Trackwork and signaling installation work on this new mainline was performed by Canadian National forces

Seaway Diverts CNR Mainline

Channel changes and dam construction as part of the new St. Lawrence Seaway will cause water to flood much of the existing Canadian National mainline between Cornwall and Cardinal, Ont., making it necessary to construct a new 40-mile double-track line two miles north of the original mainline. New line is on Montreal-Toronto route

SIX MONTHS, most of them during the winter, were required for the Canadian National signal department to install automatic block signaling on 44 miles of double-track mainline in Ontario. Other work included installing an automatic interlocking at a crossing of a Canadian Pacific single-track branch line near Cornwall, and flashing-light signals with automatic short-arm gates at eight highway grade crossings on the new mainline.

The diversion is part of the Montreal-Toronto mainline which generally follows the north bank of the St. Lawrence river and Lake Ontario. The section of the old mainline to be removed because of flooding, was double-track for right-hand running, with passing sidings at Morrisburg. Automatic block signaling was in service using colorlight signals. The new line has automatic block signals for right-hand running with searchlight signals. Two 100-car sidings (one for each direction) were located at Morrisburg. The entering end of each siding is equipped with a hand-throw switch, and the leaving end is equipped with a spring switch. The Morrisburg operator can control the signal approaching the switch to display yellow-over-lunar "S," which is the take-siding aspect. The signal is 3,200 ft in approach to the switch, so that the engineman can slow down to let the head brakeman get off and reverse the switch. When the train is to leave, the Morrisburg operator throws a lever which controls the main-track signal to Stop. Then, after an adequate time interval, the leave-siding dwarf will clear. The train then trails out through the spring switch.

The new interlocking, at the crossing of the CN and the CP at Cornwall, is controlled automatically by an approaching train of either road. The first train to enter its approach section, gets the plant. If the first train does not move over the crossing or off the approach cir-

cuit, a train on the other road, moving into its approach circuit, can get the crossing after 6 min. If a signal does not clear for a train, a pushbutton release can be used. Operating the pushbutton causes all signals to go to red, and a train is then flagged over the crossing.

Signal Work During the Winter

Signal construction headquarters was set up at Cornwall, Ont., the east end of the line. Field work was done by three gangs: installing, 19 men and a foreman; bonding, 9 men and a foreman; and wiring, 6 men. All testing and inspecting was done by a signal inspector and testmen who checked out the entire job prior to putting it in service.

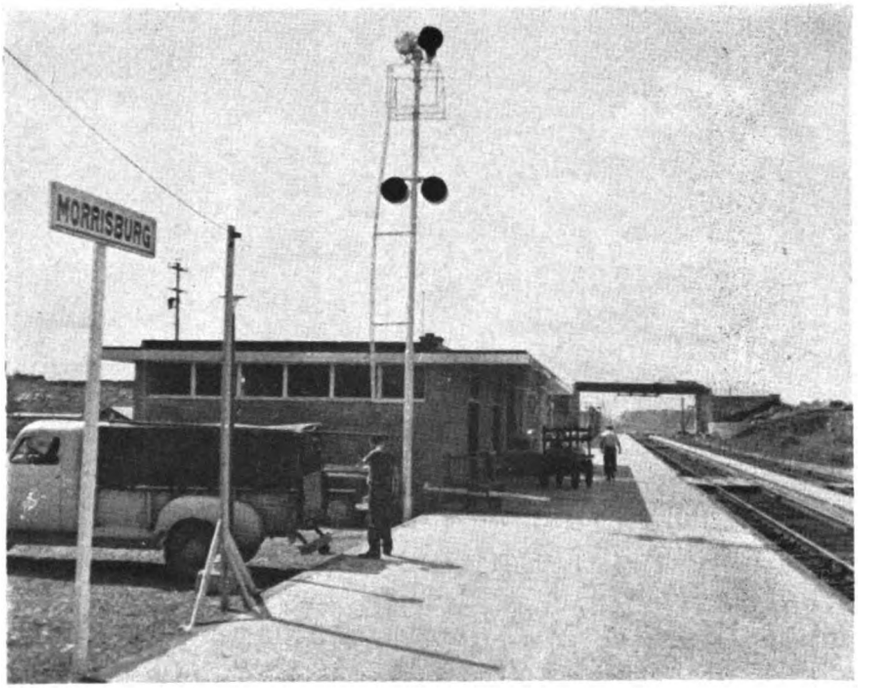
Realizing that the Ontario frost sometimes penetrates to a depth of 3½ ft, and that they would be installing underground wire and cable in January and February, the signal installing gang dug trenches early in November before the ground froze.

Fibre duct, 3 in. in diameter, was installed under tracks. At some locations, the digging was fairly easy as the track had not yet been laid, hence the signalmen worked entirely from surveyor's stakes. At this time they staked out the locations for signals and cut sections.

