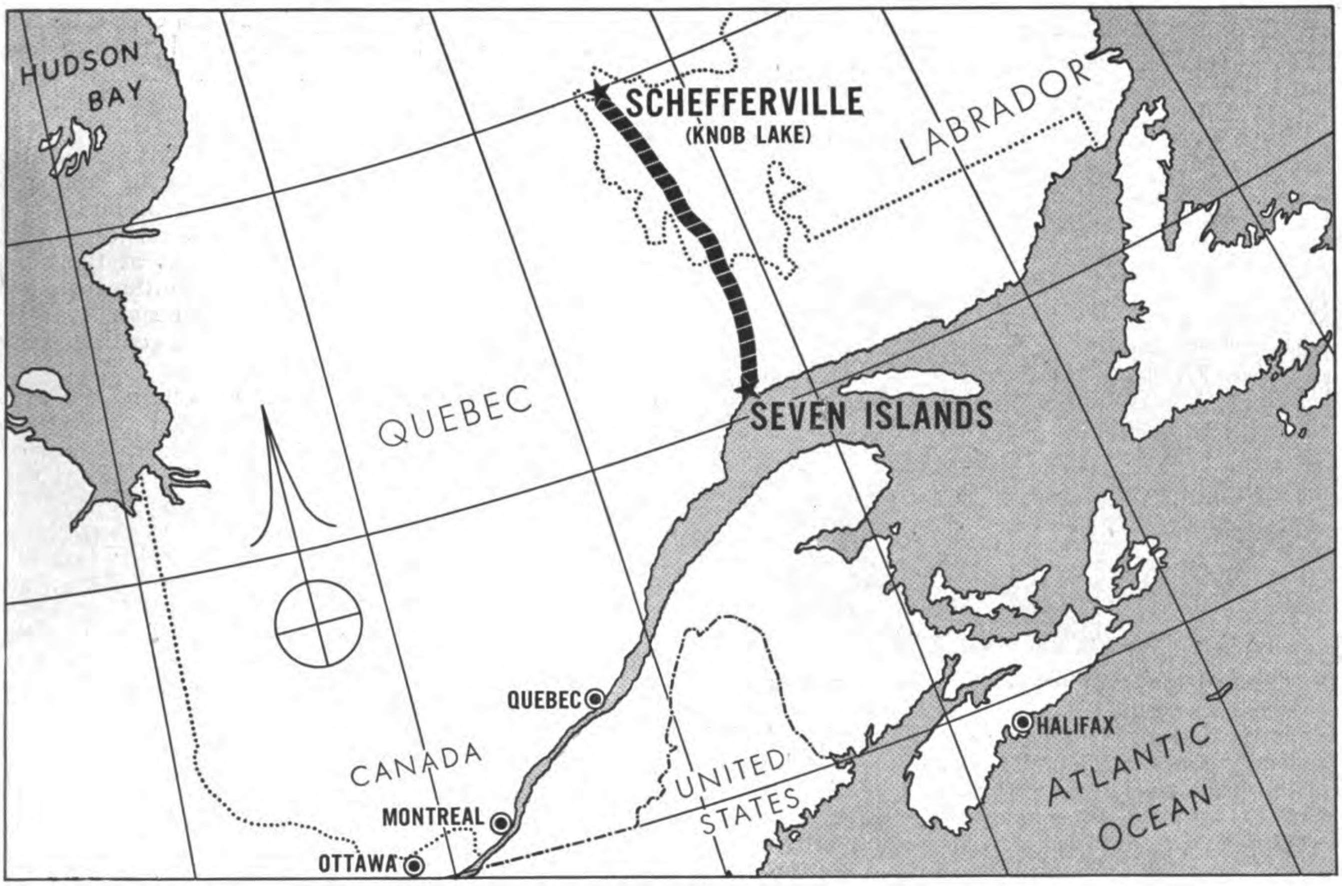


Quebec, North Shore & Labrador . . .

. . . signaling includes a power switch at south end and spring switch at north end of each siding, and the block is from siding to siding. Communications on one wire pair include dispatcher's phone and 11 channels of carrier for telephone and Teletype as well as CTC code and carrier. Radio on trains and in yards

NUMEROUS special features are included in the signaling and communications facilities on the recently completed Quebec, North Shore & Labrador Railway, which was built to haul iron ore from Schefferville, southward 363 miles to docks at Seven Islands, on the north shore of the Gulf of St. Lawrence, 484 miles down the St. Lawrence river from Montreal.

The first ship was loaded with ore on July 31. Approximately 1.5 million tons is the goal for the 1954 season; about 6 million for 1955 and perhaps 10 million for 1956. Three ore trains are being operated daily. For a season of 165 days, 10 million tons will require seven 100-car trains of ore southward and an equal number of empty cars northward every 24 hours.

In addition to ore trains, numerous work trains and supply trains are being operated. In future normal operations the railroad expects to operate one "heavy supply" and two "express supply" trains each week. The "express supply" trains will distribute food and other lightweight supplies. The "heavy supply" train will haul heavy supplies to railroad camps, and do whatever switching is necessary.

Most of this railroad was built through very rough terrain. The first 10 miles is on an open plain with light ascending grades. Near MP 12 a 2,206 ft. tunnel leads through to the Moisie river. For the next 138 miles the railroad follows up the valleys of the Moisie, Nipissis and Wacouno rivers and headwater lakes, and thence to the Quebec-Labrador boundary at MP 150 which is the height of land at 2,056 ft. Then the line goes across the plateau, but in general follows the Ashuanipi and Menihek lakes to MP 330 where it turns across the grain of land to Silver Lake yard at Knob Lake, now known as Schefferville which is on the south edge of an iron ore area 80 miles long and 6 miles wide.

Grades are Controlling Factor

For the most part, the heavy ascending grades are northward, with one section of 1.32 per cent about 16 miles long between MP 59 and MP 75. Southward there are a few sections of ascending grade that range up to 0.4 per cent between the mines and the height of land at MP 150. The tonnage of loaded cars which locomotives can haul up these 0.4 per cent grades is the controlling factor, rather than the tonnage of empty cars up the 1.32 per cent ascending grade northward. Maximum curvature is 8 degrees, and all the sharp curves are in the rugged country between MP 12 and MP 97.

