QUEBEC NORTH SHORE AND LABRADOR RAILWAY

Part II

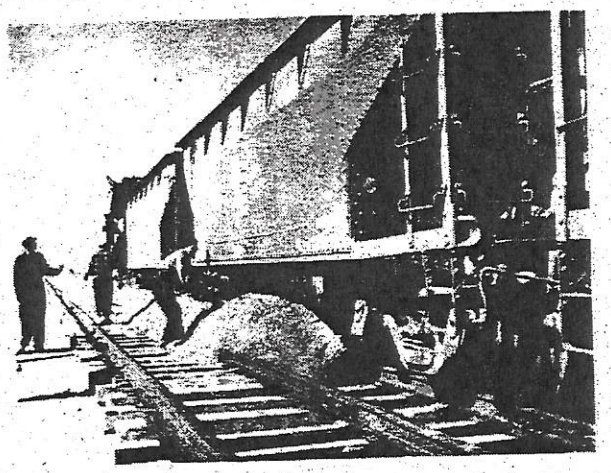
Canadian Transportation

The Labrador Iron Ore Development

By J. H. Miller, Chief Mechanical Officer, Quebec, North Shore and Labrador Railway Co.

(Editor's Note.—An address with the above title was presented by Mr. Miller before the Canadian Railway Club, in Montreal, on October 19, and, in reproducing it here in full, we feel sure that it will be of great interest to our readers, not only on account of the detailed information presented in regard to the 360-mile Quebec, North Shore and Labrador Ry. and the terminal development at Seven Islands, but also because of the historical information presented, the description of the iron ore deposits on the Quebec-Labrador border, and the explanation of the manner in which the physical facilities being provided are tied in with the necessity of supplying each customer with the particular type of iron ore required. In this latter connection it is to be noted that the main function of the classification yard at Seven Islands is to sort out the cars containing different grades of ore.

Among the many features of interest which Mr. Miller describes are his explanation of the necessity for an accumulation of ore at Seven Islands; the manner in which the use of a car dumper and conveyor belt ore handling system there, instead of a trestle pocket type ore dock, influenced the design of the ore cars to be used; the reasons for using cars with four-wheel trucks instead of six-wheel; the manner in which the Diesel-electric locomotives are to be operated, to permit concentration of maintenance work at Seven Islands and to reduce the necessity of maintenance facilities elsewhere; the use to be made of dynamic braking in train handling; the description of the ore cars to be used; details of the operation of the car dumper at the Seven Islands terminal, and the method employed to expedite the tracklaying in the railway constructon work. The foregoing are only a few of the highlights of the address, all of which, we are certain, readers will find of absorbing interest.)

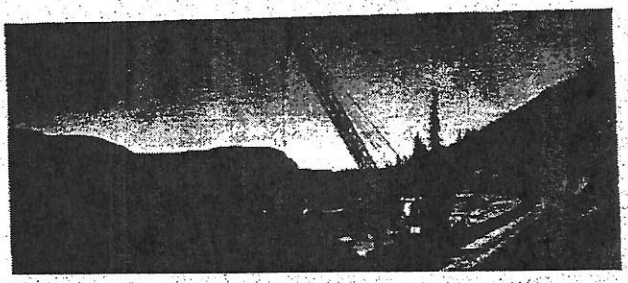


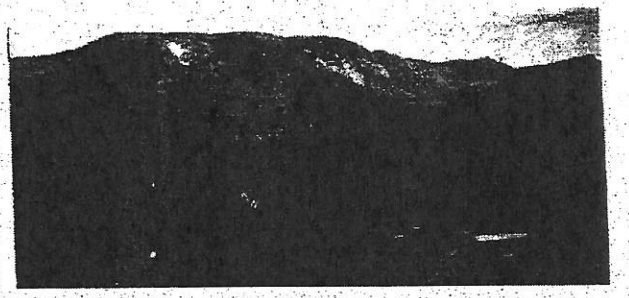
Spreading Ballast in Seven Islands Classification Yard. Note Narrow Gauge Track for Pusher Locomotives at Left.

In addressing the Canadian Railway Club meeting, Mr. Miller stated as in the following:

The current development of the Labrador iron deposits is not the result of a recent spectacular discovery but is due to gradual changes in the relative availability of high grade iron ore in other parts of this continent.

Actually the existence of iron in the Labrador region has been known





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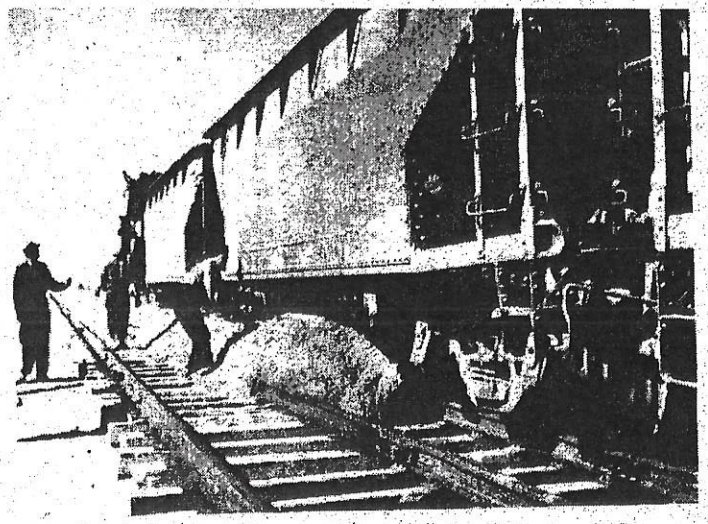

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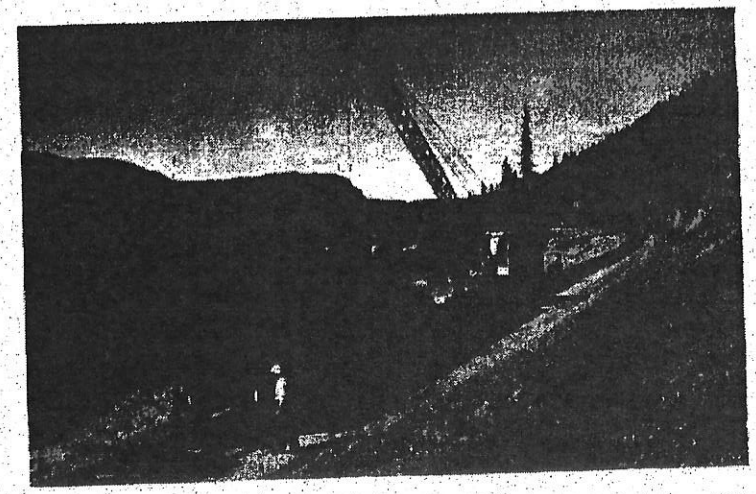
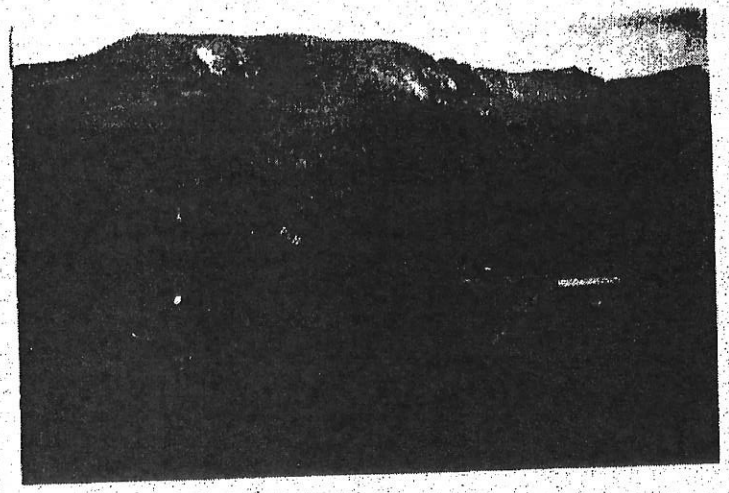
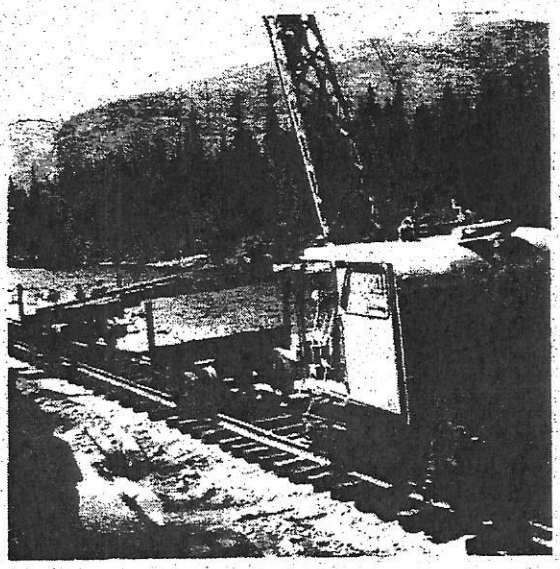




