

New No. 20 equilateral turnouts, at ends of double track, save train time

One Track Does Work of Two

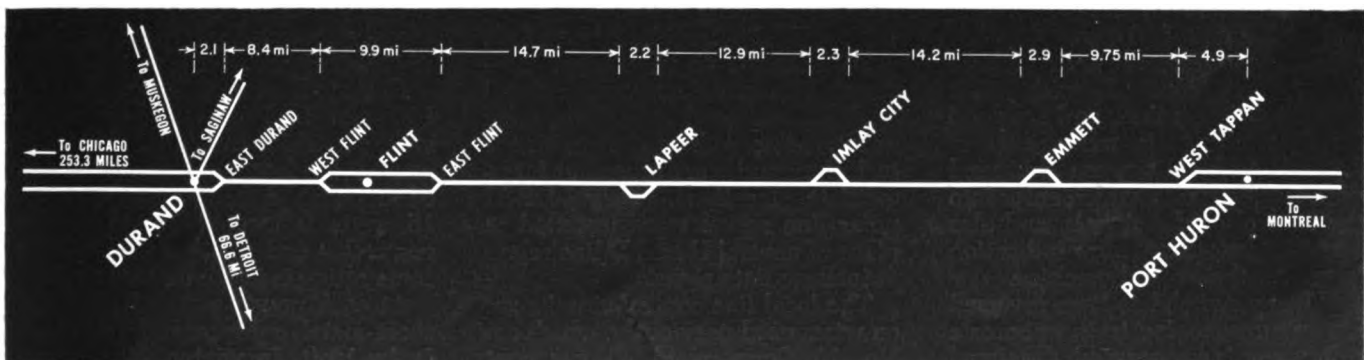
ON 73.1 MILES between Durand, Mich., and Port Huron, Mich., the Grand Trunk Western has changed from double-track to single-track main line, on two sections totaling 60.7 miles. One section, 8.4 miles, is from East Durand to West Flint, and the other is 52.3 miles, from East Flint to West Tappan. Both main tracks were left in service on 12.4 miles of heavy industrial area between West Flint and East Flint. Sections of the previous second main were left in place for use as sidings at three locations and for various station tracks. Thus second track was removed on 50 miles.

On main route, handling up to 20 trains daily, the Grand Trunk Western has taken up second main track, and has installed centralized traffic on the remaining single track on 60.7 miles

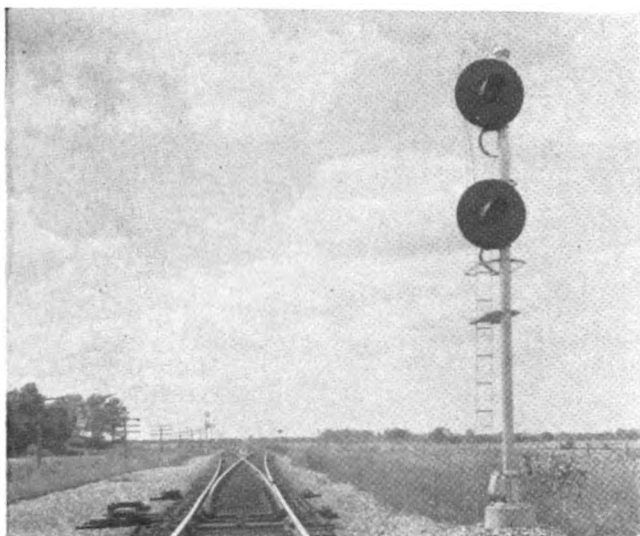
This territory is part of the Canadian National—Grand Trunk Western route between Montreal and Chicago, 851 miles, practically all of which has been double track for over 40 years. A line starting at Detroit extends 66.6 miles to Durand. Also a secondary line extends from Bay City south for 53.2 miles to Durand. Traffic from Detroit or Saginaw to Chicago and return, is

routed over the Chicago Division between Durand and Chicago. Thus to a certain extent, traffic is lighter east of Durand. This is one reason why the section east of Durand was chosen as the first on which to remove second main track.

The normal daily traffic on the East Durand-West Tappan section includes three passenger trains and about eight freight trains each way



Single main track replaces double, East Durand to West Flint, and East Flint to West Tappan



High-green aspect for move over equilateral turnout



Two-arm dwarf is "leave-siding" signal

daily, totaling 18 to 20 trains. Freight trains range from 125 to 145 cars.

High-Speed Equilateral Turnouts

At the new ends of double track at East Durand, West Flint and East Flint, the junctions from single-track main line to double-track main line are new equilateral turnouts using No. 20 frogs, and 39-ft curved switch points. By thus cutting the diverging distance in half, train movements in either direction can be made with safety through the turnout at 60 mph. Thus the aspect displayed for such train movements is the "high green." The end of double track at West Tappan is a lateral turnout using a No. 20 frog and 33-ft switch points, due to ascending grade on westward main track.