Trains stop at Oreway, MP 186,

Southbound loaded ore trains hold main track for meets

for inspection and to change crews. Normally the southbound trains of loaded cars run from Silver Lake yard to Oreway 180.4 miles without stop, and from Oreway to Seven Islands yard 186 miles without stop. At present the speed of loaded trains is limited to 30 m.p.h. maximum, and to 20 m.p.h. on descending grades. When the roadbeds are settled and rock ballast is applied, speeds may be increased to about 40 m.p.h. for loaded trains, except on heavy grades, and to 50 m.p.h. for empty trains. The run either way between Seven Islands and Silver Lake yard is being made in about 18 hours, which will likely be decreased.

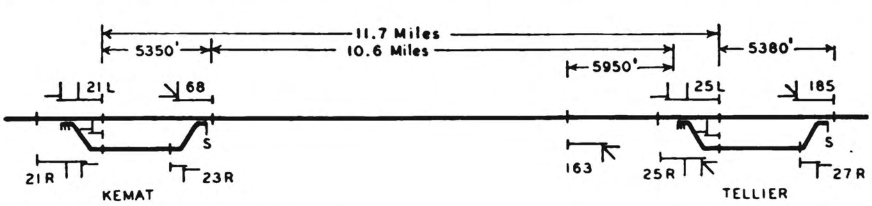
Two main tracks extend from the north end of the Iron Ore Company terminal at Seven Islands to an end of double track switch near MP 3, from which point single main track extends 360 miles to Silver Lake yard, the northern terminal of the Iron Ore Company located a mile from Schefferville. Twenty-three sidings are located between Seven Islands and Silver Lake. Because of the rough terrain, sidings could not be constructed equal distances apart, therefore the distances between sidings range from 2.8 miles to 22.8 miles. Each siding has a capacity of 125 ore cars including a four-unit diesel locomotive and a caboose. The turnouts to the sidings are No. 12 with 22 ft. 6 in. points.

Special Type of CTC

The centralized traffic control was designed to meet the special requirements of train operation on this road. The loaded ore trains, which move south, stay on the main track when making meets with northward trains of empty cars, which take siding. To route northward trains into sidings, a power switch machine was installed at the south end of each of 22 sidings. A spring switch at the north end permits northward trains to pull out without stopping. Power switches were installed at both ends of Oreway siding where the crews change.

Operation of Switches

As shown in Fig. 2, at each power switch there is a standard arrangement of three dispatcher-controlled signals to authorize trains to proceed either north or south on the main track, or to enter the siding.



The block is from signal 25L to 21L

At the spring switch end, the leave-siding dwarf signal is dispatcher controlled. The southward signal 185 located immediately in approach to the spring switch is an automatic signal that serves two purposes: (1) as facing-point protection for the switch; and (2) as an approach signal for dispatcher-controlled signal 25L at the south end of the siding. Northward signal 163 is the approach signal for the northward dispatcher-controlled signal 25R at the power switch.

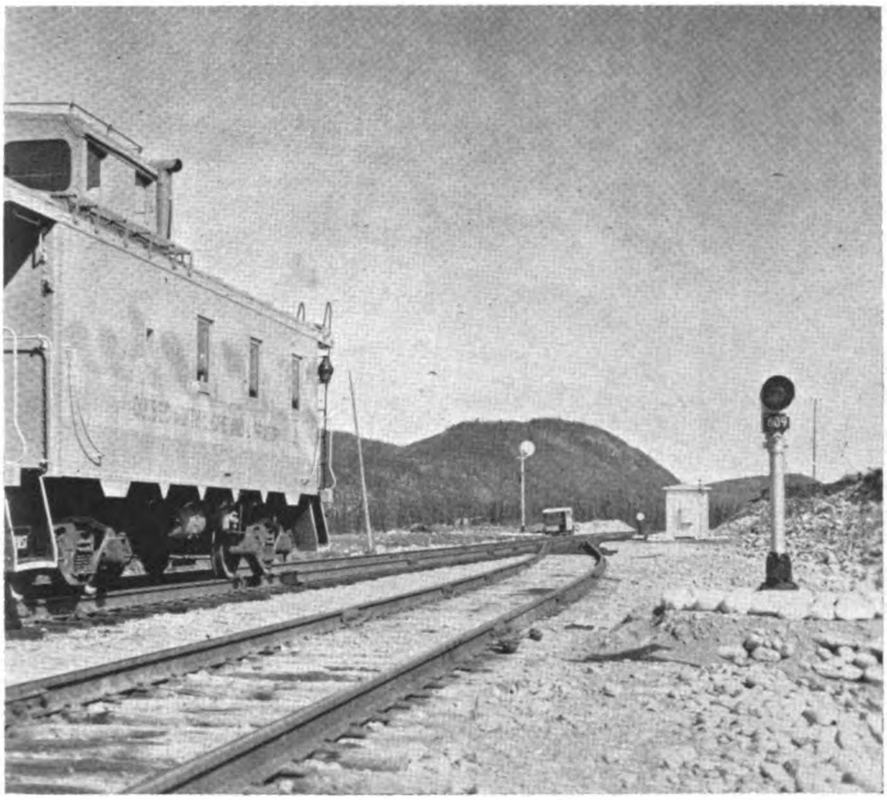
Normally the trains of the same direction are spaced uniformally throughout the 24 hours. If four ore trains are operated southward they are about 6 hours apart and run maybe 100 miles apart. Accordingly there was no reason for installing intermediate automatic block signals to permit following trains to occupy the same siding-to-siding block, the longest of which is about 22 miles. Referring to Fig. 2, a typical block (for use by one train at a time) extends from one power switch to the next power switch; for example, from northward signal 21R at Kemat to northward signal 25R at Tellier.