Left, a View Along the Moisie River Valley, Showing Laying of Rails Before the Adoption of the Cavanagh Skeleton Car Method. Right, a Shovel Working on a Side Cut Along the Wacouna River Valley.



Crane Puts Skeleton Car in Ditch After Rails Unloaded and Laid.

for many years, records in the Canadian government's files as far back as 1894 containing reports of iron discoveries there. Additional reports were made on the presence of iron from time to time, but the remote location made it virtually worthless from a commercial standpoint. It was not until 1936, that a group of Montreal mining interests appreciated the future demand for iron ore and obtained a 20,000 square mile concession in Labrador to begin prospecting and geological mapping in a serious way.

This group continued its exploration until by 1939, six of the currently recognized ore bodies had been found. At that time it was realized that iron deposits also existed on the Quebec side of the boundary as well as in Labrador, and a 3,900 square mile concession was obtained in this province for exploration. Further work lagged, chiefly because of lack of money until 1942, when Hollinger Consolidated Gold Mines and the M. A. Hanna Company of Cleveland joined the exploration work, which basically consisted of searching for ore bodies of sufficient size and quality to justify commercial development.

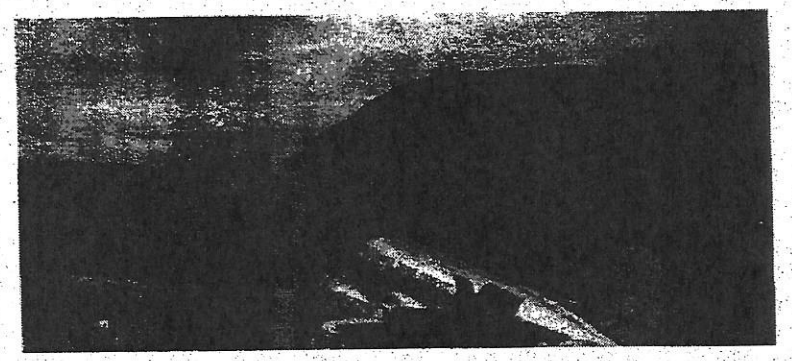
General exploratory work, which consisted of sinking test pits, some drilling and geological mapping progressed by 1947 to the point where the management decided to concentrate on proving 300 million tons of direct shipping ore that could be mined cheaply from open pits. The machine shops, saw mill, trucks, jeeps, tractors, bulldozers and drills were flown in, the first landing field being the ice on Knob Lake until a land strip could be built.

The drilling program proved 300 million tons of ore by the end of 1948, but by then it was considered necessary to continue until 400 million tons were proven, this objective being reached by 1950. Proving an ore body by drilling consists of sinking drill holes on fifty foot centres and analyzing the cuttings at each five foot level. By plotting this information graphically it is then possible to make an accurate estimate of the quality and quantity of ore available. This is essential information not only for assessing the value of a deposit, but also to assist in planning the actual mining procedures that follow when mining starts. Checks of the information obtained by drilling were made from time to time by sinking test shafts in some cases, and running lateral adits into slopes in others. A great deal of shallow pitting and trenching was also done.

When it became evident that there was sufficient ore available to justify commercial development, the Iron Ore Company of Canada was formed to finance the work. In this new organization, five steel companies—Republic Steel Corporation, National Steel Corporation, Armco Steel Corporation, Wheeling Steel Corporation and Youngstown Sheet and Tube Company, joined with Hollinger Consolidated Gold Mines and the M. A. Hanna Company to prepare for commercial production. The Iron Ore Company of Canada possesses the right to lease a large part of the area in both provinces from the original concession companies for mining.

The ore field, as developed at present, is located geographically some 320 air miles due north of the village of Seven Islands, which is a very old community on the north shore of the St. Lawrence River, some 500 miles below Montreal. Most of the ore deposits are close to or actually astride the Quebec Labrador boundary. The area is a glaciated plateau of moderate relief between 1,500 and 2,500 ft. above sea level. Lakes, and rivers running generally North-West to South-East, are numerous, and in many parts water covers over 50% of the area. There is some timber in the valley, but the hills and ridges are generally bare of trees. Outcrops of rocks are frequent in the northern section, but are confined mostly to the crests and slopes in the southern section.

The ore bodies in the area are not continuous and the ore varies in type



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General exploratory work, which consisted of sinking test pits, some drilling and geological mapping progressed by 1947 to the point where the management decided to concentrate on proving 300 million tons of direct shipping ore that could be mined cheaply from open pits, the purpose being to obtain additional financing. For this program a semi-permanent camp was established near Knob Lake as a base for an intensive drilling campaign to determine the size and quality of the ore deposits that appeared promising. All the materials and equipment for this camp which included bunkhouses, dining halls, chemical laboratory, machine shops, saw mill, trucks, jeeps, tractors, bulldozers and drills were flown in, the first landing field being the ice on Knob Lake until a land strip could be built.

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Unloading a DC-3 Plane at Airstrip at Mile 86.

and quality between deposits and sometimes from place to place in a deposit. Dr. Moss, the chief geologist of the Iron Ore Company, has described the formation by saying that the iron ore bodies occur throughout the field like raisins and plums in a cake that has not been mixed very well. The ore is mostly hematite, with some magnetite present occasionally. It ranges from soft lump to solid rock, and some is highly manganiferous.

Some idea of the ultimate possibilities of the area can be appreciated by a comparison with the famous Mesabi range, South West of Lake Superior in the United States, the near depletion of which has made the Labrador development economically feasible. On the Mesabi range, the area of favourable iron formation is 110 miles long and from one to five miles wide with a productive zone 70 miles long. On this new development in what is known as the Labrador Trough, the favourable area is 225 miles long, and from 10 to 60 miles wide, with the exploration to date indicating that the productive zone is 90 miles long with good possibilities of extension. On the Mesabi, the remaining high grade direct shipping ore is covered generally by thick overburden, the iron being discovered by test pitting and drilling. In the Labrador Trough, the deposits proven to date have been discovered from surface outcrops with one exception and 200 million tons are within a three-mile radius of the Knob Lake camp.

