Q&LSJ

CANADIAN NORTHERN QUEBEC

C. H. RIFF

5

Canadian Northern Quebec Ry.—The line under construction to connect the Great Northern Ry. with the old Montford and Gatineau Colonization Ry., leaves the G.N.R. about two miles south of St. Jerome, passes through that town to Shawbridge, 12 miles; thence to the M. and G.C. Ry., at near Arundel, about two miles north of the junction of that line with the C.P.R. Nomininguе branch. The country through which the line passes is generally somewhat difficult, the rise in elevation being very marked, necessitating stretches of grade development to rise the required elevation, there being a difference of 300 ft. between the Riviere du Nord at St. Jerome and Shawbridge. The maximum gradient is 1% compensated for curvature; the curvature being rather heavy owing to the grade development necessary. The line follows to some extent the valley of the Riviere du Nord, which is crossed three times, at mileage ½ and mileage 10½ by bridges each of two 75 ft. deck plate girder spans, 16 to 20 ft. above the river, and at mileage 12 by a centre span deck plate girder, 90 ft., with approach spans of 50 ft. and 30 ft. at each end, 45 ft. above the water. The grading for the most part is light clay, sand and boulders. The grading is expected to be completed and ready for tracklaying by the end of Aug. The contractors are M. J. O'Brien and J. P. Mullarkey, who sublet contracts for grading to J. A. Morrison, I. Kent, and Bonneville & Mulhern; and for permanent trestles and bridge foundations to Sunstrum and MacDonald. W. P. Chapman, St. Jerome, Que., is Chief Engineer in charge of construction.

Three sections are under construction on the cut-off from near Garneau Jct. to Quebec, and some revision of location is being done on the remaining sections. Some sub-contracts for grading have been let; also one for the permanent trestle and bridge foundations to Sunstrum and MacDonald. The contractors are M. J. O'Brien and J. P. Mullarkey, and W. P. Chapman, St. Jerome, Que., is Chief Engineer in charge of construction.

August 1906

p467

Canadian Northern Railway Construction.

Canadian Northern Quebec Ry.—At the last session of the Dominion Parliament the Great Northern Ry. of Canada, one of the lines amalgamated under the above title, was granted an extension of time for the construction of its line between St. Jerome, St. Sauveur or Lachute, and a point on the Ottawa, Northern and Western Ry., in Wright county, for a further period of five years.

A contract has been entered into between the Dominion Government and the Chateauguay and Northern Ry., another of the lines amalgamated under this title, for the construction of a railway from Hochelaga Ward, Montreal, to the Great Northern Ry. of Canada, near Joliette, Que., passing at or near L'Assomption, together with a spur line into that town. The total distance covered by the contract is 42 miles. The line from Montreal to Joliette, 36.0 miles, has been constructed and in operation since early in 1904.

September
1906

Canadian Northern Railway Construction.

Canadian Northern Quebec Ry.—D. D. Mann, Vice-President Canadian Northern Ry., in an interview at Ottawa, Oct. 17, stated that the line would be opened from Montreal to Quebec in 1907. The construction work between Garneau Junction and Quebec is being rapidly pushed, and the contractors state that the work already done is well up to anticipations. An injunction has been obtained restraining the St. Maurice Valley Ry. Co. from carrying its tracks across the company's lines in the vicinity of Shawinigan Falls, Que., and the question is still before the courts.

November 1906

Canadian Northern Railway Construction.

Canadian Northern Quebec Ry.—Application will be made at the current session of the Dominion Parliament for an act extending the time for the construction of a branch from the main line between Montreal and Joliette, to Rawdon, Que., touching at St. Jacques, and authorizing the construction of an extension of such branch beyond Rawdon to near Lake Archambault, in Montcalm county. It has also given notice that it will ask for an act authorizing it to enter into agreements for any purpose mentioned in the Railway Act, 1903, sec. 281, with the Canadian Northern Ontario Ry., the Canadian Northern Ry., or any of them; to lease its lines to either of them; confirming an issue of 4% perpetual debenture stock, and for other purposes.

The Minister of Railways was asked Oct. 31, to approve of plans for the extension of the company's railway from Quebec to Quebec Bridge. Objection was made on behalf of the National Transcontinental Ry. Commission and the matter was held over pending the consideration of the plans for joint terminals.

December
1906

Canadian Northern Railway Construction.

Canadian Northern Quebec Ry.—The grading upon the cut-off from near Garneau Jct. has been finished to the crossing of the Batiscan River at St. Stanislas, Que., 12 miles. From this point to the crossing of the Charest River, 8 miles, the grading was expected to be finished at the end of Dec., with the exception of a few small cuttings. About half the grading has been completed on the section between the Charest River and the crossing of Ste. Anne River, at St. Casimer, 6 miles. Work is to be carried on continuously during the winter, unless the weather becomes too severe. Between the points mentioned there is considerable bridge work to be done, the substructures at the Ste. Anne and Batiscan Rivers are well under way.

We have since been advised that tracklaying has been started on the line from Garneau Jct., on the old Great Northern Ry., into Quebec, 8 miles; and on the line from St. Jerome, on the same line, to Morin Flats, Que., on the old Montford and Gatineau Colonization Ry., about 15 miles. The contractors are O'Brien and Mullarkey, Montreal.

In addition to the construction work on hand, there is projected a line from Montford Junction to Morin's Flats, Que., about 5 miles.

The point of junction of the old Great Northern Ry. with the National Transcontinental Ry., now known as Tawachiche, has been changed to Hervey Junction, and the station at Reed's Camp, where the headquarters of the N.T. Ry. survey parties have been located, has been closed.

JANUARY 1907

Canadian Northern Quebec Ry. [illegible] Hanna, [illegible] Vice President C.N.R., is reported as having stated at Quebec recently, that with the construction of its branch lines being proceeded with satisfactorily, he expected the line to reach Quebec in the near future. H. J. Wilgress recently completed a trip of inspection over the new lines under construction, and he stated on returning to Montreal that very satisfactory progress was being made. Tracklaying on the line from St. Jerome to connect with the Montreal and Northern branch was expected to be in progress [illegible] time.

JUNE 1907

Canadian Northern Ry. Construction.

Canadian Northern Quebec Ry.—The construction of the cut-off between Arnprior Junction and Quebec, is being proceeded with rapidly, and it is expected to get it completed by July 31. Over 2,000 men are at work.

The St. Leon Ry. Co. was incorporated by the Dominion Parliament in 1907, to construct a line of railway from Louiseville, in Maskinonge Co., northward to Lake St. Leon, with branches from St. Leon to the Rivers and to Lake Maskinonge. No construction has been undertaken.

JULY 1909

Canadian Northern Quebec Ry. Construction is being prosecuted with a satisfactory rate on the line between Garneau Jct. and Quebec, and tracklaying is in progress. It is expected that much of the tracklaying will have been completed by the end of the year, and that the line will be fully completed and ready for operation by June, 1908. Work is being pushed between Lorette and Cap Rouge, where the road connects with the National Transcontinental Ry. The greater portion of the right of way between Quebec and the bridge terminals has been secured, most of the proprietors having come to terms with the company, while the rest will have their claims settled by arbitration.

J. A. Lash, K.C., wrote recently to the Mayor of Quebec, stating that D. D. Mann, Vice-President, authorized him to state that the report that the company proposed to erect locomotive and car shops at Montreal had its foundation in the fact that the company had decided to erect divisional repair shops there. Further, as soon as the direct line from Garneau Jct. was completed into Quebec it was the intention of the company to establish new shops in or near the city for the C.N.Q. Ry. and the Quebec and Lake St. John Ry., closing this latter company's present shops, and using the site for terminal purposes. The details of the plans had not yet been considered.

August 1907

Canadian Northern Ry. Construction, Etc.

Canadian Northern Quebec Ry.—Track-laying is reported to have commenced on the cut-off from near Garneau Junction, into Quebec. The work is being carried on from Garneau Junction, and is expected to be completed this year. The cut-off is about 50 miles long, the contractors being O'Brien and Mulcahey. The new line from St. Jerome, to connect the old Great Northern Ry. of Canada with the old Montfort and Gatineau Colonization Ry. at St. Sauveur, Que., about 13 miles, has been completed and it was expected that it would be opened for traffic Aug. 19. The proposed line from Montreal to St. Jerome is expected to be constructed during 1908.

September
1907

Canadian Northern Ry. Construction, Etc.

Canadian Northern Quebec Ry. At the current session of the Dominion Parliament application will be made for an act authorizing the construction of a branch line from St. Jerome to St. Faustin, Que., and a line from Ottawa, via Hawkesbury, Que., to Montreal, terminating on Montreal Island to enter Montreal from the north-east and south-west

January 1908

Canadian Northern Ry. Construction.