Signal Aspects

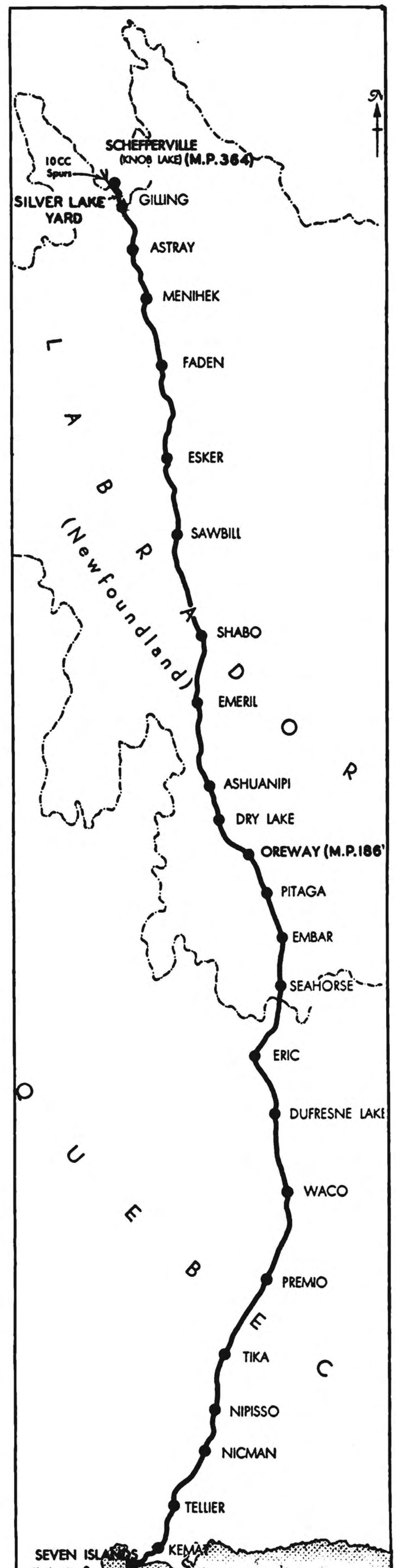
The signals are the searchlight type. A high signal, such as southward signal 25L at Tellier, normally displays the Stop aspect, red-over-red. This signal can be controlled by the dispatcher to display green-over-red which authorizes a train to proceed to signal 21L at Kemat. These are the only two aspects displayed by signal 25L. A signal such as 21R at Kemat can be controlled to display green-over-red, to authorize a train to proceed to signal 25R at Tellier. With the power switch reversed, signal 21R displays red-over-yellow to authorize a train to enter the siding. Dwarf signal 23R displays green to authorize a train to pull out of the siding and proceed to signal 25R at Tellier. Approach signal 163 displays the green aspect when signal 25R displays green-over-red, and approach signal 163 displays yellow when 25R displays red-over-red, or red-over-yellow.

In each siding-to-siding block the track circuits are the either-direction coded type. Normally these track circuits are deenergized. When a signal such as 25L is to be cleared, a preliminary part of the controls is to feed the track circuits northward from Kemat to Tellier, in cascade.

The power switches are operated by GRS 24-volt switch machines



View showing rear of southbound train on main track and dwarf signal on the siding to direct northbound empty-car train to pull out through spring switch



Map showing locations of sidings on the 363 mi. of single track

which include dual-control, so they can be operated by hand when making switching moves. The buffer-spring units for the spring switches are the Mechanical Switchman type made by Pettibone-Muliken, and each such layout includes a mechanical facing-point lock made by the General Railway Signal Company.

Vertical-pin type front rods and switch rods, made by Ramapo Ajax, are used in the power switches, as well as in the spring switches. Each layout includes four insulated gage plates with Racor adjustable rail braces, made by the Dominion Brake Shoe Co. Two of the gage plates extend and are attached to the switch machine to maintain the exact distance between the machine and the stock rail.

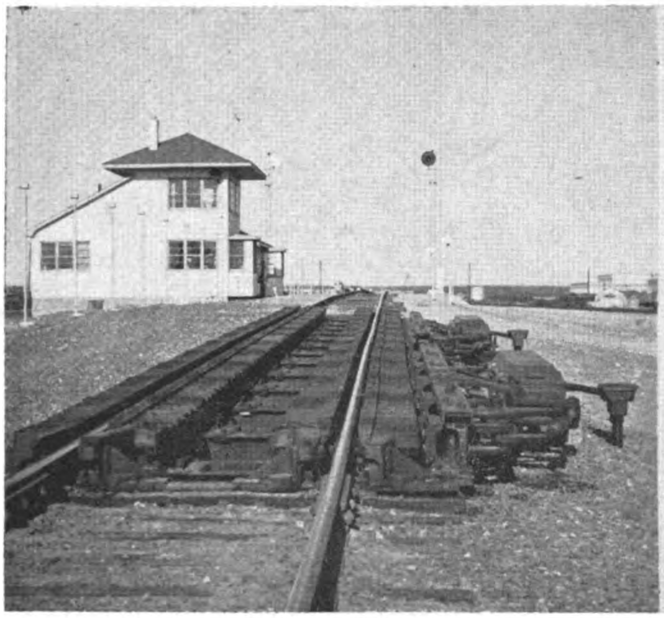
The power switches and signals for authorizing train movements, on the entire 363 miles of road, are controlled by levers in the dispatcher's machine at Seven Islands. The track diagram on this machine has lamps which are lighted to show the locations of trains when on a corresponding track section of main track or on sidings. The desk section of the machine includes an automatic graphic recorder that records the movements of trains. The major items of equipment for the signaling system were furnished by the General Railway Signal Company.

Fast Movement From Yard to Dock

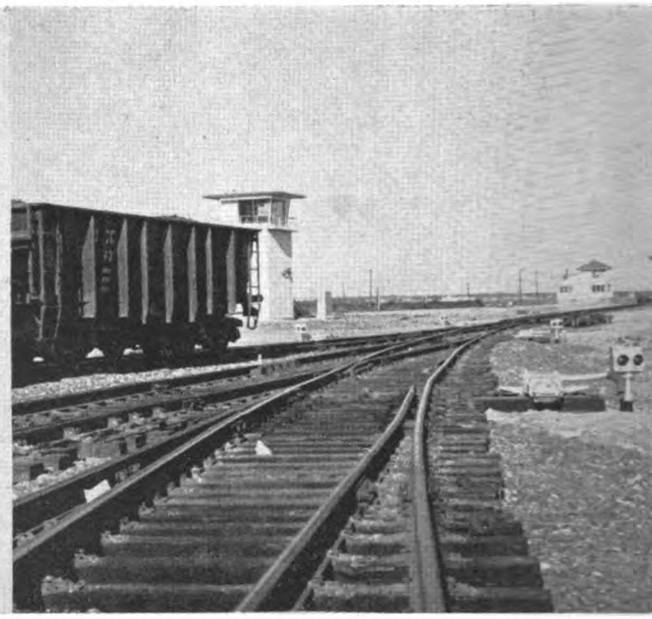
The receiving yard at the Iron Ore Company's Seven Islands terminal has five tracks, each of which has a capacity of 125 cars. Ordinarily the fifth track is left open as a running track. Area is available for five more tracks. From the receiving yard, cars are pushed up to the hump leading to the classification yard.

