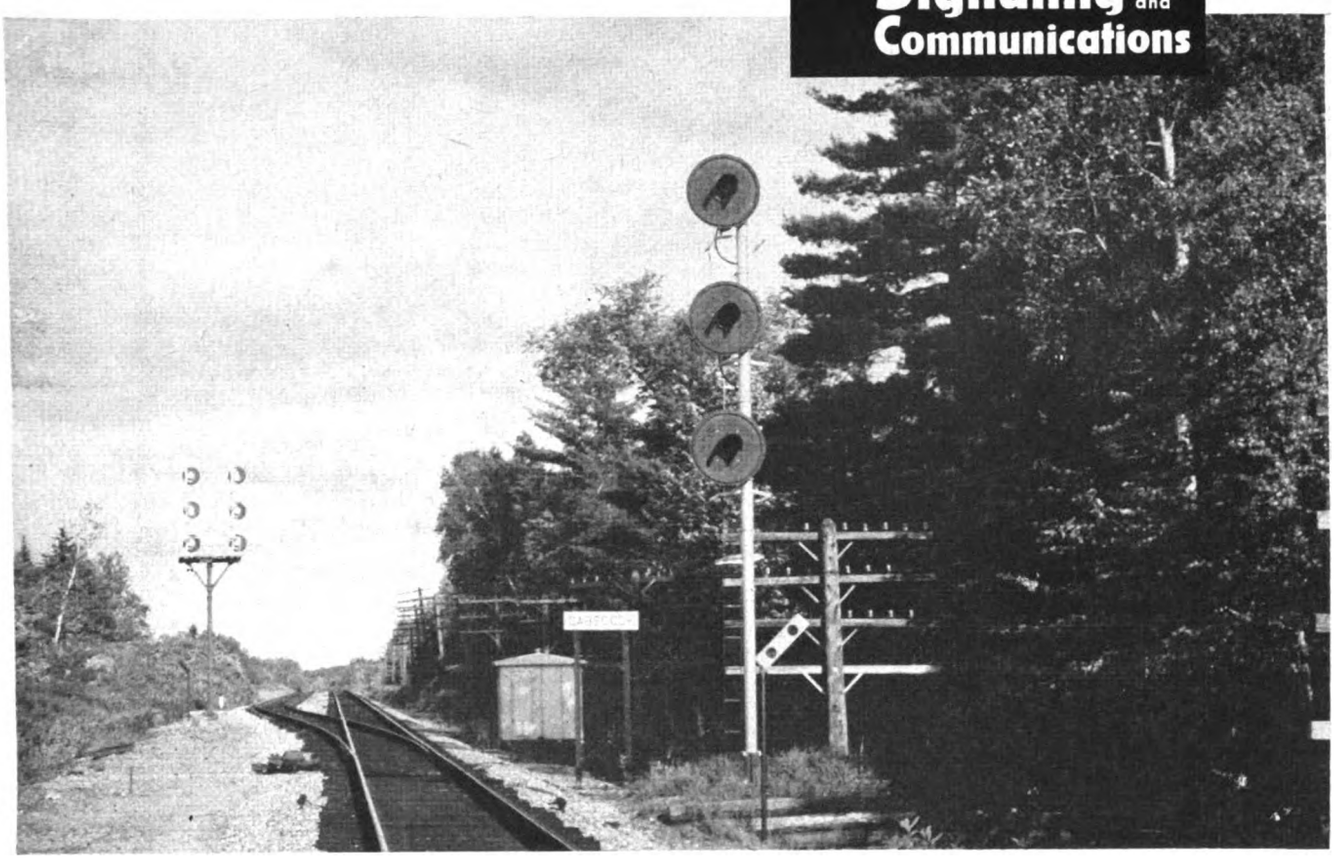
Railway Signaling and Communications



Single track with long sidings and centralized traffic control provides adequate track capacity

One Track Does Work of Two on M. C.