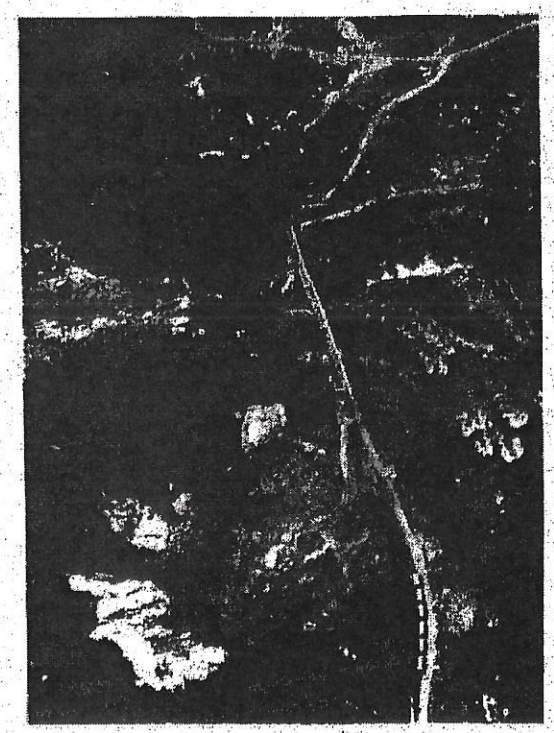
The possibilities of further discoveries are indicated by the exception just mentioned, which is an ore body discovered by the Knob Lake machine shop crew, who were testing a new churn drill behind the shop one day. After drilling two or three feet, iron was encountered and found to continue to a depth of 367 feet, still in high grade ore. Further investigation showed the whole camp

Bulldozers scraping roads frequently turn out high grade ore a foot or two below the surface but there has been no time to investigate these discoveries yet.

In addition to the 400 million tons of direct shipping ore already proven, there are millions of slightly lower grade ore which can be prepared for direct shipping by a single and inexpensive water washing process. There is also an almost unlimited quantity of concentrating ores which can be upgraded to direct shipping quality at a reasonable cost, though this is a problem for the future.

However, the immediate program is to commence mining the proven direct shipping ore. This is able to compete with that from other parts of the world in spite of the long transportation hauls involved because the small amounts of overburden to be removed permits low cost open pit mining. In contrast, some of the deposits currently being opened on the Mesabi range are covered with 200 feet of overburden which will require about two years of stripping by a 30-yd. walking dragline before mining can start.

Open pit mining in Labrador will be done by blasting where necessary, loading the ore into 30-ton Diesel powered trucks by 6-yard electric powered shovels, hauling to a crushing and screening plant for reduction to minus six inch size and elevating out of the pit by a conveyor belt into a loading pocket, for dumping into railway cars. This method has superseded generally the older one of loading directly into the cars with shovels and hauling the trains out of the pit on tracks set on benches around the perimeter, the benches and tracks being constantly shifted as the pit gets deeper and wider. The working season will be limited to 5½ or 6 months, not because of weather conditions at the mine, but because the freezing of ore in the



The Moisie River Bridge, Showing North Portal of Tunnel.

Mesabi range though the summer period is somewhat shorter.

After loading into cars the ore will be hauled 360 miles by rail to Seven Islands for loading into ships. The railway is the largest and most expensive portion of the whole development and is being constructed and equipped with the objective of providing economical and reliable transportation. This objective demands a heavy and rugged track structure which will carry large tonnages on high wheel loads at relatively high speeds so that operating costs and the car and locomotive inventory can be kept to a minimum.

The track is being constructed with 132 lb. rail, 14-inch tie plates, six-bolt joint bars, set on treated hardwood ties spaced at 3,200 to the mile. Incidentally about one-third of the ties had to be imported from

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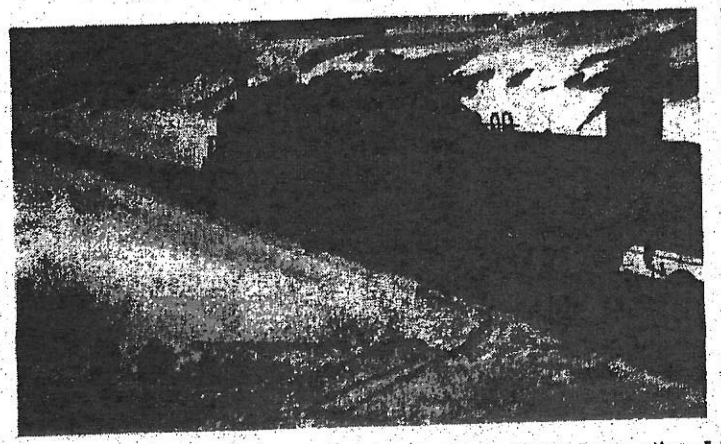
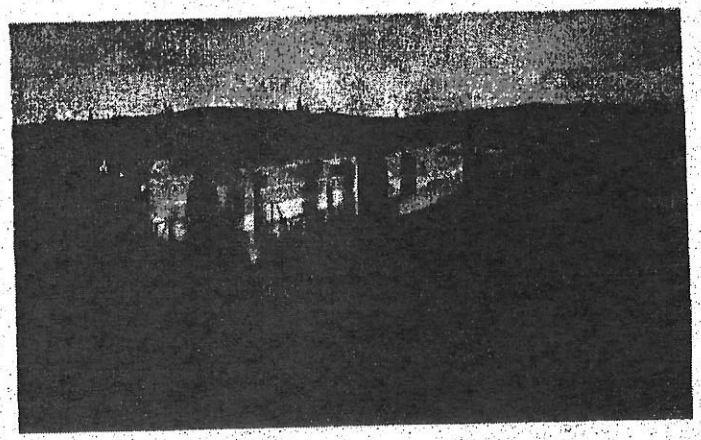
The track is being constructed with 132 lb. rail, 14-inch tie plates, six-bolt joint bars, set on treated hardwood ties spaced at 3,200 to the mile. Incidentally about one-third of the ties had to be imported from Texas, because they could not be produced by the Canadian suppliers. Some native untreated soft wood ties are being used in yards and other secondary tracks. The ballast used initially was pit run gravel which





Left, Thawing Culvert with Steam from Work Train Locomotive About Mile 24, in Spring of 1953. Right, a Supply Train with 38 Cars, 2,700 Tons, Leaving Seven Islands for the End of Steel.

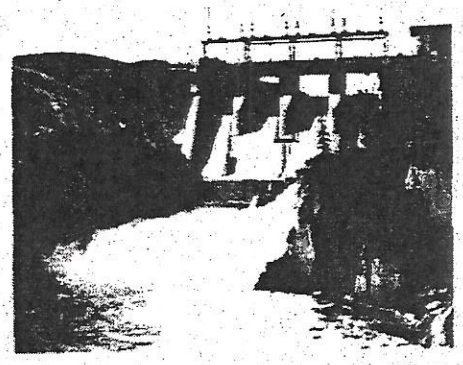
is now being supplemented with crushed and screened gravel.

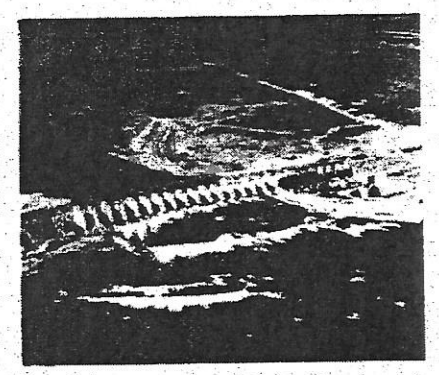
The route follows rugged river valleys as it climbs to the height of land 2,000 feet above sea level at Mileage 150, north of Seven Islands, from which it descends gradually to an elevation of about 1,700 feet at Knob Lake. There is some muskeg above the divide but it is not of the bottomless pit kind found elsewhere in Canada. The curvature totals 49 complete circles and is most severe in the first 100 miles, though on the final alignment there will be only three 8° curves, the balance being 6° or less. The maximum grade against the loaded trains, that is southbound, will be 0.4% compensated, and that against the empty trains will be 1.3% compensated. However, this 1.3% grade is 14 miles long, and is a part of a continuous downgrade nearly 40 miles in length which varies from 0.5% to 1.3% and which must be descended by the loaded trains grossing around 14,000 tons behind the locomotive. This profile is definitely favorable to loaded train movement from a locomotive horsepower standpoint, but it imposes a severe braking problem on the train operation.