Sometimes the fogs are so heavy that the retarder operator cannot see the cars when passing down the hump and through the retarders and switches. Therefore a row of six General Electric sodium vapor lamps were installed just below the hump along the track and master retarder, on the side opposite the office and the retarder control tower. Even in a dense fog, these lamps cast shadows of cars so the operator can see their progress. On each car, the car number and light weight are in "Scotchlight" reflecting print to assist the scale clerk in identifying car numbers, and as an aid to the retarder operators in watching the progress of cars.

Because all of the cars to be classified are loaded, a very low "hump" is sufficient. From the receiving yard



After passing yard office, cars go through this master retarder . . .



. . . then through group retarder and switches to classification tracks

a grade of 1 per cent ascends to the hump which is at elevation 50 ft. From the hump the grade descends at 1 per cent for 145 ft. including the scale which is 60 ft. long. Then the grade descends at 2.67 per cent for 95 ft. including the 66-ft. master retarder. Then the grade descends at 0.485 per cent for 515 ft. through the 88-ft. group retarder on the lead connecting to the eight yard tracks. Then a grade of 0.18 per cent extends for 335 ft. through the switches and turnouts. From there on down the classification tracks the descending grade is 0.1 per cent for 1,500 ft., then on a grade of 0.10 per cent for 1,500 ft., and from there on level grade to the barney pit.

The seven switches leading to the classification tracks are operated by high-speed 110-volt electric switch machines. At each switch there is a color-light type indicator "target" which indicates the position of the switch; green for normal and yellow for reverse.

The reason why the cars must be classified is that they must be grouped for dumping so that the ore mixture, when delivered into the hold of a ship, will meet the selling specification. Before leaving Silver Lake yard near the mines, samples are taken of the ore in each car. Analyses are made by the chemical department of the Iron Ore Company, and while the trains are on the way south, the information is sent by Teletype to the dock office at Seven Islands, and is used in conjunction with the train consist report to prepare the switching list.

An IBM card-to-tape machine makes a train consist tape from the punched mine waybills which is sent by Teletype and received at Oreway and at Seven Islands hump office, dock office and railway office. At the hump office a reperforator recreates a tape; this tape when fed through an IBM machine, punches a card for each car, showing the car number, kind of ore, mine number, and data. These cards, available several hours before the train reaches Seven Islands, are kept in car order for each train, and stored until the train is ready to be classified. Then they are fed into the scale recording mechanism, which automatically punches on each card the gross weight as the car passes over the scale. The train consist copy at Oreway is handed to the conductor as the train passes. The dock office copy at Seven Islands is used for preparing the switching list.

Television

Television has been tried successfully to "grab" the car numbers when entering the receiving yard. If the television is installed permanently, it could be used to check the train list before humping. The track scale is located just over the crest of the hump before coming to the master retarder. This scale is fully electronic in operation, and each car must be on the scale by itself for a minimum of about 3 seconds. For this reason, every car is humped individually, i.e., every cut has only one car. At present, humping is at the rate of about 4 cars per minute, but this can be increased to 6 or 7 if necessary.

The classification yard has eight tracks with a total capacity of about 760 cars. Eight more tracks are now being added, and space is available for a total of 48 tracks. Power switches and retarders are in service, using conventional lever controls. Automatic switching controls and automatic retarder controls may be added later when the yard is enlarged.

From Cars to Ships

At the lower end of the classification tracks, side-arm pusher locomotives, running on narrow-gauge tracks alongside the classification tracks, move the cars, two at a time, to the barney pit; from which the barney hoist pushes the cars, two at a time, into the rotary car dumper which empties the cars. The whole two-car cycle can be completed every 65 seconds. When dumped, the ore goes through a crusher and onto a belt conveyor which loads the ore into the hold of a ship at the dock, or if no ship is waiting, the ore is taken to a stock pile nearby. The maximum capacity of the conveyors is 8,000 tons an hour with an average of about 6,500 tons. At this rate a 25,000 ton ship can be loaded in about 4½ hours, requiring 300 cars of ore.

When ore is to be taken from the stock pile, a 7-yd. shovel loads it into cars. Samples are taken of the ore in each car, and then the cars are routed through the classification cycle as previously discussed. Thus this introduces additional operation of the classification yard, over and above the incoming cars from the mine.

After the cars pass through the dumper, they roll by gravity around a 180-degree curve, leading to another retarder 49 ft. long and to power switches where the cars are routed to any one of the four tracks in the "empty-car" yard. In this yard, trains are made up by the terminal personnel, and are handed over to the Q.N.S.&L. Railway which operates only between yard limits at Seven Islands and Schefferville. Once within yard limits, the further handling of trains is assumed by the Iron Ore Co. itself, although railway crews bring their train into the yard on arrival and out on departure. The power switches, retarders and control machines in these yards were made by the General Railway Signal Company.

Power Supply for Retarders

The car retarder motors operate on 220 volts d.c., and the switch machine motors on 110 volts d.c. A diverter-pole motor-generator, rated at 265 volts, 10 kw output, is normally in operation to provide a floating charge across a set of 180 cells of 142-a.h. Nicad storage batteries. The 265-volt feed for the retarders is across the battery. Feeds for the switch motors, at 132 volts, are in groups, each of which is across half of the battery.

The track circuits in the yard are straight a.c. If the incoming a.c. fails, the a.c. required for track circuits, lamps, etc. is supplied by a motor-generator set which starts automatically and is fed from battery. The output of this machine is rated at 21.7 amp., 110 volts a.c. A second and similar power supply is in service in the "empty-car" yard.