The wire gang worked on case wiring at Cornwall construction headquarters. One baggage car was for storage of relays, wire, tools, batteries, etc., and a second served as a shop. The men were able to wire four cases at a time in the car. The relays are the plug-in type, mounted in hinged racks so that the maintainer can remove a relay without opening the rear doors of the case. Extra terminals, to the right of the arresters, on the terminal board in the cases, were added to form a test link so that the incoming cable can be "meggered" without disconnecting the cable. The cases, completely wired with relays and storage batteries tied down, were hauled to the field for setting.

Work Train and "A" Frames

Where the track was in, a work train crane set the precast, one-piece concrete foundations for instrument cases and signals. Each instrument case is supported by four concrete foundations. The work train crane was used to set the instrument cases and signals. The signal head, background, ladder and a mast were assembled prior to



Top light unit is train order signal; bottom unit is flag-stop signal

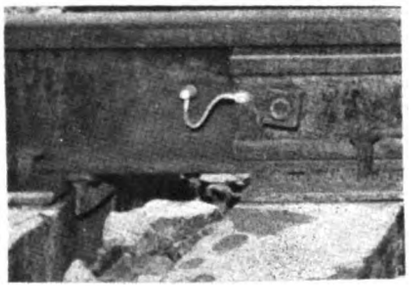
setting in the field. At some locations the signal crews were ahead of the track laying forces. Here the signal men used trucks equipped with "A" frames to set the foundations, cases and signals.

The cable from the cases to the signals was laid in 3-in. fibre duct, and goes up through the signal foundation and inside the mast to the signal head. The cable used is 14-conductor and 12-conductor, sizes No. 14 down to No. 9. Line drops are 10-conductor No. 14 solid copper, and track wires are single-conductor No. 9 solid copper. The bootlegs are outside the track beyond the ends of the ties. The bonds, on the 132-lb rail, are of special Canadian National design. They are type S-8 SB5 American Steel & Wire Co. stranded copper with channel pins driven into the web of the rail and the ends of the joint bars, there being two bonds per joint. These bonds are on the gauge side of the rail for easy maintenance inspection.

A two-wire line circuit is used for each direction. These circuits are double-break. Thus no common line wire is used. This practice minimizes the effects of interference caused by power lines using a ground return.

Blocks are 8,000 ft

Signaling is for 80 mph, with blocks 8,000 ft long. Signals display the three aspects, red, yellow or green. Track circuits are 4,000 ft, being conventional d.c. Resistors

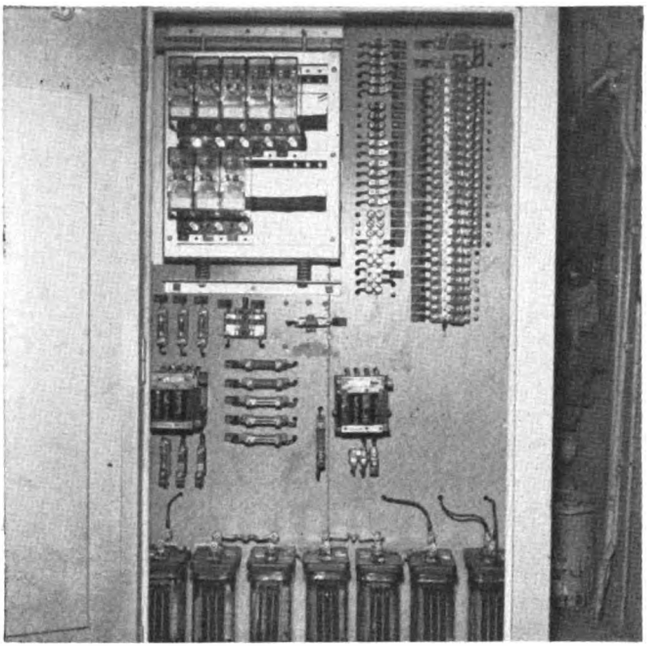


Special CN design bonds are on the gauge side of the rail and joint bar

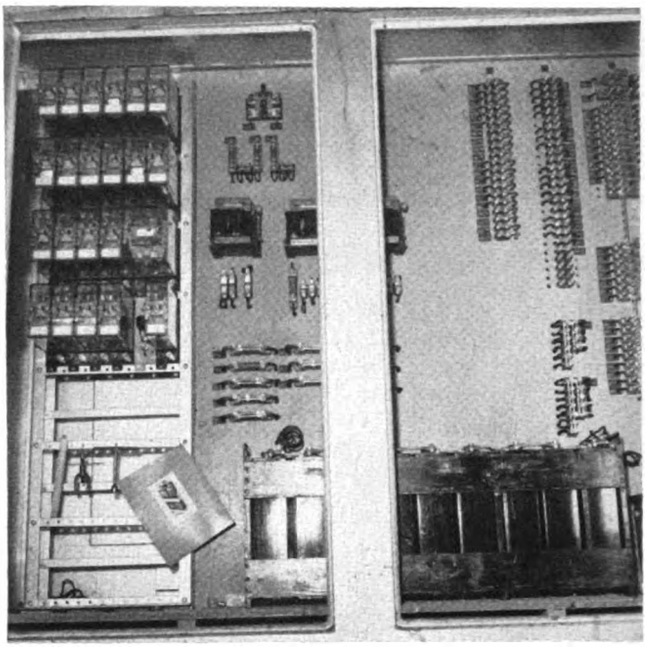
are used at the relay end as well as at the battery end. Track circuit length is adjusted so that a circuit will end at the positive section of a highway crossing protection installation. Block lengths are also adjusted so they will end at this highway crossing circuit. As there are only eight highway crossing protection installations in the 44 miles, this block adjustment was not difficult, and had two advantages: (1) reduced cost because of the elimination of a cut section; and (2) made maintenance easier. The maintainer can get into the crossing to check the flashing-light signals and gates, as well as the block signals.

