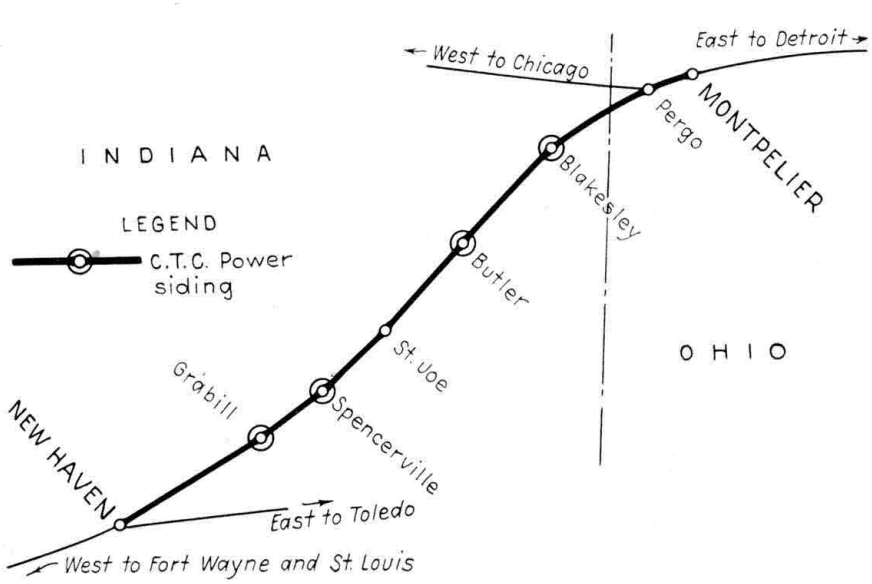


Fig. 1—Map of the C.T.C. territory between Montpelier and New Haven

bash movements, the local operator must make his line up agree with the Wabash dispatcher and, for Nickel Plate movements, he must line up to agree with the Nickel Plate dispatcher.

Traffic in the territory consists of an average of about 18 trains daily, 4 of which are passenger, and the balance red-ball freights, plus locals and extras as required. In addition, between Montpelier and Pergo, there are 6 red ball and 2 mixed trains to and from the Chicago line, bringing the total number of trains daily in this part of the territory to 26. Freight consist is largely general merchandise, including a considerable amount of automatic equipment westbound out of Detroit. Maximum train speeds are 50 m.p.h. for freights and 78 m.p.h. for passenger trains.

Trains are Bunched

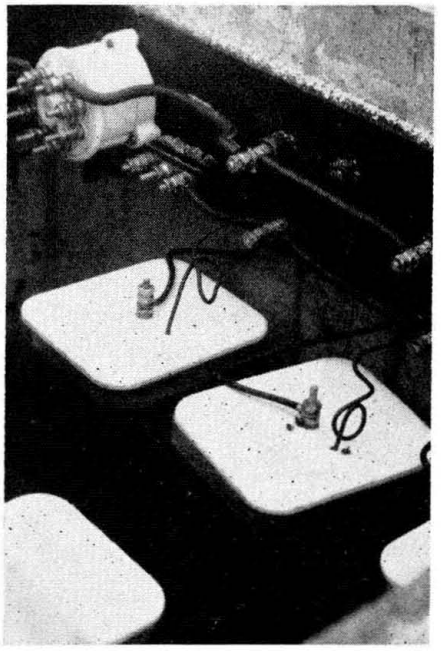
The busiest time insofar as the number of trains is concerned is between 12 midnight and 8 a.m., and between 4 and 8 p.m., when there are approximately 9 trains. Traffic is thus somewhat bunched and, under time table and train orders, was running into delays because of the impossibility to issue orders fast enough to keep up with the trains during these busy rush periods. Trains would be stopped at the interlockings in the territory because of trains of foreign roads occupying the crossings. Other trains on sidings in advance for meets, in turn, were delayed, unless new orders were issued authorizing the trains to proceed to the next crossing—a procedure requiring considerable time in itself by the time annul and new orders were issued. The same thing applied if trains were waiting on sidings for meets and anything else happened to delay the other trains they were to meet.