Canadian Northern Quebec Ry.—Application is being made at the current session of the Dominion Parliament for an act authorizing the construction of a line from near St. Jerome to St. Eustache, Que., and authorizing the company to construct or otherwise acquire a line from or near Ottawa, via Hawkesbury to Montreal, branching on Montreal Island to enter Montreal from both the northeast and the southwest.

Considerable progress has been made with construction on the cut-off from Garneau to Quebec. On the western division track has been laid from Garneau to the Batiscan River, and from Lachevrotiere west to the St. Ann River, 18.14 miles. The material for the superstructure of the bridge across the St. Ann River is being delivered. This bridge consists of four 80 ft. deck-plate girders. On the eastern division, 2.5 miles of track has been laid from Lachevrotiere easterly, and considerable grading done. The grading on the loop at Quebec has been completed.

The St. Jerome-Montford branch which connects the main line with the old Montford and Catineau Colonization Ry., which was opened for traffic in Sept., 1907, is 15.2 miles long. The stations and freight sheds at St. Jerome and Shaw Bridge have been completed. Bridges have been completed at all points except at the first crossing of the North River.

MARCH 1908

Canadian Northern Ry. Construction, Etc.

The Quebec and Lake St. John Ry. has filed plans for extensions of the Quebec and Lake St. John Ry. from Roberval and Chicoutimi, and it is expected that construction will be started in the spring.

Canadian Northern Quebec Ry.—At a recent meeting of the Quebec city council, a letter was read from the company, signed by W. A. Kingsland, Auditor, and H. K. Wicksteed, Chief Engineer, stating that the present yard and trackage was excessively cramped and inadequate for the requirements of the present time. The company, in view of the early opening of the direct line to Montreal, and of the Hawkesbury-Ottawa line, considered that a rearrangement of the present yard was imperative. Plans had been prepared for the solution of the difficulty. These involved the removal of the freight shed to another site and making available for passenger business six separate tracks, three for arrival and three for departure, in place of the single one now used. This arrangement involved the removal of the present shops and engine house, which were quite inadequate for the carrying on of the company's business. Plans for the company's requirements showed an area of about 20 acres to be covered with tracks and buildings. It was, in the company's opinion, impracticable and contrary to the city's interests that any such area of land within the present city limits should be devoted to this purpose, and, therefore, an outside area would have to be obtained. It was submitted that an area of land in the direction of the Beauport flats afforded the only chance for the necessary expansion of the facilities. The President had authorized progress to be made with the work, but before making a start the company desired to have the approval of the corporation to the general scheme of improvement. If the council would pass such resolutions as would enable the company to make an immediate start, the first step taken would be the erection of the car repair shop. This would have the effect of concentrating in Quebec a large amount of work now done in Shawinigan and other outside points. The letter was referred to the Finance Committee for consideration, and is being taken up in connection with the proposal to annex St. Malo and Limoilou to the city. If the amalgamation is decided upon the city council is favorable to the company's proposals, as the present agreement with the city, with respect to the location of the shops within the city, will not require to be amended. One of the conditions of the amalgamation will have to be more direct communication by means of at least one additional bridge. Dorchester bridge is a long distance away from the heart of the village, and the railway bridge has no communication except for steam and electric cars. At low water the St. Charles River, separating Limoilou from Quebec, is less than 300 ft. wide.

Tracklaying on the Gatineau cut-off was completed Dec. 10, but G. Fombs, General Freight and Passenger Agent, said it was not likely that a passenger service would be operated before the spring, although schedules had been arranged.

The Department of Railways has entered into a contract with the company, under the terms of the act granting subsidies in aid of certain railways, for the construction of a line of 30 miles, from near Arundel, at the northerly terminus of the Montfort and Gatineau Colonization Ry., to the united townships of Preston and Hartwell; and for a line of 15.2 miles to connect the Montford and Gatineau Colonization Ry. with the main line of the C.N.Q.R. at St. Jerome, Que. This latter line has been constructed.

A branch line to Totogan, Man., has been opened. This is an extension of the Oakland branch, starting from Portage la Prairie, Totogan being 28 miles distant.

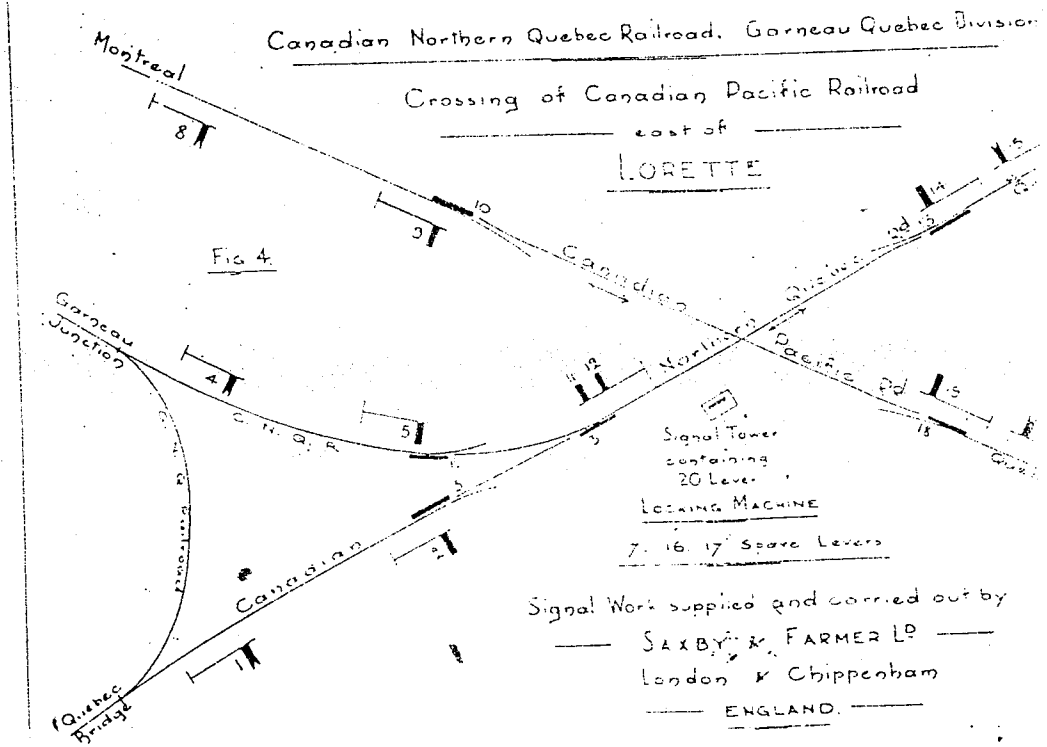
M. H. McLeod, General Manager, on his return to Winnipeg, after a trip of inspection over the company's Western lines, Dec. 9, stated that three spans of the six-span bridge over the Saskatchewan River at Prince Albert, Sask., had been completed, and he expected that the whole structure would be completed by March.

JANUARY 4 1909

Canadian Northern Ry. Construction, Etc.

Canadian Northern Quebec Ry.—The Board of Railway Commissioners has ordered the company to effect considerable improvements on its Montford branch between St. Jerome and Arundel, Que. The length of line covered by the order is about 40 miles, but the first 10 miles is reported to be comparatively good. Guy. Tombs, the company's General Freight and Passenger Agent, stated subsequently that workmen were busy all last summer ballasting the track, digging ditches, erecting new stations and doing other work. New and heavier rails had been purchased in the fall; these had been delivered and were ready to be laid as soon as the spring opened up. Other betterments would be gone on with during the season.

April 1909



Canadian Engineer
May 21 1909

RAILWAY AND MARINE WORLD

Canadian Northern Ry. Construction.

Canadian Northern Quebec Ry.—Two bridges on the line in the vicinity of Grand Mere were burned July 8, the fires it is believed, being incendiary. The first fire destroyed one span of the bridge at Burrill Siding, and the second destroyed the bridge between Charett's Mills and St. Poulin. This bridge, of which 11 spans were destroyed is 150 feet high. Temporary repairs have been made, and traffic has been resumed.

August 1909

Canadian Northern Ry. Construction, Etc.

Quebec and Lake St. John Ry.—Subsidies have been voted by the Dominion Parliament in aid of the construction of the following lines:—From Valcartier station to St. Catherine, Que., 18 miles; from Valcartier station towards Gosford, not exceeding 5.5 miles; from mileage 35 of the branch to La Tuque, on the River St. Maurice, to La Tuque Falls, 5 miles; from La Tuque Falls to the mouth of the Creche River, 5 miles; from the La Tuque branch to the steamboat landing near La Tuque, 1.6 miles; from Herbertville to St. Joseph d'Alma, 10 miles; from Chicoutimi south or south-east for 5 miles.