New Long Sidings

No siding was provided on the 8.4 miles of single track between East Durand and West Flint. On the single track between East Flint and West Tappan there are three sidings, each nearly two miles long; the one at Lapeer holds a train of 208 cars; at Imlay City, 230 cars; and at Emmett, 290 cars.

The turnouts at the ends of these sidings are No. 20 with 33-ft straight switch points, and are good for diverging train movements at 30 mph. The sidings are equipped with track circuits, which enter into the control of the signals, and also control track-occupancy indication lamps on the control machine.

When a switch has been reversed for an approaching train to enter a siding that is unoccupied, the signal is cleared to display an aspect of

red-over-yellow-over-red. At some locations, the entering signal will display red-over-green-over-red when the signal at the leaving end of the siding has been cleared. If the siding is occupied by a train of the same direction, the signal can be cleared to display red-over-red-over-yellow. If the siding is occupied by a train of the opposite direction, the signal cannot be controlled to display a proceed aspect.

Formerly Automatic Block

Formerly this territory was double track with automatic block signaling for right-hand running. When changing to single track with CTC, new searchlight type signals were installed at the power switch locations at ends of double track and ends of sidings. The previous color-light type signals in the automatic block were relocated as required, for use as approach and intermediate signals on the single track. Thus the signaling system was completely rebuilt.

A new idea was used in the construction of the cantilever signal bridges at one end of each siding. The main mast of each such bridge consists of steel pipe 16-in. outside diameter with walls $\frac{3}{8}$ -in. thick.

New PN-150 track and line relays were installed at all control locations. The previous conventional track relays, rated at 4 ohms, were quartered to reduce the resistance to 1 ohm, and were reused at intermediate locations. New DP-21 polar line relays were installed in place of neutral H and D line relays at intermediate signals.

The local line control circuits are on wires used previously, which are No. 10 Copperweld 40 per cent conductivity. The CTC code line

circuit is on two new No. 8 Copperweld wires, 40 per cent conductivity, with neoprene weatherproof covering. The control machine is in the dispatcher's office at Battle Creek, Mich., which is 78.7 miles west of the west end of the present CTC. Line code repeaters are located at Durand.

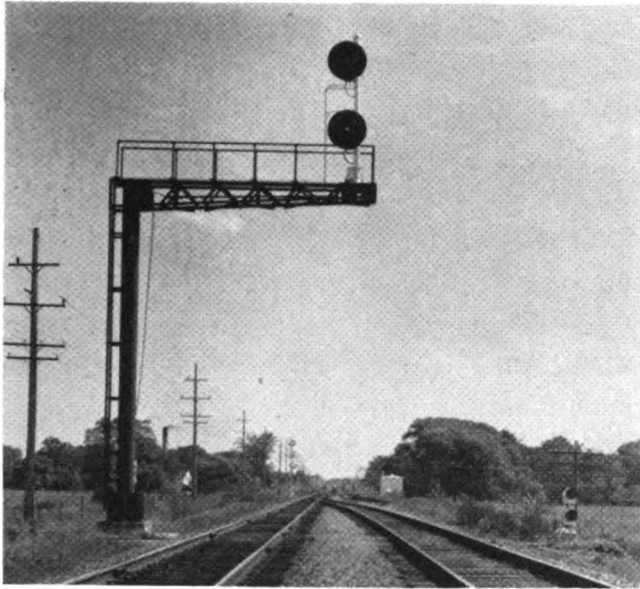
Switch Layouts Well Built

The electric switch machines are the M 23B type with dual control. On the equilateral turnouts a special 1-in. pipe connection extends via cranks from the operating rod to the mid-point of the 39-ft. switch points, thus insuring that the entire length goes over properly. Each set of switch points is equipped with two sets of roller bearings which normally raise the switch points off their respective slide plates, thus easing the operation. Tie plates are treated with a coat of graphite lubricant.

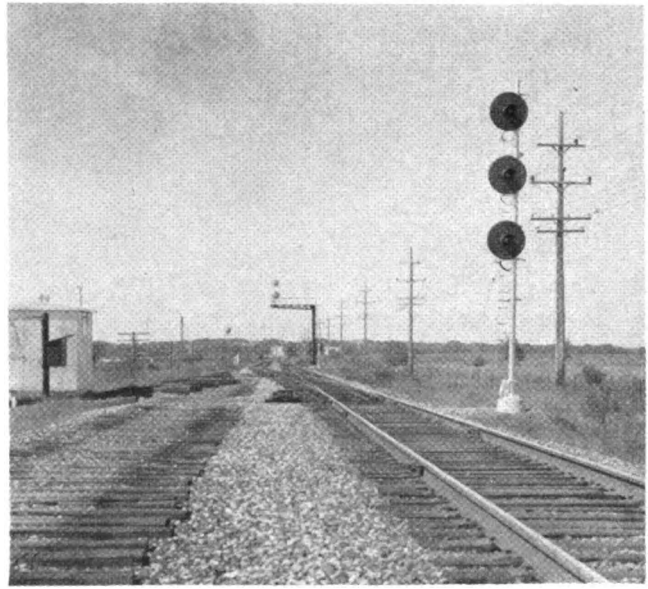
The switch rods are the Racor "MJ" adjustable vertical-pin type, and the adjustable rail braces were made by the same company. Four gauge plates are used. Adjustable rail braces are used on 12 ties. Extra adjustable braces are used on the gauge side on the first tie ahead of switch points to prevent "rolling" of the stock rail.