Non-Stop Meets

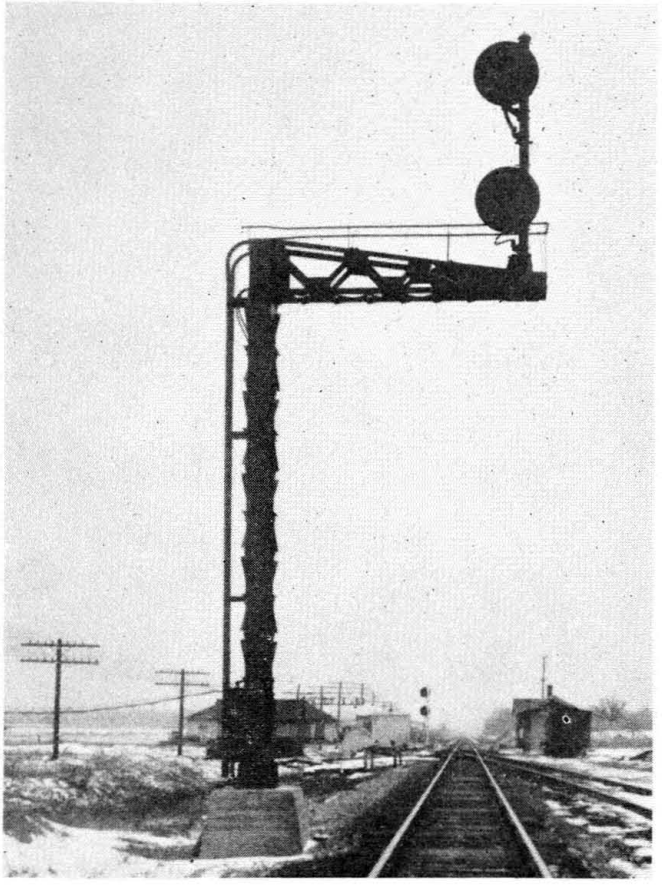
Under C.T.C. operation, however, if a train is delayed at one of the interlockings or for any other reason, other trains may be advanced accordingly by signal indication with minimum delay. By observation of the illuminated track diagram in front of him, the dispatcher is able to keep a close check of the progress of trains in the territory, and thus plan meets on closer schedule than was possible under train-order operation. Non-stop meets are now being made in any number of instances, some trains saving as much as 20 min. in getting through sidings. Through trains are thus saving anywhere from 20 to 30 min. on the run in each direction between Montpelier and New Haven. Considerable time is also saved by trains getting into and out of the yard at Montpelier.

During construction, existing A. P.B. signaling was cut out of service in sections, trains operated under manual block rules in these sections, and intermediate locations between sidings respaced as required, and switch machines installed. As each section was made ready, it was tied into the control machine and cut in service.

The project includes power-operated switches and controlled signals at the ends of four passing tracks, namely, Blakesley, Butler, Spencerville and Grabill, the capacities of which are 120,170,123 and 115 cars, respectively. A typical power siding with controlled signals is shown in Fig. 2. The switch machines at the ends of these sidings are the Style M-22A, designed for operation on 24 volts d.c., and the turnouts are No. 20's with 33-ft. 115-lb. points on roller bearings.



Primary battery for track circuits

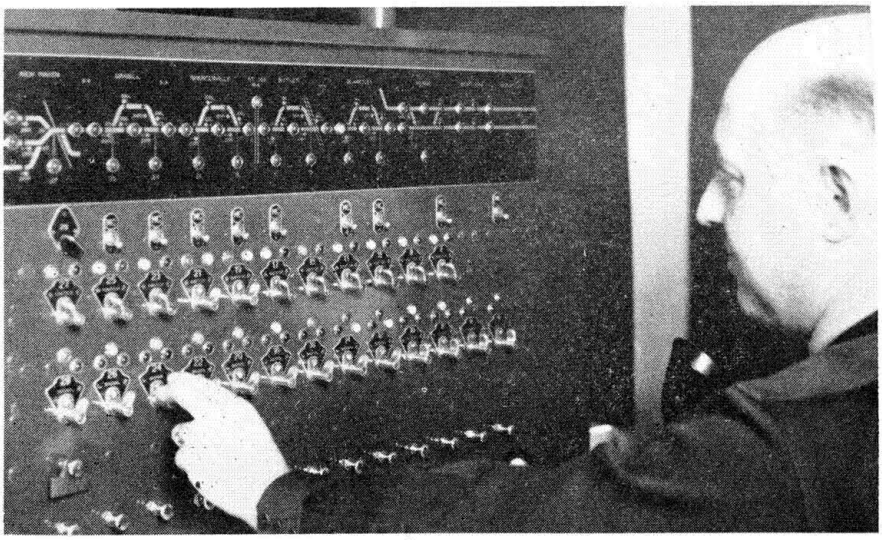


Main-line station - departure signal on cantilever

Either-Direction Signaling

At the end-of-double track at Pergo, 1.5 mi. west of Montpelier, two No. 20 crossovers with 33-ft. points are in service, and the two main tracks between that point and Montpelier are signaled for train movements in both directions, as shown in Fig. 3, thus increasing the flexibility of operation of trains getting in and out of Montpelier yard.

The end-of-double-track layout at New Haven includes a No. 20 equilateral turnout, good for train speeds up to 50 m.p.h. as shown in Fig. 4.