- **One of two main tracks removed on 24 miles**
- **CTC installed on the remaining single track**
- **Annual return of 32% on a net expenditure**
- **Saving each year is: $30,000 on rail, $8,448 on ties, $13,000 on ballast, $50,000 track labor**

ON 24 MILES of road between Pittsfield and Hermon Pond, the Maine Central has changed from two main tracks to one, the track capacity on the single track being secured by installing centralized traffic control including power switches and signals.

This section is on the main route between Portland and Bangor; Hermon Pond being 3.8 miles west of the freight yards at Northern Maine Junction, near Bangor. The traffic on this route includes 12 passenger trains daily. Freights range from about 8 daily in summer to 18 in winter. This same traffic is being handled on previously existing single track west of Pittsfield.

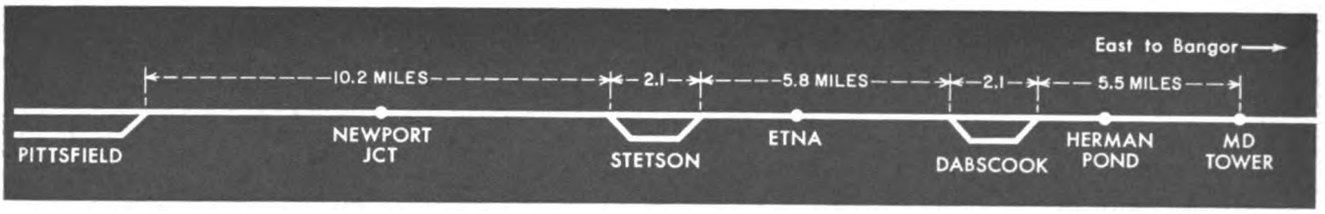
Value of Rail Removed

When making the change-over from double-track to single main track, portions of the previous second main were left in place for use as passing tracks at Pittsfield, Stetson, and Dabscook, these passing tracks totaling 6.4 miles, which, subtracted from the total, leaves 17.6 miles of second main actually taken up. This rail has been or will be relaid in branch line territory or sold as relay rail. Its market value is at least $75 per gross ton. Also 43,434 treated crossties, suitable for reuse, were salvaged at $2 each.

In the previous double-track layout there was a center passing track 3627 feet long at Hermon Pond, which was removed as part of this project. Also, the previous double track included six hand-throw crossovers between the two main tracks, located at Carmel, Etna, East Newport, Newport and Pittsfield. These crossovers were also removed.

Cost for Rail Not Laid

The 100-lb. ARA-A rail in the two previous main line tracks was in such condition that the railroad was faced with the prospect of having to replace it in 24 miles of the westward track and 9.8 miles of the eastward track. The remaining 14.2 miles in the eastward track,



Double-track was changed to single-track between Pittsfield and Hermon Pond

consisting of 112-lb. RE rail laid in 1940-41-44, was considered good for many years in view of the fact that about 1/3 of the tonnage hauled in this territory is on this track and 2/3 of it on the westward track. Hence conversion to single track, with utilization of the track having 14.2 miles of 112-lb. rail, eliminated the immediate necessity of laying rail in 24 miles of track at an estimated cost of over $500,000.

Considering tonnage, as well as other factors in rail life, it was concluded that the 112-lb. rail had a remaining service life of at least 15 years in its present location, functioning as a single main line track. Elimination of the relaying of rail in the 24 miles was, therefore, considered as being worth $30,000 a year to the railroad.

Expense for Ties and Ballast

With respect to crossties; experience on the Maine Central indicated that for the tonnage now hauled, or in prospect, the ties in the single-track left in service would render just as long life as they would have if double-track operation had been continued. In this territory the average charges for tie renewals, material only, at $4 each is $480 per mile of main track annually. Thus applying for the 17.6 fewer net miles of track, this totals $8,448 saved annually.

The ballast in this territory is a good grade of washed gravel, which is resurfaced about every 20 years at an estimated average cost of $11,000 per mile. Applying this figure for the entire 24 miles of second main track eliminated gives an average saving of $13,200 annually for ballast.