There are only two tunnels on the line, one at Mile 12 from Seven Islands which is 2,200 feet long and the other at Mile 65 which is 600 feet long. The longer tunnel opens at its north portal immediately onto a bridge 700 feet long and 150 feet above the Moisie River, the largest on the railway. While there is a total of 26 bridges, none of the others are large. There are 22 passing tracks, 5,500 feet long located at on-

tion yard, each car being cut off and weighed in motion as it passes over the hump. The classification yard is equipped with narrow gauge side arm pusher locomotives running on tracks set between the standard gauge tracks, to move the cars up to the Barney pit. The Barney hoist then pushes cars two-at-a-time, up an incline into a two-car tandem rotary dumper, which turns the cars upside down. The ore falls through a screen and crushing plant onto a belt conveyor system which carries it to the loading dock for loading into ships or to the stackers at the stockpiles for future loading. When the cars are empty the dumper rights itself and the two empty cars are pushed out of the way by a pair of oncoming loaded ones, and roll by gravity into the empty car yard to be marshalled into trains and return to Knob Lake. The cycle on the car dumper takes about 60 seconds, and the conveyor belt system has a capacity of 8,000 tons per hour, though in actual practice it will be good operating to run the belt at an average of 80% of this nominal capacity. The loading dock which is 800 feet long is equipped with two loading towers which are part of the belt conveyor system for distributing the load without moving the ship. There is also a mooring dock 800 feet long for ships waiting their turn to load.

The purpose of the classification yard is to separate cars containing different grades of ore, so that the customer, which in this instance is the blast furnace operator, can be supplied with ore of the analysis required by the end use of the product. Commercial direct shipping iron ore





Left, the Marguerite River Dam Under Construction: Right, the Menehik Rapids Dam Under Construction.

The track will run on top of the Menehik Dam.

begins with the cross section drilling of each ore body mentioned previously which guides the mining operators in selecting ore for a specific order. After the ore is loaded, samples taken from each car are analyzed while the train is en route. The results of the sampling are available by the time the train arrives at the terminal, having been forwarded by teletype to the ore grader, who is responsible for supplying the correct grade of uniform mix to the customer's requirements. The ore grader directs the cars into the classification yard and then into the dumper in the proper sequence to produce a uniform grade that will meet the specifications. This mixing of ore is quite complicated and frequently requires mixing cars of ore from different deposits to obtain the required grade.

A stockpile is necessary at Seven Islands to avoid using ore cars for storage bins for more than one day or so. When ships are delayed for various reasons, the ore must be unloaded into stockpiles to release cars. These stockpiles will permit the loading of ships for a much longer period each year than the mining season will last, and building up of the stockpiles for this purpose will allow a more or less uniform rate of mining production, independent of ship movement. The port of Seven Islands is open for nine or 10 months and could easily be kept open all year if necessary. Freezing of the stockpile is not expected to be serious, the temperature at Seven Islands being more moderate than Knob Lake.

The decision to equip the Seven Islands terminal with a car dumper and conveyor belt ore handling system, instead of the older trestle pocket type ore dock as used at the head of the Great Lakes, helped to settle the design of ore car for the railway by eliminating hopper doors and removing restrictions on physical size. In a terminal which uses a car dumper for unloading a bulk commodity, the speed of the dumper cycle is the controlling factor in the terminal's capacity. Therefore, large capacity cars assist in reducing the number of dumper cycles required to handle a given tonnage and increase the capacity of a given dumper. In the case of Seven Islands, the 1956 objective of 10 million long tons of ore in 165 days calls for unloading an average of more than 60,000 long tons or 700 to 750 cars per day.

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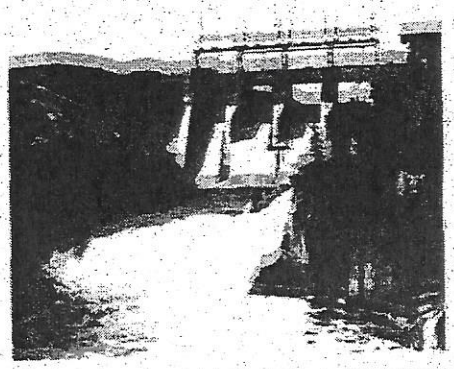

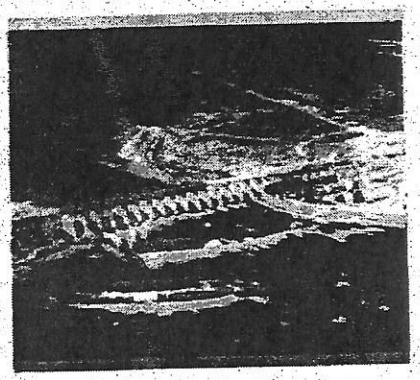

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There are only two tunnels on the line, one at Mile 12 from Seven Islands which is 2,200 feet long and the other at Mile 65 which is 600 feet long. The longer tunnel opens at its north portal immediately onto a bridge 700 feet long and 150 feet above the Moisie River, the largest on the railway. While there is a total of 26 bridges, none of the others are large. There are 22 passing tracks, 5,500 feet long, located at approximately 15-mile intervals and controlled by a centralized traffic control signal system with power switches.

The terminal yards at Seven Islands are approximately three miles long and are designed solely to unload ore from railway cars and transfer it into ships or stock piles. Loaded trains enter a five-track receiving yard from which the cars are distributed over a retarder equipped hump into an eight-track classifica-

ships or to the stockpile yard, with piles for future loading. When the cars are empty the dumper rights itself and the two empty cars are pushed out of the way by a pair of oncoming loaded ones, and roll by gravity into the empty car yard to be marshalled into trains and return to Knob Lake. The cycle on the car dumper takes about 60 seconds, and the conveyor belt system has a capacity of 8,000 tons per hour, though in actual practice it will be good operating to run the belt at an average of 80% of this nominal capacity. The loading dock which is 800 feet long is equipped with two loading towers which are part of the belt conveyor system for distributing the load without moving the ship. There is also a mooring dock 800 feet long for ships waiting their turn to load.

The purpose of the classification yard is to separate cars containing different grades of ore, so that the customer, which in this instance is the blast furnace operator, can be supplied with ore of the analysis required by the end use of the product. Commercial direct shipping iron ore generally contains from 51% to 53% iron and the blast furnace operator has to be assured of uniformity in this and other constituents such as moisture, phosphorus and silica. The customer has the right to sample ore from any point in a boat load and failure to meet the specifications involves a price penalty against the ore company. Therefore every effort is made to supply the grade of ore specified.

In practice, control of ore quality sequence to produce a uniform grade that will meet the specifications. This mixing of ore is quite complicated and frequently requires mixing cars of ore from different deposits to obtain the required grade.

A stockpile is necessary at Seven Islands to avoid using ore cars for storage bins for more than one day or so. When ships are delayed for various reasons, the ore must be unloaded into stockpiles to release cars. These stockpiles will permit the loading of ships for a much longer period each year than the mining season will last, and building up of the stockpiles for this purpose will allow a more or less uniform rate of mining production, independent of ship movement. The port of Seven Islands is open for nine or 10 months and could easily be kept open all year if necessary. Freezing of the stockpile is not expected to be serious, the temperature at Seven Islands being more moderate than Knob Lake.

The decision to equip the Seven Islands terminal with a car dumper and conveyor belt ore handling system, instead of the older trestle pocket type ore dock as used at the head of the Great Lakes, helped to settle the design of ore car for the railway by eliminating hopper doors and removing restrictions on physical size. In a terminal which uses a car dumper for unloading a bulk commodity, the speed of the dumper cycle is the controlling factor in the terminal's capacity. Therefore, large capacity cars assist in reducing the number of dumper cycles required to handle a given tonnage and increase the capacity of a given dumper. In the case of Seven Islands, the 1956 objective of 10 million long tons of ore in 165 days calls for unloading an average of more than 60,000 long tons or 700 to 750 cars per day.