Control machine for the Montpelier - New Haven C.T.C. at division headquarters in Montpelier, Ohio

This switch and the eastward home signals at New Haven are jointly controlled from the interlocker at that point and the C.T.C. dispatcher at Montpelier, to prevent line-up of conflicting routes and train movements. Similarly, control of the home signals at the N.Y.C. interlocking at Butler, are coordinated and, before they can be cleared, must also be cleared from Montpelier. The signals at the B.&O. plant at St. Joe are coordinated with the direction of traffic established by the dispatcher. Indication of their condition is provided on the C.T.C. panel at Montpelier, by a green lamp, normally extinguished in the track diagram. When lighted, it indicates that the towerman has lined the route and cleared the signals for a Wabash train movement through the interlocking.

All main-line hand-throw switches are equipped with Style T-21 stands and Style SL-25 electric switch locks. Switch lamps are the electric type, continuously lighted off the 10-volt d.c. power source for the locks. Where practicable derail lamps are also so lighted.

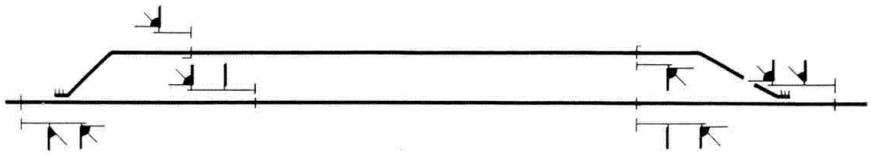


Fig. 2—Typical controlled passing track, showing arrangement of signals

Searchlights and Color-Lights

The new controlled high and dwarf signals at the ends of the passing tracks and elsewhere are the Style H-5 plug-in searchlight type, and the intermediate automatic signals are the Style R vertical color-light type. All controlled signals, except dwarfs without approach track circuits, such as on sidings, and the intermediate signals are approach lighted. The intermediates in each direction between sidings are spaced an average of about 10,000 ft., and are controlled by one reversible two-wire line circuit. Track circuits average approximately 4,500 ft., and are the standard d.c. type with DN-11 type neutral relays.

Standard Code A.A.R. signal aspects are displayed by all signals. Where braking distance between certain signals, such as those between the ends of sidings, is insufficient, the distant control of the station-entering signal is taken back to the first approach signal to cause that signal to assume the Advance Approach aspect, yellow-over-yellow, Rule 282A, Proceed Preparing to Stop at Second signal, when the station-entering signal is displaying the Approach aspect, yellow, Rule 285. Similarly, if braking distance between the station-leaving signal and the next signal in advance happens to be insufficient, such as in the case of approach to an interlocking, the distant control of the station-leaving signal is overlapped to the station-entering signal to cause that signal to display the Advance Approach aspect, if the station-leaving signal is Approach.

Signals at Montpelier

As shown in Fig. 3, the first westward signals at the west end of Montpelier yard, 4L and 6L, have two "arms", the top "arms" only being controlled semi-automatic stick. The bottom "arms" are automatic and will indicate Proceed at Restricted Speed if the block is clear and no opposing signal has been lined. This feature was provided so the numerous yard movements could be made without requiring the dispatcher to line the signals for each movement. Trains departing from Montpelier by special instructions, are not permitted to leave except on a proceed indication on the top "arm."

Power switch machine on crossover at Pergo

The control machine in the dispatcher's office at Montpelier is a 2½-ft. unit, and includes an illuminated track model, 15 pen graphic train recorder, and conventional-type signal and switch control levers and indication lamps. Track-occupancy and OS lamps on the diagram are normally extinguished, being lighted upon the presence of a train in the corresponding sections. The OS lamps are also used to indicate power failures in the field, which may be checked by sending out the maintainers call for the corresponding locations when the lamps are lighted. If the OS lamp is extinguished by this action, a power failure is indicated.

Joint Control

The eastward signals, equilateral turnout and siding switch west of the Nickel Plate crossing at New Haven, as shown in Fig. 4, are controlled jointly from the interlocking at that point and from the C.T.C. machine. The normal position for the equilateral turnout is for the westbound main line. A push-turn lever for this switch is provided on the C.T.C. control panel, and is used by the dispatcher only when reverse train movements are to be made on the westbound main track from the line from Montpelier. The position and function of this lever is the same as all other switch levers. A conventional switch lever and indication lamps are on the machine for the siding switch, and a separate special starting button is used to recheck the indication of the track lamp on the westbound main line out of New Haven. To clear eastward signals at that point, for a train movement towards Montpelier, the interlocking and C.T.C. machine signal must be placed in corresponding positions.