Canadian Northern Quebec Ry.—The Dominion Parliament has voted subsidies in aid of the construction of the following lines:—From Arundel to a point in the united townships of Preston and Hartwell, Que., not exceeding 30 miles; from Montreal to Hawkesbury, Ont., not exceeding 65 miles.

In an interview at Montreal, May 4, D. B. Hanna, President, is reported as saying: "The question of providing big railway terminals in this city is one that is engaging our attention, but matters have not got to such a point yet that I can make any announcement. Our company fully realizes the necessity of such terminals and the importance of providing them, and you may rest assured that we shall push ahead with the work as rapidly possible."

June 1910

p 185

Canadian Northern Ry. Construction, Etc.

Canadian Northern Quebec Ry.—A contract has been entered into between the company and the Dominion Government under the act granting aid to certain railways for the building of a line from near L'Epiphanie on the main line north of Montreal, by way of St. Jacques L'Achigan to Rawdon, a distance of 16 miles. This line was completed in 1909, and a regular train service is being operated over it.

With a view to making Joliette a division point a round house, and shops for the making of running repairs to rolling stock are being erected. As soon as these are completed the employes at the present shops at Shawinigan Jct., will be moved there. The dispatching of trains on the line has already been centered at Joliette, it having been found to be a more convenient point than Montreal. The Assistant Superintendent has also been transferred there from Montreal.

The C.N.R. has secured options on a considerable area of property in Montreal, in the vicinity of St. Catharine St., and press reports state that it is being acquired for terminal purposes. Some papers credit the company with having in view the boring of a tunnel under Mount Royal.

The Board of Railway Commissioners has approved the location plans of a line from Hawksbury to Montreal. The line will cross the Ottawa River and run through Carillon, St. Andrews and St. Eustache to Hochelaga and Montreal. The company now obtains an entrance into Montreal by the line built as the Chateauguay and Northery Ry., joining the Ottawa-Quebec line at Joliette, but the route now located will give a very direct line. Tenders have been asked for the building of the line.

Quebec and Lake St. John Ry.—The first three of the lines for which the Dominion Parliament voted subsidies last season, particulars of which were given in our June issue, page 485, have been built, and trains are being operated over them. We are advised in regard to the other three lines, for which subsidies were voted, that it has not yet been decided whether any construction work will be done on them this year.

Canadian Northern Ontario Ry.—Plans have been filed with the Board of Railway Commissioners showing the route of entrance of the Toronto-Ottawa line into Ottawa. Starting from the point to which the route had previously been approved—at the crossing of the Rideau River, near Nepean and Gloucester streets—it crosses almost at right angles the Bank St. extension, or Metcalf road, some distance south of Billing's Bridge, by an overhead crossing; parallels the St. Lawrence and Ottawa line of the C.P.R. to Rideau Jct.; crosses the G.T.R. and the C.P.R. near the second diamond, and effects a junction east of the Rideau River with the company's Montreal line, terminating for the present on Gladstone Ave.

We are advised that the sub-contractors engaged on the Don Valley-Trenton section of the line from Toronto to Ottawa, with their headquarters, are as follows:—Henderson & Kroft, mileage 237-241¼, Malvern; A. Piro & Co., mileage 233-234¼, Cedar Grove; John Baskin, mileage 229¾-233, Greenwood; C.A. Cook, mileage 226-229¾; Pickering, J. L. Boyd, mileage 219-222¼, Brooklin; J. A. Livingston, mileage 216¼-219, Brooklin; Ross & McComb, mileage 213-216¼, Oshawa; E. Mackenzie, mileage, 192-213, Toronto; W.M. Murray, mileage, — 192, Osaca; Allan & McPherson, mileage 171-177, Cobourg; Stewart & McInnis, mileage 165-171, Grafton; J. O. Giroux, mileage 155-165, Colborne; Delvin and Verlando. mileage 145-155, Trenton. The contractors for the concrete work on this contract are, Henderson

July 1910

Canadian Northern Railway Construction, Betterments, Etc,

The Canadian Northern Quebec Ry.—The Board of Railway Commissioners has authorized the building of a 90 ft. deck plate girder bridge across the St. Charles River, at mileage 4.38 from Quebec.

The question of the extension of the company's yards in Hochelaga ward, Montreal, has been before the Board of Railway Commissioners on several occasions recently, and an appeal to the Supreme Court is being made against one of the Board's rulings. In this connection the Montreal city council has been recommended to delay granting roads.

The Board of Railway Commissioners has extended the time for the completion of the line across Notre Dame St., and the Montreal Street Ry. tracks.

October
1911

James Bay and Eastern Ry.—The Board of Railway Commissioners has approved revised location for this projected railway from mileage 18.2 to 19.6, in Ashuapmouchouan tp., Que.

Quebec and Lake St. John Ry.—In addition to the sections relating to finance in the act which the Quebec Legislature is being asked to pass, the company is applying for power to build branch lines from any point on its existing lines, and for an extension of time within which already authorized branch lines may be built.

Canadian Northern Quebec Ry.—The Dominion Parliament is being asked to extend the time within which the lines described in pars. c, e and f, sec. 3, chap. 73 of the statutes of 1907 may be completed. These lines are, from Quebec to Moncton, N.B., and Pugwash, N.S.; from St. Jerome towards the Ottawa, Northern and Western Ry. in Wright county, Que.; and the branches and extensions of the Chateauguay and Northern Ry. mentioned in sec. 2, chap. 75 of the Quebec statutes for 1899.

The action brought by the Quebec city council to recover from the company $200,000 cash subsidy paid, owing to its alleged failure to comply with the condition that shops should be built in the city, was set down for hearing Nov. 6. The agreement was made with, and the subsidy paid to the old Great Northern Ry., which is now part of the C.N.Q.R. Before the action came on for hearing, an agreement was reached between the city and the company. A plan showing the layout of the company's yards at Limoilou was placed before the committee on Nov. 6, and a letter, signed by D. B. Hanna, President, was read. In this letter Mr. Hanna said while the company's plan of reorganization had not yet been ratified by Parliament, but with a desire to meet the city the company was willing to make a start on the new shops at Limoilou. The building of the roundhouse, machine shop and car shop would be proceeded with at once. It was desired, however, to have an assurance that the council would not directly or indirectly assist in the expropriation for a highway through the company's property, and would also agree to the closing of certain streets within the area acquired or sought to be acquired for yards, etc.; and that the property of the C.N.Q.R. and Quebec and Lake St. John Ry. in the city be subject to a fixed assessment of $6,000 a year for 20 years. The company had already acquired 85 per cent. of the property proposed to be secured for yard purposes. In explaining the matter to the committee, Mr. Hanna said the buildings would be completed by Nov., 1912; as a result of the discussion it was agreed to allow the action to remain in abeyance; to approve the company's proposals as to terms, upon a report of the city engineer that a serious start had been made upon the erection of the buildings, and to deal with the question of a fixed assessment later.

A plan for the construction of a bridge over the St. Charles River was also considered. After some discussion it was agreed that further plans be submitted, the bridge to provide accommodation for two steam railway tracks, two electric railway tracks, a road for ordinary traffic, and one for foot passengers. This bridge will replace an existing one, connecting with Limoilou.

The Board of Railway Commissioners has authorized the company to build a double track across Orleans and Ste. Jean d'Arc streets, Montreal.

Montreal Terminal Plans.—It was stated unofficially in Montreal, Nov. 17,

December 1911

Canadian Northern Railway Construction, Betterments, Etc.

Canadian Northern Quebec Ry.—We are officially advised that the projected line from St. Jerome to St. Eustache, Que., is an old project for which a trial line was run some years ago, but which it was not deemed advisable to build until the Montreal approaches were completed. The building of this piece of line will give a more direct connection between Montreal and the old Great Northern Ry. than at present exists. It is also expected that a cut off between St. Stanislas and St. Justin will be located during the winter. By this it is hoped to cut out some six or eight miles of the distance between Montreal and Quebec, and to eliminate heavy curves on the original Great Northern Ry. and the Laurentide Ry., bringing the entire line to a 0.4 and 0.6 standard gradient, as between Quebec and Port Arthur. Another object of the work is to place Shawinigan Falls on the main line for passenger traffic, instead of on a branch. A trial line was run for this piece of work during 1910-11 by A. W. Whitney, and the present surveys are being made by Jno. Congdon, under the direction of H. K. Wicksteed, M. Can. Soc. C.E., Chief Engineer of Surveys.

The development of the company's plans in the vicinity of Montreal are dealt with separately on another page.

February 1912

Gas-Electric Motor Car for Quebec and Lake St. John Railway.