The largest car practicable with dumper unloading would be a solid bottom gondola type carried on two six-wheel Buckeye type trucks, and would have a capacity of about 125 short tons. The history and experience of this type of truck were investigated very thoroughly and it was evident that this type of car possessed several desirable features particularly those of conservative wheel loads combined with large car capacity. However, it was found also

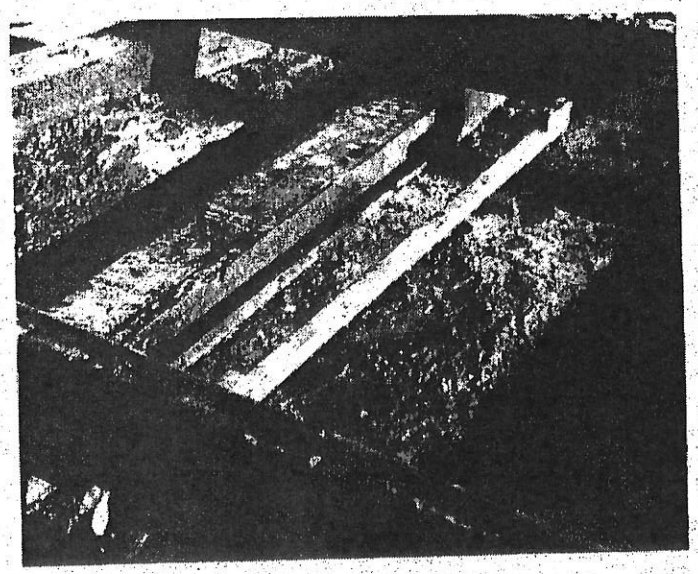
that the cost of owning and operating a given total car capacity on six-wheel trucks would be considerably higher than for the same capacity on four-wheel trucks, so the design finally settled on the largest car that could be carried on two four-wheel trucks with 6½" x 12" axles, and steel wheels.

As built, the car has a capacity of 98 short tons and light weight of 27 short tons. It is of all-welded construction, with outside stakes to form a smooth interior, which along with sloping sides and ends will assist in rapid clearing of the lading. The car has been arranged to be as long and low as economically feasible to obtain good riding at high speeds in contrast with the usual short and high ore car designed to suit a trestle dock with 24 feet pocket spacing. The trucks are equipped with roller bearings, 2½" travel springs, a built-in snubber clasp brake rigging and multiple wear wheels 36 inches in diameter to reduce the unit wheel loading. The air brakes are provided with a manually operated empty and load equipment which provides braking ratios of 27% loaded and 48% empty. Freight type tight lock couplers are used to reduce the slack action in long trains. It is expected that the design features will keep car maintenance at a minimum for many years.

There are more than seven hundred of these ore cars already in use at Seven Islands hauling construction material and they have proved to have very good riding and tracking qualities, both empty and loaded at speeds up to sixty miles an hour.

Ore trains will consist of 115 to 125 cars grossing approximately 14,000 trailing tons and will be hauled by 6,000 h.p. four-unit Diesel electric locomotives geared for 65 m.p.h. Speed time studies of such a train over the profile of the railway, indicate that the 6,000 h.p. locomotive can haul a southbound loaded train up the ruling 0.4% grades at not less

equipped with multiple unit control, dynamic braking, the 24 RL brake schedule and are built on the standard freight type underframe. This type of locomotive is particularly suited to the operating requirements of a single traffic railway as it permits standardization on one type of unit. Because the switching assignments at Knob Lake and Seven Islands often require two large units in multiple to handle heavy tonnage or negotiate steep grades, ordinary switcher locomotives are not required and it will be possible to shift locomotive units between yard and road service at will. A newly-serviced unit can be run in revenue service as



Gauge Bar to Hold Rails to Gauge Prior to Spiking.

part of a locomotive consist and changed off with one on a switching assignment due for servicing in the shops. This will permit concentration of maintenance work at Seven Islands, and reduce the facilities required elsewhere to a minimum.

Dynamic braking has been applied to the locomotives because the braking effort of a four-unit locomotive will supply about 30% of the braking effort required to hold a 14,000-ton train while descending the ruling

the open pit mining at Knob Lake. It will also furnish power for the community there.

I would like to mention the important work done by the Hollinger Ungava Transport, which is a subsidiary of the Iron Ore Company of Canada, in flying men and materials to expedite construction of the Railway and associated projects. Some idea of its scope is given by the traffic carried during 1952, which totalled 45,000 passengers and 63 million pounds of freight. The fleet consists of 18 planes, 7 of which are DC3's, the remainder including a Canso flying boat, Norsemen, Beavers, Helicopters and so on for exploration

work. The DC3's are equipped with crosswind landing gear to enable them to land on the single strip landing fields in relatively high cross winds. The planes are maintained at Mont Joli, and fly to Seven Islands and Knob Lake and fourteen intermediate airstrips built along the railway route to service the construction camps. As steel laying has advanced, the airlift has shortened, material being handled by rail to the airstrip nearest to the end of steel. Generally planes fly around the clock and have produced

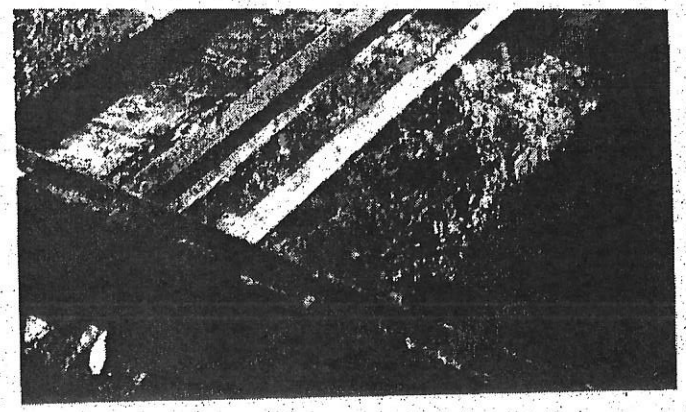
shudder clasp brake rigging and multiple wear wheels 36 inches in diameter to reduce the unit wheel loading. The air brakes are provided with a manually operated empty and load equipment which provides braking ratios of 27% loaded and 48% empty. Freight type tight lock couplers are used to reduce the slack action in long trains. It is expected that the design features will keep car maintenance at a minimum for many years.

There are more than seven hundred of these ore cars already in use at Seven Islands hauling construction material and they have proved to have very good riding and tracking qualities, both empty and loaded at speeds up to sixty miles an hour.

Ore trains will consist of 115 to 125 cars grossing approximately 14,000 trailing tons and will be hauled by 6,000 h.p. four-unit Diesel electric locomotives geared for 65 m.p.h. Speed time studies of such a train over the profile of the railway, indicate that the 6,000 h.p. locomotive can haul a southbound loaded train up the ruling 0.4% grades at not less than 15 m.p.h. and will be able to haul the same train of empty cars up the 1.3% grade northbound also at better than 15 m.p.h. Tentative speed restrictions other than these imposed by curves and track conditions, have been set at 40 m.p.h. for loaded ore trains and 50 m.p.h. for empties. The studies indicate an overall running time of 15 hours for the loaded trains and 13 hours for the empties making a round trip total running time of 28 hours for 720 miles.

Loaded trains will normally hold the main track and the C.T.C. signal system should permit them to proceed south without stopping, the northbound empty train taking the siding at all meets. Crews will be changed at the midpoint named Oreway so that in effect, the railway will consist of two subdivisions, each approximately 180 miles long.

The locomotive units themselves are of the road switcher type



Gauge Bar to Hold Rails to Gauge Prior to Spiking.

part of a locomotive consist and changed off with one on a switching assignment due for servicing in the shops. This will permit concentration of maintenance work at Seven Islands, and reduce the facilities required elsewhere to a minimum.

Dynamic braking has been applied to the locomotives because the braking effort of a four-unit locomotive will supply about 30% of the braking effort required to hold a 14,000-ton train while descending the ruling grade of 1.3%, and this should assist the enginemen considerably when recharging the reservoirs during cycle braking on the long hill. Some of the locomotive units are equipped with a semi-tightlock coupler and anti-jackknifing device to reduce the tendency for units to jackknife during dynamic braking.