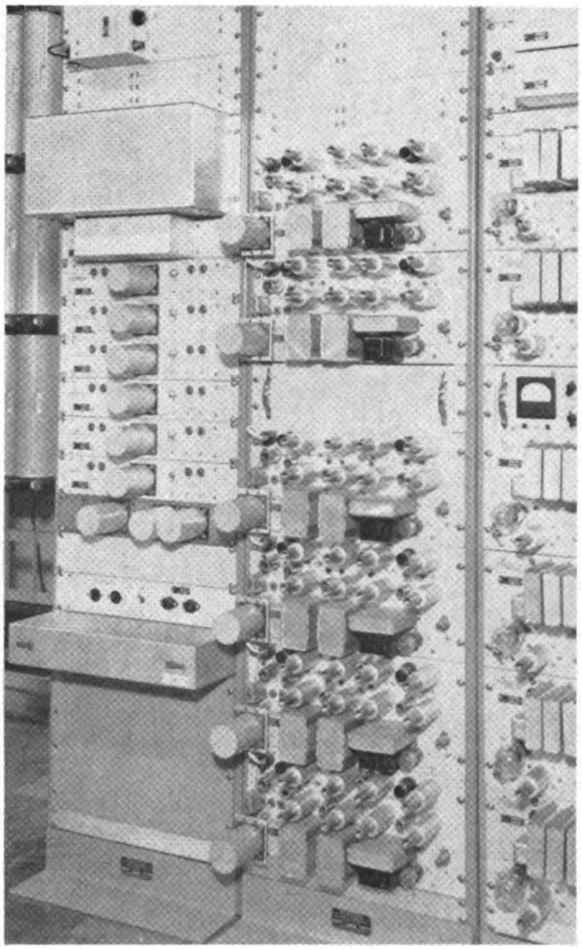
Only Four Line Wires

The railway pole line is unusual, not only because of its construction but also because it has only four wires. One pair, at the top, is for the 23,000-volt single-phase power for the signal system, and future wayside-to-train radio, and the bottom pair is for the CTC line code as well as the telephone and Teletype communications.

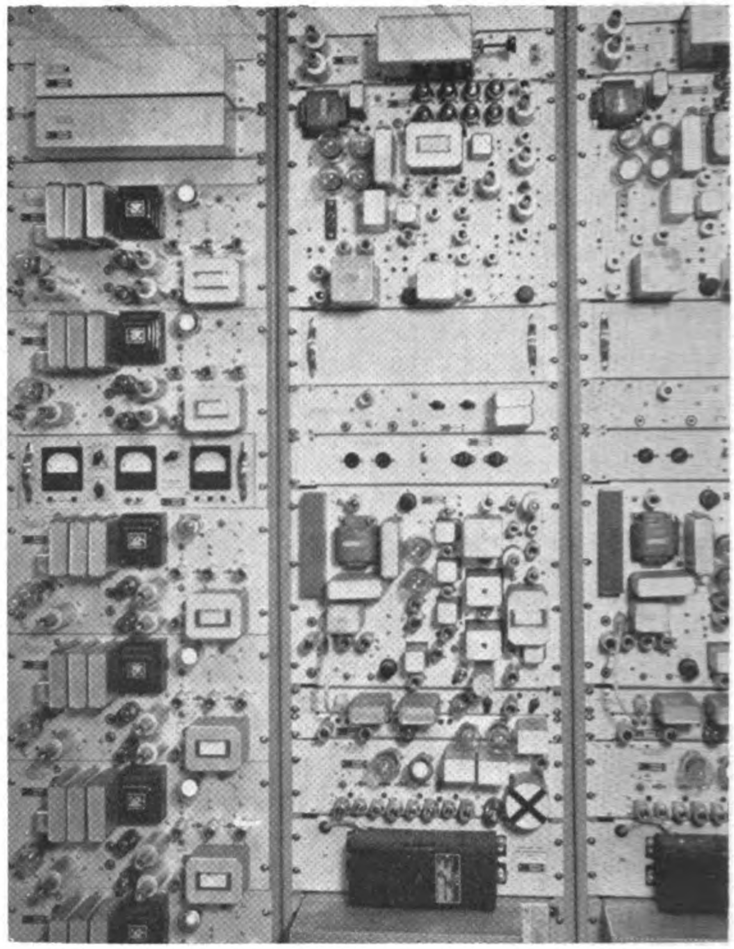
Each line "wire" consists of seven strands of bare aluminum which are spiral wound around a steel core. The overall conductivity is equal to No. 6 copper. Where the terrain permits, the poles are spaced 20 to the mile, 264 ft.; however, where necessary some of the spans range up to 1,500 ft. High-voltage insulators, made by Ohio Brass Company are used not only on the 23,000-volt a.c. pair, but also on the communications line. These power type insulators were used on the communication line in an effort to reduce the usual attenuation fluctuation between dry and wet weather by taking advantage of the high leakage path (12½ in.). Physical construction requirements using No. 4 ACSR and armour rods requires a physically large insulator in order to properly support and tie the conductor. The OB insulator is of the noise free type to further reduce the possibility of noise in the communication system. The insulators are on metal side brackets; the 23,000-volt pair, at the top of the pole, are 36 in. apart, and the second pair, 13 ft. 6 in. lower, are spaced 24 in. The power wires are not transposed being a balanced system supplied from a supply transformer with the center tap grounded, but the bottom pair are in a continuous roll that is completed every fifth pole, thus minimizing interference.

The 23,000-volt a.c. signal power is fed north from Seven Island to Oreway, 186 miles. From a hydroelectric plant at MP 330, the 23,000-volt signal power line is fed south to Oreway and north to Silver Lake yard. The 23,000 was chosen since it is low enough not to be troublesome from corona and insulation problems, and yet provides good voltage characteristics on the system. It is to be noted that the supply is 23,000 line to line but only 11,500 line to ground due to the center tap feed arrangement. Special precaution was taken in engineering the power system to minimize the possibility of induction and noise problems even to the point of specifying a TIF (telephone interference factor) of 15 or less for the generators installed in the hydro plants.