The Q. and L. St. J. Ry. has recently ordered from the General Electric Co., Schenectady, N.Y., a gas-electric car to be operated between Quebec and Lake St. Joseph, where the company has a summer hotel. While this will be the first of its kind in Canada, there have been several of like construction on United States lines, their peculiar field of adaptability being on branch steam lines where the volume of traffic does not warrant a frequent train service. It is stated that the total cost of operation and maintenance of these cars only runs up to from 18 to 20c. per mile.

These gas-electric cars are independent train units, self-contained in every particular. The power is derived from a gasoline engine, direct-connected to a generator in the cab of the car. This electric power is transmitted to electric

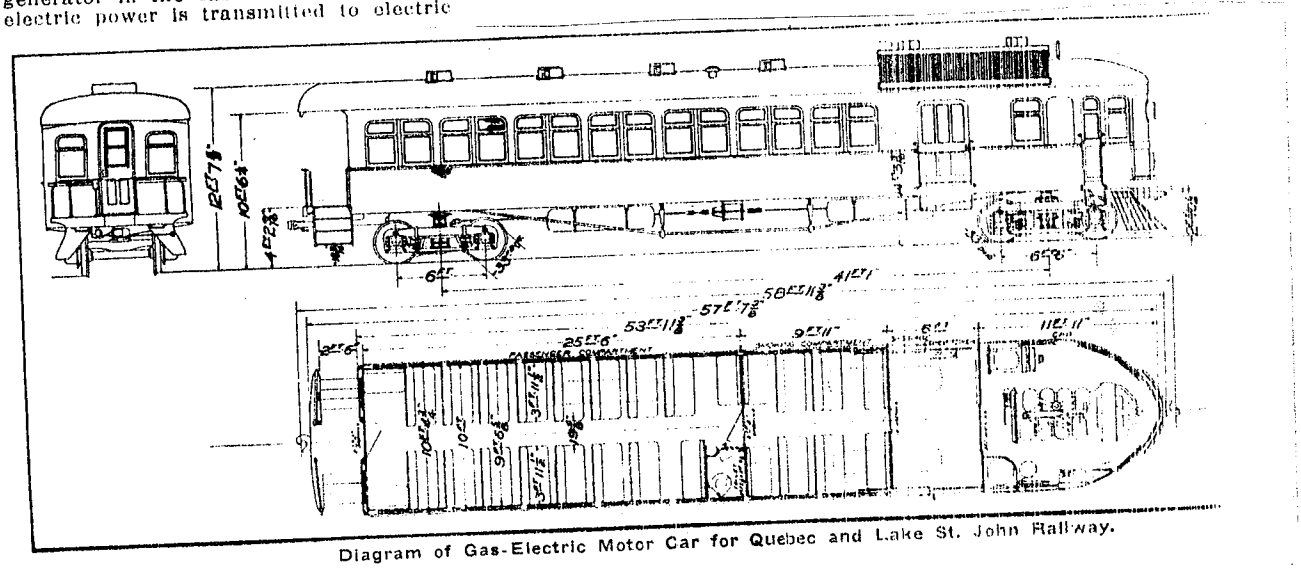


Diagram of Gas-Electric Motor Car for Quebec and Lake St. John Railway.

motors on the two axles of the truck under the cab, there being no direct mechanical drive. This truck carries from 65 to 70 per cent. of the car weight, ensuring ample adhesion. The car is operated from the forward or cab end through a controller. Motors, control and generator comprise the complete electric drive, making a simpler arrangement than a mechanical drive.

The car is divided into four compartments: passenger, smoking, baggage and cab. The general particulars are:—

Length over couplers	58 ft. 11⅜ ins.
Length over platform	57 ft. 7⅜ ins.
Length, body	53 ft. 11⅜ ins.
Length, passenger compartment	25 ft. 6 ins.
Length, smoking compartment	9 ft. 11 ins.
Length, baggage compartment	6 ft.
Length, cab	11 ft. 11 ins.
Width, over all	10 ft. 4¾ ins.
Width, inside	9 ft. 6⅝ ins.
Height, over all	14 ft. 3 3-16 ins.
Height, roof	12 ft. 7⅝ ins.
Height, coupler	2 ft. 10½ ins.
Height, floor	4 ft. 2 9-16 ins.
Wheel base, car	41 ft. 1 in.
Wheel base, driving truck	6 ft. 6 ins.
Wheel base, trailing truck	6 ft.
Wheels, diameter	33 ins.
Car weight	40.5 tons
Seating capacity	76

The car on delivery is to be run from Toronto to Trenton, Ont., out of which point it is to operate for some time prior to being sent down to the Quebec-St. Joseph service.

April 1912.

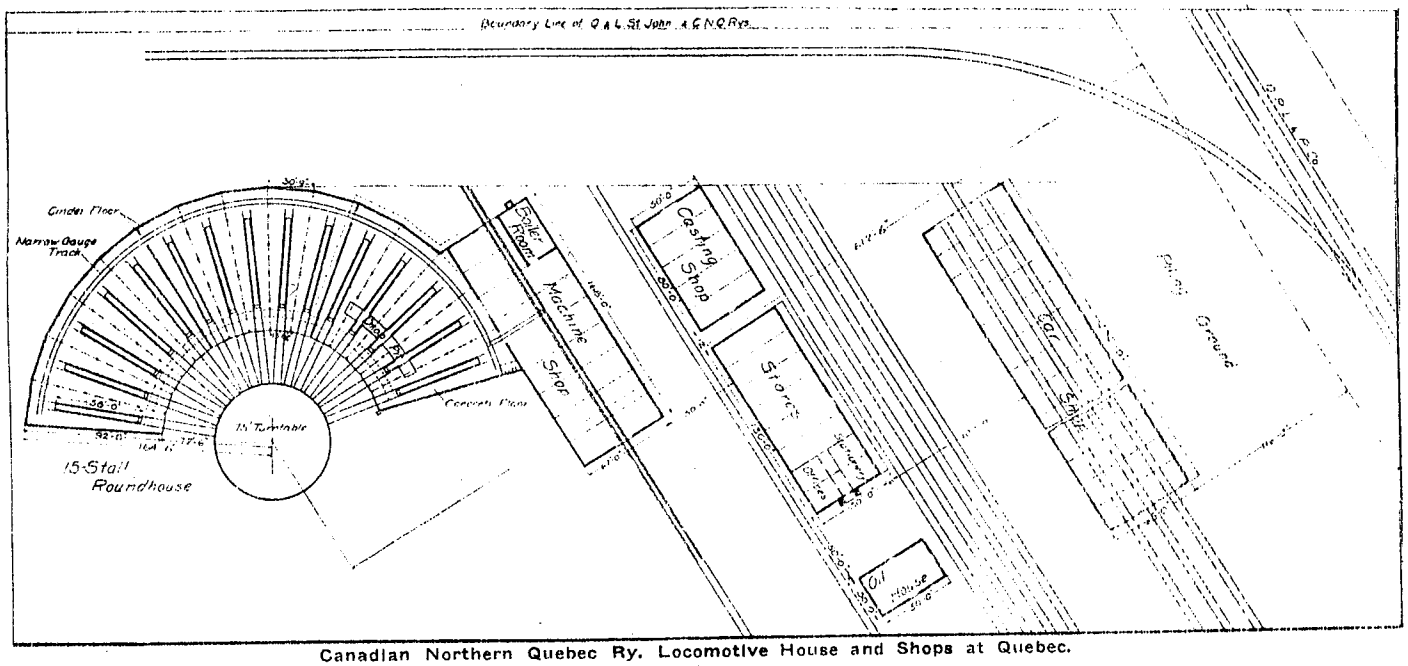
The C.P.R. locomotive was in regular service last October, while the Pennsylvania one, as far as can be ascertained, was not working before the end of November.

The writer is indebted to the C P.R. Motive Power Department for the information contained in the foregoing.

Canadian Northern Quebec Railway Locomotive House and Shops at Quebec.

The Canadian Northern Quebec Ry. is building a roundhouse and shops at Quebec for joint use with the Quebec and Lake St. John Ry. The location is on the outskirts of the city, just across the St. Charles River, at a point where the two railway lines come together in the old village of Limoilou, which was absorbed by the city a couple of years ago.

The site, which is practically level, occupies some 20 acres laid out in the manner indicated in the accompanying ground plan. Electricity for both power and lighting purposes is distributed to all the buildings from outside sources.



Canadian Northern Quebec Ry. Locomotive House and Shops at Quebec.

The grounds are piped with city water, which with steam and compressed air piping, is carried in a tunnel connecting all the buildings with a central power station in which will be located all the heating apparatus, compressors and water pumps.

All the buildings are single story, constructed throughout in a fireproof manner of reinforced concrete. Entrance to all the buildings from the tracks is from the lower end.