Reduction in mileage of track, to be maintained, permitted changes in track forces that make a wage saving of over $50,000 per year. The project was completed January 9, 1957, thus the annual savings for 1957, and for each future year, namely, $30,000 for rail, $8,448 for ties, $13,200 for ballast, and $50,000 for track labor, totals $101,648 annually.

In all sections where the second main track was removed, a Jordan spreader was used to level out the ballast, thus forming a smooth roadway for trucks and other rubber-tired highway vehicles. Existing local highways cross the track at grade, thus permitting railroad highway trucks to get to or from the new access road along the track.

32 Per Cent Saving

The previous double-track was equipped with colorlight automatic block signals for right-hand running, with blocks about 1.5 miles long, a total of 35 automatic signals being involved. These signals were removed as part of the change.

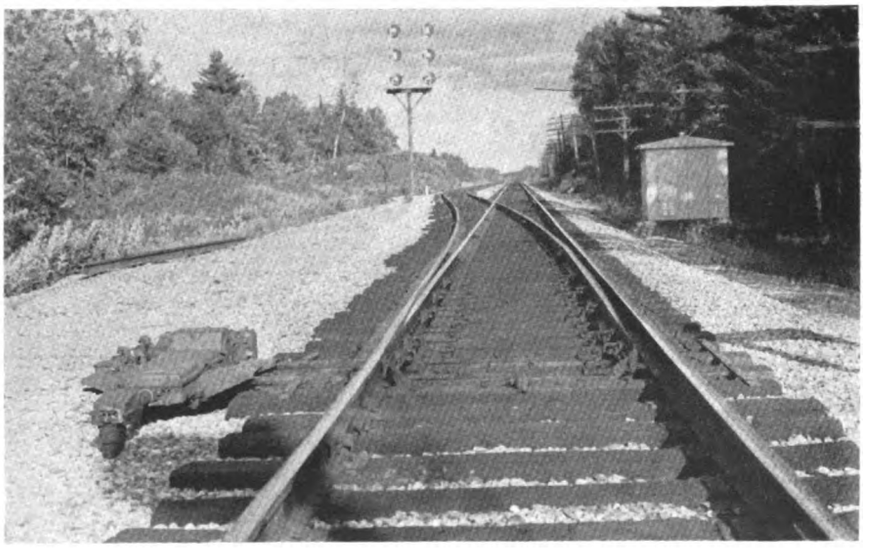
In the new arrangement, centralized traffic control, including power switch machines and signals, was installed on the 27.7 miles of single track between Pittsfield and MD Tower, which is at the west end of the Northern Maine Jct freight yard, about 6 miles west of Bangor.

The gross cost for signal and telephone materials, and labor for installation, was approximately $493,000, less about $5,100 for salvage. The signal maintainer territories are the same as previously for the automatic block. Considering the track work and signaling, the entire project involved a gross cost of about $660,000. Retirements were $336,000 and salvage $341,000. The savings represent about 32 per cent annually on the net expenditure.

Siding-to-Siding Blocks

When planning this project, a study showed that instances in which trains followed one another at less than 10 to 15 miles would be rare. Therefore, to reduce the number of signals, and to simplify controls, the blocks for following trains, as well as opposing, are from siding to siding, with no intermediate signals, as such, to allow for following moves except between Pittsfield and Stetson siding, where considerable switching is performed at Newport Jct. Therefore, automatic intermediate signals were provided in approach to this point to permit a following train to close in to a train performing switching.