Line-break knife switches are located at the south end of each siding so that the line can be sectionized in case of trouble. No small capacity 23,000-volt transformers are commercially available. Therefore, at each siding two 11,500-volt transformers with the primaries in series, are connected to the 23,000-volt line. The 220-volt secondaries of the two transformers are connected in parallel. Each transformer is rated at 3 kva, totaling 6 kva. The 220 volts feed the low-voltage transformer to supply the signal lamps and to operate the rectifiers



Left—Teletype applique equipment
Right—frequency shift Teletype transmitters



At left—frequency shift Teletype receivers
At right—single side-band voice channel

to charge the storage batteries. The 220-volt power is extended on a separate pair of line wires to the signal at the spring switch end of the siding and to the approach signal in the opposite direction.

At each power switch, a set of 18 cells of 180-a.h. storage battery feeds the switch machine motor and the coding equipment. A set of 9 cells of 120-a.h. storage battery feeds the local 12-volt controls and is standby for the signal lamps if the a.c. fails. At each spring switch, 18 cells of 90-a.h. battery operates the coding equipment, and 9 cells of 135-a.h. battery supplies the local 12-volt circuits and serves as standby for the signal lamp. At each outlying approach signal, such as signal 163 in Fig. 2, there is a set of 9 cells of 120-a.h. which feeds the signal operating coil and the lamp.

At siding switches and at approach signals, where a.c. power is available to operate rectifiers, storage batteries are used to feed track circuits. Each OS track circuit is normally energized by two cells of 120-a.h. storage battery connected in series. Also there is a similar normally-energized track circuit on each siding, which is used to control the track-occupancy lamp on the dispatcher's control panel. These siding track circuits do not enter into the control of signals. Track circuits other than those mentioned above are normally deenergized, coded, and where a.c. is available, each such track circuit is fed by one cell of 120-a.h. storage battery. All the storage batteries listed above were made by the Nickel Cadmium Battery Corp.

At the track cut locations between sidings, no a.c. is available, and at each such location there are two sets of four cells each of 1,000-a.h. Edison primary battery type M-1302. One set of these batteries is used when the feed is north, and the other when the feed is south. These track circuits are normally deenergized, and are about 9,500 ft. long. In one instance lightning ruined a relay, and the circuits were cut through to feed 19,000 ft. successfully until replacements could be made.

In the CTC office at Seven Islands the local d.c. circuits are fed from a set of 18 cells of 312-a.h. Nicad storage battery, and the CTC code line is fed at 150 volts by a set of 119 cells of 16.5 a.h. Nicad storage battery. If the incoming a.c. fails, the a.c. motor on the graphic train chart recorder and the a.c. communications load will be supplied from a Carter motor-generator which runs on battery to produce 100 watts of 110 volt a.c.

Many Circuits on Bottom Pair

The bottom pair of line wires handles as many as 21 circuits, including: (1) the CTC codes as d.c. pulses and as carrier; (2) the dispatcher's telephone as a physical pair; (3) eleven carrier voice channels and six frequency-shift Teletype circuits derived from carrier.

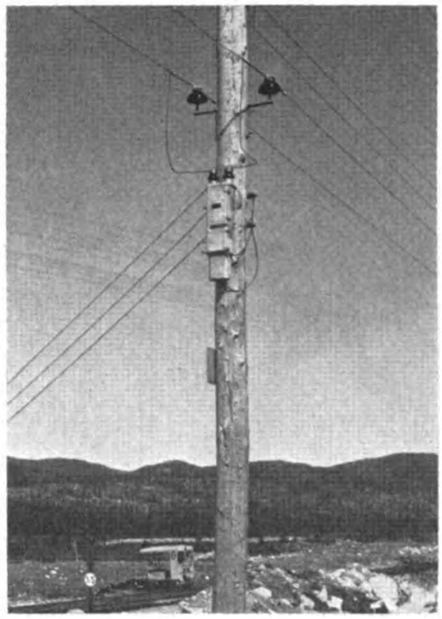
The CTC uses conventional d.c. code, at 150 volts, for the 181-mile section from the control station at Seven Islands to Oreway. Coded outgoing CTC carrier is superimposed on the line wires between Seven Islands and Oreway. At Oreway, this carrier code is converted to d.c. codes for controls to CTC field locations on the 181 miles between Oreway and Silver Lake yard. From these field stations, d.c.

indication codes go south to Oreway where they are converted to coded carrier, to go on back to the control machine at Seven Islands.

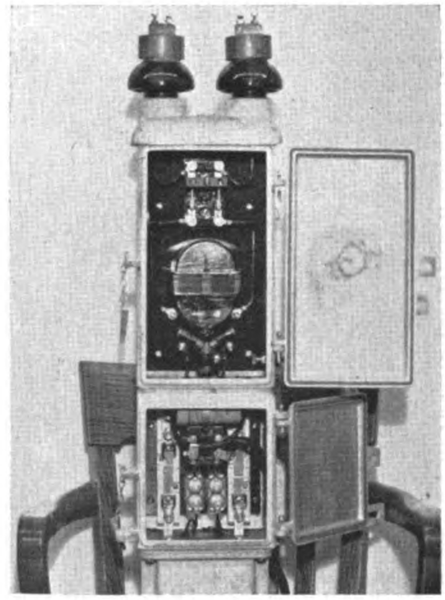
The dispatcher's telephone is on the two-wire physical circuit. This line is connected to phones in boxes at ends of sidings, at spurs leading to gravel pits, stone quarries and in headquarters of track crews and signal maintainers. From Seven Islands north to and including Oreway there are 26 such phones. From Oreway north to Silver Lake yard there are 25 such phones.

Special Protectors

At each of these telephone locations, a special protector was installed to prevent personal injury to a man using the phone if the 23,000-volt a.c. power line should break and fall onto the lower pair of line wires or if high voltages from induction should appear on the code line due to faults on the power pair. However, both conditions would be for a fraction of a second only until the fault protection functioned to remove voltage from the power line. One item in each of these protectors is a 1-to-1 transformer to isolate the telephone circuits. Rare-gas arresters operate to ground if more than 450 volts comes in. If more than 4 amp. of a.c. flows, the lines are shorted to ground by a relay. A particular interesting feature of the protector is the unique electrical characteristics of the unit as a whole. Sufficient inductance and the necessary capacitance was added to the relay inductance to make the whole unit function as a carrier bridging filter usable from 10 to 200 kc. If a surge of more than 440 volts comes in, a relay is operated to ground the line. Capacitors are connected across a choke to form a filter. As originally installed, these chokes caused leakage which prevented proper operation of the CTC carrier. This trouble was corrected by replacing the iron cores in the chokes. These special protectors, which cost about $300 each, were made by Osborne Electric Company Limited, Toronto.