ROUNDHOUSE.—A 15 stall roundhouse is located at the left end of the grounds. It is divided into three 5 stall sections by two fire walls, with communication between the sections through doors at the rear. A 75 ft. turntable provides access to all the stalls. The two sections to the left have cinder floors, while the third is laid with concrete for washout purposes. This latter section also has a connecting drop pit under three of its stalls, each equipped with hydraulic jacks for lowering driving wheels, etc. Around the rear wall of the roundhouse, there is a narrow gauge track for the carrying of parts, leading into the machine shop by means of a couple of small turntables.

MACHINE SHOP.—Along the right edge of the roundhouse is the machine shop for locomotive repairs. It is a reinforced concrete building 62 x 168 ft., provided with both standard and narrow gauge tracks down the centre, the latter connecting with the narrow gauge system in the roundhouse. One corner of the shop is partitioned off for the boiler room, and contains the heating apparatus and the necessary auxiliary equipment. All the machine tool equipment is to be contained in the machine shop, with none in the drop pit part of the roundhouse, this being the reason for these two buildings being located adjacent to each other. The machinery from the old shops is to be installed, together with a considerable quantity of new machinery to cope with the increasing rolling stock.

THE CASTING SHOP or foundry is housed in a concrete building, 50 x 80 ft., located parallel to the machine shop with an intervening space of 50 ft. It is to be equipped with the latest in foundry appliances.

THE STORES are located in a 50 x 130 ft. concrete building in line with the casting shop. It is to be fitted with shelves and racks for easy access to the supplies. The storekeeper's and officials' offices are located at the front of the building on one side of the central entrance. A similar division on the other side of the entrance forms a stationery store room.

THE OIL HOUSE, 30 x 50 ft., is in line with the stores building, but 50 ft. in front, designed in the most approved manner. Self-measuring oil pumps located along the side walls, connect with the oil supply tanks in the basement, where they are away from disturbing influences. The whole structure is of reinforced concrete.

THE CAR SHOP, located 100 ft. to the right of the last row of structures, is a reinforced concrete building, 65 x 350 ft., extending some distance below the position indicated as its end in the plan. There are three repair tracks extending the length of the building. One end of the shop is to be set aside for the necessary wood-working machinery.

PILING GROUND.—Alongside the car shop there is a strip of land 116 ft. wide for timber, car repair parts, and sundry outdoor stores.

The shops as at present planned are not very extensive, as the intention is to only handle such rolling stock there as terminates at that point. This will include the Quebec and Lake St. John Ry. and the eastern end of the Canadian Northern Quebec Ry. For the purposes required at present and in the near future the shops will be of sufficient capacity to meet all demands.

MAY 1912

Canadian Northern Quebec Ry.—The locomotive house and machine shop at Lincoln, Que., are well advanced to completion, and work has been started on the erection of the car shops adjoining. A number of houses have been removed to make room for the approaches to the shops and the yard surrounding them which is to be laid out.

The company has started the laying of a permanent branch into the exhibition grounds at Quebec, on a right of way granted by the city.

The route map for a line from St. Jerome Jct., southerly through the counties of Two Mountains and Terrebonne to a junction with the line under construction from Hawkesbury to Montreal, near St. Eustache, has been approved by the Minister of Railways. After the old Montford and Gatineau Colonization Ry. was acquired by the C. N. Q. Ry. it was extended southerly from near Montford to St. Jerome, and the proposed line will give a direct connection with Montreal.

September
1912

Canadian Northern Railway,

James Bay and Eastern Ry.—The Board of Railway Commissioners has approved revised plans for the line mileage 20.43 to 21.40 from Roberval, Que. This line is under construction, J. P. Mullarkey being the contractor. Considerable grading has been done, but no track has been laid.

Canadian Northern Quebec Ry.—Application is being made to the Dominion Parliament to extend the time for the building of the projected line from Rawdon northerly to a junction with the National Transcontinental Ry., having a branch to Joliette, and the projected line from St. Jerome to St. Eustache, and to authorize the building of the following additional lines:—From Montreal, crossing the St. Lawrence river opposite the city, and from thence to Levis; and from some point on such line east of the St. Lawrence river to St. Rose Jct., thence to near Sherbrooke or Lennoxville.

Application is being made to the Quebec Legislature to confirm an agreement between the city of Quebec and the company regarding the new shops at Limoilou which are practically completed.

Route plans have been approved by the Minister of Railways for 12 miles westerly from Huberdeau, Que., the present terminus of the old Montford and Gatineau Colonization Ry.; and from Rawdon, the present terminal of L'Epiphanie branch, to St. Donat, Que., 42 miles.

Canadian Northern Montreal Tunnel and Terminal Co.—The Board of Railway Commissioners has approved of location plans in Montreal from station 134+79.7, La gauchetiere street, to station 447+17.9.

Sir Donald Mann visited the tunnel works Dec. 19, and is reported to have expressed himself thoroughly pleased with the progress being made. The total length of the tunnel under Mount Royal, from the northern portal to Dorchester street, Montreal, will be 3.5 miles. The heading from the northern end has already been driven 600 ft., and the heading from Dorchester street 500 ft. A shaft 238 ft. deep has been sunk immediately at the back of the mountain, and headings are being driven therefrom in both directions. Two additional shafts are to be dug, so that four additional headings may be driven. It is expected to have the tunnel driven by the end of 1913, and ready for the operation of trains by the end of 1914. From the northern portal to the St. Lawrence river the track will be an elevated one, the exact location and plan of the structure is under consideration by the Board of Railway Commissioners. From the waterfront to a point six miles north of the northern portal of the tunnel the line will be operated by electricity.

JANUARY 1913

Ha Ha Bay Ry.—We are officially advised that the branch from Chicoutimi to Labrosse Jct., 2.5 miles, is now operated by electricity, two electric motors taking care of the freight and passenger service. The Laterriere branch is being extended to Lake Kenogami, four miles. The contractors are Riverin and Riverin. The grading is mostly completed, and it is expected to have track laid and the extension in operation by May 1. The steel superstructure of the bridge at the mouth of Riviere a Mars is in course of erection, and when this is finished it will be possible to complete the line as far as the government wharf at Bagotville. During 1912, one mile of new track was laid. J. E. Robitaille, Chicoutimi, Que., is Comptroller. (Dec., 1912, pg. 604.)

[illegible] Bay Ry.—The

April 1913

The Canadian Northern Railway's Montreal Tunnel.

S. P. Brown, M. Am. Soc. C.E., M. Am. Soc. M.E., Managing Engineer, Mackenzie, Mann and Co., and Chief Engineer, Canadian Northern Montreal Tunnel and Terminal Co., read a paper on tunnelling before the Canadian Railway Club in Montreal recently in which he dealt with the subject most exhaustively, covering its history and the questions of classification, surveying, design, ventilation, signals, tracks, construction, plant, excavation, and linings very thoroughly. Following are extracts which refer particularly to the C.N.R.'s Montreal tunnel, which he places in class 2 of the three classes into which he divides tunnels.

Class 2.—Entries into cities, where natural surroundings make tunnels imperative, where city ordinances prohibit grade crossings, where land values do not allow of a private right of way for an open cut with bridges at street crossings, or where grades or cost of construction and maintenance make an elevated viaduct inadvisable or impossible.

The Canadian Northern is just completing its transcontinental system, for which terminal facilities in Canada's principal city are essential, especially as this city is the main eastern seaport during the busiest half of the year. Montreal's natural location, between the St. Lawrence river and Mount Royal, made the problem of entry appear complicated. To enter from either end of this narrow strip meant a detour that was undesirable, and might possibly have resulted in two separate stations for the east and west bound traffic. Grade crossings were out of the question. Cut, cut and cover subway, or elevated viaduct would have necessarily been of considerable length, which would have been difficult and expensive in many ways. The natural alternative was a tunnel; and as by developing the country back of the mountain, suburbanly, for Montreal's rapidly increasing population, much of the expense of the improvements could be covered, it was the only logical course. Furthermore, the topography of the city—combined with the distribution of business activity of different sorts—made the actual terminal location, yards, etc., equally logical and simple.

The line of the Canadian Northern Montreal Tunnel and Terminal Co., from its junction with the main line of the Canadian Northern Quebec Ry.—near the Jacques Cartier Union Ry.—is depressed through the new town of Mount Royal to the tunnel portal, where it passes under the C.P.R. belt line, about a mile from the latter's Outremont yard. From this point the tunnel goes down at a 0.6% grade, in an almost due easterly direction, to the McGill College grounds, where it curves into McGill College avenue, which leads to the main passenger terminal, situated in the blocks between Cathcart and Lagauchetiere streets and Ste. Monique and Mansfield streets. The grades and elevations are such that the tunnel passes under St. Catherine street, with ample room for a future rapid transit subway above it, and the tracks are able to be carried level through the station and over the lower town on the proposed viaduct, where a yard for light and perishable freight is contemplated, to connect with the proposed Harbor Commissioners' elevated and a possible bridge across the St. Lawrence river.

demands. The main yard will be located near the Back river, where the electrical transfer yard will also be situated. There will also be a delivery yard in Mount Royal and an elevated yard in the commercial part of Montreal.