Along with the railway and its rolling stock the overall project includes two hydro-electric power plants, one on the Marguerite River 18 miles West of Seven Islands, and one at Menihek Rapids 330 rail miles north of Seven Islands. The Marguerite River plant is a relatively high head one and will have an initial capacity of 25,000 h.p. Its purpose is to furnish power to the Seven Islands ore handling terminal and the town in general. The Menihek Rapids development is a low head installation and will make 12,000 h.p. available for the electric shovels used in work. The DC3's are equipped with crosswind landing gear to enable them to land on the single strip landing fields in relatively high cross winds. The planes are maintained at Mont Joli, and fly to Seven Islands and Knob Lake and fourteen intermediate airstrips built along the railway route to service the construction camps. As steel laying has advanced, the airlift has shortened, material being handled by rail to the airstrip nearest to the end of steel. Generally planes fly around the clock and have produced one of the highest rates of utilization anywhere.

The freight carried includes everything imaginable from tomato juice to bulldozers and horses. While other railroads have been built without airplanes, the Quebec North Shore and Labrador has certainly benefited from their use.

I believe many of you will be interested in the method of laying rail that has been developed on the job. During the early stages of rail laying, it became evident that serious delays were developing because of the time taken to switch out empty flat cars behind the rail laying crane due to the relatively long distances between sidings. It must be remembered, that all track materials for the actual track must be handled past the rail laying crane at the end of the steel because there is no other available transportation.

Several ideas were explored to eliminate the need for switching out empty flats beyond which the crane boom could not reach including temporary sidings and track laying machines of all types. In most cases the extra sidings involved as much construction as the main tracks and investigation of track laying machines indicated they created as many nuisances in their way as the difficulties they were supposed to eliminate. Finally, Arthur Cavanagh, who is known to many of you, hit on the idea of laying rail as shown in the picture. *(A moving picture was shown, immediately following the address.—Ed.)* It consists of distributing about one-third of the final number of ties for each day's work the night before in Koehring "Dumptors". A similar number of tie plates are distributed with the ties. Rail is transferred at the nearest siding behind the end of steel from standard flat cars, to skeleton cars, each rail being fitted with a pair of loosely bolted joint bars at the end, facing the direction of track laying. The skeleton cars consist of a pair f 5½ x 10 trucks, carrying a skeleton underframe with link and pin couplings, and are loaded with 80 rails each. At the beginning of each day, a train of skeleton cars with enough rail for the day's work is pushed up behind the Burro rail laying crane, which when it unloads a car of rail, sets the empty skeleton frame and trucks into the ditch and thus keeps a load of rail immediately behind it under the boom at all times without switching.

The rail is laid on the skeleton tie crib, securely bolted and held to gauge with four clamps per rail length. These homemade clamps called bridles fit across the track under the base of each rail. Many times 125-ton locomotives have been operated over two miles of rail laid in this way without a single spike. Immediately behind the skeleton rail cars is a train distributing the full complement of ties, tie plates, rail anchors and spikes, and this in turn is followed by the crew inserting this material in the track and fastening it in final location. Following the material train, a crew picks up the discarded skeleton car trucks and frames and returns them to the last siding to be reloaded with rail. This track laying scheme has been developed to the point where the rail crane is putting down one rail every 60 seconds and as high as 10,600 ft. of track has been laid in a working day.

Notable Crane for Iron Ore Railway

A Bucyrus-Erie Diesel-electric wrecking crane, supplied the Quebec, North Shore and Labrador by F. H. Hopkins and Co., Ltd., is the largest of its type ever built, with 250-ton lifting capacity, and with Ward-Leonard electric control, conferring numerous advantages.

Accompanying illustrations show a Bucyrus-Erie wrecking crane supplied the Quebec, North Shore and Labrador Ry. by F. H. Hopkins and Co., Ltd., Montreal. This crane, the largest of its type built to date, has 250-ton lifting capacity and full Ward-Leonard electric control, with twin Diesel drive to the individual D.C. generators.

Crane Demonstrated — Lifts Car of Sand in C.P.R. Yards.

elimination of reversing gears, because the motors are reversible; simplification of braking, most essential for holding heavy loads; elimination of throttle control during hoisting, Diesel engine speed being constant and speed variations being achieved electrically; improved control, especially when lowering when no brakes are used and the motor becomes a generator. Both the hoist and swing motors are equipped with automatic brakes which act when either controller is returned to neutral or stop position. These brakes are of the spring set, air release type, and will set automatically should there be a failure of air or electric power.

Four drums are provided and have air set clutches. An automatic brake is set on each drum as its clutch is disengaged. The four drums control the boom hoist, main hoist, auxiliary hoist, and whip lines; the last three having capacities of 250, 60, and 15 tons, respectively. The main hoist and boom hoist are twin rope, having 6 and 7 part reeving, giving 12 and 14 part lines for final service.

The whip line can be used at the boom point, or below the main hook on the boom or over a fairlead at the boom foot for dragging or long distance pulling.

A large air compressor is driven from the main engines and provides air for all clutches and brakes as well as an ample supply for train line service, should the crane be used for switching. Air brake schedule is Westinghouse 6-SL, with clasp brakes on all twelve wheels.

A Kohler 2KW, 115 volts A.C. light plant is provided with suitable lights, wiring, switches, etc., in cab, and large flood lights on boom and front of cab. The light plant also serves as a heater for the main engines, which are equipped with immersion heaters in their cooling systems. These heaters can also be fed by 110 volt current from an outside source when the crane is not operating or going to a wreck.

Trucks are Buckeye, equalized, six wheel, with 33 in. diameter rolled steel wheels, and journals are 6½ x

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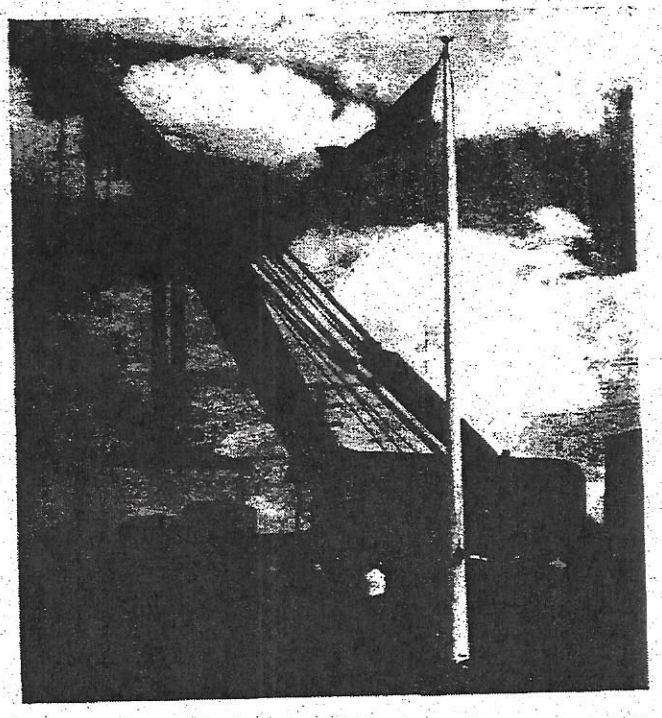

Crane Demonstrated — Lifts Car of Sand in C.P.R. Yards.

The Bucyrus-Erie Company wished to take advantage of the low stand-by and operating costs and availability of Diesel engine drive and to improve on the operating characteristics of a Diesel-mechanical crane. Ward-Leonard control, such as used on large shovels of up to 36 cu. yd. capacity, was adapted to the 250-ton wrecking crane. This type of control uses a D.C. mill type motor for each operation. Each motor is connected, through suitable low voltage control, to its own D.C. generator. All generators are driven by one A.C. motor in shovel operation, where central power is available. In the wrecking crane, the prime mover is a pair of General Motors 6-71 Diesel engines driving through a silent chain to the generator shaft.

The crane can propel and lift its rated capacity with one engine.