Protector mounted on pole

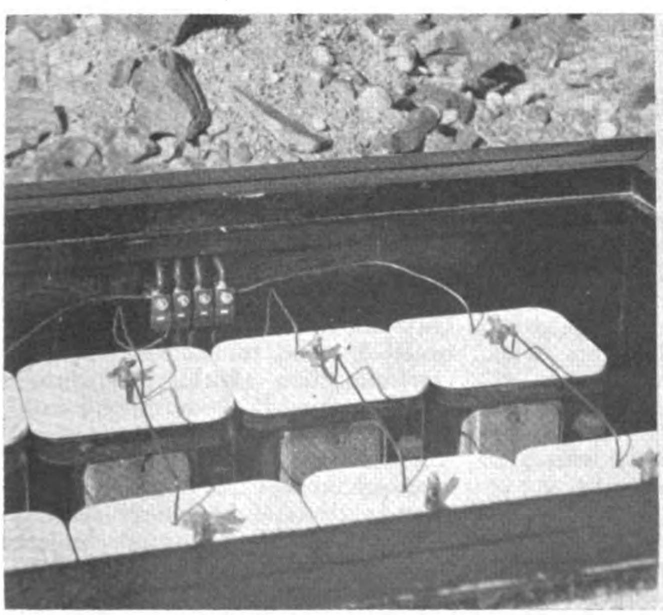


Protector with doors open

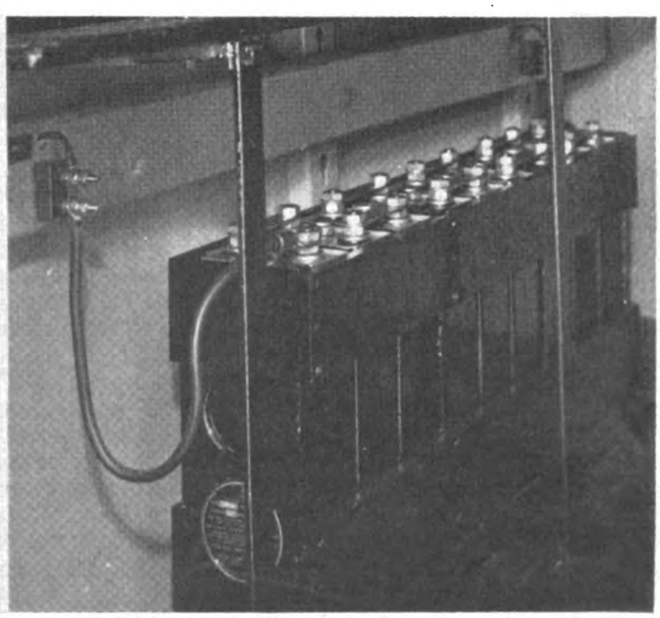
Carriers for Communications

The through telephone circuits are derived from 11 sets of Westinghouse single-channel carrier, which operates at 8 watts on the line, and therefore goes through with one repeater station for 363 miles. Six channels, between 40 kc and 180 kc are used as voice for through telephone service between offices at Seven Islands and Schefferville. Four channels are used as voice between Seven Islands and Oreway. When construction is finished, perhaps two of these channels will be changed to operate all the way between Seven Islands and Schefferville.

The frequency-shift Teletype channels are separate and operate independently of each other in the range 100-130 kc. One party line circuit connects No. 19 Teletype machines at the Iron Ore mine office at Schefferville to a similar machine equipped with a reperforator at the hump office in Seven Islands. No. 15 page printers are also con-



Primary battery at cut-section location



Storage battery at power switch location

Teletype equipment in yard office

nected at the dock office and the Q.N.S.&L. office at Oreway and Seven Islands so that all interested parties, both the Iron Ore Company and the Railway may receive the train consist. A separate Teletype circuit is operated for the Iron Ore Company operational traffic between Seven Islands and Schefferville. Teletype connects the Knob Lake and Seven Islands airport for company airline operations.

Automatic Telephone Exchanges and Radio

Automatic telephone exchanges, with phones in offices and yards are located at Schefferville and Oreway, these exchanges being manufactured by the Automatic Electric Company. Another automatic exchange made by the Telephone Manufacturing Company, London, connects the offices, yards and docks of the Iron Ore Company at Seven Islands in a private system. Subscribers on the telephone system at Schefferville and Oreway may dial each other direct or over the carrier system or may dial the Seven Islands operator for connection to the local Seven Islands telephone system or to the area toll center for long distance. The manual switchboard at Seven Islands is the point of connection with the local telephone company, and the operators actually act as attendants for the Knob Lake and Oreway exchanges, eliminating operating staff at these points.

About 50 road locomotives and 15 cabooses are now or soon will be equipped with two-channel radio. One channel is for communication, head to rear, between trains, and with wayside radio stations at Seven Islands, Oreway and Schefferville. When a locomotive is in the yard, the second channel is used for communication with the yardmaster. In addition to the conventional radio on each caboose, a walkie-talkie set is provided for use by trainmen when inspecting their trains.

Yard classification pusher locomotives used at Seven Islands are equipped with two-frequency radio. One frequency is used for communication with the yardmaster and hump master. The second frequency is used to communicate with the man in charge of the operations of the car dumpers and movement of ore to the ships at the dock. Walkie-talkie radio sets are used by foremen on the docks. The radio equipment was furnished by Motorola. The equipment on the locomotives and cabooses is the Motorola FMTRU type, including in one rack, the transmitter, receiver and power unit.

The transmitters have 30 watts output; they are frequency modulated, and have 10 tubes. The 115-volt a.c. sets on the locomotives draw 90 watts, and the sets on the cabooses draw 11 amp. when standing by, and 29 amp. when transmitting. The receiver is designed for detecting a frequency-modulated signal and has a one-half microvolt sensitivity with a 20 db residual noise quieting.