The designs for the Mount Royal tunnel are not yet completed, but it is probable that both twin tunnels and double track sections will be used, depending on the ground. Where the rock is of the proper character to permit it, the tunnel may be left unlined, although this cannot yet be determined. The minimum clearance has been limited to 16½ ft. above the rail, but the standard tunnel clearance will be 17½ ft. The standard clearance in width is 6 ft. off the centre line of track, which may be slightly reduced near the bottom as, for instance, at station platforms.

In the twin tunnel, centre walk ways will be provided at about the level of the coach floors, and cross passages will be cut through the dividing wall, at intervals, for communication between the twin tubes. Refuge spaces are allowed for track men under the walk ways. The ducts will be carried in the centre wall. The relation of the train cross section to the tube area will be approximately 50%.

In the double track section the two tracks will be separated by the duct bench, which is the same height as the centre walk ways in the twin tunnel, so that in case of derailment one train cannot block both tracks.

The studies for electrification have not yet been completed, so that there is not much to be said on this subject. Owing to the climatic conditions outside the tunnel, it is improbable that a third rail will be used on the ground, which will probably force the adoption of some form of trolley. This means high voltage, either direct or alternating current. Great strides have been and are now being made in high voltage, direct current railway work and, until very careful and exhaustive studies have been completed, no decision can be made. This is important in the final design of tunnel cross sections, as the amount of head room for 10,000 volts alternating is quite different to that required for 1,500 volts direct current.

In the Mount Royal tunnel, where soft ground is encountered, a cap and post system of construction will probably be used, owing to the location of the rock surface, this running in general fairly near the roof line permits the full width timbering to be done without shifting posts, which rest directly on the rock. As fast as the roof excavation can be carried on in this manner, the arches will be built, so that the roof will be absolutely protected. After the arches are in, the lower excavation will be removed and arches underpinned where necessary.

The plant for the Mount Royal tunnel will be quite complete. The compressor plants at each end consist of one direct connected cross compound unit of 2,200 cu. ft. per minute capacity, driven by a synchronous motor and three belt driven cross compound units of 1,100 cu. ft. per minute capacity, with induction motors. The power is three phase, 62½ cycles at 2,200 volts. Pumps, drills and some small motors are run by air. Most power used, however, is electrical. The drills used are the pneumatic

the axles. Both gasoline and electric locomotives will be used. Part of the tunnel muck will be crushed for concrete stone and ballast; part being used for fill and subfoundation work. The crushers are gyratory and roll hammer types, to give the desired grades, and both revolving and oscillating screens will be used over the bins.

The cages used at the shafts are of the counter balanced automatic dumping types, with electric hoists. These are designed for a capacity of about 800 cu. yds. per day.

The shops consist of a blacksmith shop, equipped with an air hammer, shears, punches, drill sharpening machinery and the usual forges; machine shops equipped with large and small lathes, a shaper, radius drills, saws, pipe machine, emery and grindstones, etc.; carpenters shops, with band and circular saws and drill repair and testing shops, as well as garage for the maintenance, storage and repairs of automobiles and auto trucks.

The method of excavation adopted in the Mount Royal tunnel is a bottom centre heading, with breakups at intervals where the full sized tunnel section will be developed. The heading is driven by the horizontal bar method. Later, a carriage and other auxiliary apparatus is expected to be used, as described under plant. At the breakups, jumbo timbers will be placed in the heading so that traffic can be maintained and the upper portion of the tunnel stoped down on the top of this and run directly into cars in the heading by gravity. As many as these breakups will be opened as are found necessary to keep up with the heading progress.

The firing is done electrically, but an effort is being made to get some special fuses with electric igniters, by which the cut may be fired electrically, at the same time igniting the time fuzes of the relievers and line holes. This should give a better result than the ordinary time fuse method, without its accompanying risk, and will relieve the men from the necessity of going back into the smoke to load the later rounds.

In the Mount Royal tunnel, at present, the average progress at the west end is 20 ft. per day. In the east end, where the ground is rather bad, requiring timbering, and where no shooting is allowed at night, on account of public annoyance, the average progress for the last two months was 12 ft. per day. Heading 9 x 12 ft., 4 cu. yds. per foot. No drill carriage; percussive drills used with water attachment, 24 in. gauge temporary track cars still in use.

National Transcontinental Ry. Arbitration. Sir Wm. Whyte has accepted the position offered him by the Dominion Government, with the consent of the G.T. Pacific Ry., as sole arbitrator in settling the points of difference between the Government and the company as to the operation of the Winnipeg-Lake Superior div. section of the National Transcontinental Ry. Involved in this question, M. Donaldson, Vice President, G.T.P.R., is reported as saying, Dec. 10, is the settlement of the point whether the shops at Transcona are part and parcel of the National Transcontinental Ry. Mr. Donaldson believed that possession of the shops would be taken Jan. 1, the details of

Gas Electric Car on Quebec and Lake S. John Railway.

The gas electric car for the Quebec and Lake St. John Ry., described in Canadian Railway and Marine World for April and May, 1912, operated from May 1 to Oct. 1, 1912, very successfully, running between Quebec and Lake St. Joseph, 22 miles, making 4 round trips daily, a total daily distance of 175 miles. The actual operating cost was about 16c a mile, exclusive of general repairs.

The car was placed in service to provide a more frequent service and encourage suburban traffic. A considerable increase in traffic was experienced, and as last year's operation was in the nature of an experiment, it is anticipated that this year will see a much greater proportionate increase in the suburban traffic handled. The absence of smoke and cinders in its operation makes it conducive to the development of tourist traffic.

This car is self propelled by electric motors on the forward truck, receiving their energy direct from a 375 h.p. generator in the forward compartment of the car, direct connected to a 6 cylinder gas engine. The car is 54 ft. long, with a seating capacity of 76, and is capable of attaining a speed of 55 miles an hour.

June 1913

P 329

The Military Concentration Camp at Valcartier.

On the outbreak of war the Canadian Militia Department, in anticipation of the acceptance by the mother country of the offer of Canadian troops for service abroad, proceeded to lay out a concentration camp at Valcartier, Que., 16.2 miles from Quebec, on the Quebec and Lake St. John Ry., now part of the Canadian Northern Ry. system, where the troops might be placed in condition to be effective in assisting the British arms. To handle the large contingent promised by this country special railway facilities were required in a great hurry, and the railway officials proceeded immediately to put in such railway accommodation as would meet the requirements. The accompanying plan shows the railway facilities provided, the solid lines showing the existing tracks, and the dotted lines the tracks are laid for military purposes. Three miles of track were laid in a week.

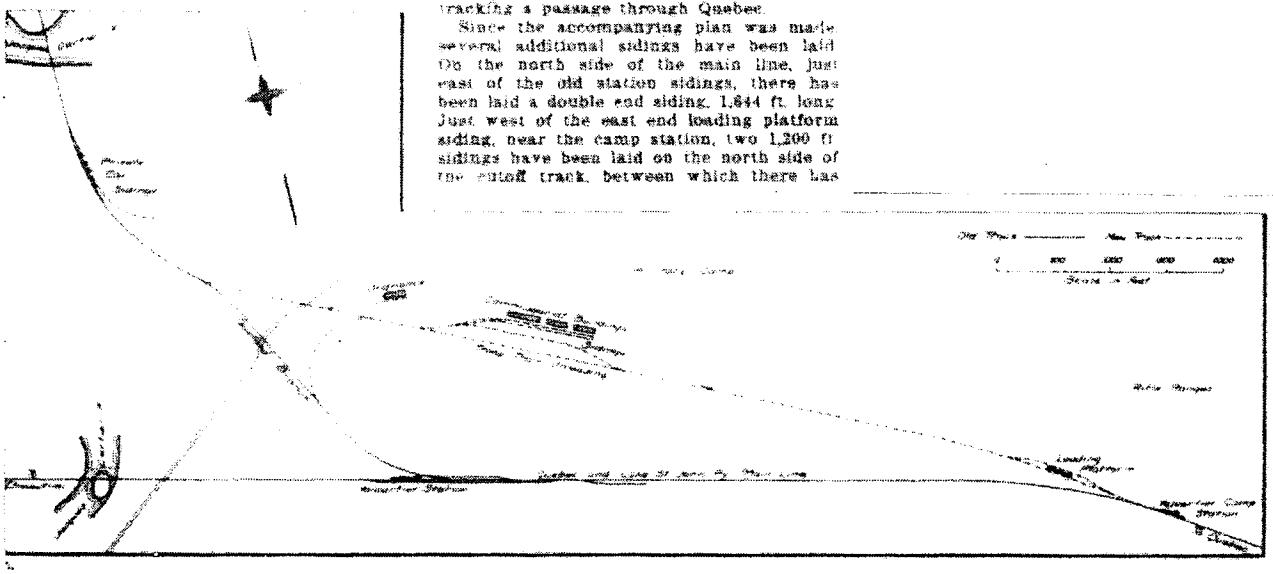
At Valcartier station the old Gosford branch of the Q. and L. St. J. Ry. leaves the main line. The site selected is in the area bounded by this line on the west, and by the main line on the south. As the main railway connection to the camp, a line 8,800 ft. long was laid from mileage 15.05 to a point on the Gosford branch, and a little west of midway in this line, three sidings were laid as the main transfer point, one of these sidings being double ended, the other two entering only from the west. Several additional sidings are being laid. A 12 degree loop from the west end of the sidings is connected back into the Gosford line in the return direction, so that the traffic may make a return loop back to Quebec, providing an effective means of giving an uninterrupted service in the immediate vicinity of the camp. On this siding the Militia Department has erected three commissariat buildings, each 48 ft. wide, two 300 ft. long, and the third 200 ft. long.