From Newport Junction a branch line extends north 29.5 miles to Dover-Foxcroft. Service on this branch includes only a local freight each way daily, except Saturday and Sunday. This branch is connected with the main track by a hand-throw switch equipped with an electric lock. A dwarf signal is located at clearance on the branch. With no train in the overall block between sidings at Pittsfield



110-volt switch machines operate quickly and crush ice or coal in points

Gas heaters, controlled by CTC, melt the snow and ice in switches

and Stetson, and no signal cleared into this block, the lock on the hand-throw junction switch may be released without delay. When a trainman throws the switch, the dwarf on the branch will clear, as an automatic signal aspect indicating that the track is unoccupied for the train to proceed westward to Pittsfield. This feature avoids delay that would otherwise be incurred by the train being required to operate at reduced speed all the way to the east end of Pittsfield siding.

Holding Signals Save Time

Absolute Stop holding signals, controlled from the CTC machine, are located at yard limit west of Pittsfield. This permits switching to be continued at maximum time in this area while, in the meantime, a through train can be advanced without delay from the next siding to the holding signal.

Also, as a part of the CTC project, electric locks were installed on other hand-throw main-track switches leading to house tracks, etc., with the exception that no electric locks were installed on switches at five short spurs where trains cannot clear the main track when setting out or picking up cars.

Conventional normally-energized d.c. track circuits with 4 ohm relays are used for OS switch detector circuits and for controls of highway crossing signals. Elsewhere the Trakode system is used, the advantages being that track circuits can be longer and no line wires are required for local controls of signals.

Normally, code feeds cascade through all the track circuits in a station-to-station block, first one direction and then back the other direction. When a control is sent out to clear a signal, track code feeding the opposite direction is cut off. Basic information on Trakode is given in two articles published in the May and the August issues of Railway Signaling and Communications.

For Trakode, the resistance of the wires from a relay to the rail connections should not exceed 0.1 ohm. For leads under 100 ft. long, No. 6 copper wires are used. Over 100 ft., two No. 6 wires are used for each side of the circuit, totaling four wires. The insulated wire and cables on this project were furnished by Simplex Wire & Cable Co.

The CTC code line circuit is on No. 6 Copperweld wire with polyethylene covering. This line circuit is transposed for 30 kc using Case transposition brackets, spaced an average of 15 to the mile. Commercial a.c. power at either 110 volts or 550 volts is fed both ways from numerous locations so that a.c. is available at all power switch locations and all approach signals. This a.c. power is on two No. 6 copper wires with polyethylene covering.

The switch machines are the Model 5D dual control, with 110-volt d.c. motor. The reason for using 110-volt motors is to provide greater power for crushing ice, coal or other such objects that otherwise might obstruct a switch and thereby prevent proper operation. Also, operating speeds are faster.

Each switch machine is fed by a set of 55 cells of Exide lead type storage battery rated at 16 a.h. Wherever a.c. is available to feed rectifiers to charge storage batteries, each track circuit is fed by one cell of 100 a.h. Exide lead battery. At track circuit cut sections, where a.c. is not available, 500 a.h. Edison carbon A500 primary batteries are used.

In this project the signals are normally dark, being lighted on approach control. Also, when a control goes out from the office to clear signals for one direction in a siding-to-siding block, the signals for the other direction are lighted, this being done as an aid to warn men on motor cars.

Gas Switch Heaters

Each of the power switches is equipped with a propane-gas snow-melter switch heater. These heaters are turned on and turned off by control from the CTC control machine. The heaters, including devices to ignite the gas, were furnished by The Rails Company.

As originally installed, a flexible hose to feed gas to one section of a heater was located under one end of the switch machine. A hole cut in this hose by a track shovel allowed gas to leak under snow and into the switch machine. When the gas was lighted by CTC control, the explosion, inside the switch machine, blew it apart, causing so much damage that it was cheaper to buy a new machine than to replace damaged parts. The location of the gas pipe has been changed to prevent similar trouble in the future.

This project was planned and constructed by the Maine Central Railroad forces under the jurisdiction of J. W. Wiggins, Chief Engineer, the signaling being under the supervision of J. F. Stanford, Signal Engineer, and the track changes under the supervision of C. D. Prentice, Engineer of Track. The major items of signal equipment were furnished by the General Railway Signal Company.