The advantages of Ward-Leonard control in a wrecking crane are numerous. The features exclusive to this crane are:—Independent hoisting and swinging, through individual motors; [illegible] cause the motors are [illegible] plification of braking, most essential for holding heavy loads; elimination of throttle control during hoisting. Diesel engine speed being constant and speed variations being achieved electrically; improved control, especi- is set on each drum as its clutch is disengaged. The four drums control the boom hoist, main hoist, auxiliary hoist, and whip lines; the last three having capacities of 250, 60, and 15 tons, respectively. The main hoist and boom hoist are twin rope, having 6 and 7 part reeving, giving 12 and 14 part lines for final service.

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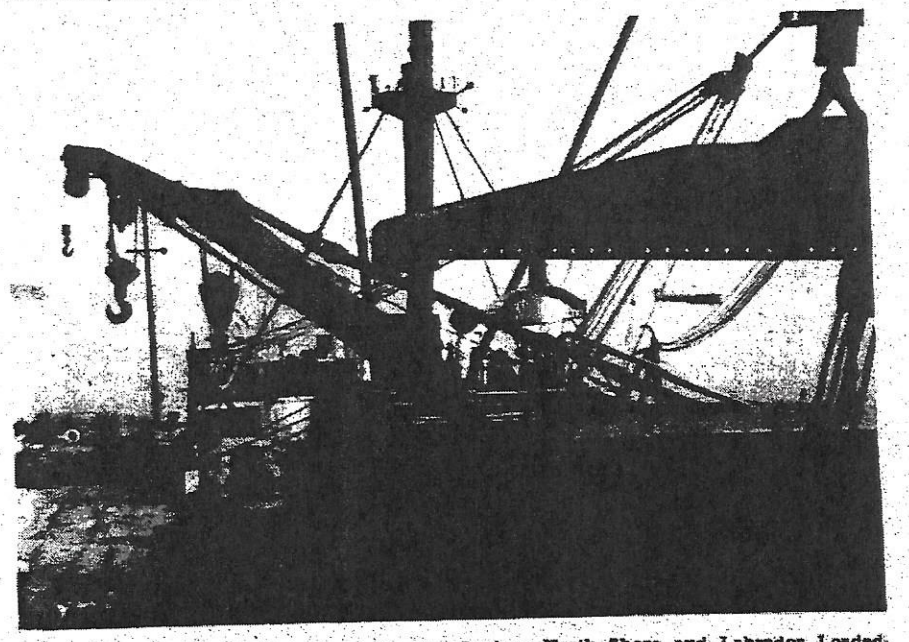
A Kohler 2KW, 115 volts A.C. light plant is provided with suitable lights, wiring, switches, etc., in cab, and large flood lights on boom and front of cab. The light plant also serves as a heater for the main engines, which are equipped with immersion heaters in their cooling systems. These heaters can also be fed by 110 volt current from an outside source when the crane is not operating or going to a wreck.

Trucks are Buckeye, equalized, six wheel, with 33 in. diameter rolled steel wheels, and journals are 6½ x



The Diesel-Electric Wrecking Crane for the Quebec, North Shore and Labrador Loaded Aboard the Ss. John Lyras in Montreal Harbour.
The crane was run aboard the ship under its own power, on specially-prepared rails, at Montreal, and was unloaded at Seven Islands, Que., by similar method.

12 in. Truck wheelbase is 11 ft., centers 19 ft., and axle loading, 65,000 lb. Working weight of crane is approximately 378,000 lb. Length is 41 ft. 10½ in. inside of coupler knuckles. Extreme height, with boom in travelling position, is 15 ft. 8 in. from top of rail.

Before shipment to Seven Islands from Montreal, the Quebec, North Shore and Labrador Ry. and F. H. Hopkins and Co., Ltd., demonstrated the crane to a group of railway officials from the Canadian National, Canadian Pacific, and Ontario Northland. One of the accompanying illustrations shows a part of the demonstration, which consisted of lifting a loaded car of sand, at the C.P.R. Outremont yards.

The other illustration shows the crane aboard the ss. John Lyras in Montreal Harbour. The crane ran aboard ship under its own power on specially prepared rails, and was unloaded at Seven Islands by similar method.

The Quebec, North Shore and Labrador Ry. is acquiring, through F. H. Hopkins and Co., Ltd., a second crane of this type, and official advice is that this second unit was scheduled for factory lifting tests in May, with shipment to Montreal about the end of May.

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in the first four months of this year nine in the Western. The average re- appear in tabular form.

Ore Cars for Quebec, North Shore and Labrador Ry.

The 1,200 ore cars being built for the Quebec, North Shore and Labrador Ry., by Pullman-Standard Car Manufacturing Co., are to be of the solid bottom, gondola type, with sloping sides and ends, suitable for unloading in a tandem rotary car dumper. With light weight of 54,700 lb., and load limit of 196,300 lb., cubic capacity level full will be 1,283 cu. ft., and with 16% heap, 1,490 cu. ft. The cars will be 34 ft. long between pulling faces of couplers.

Many people have been wondering as to the type of car which the Quebec, North Shore and Labrador Ry., the 360-mile line now being built to connect the Labrador-Quebec iron ore fields with the port of Seven Islands, on the St. Lawrence, will employ to haul the iron ore from mine to tidewater. This article is designed to answer all questions in that regard.

A lot of 1,200 ore cars is now being built by Pullman-Standard Car Mfg. Co. at Butler, Pa., for the Q.,N.S. and L. These cars, of the solid bottom gondola type, for unloading in a tandem rotary car dumper, are being arranged with sloping sides and ends, along with a smooth interior, to ensure rapid clearing of the ore when dumping. The design is based on the carrying of the greatest possible load within the limits of two four-wheel trucks and 6½x12 in. journals, consistent with sturdiness and freedom from undue maintenance expense. The cubical capacity is calculated on the basis of average ore weight of 130 lb. per cu. ft. Protection against overloading will be provided by weighing devices at the ore loading pockets, in the event of material of higher density being handled. The cars will feature welded construction, to provide smooth interior surfaces and adequate strength. They will have outside stakes, leaving the interior sides free and uninterrupted throughout their length, and the underframe will be of heavy design, to withstand long train and hump yard operation and car dumper unloading. They will be equipped with the type F coupler, to accommodate the impacts encountered in the operation of long and heavy trains over rolling ja. rain, and

Commander of the ss. Prince Rupert, succeeding Capt. W. E. Eccles.

Canadian Pacific Ry.

The following appointments in C.P.R. service are announced:—

A. L. Blaser, previously Assistant Superintendent, Fort William, Ont., to be Assistant Superintendent, Fort Macleod, Alta., succeeding A. L. Lowe.

D. M. Dunlop, previously Assistant Superintendent, Weyburn, Sask., to be Superintendent, Moose Jaw Division, with headquarters at Moose Jaw.

J. A. Forbes, previously Assistant Superintendent, Wynyard, Sask., to be Assistant Superintendent, Moose Jaw, Sask., succeeding C. F. Gwyn, transferred.

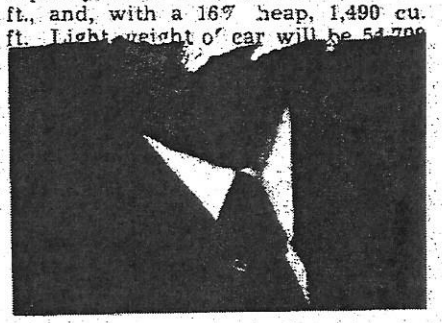
C. F. Gwyn, previously Assistant Superintendent, Moose Jaw, Sask., to be Assistant Superintendent, Kenora Division, with headquarters at Fort William.

C. H. Labreque, to be City Freight Agent, Three Rivers, Que., reporting to the District Freight Agent at Quebec.

C. E. Lister, previously General Superintendent, Saskatchewan District, and recently [illegible] General Manager, Prairie Region, to

in the tandem dumper when upside down.