To the west of these three sidings another blind siding has been laid, on which the Militia Department has erected an ordnance building, 48 by 300 ft. A double ended siding has also been laid near the east end of the military cut off, where an unloading platform has been erected. Beyond the west end of the cut off a double ended siding has been laid, with two branching blind sidings, to be used for official cars. The camp station is located at mileage 15, near the east end of the cut off.

At this point the railway is particularly well supplied with siding accommodation for holding trains in readiness. The Gosford branch at the west end has no passenger service, so that it may be used as a long siding if required, and in the meantime there is a large amount of siding provided some distance along this line at a large lumber mill, the sidings for which will be utilized. This accommodation is in addition to the three sidings at Valcartier station.

For the handling of troops from points west of Quebec the Q. and L. St. J. Ry. has a good connection a short distance outside Quebec city. Both the Canadian Northern Quebec Ry. and the Q. and L. St. J. Ry. run into Quebec from the north over tracks that parallel each other for some distance near the city. A switch at the point where these lines meet transfers the traffic from the C.N.R. to the line to the camp, sidetracking a passage through Quebec.

Since the accompanying plan was made several additional sidings have been laid. On the north side of the main line, just east of the old station sidings, there has been laid a double end siding, 1,844 ft. long. Just west of the east end loading platform siding, near the camp station, two 1,200 ft. sidings have been laid on the north side of the cutoff track, between which there has been built a loading platform 330 ft. long, and at the stub ends of the sidings there are 40 ft. end loading ramps. At the west end of the cutoff an additional siding has been laid paralleling the ordnance siding, and at the stub end of the older siding a further building, 300 by 36 ft., has been built by the Militia Department. On the north side of the commissariat siding, between the switch and the buildings, an additional unloading platform, 330 ft. long, has been built. Additions have also been made to the private car sidings.



Railway Connections for the Valcartier Military Concentration Camp.

The engineering work was done by C. H. N. Connell, Engineer of Maintenance of way, C.N.R., and all the railway arrangements in connection with the camp are in charge of F. M. Spaidal, General Superintendent, Quebec Grand Division, assisted by W. A. Kingsland, Auditor.

The C.N.R. has carried a large number of troops from Toronto and other points west of Quebec to Valcartier, and on Aug. 24 started a direct passenger service leaving Toronto daily, except Sunday, at 9.20 a.m., via Ottawa, Joliette and Shawinigan Jct., arriving at Valcartier the following morning at 10.23. Westbound trains leave Valcartier at 4.41 p.m., reaching Toronto the next day at 9.15 p.m.

SEPTEMBER 1914

ber of accidents which have been in the nature of derailments has been comparatively small, and the consequent damage to plant and equipment very low.

There are, at present, five track gangs at work on the line doing the necessary track repairs and other maintenance work. Owing to the abnormal traffic over the road, and the fact that it has been constructed recently, the maintenance work is necessarily very heavy, and much attention must be given to this work at all times.

A storehouse and a small machine and general shop for the handling of necessary repair and maintenance work of the railway are located at Port Weller, the northern terminus.

The Superintendent's headquarters and dispatching offices, a commodious two story building, is located at Homer, Ont.

The road was constructed by J. F. Pringle, B.A., A.M.Can.Soc.C.E., Resident Engineer, and the operation and maintenance is under the jurisdiction of A. C. Harris, Superintendent, under the direction of J. L. Weller, M.Can.Soc.C.E., Engineer in Charge, Welland Ship Canal.

The Canadian Northern Railway's Bridge Over the Riviere-des-Prairies.

The Canadian Northern Ry.'s Montreal-Hawkesbury section of its main trans-continental line approaches Montreal from the west, crossing the west and main channels of the Riviere-des-Prairies, or what is commonly called the Back River, 12 miles northwesterly from Montreal. The main crossing is composed of two through truss spans 150 ft. c. to c. of bearings, one through truss span, 275 ft. 0⅝ in., and one 75 ft. through plate girder span, making a total length between face to face of ballast walls of 662 ft. 5⅜ ins. The piers and abutments are of the usual concrete type, with spread footings, and are at right angles to the centre line of the track, which track is a tangent and has a level grade over the whole crossing.

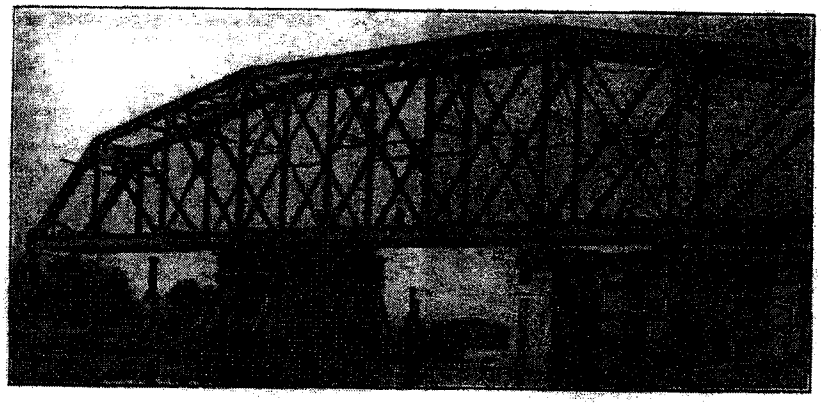


Fig. 1.—First Stages of Launching Span, Riviere-des-Prairies Bridge.

The 150 ft. spans are 6 panel through Pratt trusses of the following dimensions: 150 ft. c. to c. end bearings, 18 ft. c. to c. trusses, 30 ft. c. to c. chords. The 275 ft. 0⅝ in. span is of the curved top chord type and has the following dimensions: 275 ft. 0⅝ in. span c. to c. end bearings, 31 ft. c. to c. chords at the hips, and 45 ft. at the centre of the span, the trusses being 18 ft. c. to c. The 75 ft. through plate girder span is of the standard type with the girders placed 17½ ft. c. to c. The stringers are four to a panel and the distance, base of rail to centre of bottom chord, varies from 3 ft. 5⅜ in. for the 150 ft. spans to 3 ft. 4 in. for the 275 ft. 0⅝ in. span. The total weight of steel in the channel (275 ft. 0⅝ in.) span is 550 tons, and in the whole crossing about 2,000,000 lbs. About 2,100 cu. yds. of concrete were used in the whole crossing.

Owing to the very swift and deep current, the contractors, after considering several methods of erection, decided to adopt the one of launching by use of a scow. The plan followed was to erect the whole span in a temporary position, with slightly more than half of the length projecting over the supports riverward, the land end being held down by a heavy counterweight of steel rails. With the erection practically completed a large scow was taken from Montreal and anchored securely in place under the projecting portion of span. Upon the scow was built necessary blocking to reach the lower chords of truss. The counterweight was then removed, and a very heavy truck, running on a standard gauge track, was placed under the extremity of the land end of the truss.

The next work was to pump out sufficient water from the scow to raise it and thus take most of the weight of the truss and at the same time clear the blocking over the forward pier in the stream. This having been successfully carried out, the cables from the scow were attached to a pier beyond the main channel, and taken back to a stationary engine located on the track about 50 ft. east of the end of the truss. At a given signal the engine started and the span commenced to move, being carried slowly by the scow to its position over the piers. In a work of this kind it necessarily follows there must be some adjusting of cables, guys, windlass, etc., but there was no serious hitch or delay, and the span was moved about 120 ft. to its position over piers in about an hour and a half.

Fig. 2.—Span in Position Over Pier Ready to Lower to Permanent Position, Riviere-des-Prairies Bridge.