Special indications are provided on the C.T.C. panel to dimly light the switch and signal indication lamps when the dispatcher has established his lineup through New Haven. When the towerman at the plant has done the same, the lamps are lighted to their full brillancy. A similar arrangement applies to the joint control of facilities at the N.Y.C. plant in Butler.

Because the lower "arms" of the first westward C.T.C. signals out of Montpelier, 4L and 6L, shown in Fig. 3, are automatic, the red lamps above the Normal positions of the signal control levers are normally dark. These lamps are lighted only when both arms of the signals are red. Signal-clear lamps above the levers are lighted only when the top units of the signals are yellow or green.

Standby Power

At each power switch location, there are 8 cells of Exide 60-ah. and 10 cells of 120-ah. storage battery. The switch machines operate from 13 cells, the code equipment from 8 cells and local circuits and reserve signal lighting from 5 cells. Each track circuit is fed by three cells of 500 a.h. primary battery in multiple.

The signal equipment, such as relays, rectifiers and coding apparatus at the end of each siding is sheltered in Massey 6-ft. by 9-ft. concrete houses, each of which is equipped with an outside clear-lens maintainer call lamp. At Pergo, an 8-ft. by 10-ft. house is used. The rails are bonded with Raco plug-type and Caldwell weld-type rail-head bonds. The code line is on two No. 8 A.W.G. 40 per cent Copperweld, polyethylene-insulated wires, signal circuits, No. 10 Copperweld wire, and power circuits are on No. 8 solid copper wire, on the pole line. At each field location, the circuits between houses or cases and switch machines is in underground cable varying from 2 to 12 conductors.

A wall-type local-battery telephone is in service in the instrument house at each field location, and can be connected to the dispatcher's selector circuit or message circuit through a knife switch. Each maintainer has a portable telephone which can be connected to the C.T.C. code line for contacting the dispatcher. At the lower left-hand side of the control machine is a normally-dark red lamp and telephone-plug receptacle. Upon a call coming in from the field on the code line, the call is indicated by the illumination of this lamp. It is extinguished automatically when the dispatcher plugs the office phone into the receptacle.

This installation was made under the direction of G. A. Rodger, superintendent signals and communications. The major items of signaling equipment were furnished by the Union Switch & Signal Company.

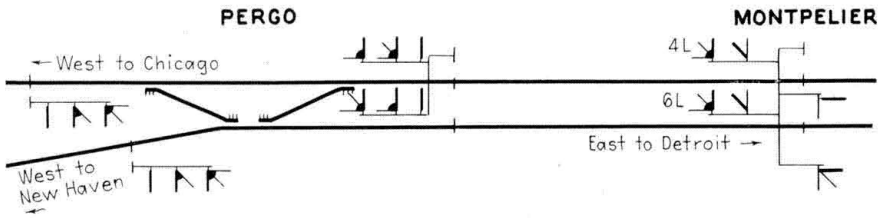


Fig. 3—Track and signal arrangement between Montpelier and Pergo

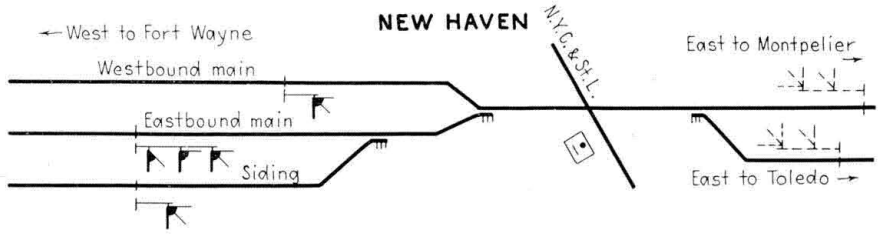
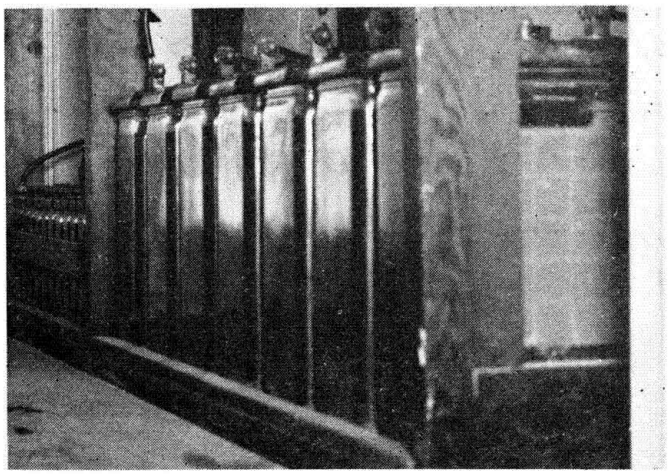


Fig. 4—Layout of tracks and signaling at New Haven



Storage battery at the control office at division headquarters in Montpelier