The cars will be 34 ft. long between pulling faces of couplers and 31 ft. 5½ in. long over striking castings, with distance of 20 ft. 6 in. between truck centers. The body will be 29 ft. 2 in. long inside, and 8 ft. wide at the bottom and 9 ft. 7¼ in. wide at the top. Width over all will be 10 ft. 5 13/16 in., while body height inside will be 5 ft., and height from rail to top of car, 8 ft. 8 1/16 in. Cubic capacity, level full, will be 1,283 cu. ft., and, with a 16% heap, 1,490 cu. ft. Light weight of car will be 54,700



A. E McGruer, General Electrical Engineer, C.P.R. (See May issue, pg. 255.)

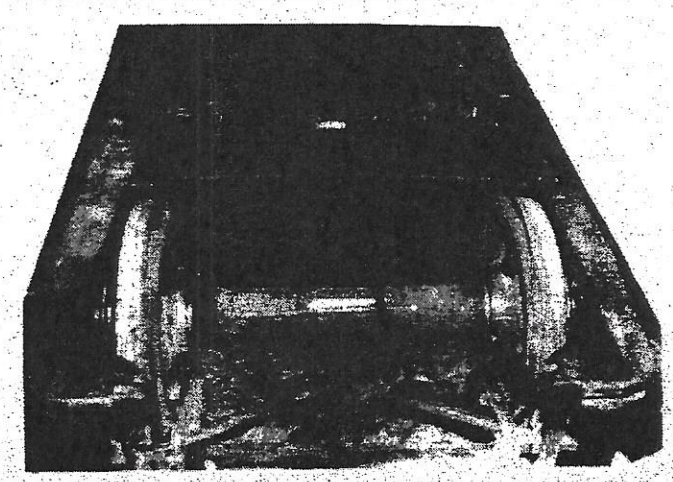
J. C. White, previously Flight Radio Officer, to be Station Manager, Brandon Man.

Capt. D. J. Woodard, previously a line pilot, to be Flight Instructor, Atlantic Region.

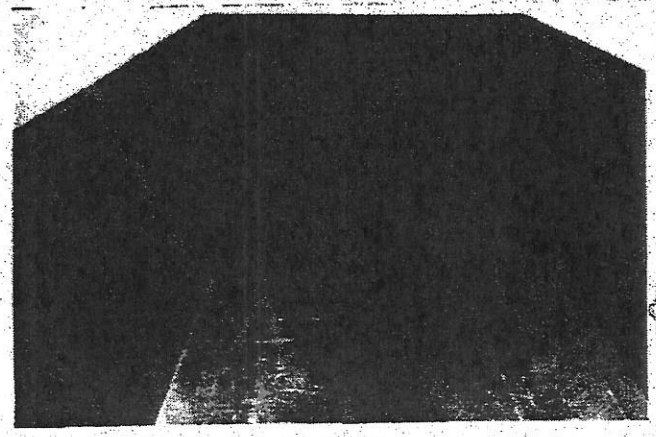
total weight on rail of a fully loaded car, 251,000 lb.

Before describing the air brake equipment, brake rigging, bolsters, trucks, etc., it might be well to describe briefly the type of service in which the cars will operate. Each southbound train will consist of 115 loaded cars, making a load of approximately 14,000 gross tons behind the locomotive. Trains of this type will be hauled 360 miles from the iron ore deposits on the Labrador-Quebec border to Seven Islands, where the ore will be transferred to ships. The maximum grade against the southbound loaded trains will be approximately 0.4%, and that against the northboud empty trains approximately 1.3%. This descending grade of 1.3% to be negotiated by the loaded trains is approximately 14 miles long being the steepest portion of a continuous grade nearly 40 miles long.

The cars will be equipped with the empty and load air brake, comprising



View of Truck and Clasp Brake Rigging



The Smooth Car Body Interior, with Sloping Sides and Ends.

a single 7⅝ in.—12x9 in. brake cylinder with 12:1 leverage ratio, to provide braking ratios of 27% loaded and 48% empty. A manual change-over control valve will be employed, as the cars are to be confined to the single service and not offered in interchange. To reduce brake beam and shoe loading and permit the 12:1 leverage ratio with the single brake cylinder, clasp brake rigging will be

The bolsters will be of cast steel, with the built-in A.S.F. A-3 ride control device, and the springs will have up to 2½ in. travel. The distance of 20 ft. 6 in. between truck centers was adopted to reduce nosing, and is the longest feasible within the limits of economical body design.

Iron ore shipments from the Labrador field are expected to begin in

months of 1952 to [illegible] cars in that period this year, but pulpwood loadings were down from 116,829 cars in the 1952 period to 66,365 cars. Loadings of automobiles, trucks and parts increased from 36,646 cars in the 1952 period to 40,378 cars. Loadings of merchandise, l.c.l., were down slightly, viz., from 335,883 cars in the first five months of 1952 to 335,681 cars.

Revenue cars received from connections decreased from 738,451 in the first five months of 1952 to 687,063.

C.P.R. New Coaches Enter Service

The first of several local passenger trains on the Canadian Pacific, serving the Montreal area, began operation June 17 with new lightweight

These cars are being fitted with Timken tapered roller bearings, making the Quebec, North Shore and Labrador the first railway to acquire 100% of its freight cars with roller bearings.

The truck frames will be of the cast steel jaw type, lengthened to accommodate the 36 in. diameter wheels.

an estimated $72 million, compared with $52 million in the 1952 month. The net railway operating income is the amount left to the railways after the payment of operating expenses and taxes, but before the payment of interest, rentals and other fixed charges.

U.S. Class 1 Railways' Results, M

	Month 1953
Total operating revenues	$919,617,23
Total operating expenses	$696,913 88
Operating ratio—percent	75.7
Taxes	$111,006,69
Net railway operating income (Earnings before charges)	93,569,68
Net income, after charges	†72,000,000

†Estimated *To nearest million

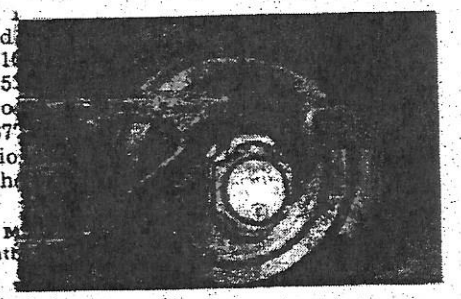
U.S. Class 1 Railways' Results,

	Month 1953
[illegible]	

Steam Locomotive Research Institute Funds

The Steam Locomotive Research Institute, which was made up of American Locomotive Co., Baldwin Locomotive Works and Lima-Hamilton Locomotive Co., went out of existence last September, an announcement at the time indicating that Diesel-powered locomotives had so well demonstrated their superiority over steam locomotives that further research on the latter was not justified. Some $40,000 remained in the treasury of the Institute. These funds are being employed to endow scholarships at the Stevens Institute of Technology, Hoboken, N.J., with such scholarships awarded deserving sons of railwaymen or deceased railwaymen who are prepared to enter the Stevens Institute of Technology during the coming autumn. The scholarships will be available to young men in Canada as well as in the United States.

Under the terms of the gift, only young men of railway families are eligible for the scholarships. To be chosen for an award, a student must, first, have the necessary preparation to enter Stevens, and, second, show the need for financial assistance. A



Truck with 36 In. Diameter Wheels

number of awards will be made, it was said, with sums ranging from $200 to $700, the full cost of a year's tuition.

It was recalled that one of the reasons Stevens was chosen as recipient of the research institute's funds was its close association with the railroad industry. Edwin A. Stevens, founder of the college, helped build one of the earliest railroads in the country, the Camden and Amboy, while his brother, Robert, invented the T-shaped rail and the wooden railroad tie over which most of the world's railroads still run. Their father, Colonel John Stevens, built, in Hoboken, the United States' first steam locomotive, and made several other significant contributions to railroading. One of the first scholarships offered by Stevens Institute was that of the American Railway Master Mechanics Association, which was established in 1901.