One Hart 60-ah lead storage cell feeds each track circuit. These cells are on floating charge from Fansteel rectifiers set at 0.9 amp. At signal locations the operating battery consists of Hart lead storage cells of 60 ah capacity.

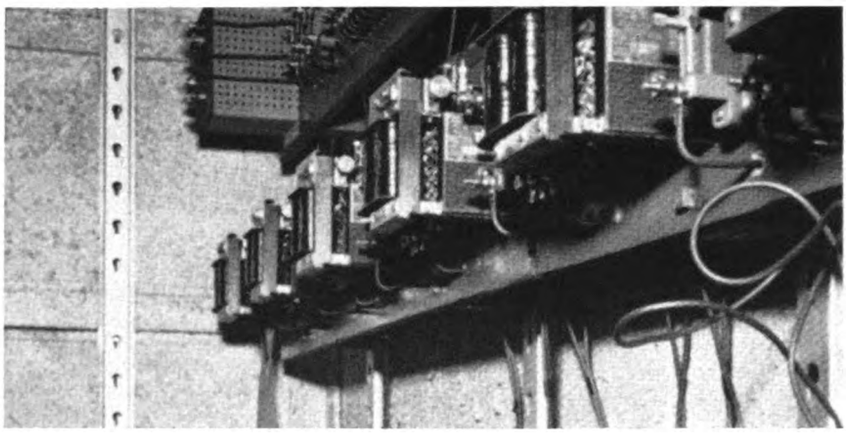
A new pole line was erected by CN Telegraphs with the three top



Baggage car served for case wiring shop at Cornwall. Test links to "megger" cable are to right of arresters



Two-door cases were used at highway grade crossing protection installations. Relays can be swung out



Rectifiers are wall mounted. Picture is taken inside bungalow at CN-CP automatic interlocking

crossarms for communication circuits, and a fourth arm for the signal circuits and the signal power line. This is a 220-volt ac circuit, fed commercial power at seven locations.

Use Phones When Aligning Signals

The searchlight signals are approach lighted. When aligning these signals, the man at the signal had a portable phone with leads clipped onto the message or dispatcher's circuit. Another signalman went about 4,000 ft. down the track and clipped his portable phone leads on to the same circuit. While standing in the track and sighting over the right running rail, he used his phone to direct the man at the signal for aligning the searchlight signal.

Train order signals are at Cornwall, Ingleside, Iroquois, and Morrisburg. They are searchlight signals and can be controlled to display red, yellow and green aspects, also providing a light-out indication for the operator. To distinguish them from the searchlight block signals, the train order signals were erected on 33 ft. masts south of the tracks and east of the stations. They are completely out of line with any automatic signals, and smaller backgrounds were provided.

Flag stop signals at Iroquois and Morrisburg, consist of a lunar lamp mounted on the train order signal mast below the signal head. To display the flag stop aspect, the agent operates a toggle which causes the lunar lamp and the green in the searchlight to flash 45 times per min. Thus the engineman observes a green and white flashing aspect.

The short-arm gates and flashing-light signals at six of the eight highway crossings are controlled automatically by track circuits, and the other two are manually controlled. Normally trains are operated right-hand running on this double track.

Extra long approach circuits (3,800 ft long) were installed, so that if a westbound train hits its approach section just after the gates have cleared behind a receding eastbound train, the gates will stay up for 10 seconds before being lowered for the approaching westbound train. This 10-seconds delay prevents the gates from being lowered on highway trucks or automobiles that have started across the crossing. During the 10-seconds delay, the bell continues to ring and the lamps in the flashing-light signals and on the gate arms are operated, thus warning drivers of other approaching vehicles not to start across the crossing.

The gates and flashing-light signals were furnished by Western Railroad Supply Company. The lamps are lighted by a.c., and gate operation is from nine cells of Edison nickel-iron alkaline storage battery. The charging rate is 1.7 amp from Fansteel rectifiers.

Planning and engineering was done under D. H. Green, Signal Engineer, Toronto, and field forces were directed by P. F. Serviss, District Supervisor of Signals at Montreal. Major items of signal equipment were furnished by the General Railway Signal Company.