Electric heater coils, operated on 110-volts a.c., are used in each switch machine to minimize trouble caused by frost and condensation of moisture. A heater coil rated at 15 watts is located in the circuit controller and another coil of the same rating is in the motor housing.

At each power-switch layout the sheet-metal equipment house is 8 ft. by 10 ft. In winter, each house is heated by a Duo-Therm oil stove.



Cantilever main mast is a 16-in. pipe



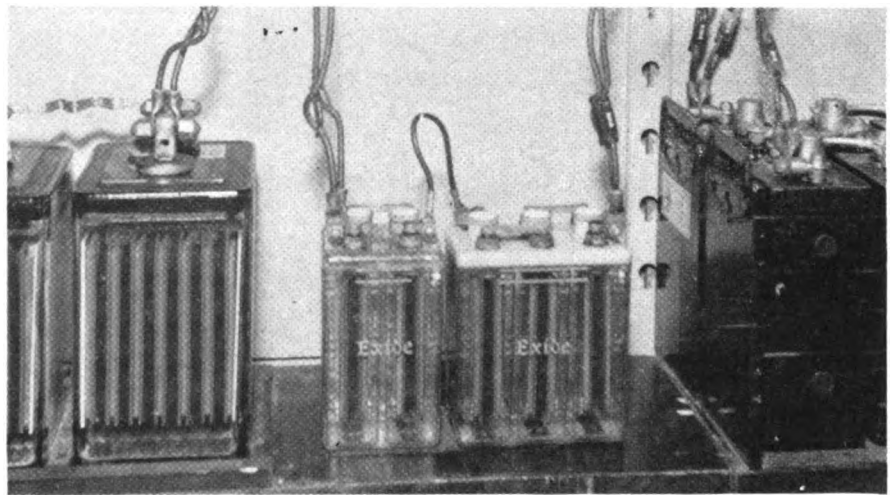
One main track was removed on 50 miles

The maintainer's call from the dispatcher controls two lamps at each equipment house, one on the outside and another on the inside, where the maintainer can see it when working in the house. The lamps are rated at 25 watts so they can be seen readily in daylight.

Each switch motor is fed by a set of 18 cells of Edison B 4H storage cells. This battery also feeds the line code equipment. Each long local line circuit is fed by a set of 5 cells of Exide DME-13 lead battery. Each short line circuit, at sidings, is fed by a set of 5 cells of Exide CME 8-a.h. battery. Where a.c. is available, each track circuit is fed by one cell of Exide battery. At locations where there is no a.c., each track circuit is fed by three 500-a.h. Edison primary cells.

The buried cable from the equipment house to each switch machine includes two No. 8 and eleven No. 14 wires. The single-conductor No. 9 extends from the house to rail outlets. Inside wiring in the houses is No. 16, with 37 strands. Insulated wire and cable was made by Simplex Wire & Cable Company. Connections to terminals are made by AMP connectors.

As part of the project, a new telephone was installed near the house at each controlled point, and at each electric lock at a hand-throw switch. These are type 45 Booth Monophones made by Automatic Electric Company. By means of a double-pole double-throw knife switch, each phone can be connected to either of two line circuits. One is the regular dispatcher's line circuit and the other is superimposed on the CTC code line. To call



Batteries are in sheet-metal houses: cells (left) feed long local line circuit; (center) short local line circuit; (right) switch machines, line code equipment

the dispatcher on the code line a maintainer whistles into the transmitter. This operates a voice-actuated relay in the office, thus controlling a lamp and bell to call the dispatcher's attention.

Electric Locks on Hand-Throw Switches

This project included the installation of electric locks on 35 hand-throw main-track switches. In approach to the facing point of each such switch, there is an audio-frequency overlay track circuit. A train or engine on the main track, that is to enter the switch, must stop on this track circuit to control a release of the lock. This use of the AFO track circuit eliminates insulated rail joints that would be required for a conventional track circuit.

For a train or engine in the clear on a spur track, the lock is released by an approach locking circuit which utilizes the two-wire reversible signal control line circuit. A novel feature of this installation also is that audio frequency overlay line circuits were used for block indication between ends of sidings, thus eliminating the need for additional line wires which otherwise would be required.

This CTC project was planned and constructed by Grand Trunk Western forces under the jurisdiction of G. I. Stonehouse, Signal Engineer, and under the field supervision of C. G. Trimble, Supervisor of Signals, and A. O. Murken, Assistant Supervisor of Signals. The major items of signal equipment were furnished by Union Switch & Signal, Division of Westinghouse Air Brake Co.