The 117 volts a.c. for the radio on each locomotive is supplied by a Cornell-Dubilier vibrator-converter, fed by the 64-volt engine starting battery. The 12 volts d.c. to operate the radio on each caboose is supplied by two six-volt 240-a.h. lead storage batteries that are charged from a Leece-Neville selenium rectifier through a regulator that controls both voltage and current. The rectifier is fed by a Leece-Neville 1,000-watt, 14-volt alternator which is driven by a Dayton V-Belt drive off a pulley on the caboose axle. The maximum current is 75 amp. with 12.6 to 14 volts on the battery. The alternator is on the caboose floor, with a hole through the floor for the belt.

The train radio in the wayside stations at Seven Islands, Oreway and Silver Lake yard office, is the same type as on the locomotives, as will be discussed later under the heading Communications Center.

Direct voice-calling and quick answers are an advantage of the intercom and talk-back loudspeaker communication systems in the yard at Seven Islands. This system connects the yardmaster, the hump foreman, the inspection pit, the scale clerk and the retarder operator. The system centers in control consoles including ten keys on the desk in the hump office. Small loudspeakers are used in offices, and paging is provided through outdoor speakers. This system has a constant monitoring feature incorporated which enables the yardmaster to hear and break-in on all conversations regardless of originator. This intercom and talk-back system was made by the Electronic Communications Equipment Company, Chicago.

Communications Center

The railroad communications controls for the Seven Island area are located in a new 25-ft. by 47-ft. concrete building that has one story and a full basement. In the main room, the radio apparatus is along the north wall and the switchboard and carrier panels are on the south wall. The radio transmitter and receiver equipment for the road train radio station is the FMTRU type made by Motorola. Equipment of the same type is used for radio communication between Seven Islands and the hydro-electric plant at Clark City, about 25 miles west. Two sets of RCA radio transmitters are for communication with prospecting crews working in the bush, and with pilots of company aircraft.

The 11 panels of Westinghouse single-channel carrier are in two rows, and the wire chief's switchboard and test panel are at the left of this group. The manual switchboard, for connecting between the commercial telephone system and the railroad telephones, is in a separate room at the east end of the building.

The telephone system is fed at 48 volts d.c. from a set of 23 cells of 50-a.h. Exide lead type storage batteries, that are on floating charge by a Lorain battery charger, known as a Flotrol. If the commercial a.c. power fails, a 10-kva gasoline engine-driven generator starts automatically to provide 220 volts a.c. The antennas for the radio are on an aluminum tower 100-ft. high, on the top of the building. A 30-deg. directional beam is used for the road train radio.

The pole line with the four wires is extended to a pole located about 100 ft. from the communications center building. As explained previously, the top pair are the 23,000-volt a.c. signal power line, and the lower pair is for the CTC line code and the communications, including the dispatcher's telephone as a physical pair, and 11 channels of carrier. On the pole 100 ft. from the building there is an arrangement of capacitors and protectors. In the 100 ft. between this pole and the building, the circuits are in buried coaxial cable.

Yardmaster's desk has automatic telephone, talk-back speaker console and radio in two top desk drawers

Tough Work Building Pole Line

This railroad was built through rugged uninhabited country where previously there was no means of transportation other than on foot or in a canoe on the rivers and lakes. In order to maintain reliable communications, the pole line had to be built at the same time the rail was laid, or ahead of the rail laying. Numerous work trains movements were required to bring up the ties, rail, joint bars, etc., so that there was very limited opportunity to bring up the poles, reels of line wire, insulators etc. Therefore the construction of the pole line was held back. Near MP 70 the track construction forces encountered about 10 days of unexpected delay. This gave the pole line crews an opportunity to bring up materials and to work around the rail laying gangs. From there north for 290 miles to the end of the road, the pole line was constructed ahead of the rail laying.

Numerous aircraft were used on the railway project, with landing strips located about 25 to 50 miles apart alongside the railroad. Two helicopters, used by supervisory forces, were equipped to land on water or on very small cleared pieces of ground. Trucks, tractors and various other vehicles and machines were used by pole line crews. The poles are spruce, cut on or near the railroad property. Butts of these poles were painted with Osmo creosote preservative. Many of the pole holes had to be dug in rock, or gravel including large boulders. Air compressors, and power drills were used to dig pole holes. In some places there was no place on the rightofway to set poles, and therefore trees had to be cleared to make a path for the pole line. Between MP 150 and MP 330 almost all of the railroad is alongside a chain of lakes. In this territory, boats with outboard motors were used to transport men and materials, as well as to move rafts of poles.

A maximum of 115 men were employed in pole line construction. These men were housed in temporary camps, constructed in advance of the rail laying. The pole line was completed to Knob Lake on December 23, 1953, and the golden spike was driven to complete the track laying on February 13, 1954. Thus the pole line was available throughout the major portion of the project to provide telephone communication needed to coordinate the overall construction project.

Signal Construction

After the main track and sidings were in place and the pole line completed, the signal construction work was pushed along as fast as possible with the forces available. The holes for the bonds were drilled with an Ohio Brass Company twin bond drilling machine. All the bonds are the rail-head pin type, about half were made by the Ohio Brass Company, and the remainder by the United States Steel Company.

The sheet-metal instrument houses at siding switches and the cases at approach signals are on concrete foundations, precast at Seven Islands. Between the housings and bootleg outlets, the track circuits are on No. 8 stranded single-conductor buried cable. The bootlegs are the 445-27 type made by Raco. Control circuits between housings and signals are on No. 14 stranded buried cable. A small crew specialized on the placing of switch machines and spring switches, and the installation of electric locks on hand-throw switches at spurs.

Power derricks or cranes were used to set the sheet-metal instrument houses, and to unload the switch machines, cases, signal masts etc. A maximum of 60 men and 3 foremen were employed on the construction of the CTC. During part of this period, a crew of 12 men and a foreman were installing the power switches, retarders signals and yard control machines.

On the entire project, mine, railway and terminal, the communication facilities as well as the centralized traffic control, power switches and the Seven Islands retarder yards, were installed by railroad forces. Where required for maintenance of communication and signal equipment in the mine and terminal area, men have been assigned from forces of the Q.N.S. & L. Railway, a wholly owned subsidiary of the Iron Ore Company. A. K. Hansen is superintendent of communications and signals with headquarters at Montreal and W. S. Switzer is signal engineer with headquarters at Seven Islands.