It was then necessary to allow water into the scow to sink it about 18 ins. and bring the forward end of the truss down firmly to the blocking on the mid-stream pier. The further lowering to seats and removing blocking was carried out by the use of powerful jacks. This operation was carried out successfully on Sept. 17, 1914. The erection of the two 150 ft. trusses was carried out on falsework.

The crossing of the west channel, about ½ mile west, is of much less importance, the channel being almost dry for a short period in summer. It is composed of five 80 ft. half through plate girder spans with central piers on the angle of the stream. All the substructure of concrete. The weight of steel in this crossing is about 589,000 lbs., and of concrete 1,600 cu. yds.

All the steel work was designed to the Dominion Government specification, 1908, class heavy loading, and was fabricated and erected by the Dominion Bridge Co., Montreal, with E. Mackinnon, Resident Engineer, in charge. The substructure was built by J. P. Mullarkey, Montreal. We are indebted to W. P. Chapman, M.Can.Soc.C.E., Engineer of Bridges, Mackenzie, Mann & Co., Ltd., for the foregoing information and for the photographs of the main span of the east channel crossing, from which the accompanying illustrations are made.

Railway Electrification in England.—The electrification of a portion of the Lancashire and Yorkshire Ry., between Manchester and Bury, approximately 11 miles, is expected to be ready for operation early in January. The work has been carried out by the company's staff, and the rolling stock has been built in the company's shops at Newton Heath, Manchester. The cars are of all steel construction, and each unit is a 5 car train, of 3 motor cars and 2 trailers. The motor cars are each equipped with four 200 h.p. motors.

Toronto Transportation Club.—The annual dinner was held, Nov. 29. The officers for the current year are.—M. G. Murphy, C.P.R., President; T. Marshall, Board of Trade, C. E. Horning, G.T.R., Vice Presidents; W. A. Gray, Delaware, Lackawanna and Western Ry., Secretary; M. Macdonald, G.T.R., Treasurer. The executive committee consists of, John Gray, M. H. Lowe, A. E. Bennett, D. C. Wood, John Thomson; and the chairmen of committees are,—F. V. Higginbottom, Entertainment; W. Mallroy, Membership; J. M. Copeland, Sick.

JANUARY 1916
P2

an Northern Quebec Ry.—The f Railway Commissioners has d the opening for freight traffic ıe through Arundel, Ponsonby, erst townships, Argenteuil and ounties, Que., mileage 0 to 9.57. he recently complete line from o Kaolin.

January
1917

Canadian Northern Quebec Ry.—The Dominion Parliament is being asked to extend the time for the completion of the projected branch lines from Rawdon to the National Transcontinental Ry., with a branch line from Rawdon to Joliette; and a line from St. Jerome to St. Eustache, Que.

Mount Royal Tunnel and Terminal Co.—The Dominion Parliament is being asked to extend the time within which the company may complete its railways and station building in Montreal.

A contract has been let to Norcross Bros., of Montreal, for the erection of the temporary station building on Lagauchetiere and St. Monique Streets. The excavation of the larger area on which the permanent station will be erected will be done by Angus Sinclair, of Toronto. This latter contract involves the removal of some 280,000 cubic yards of material.

February 1917

The Shawinigan Water & Power Co.'s annual report for 1916 has the following reference to one of its subsidiaries: "During the past year the St. Maurice Construction Co., Ltd., a subsidiary of your company, has continued the construction on the La Loutre storage dam, and steady progress is reported on this work. During the early part of the year the work consisted in building 20 miles of railway, the organization of the river transportation system and the construction of the cofferdams in the east channel of the river. The concrete has now been placed in the east channel and work is proceeding on the west, or main channel. The work is up to schedule and should be completed at the end of 1917."

We are officially advised that the railway parallels the St. Maurice River for 20 miles, beginning at Chaudiere Falls, on the river bank, 30 miles above Weymontachine, or Weymont station, on the National Transcontinental Ry. The line is standard gauge. It is operated by locomotive burning fuel oil. There are four contractors' locomotives, 18 flat cars, two box cars and 24 dump cars. The contractors and engineers were the St. Maurice Construction Co., Ltd., with Fraser, Bryce & Co., Ltd., Montreal, as supervising engineers. The maximum grade is 3½%, and the maximum curvature 18 deg.

River transportation operates between Weymont, or as a matter of fact, from Sanmaur, which is the name of a station opened for the St. Maurice Construction Co.'s operations, two miles from Weymont, to the point on the river where the railway begins. The outfit consists of about 20 scows, with capacities of between 12 and 30 tons each. These are towed by gasoline and steam tow boats. At one point in the river it is so swift that an alligator boat is used to pull the scows up. The towing is in two divisions above and below this swift water. The railway and river systems are used only

April 1917

for the St. Maurice Construction Co.'s operations and business incidental to the construction of the dam.

We are further officially advised that it is impossible to state what will be the future of this railway, whether it will be taken up on the completion of the dam, or whether it will be made a permanent work and extended.

Canadian Northern Railway Construction, Betterments, Etc.

A press report states that a contract has been let to Jos. Gosselin, Quebec, for the erection of the substructure of a bridge across the St. Maurice River, at Grand Mere, Que. The superstructure will be erected by the Dominion Bridge Co., Montreal. The estimated cost of the entire work is $170,000.

JUNE 1918

Canadian Northern Railway's Bridge over the St. Maurice River at Grand Mere.

A new bridge, replacing the old cantilever, has been completed recently on the Canadian Northern Ry. Eastern Lines, over the St. Maurice River, about a mile east of Grand Mere, Que. The bridge, as seen in the plan, fig. II., consists of two 100 ft. deck plate girder spans, two 115 ft. deck truss spans, one 250 ft. deck truss span and one 38 ft. deck plate girder span. The old cantilever bridge, shown as fig. I, was built by the Dominion Bridge Co., in 1895, and was flanked on the western side by a 100 ft. deck lattice span, the remaining portions of the depression being served by wooden trestles. In 1910 the western wooden trestle was burned and the lattice span wrecked by a train, the bracing of the west anchor arm of the cantilever being at the same time slightly damaged. To take the place of the destroyed trestle and lattice span, a steel trestle, consisting of 2 bents and 3 deck plate girder spans, was constructed by the Dominion Bridge Co. In 1915 the sway and stringer bracing of the main cantilever were reinforced and in this condition the old structure served to carry the traffic until the summer of 1918.

In order to reduce the excessive grade at this point the track has been raised 15 ft., which makes the distance from base of rail to ground line for the intermediate piers about 70 ft., and in order to minimize the height of the piers the trusses were made deeper than would otherwise have been necessary. The truss spans only are new this year, the eight-year-old girders from the trestle mentioned above being used on new piers. The side truss span has 4 panels at 28 ft. —1½ in., and is 35 ft.—9½ in. deep, while the channel span has 8 panels at 30 ft. 9 in. and is 36 ft. deep to the center of gravity of chords. The chords and diagonals of the trusses are built up box sections, while the posts are I sections, composed of a web plate and four angles. The pier members are steel castings, with pin bearing between truss and shoes. There are the usual two lines of plate stringers heading into the floorbeams.

The piers being about 50 ft. high and the river very deep, erection by the cantilever method was naturally adopted. The erection stresses were nowhere large enough to affect the sections of the truss members, so that no extra metal was necessitated by erecting in this manner. The west truss span was erected first. A timber bent was built at the center of this span and the truss was assembled by means of a Bay City derrick car working from the old bridge. A 12-ton stiffleg derrick was then set up on the span, on trucks which ran on the top chords, and with this derrick the west half of the channel span was erected, cantilevering out from pier 3. The 115 ft. span was used as an anchor arm and additional counterweight over and above the weight of the steel was secured by anchoring the free end of this truss span to pier 4, using, for this purpose, two 2 in. dia. bolts 17 ft. 2 in. long, at each corner. The east half of the bridge was then erected in precisely the same manner.

The cantilever portion was connected to the anchor span of the top chords by four 12 x 1 in. plate links on 5 in. dia. pins, and at the bottom chords were held apart by cast steel rocker blocks. These links were made 4¼ in. short of the normal length, in order that the ends of the cantilevers at the center of the channel would be elevated above normal to facilitate making the center connection. The expansion pier members were arranged to accommodate the expansion of the bottom chords during the change from the cantilever to the simple span conditions. To permit of a final adjustment in case the chords did not meet at the center of the channel span, both pier members on pier 3 were on rollers, on which the west half, both cantilever and anchor span, could be moved a few inches forward or backward as might be necessary. However, no such adjustment was necessary, as when the last section of bottom chord was lowered into place it fitted perfectly and the bolts connecting it to the center bottom lateral plate were put in place without difficulty. The anchorages were then gradually loosened, allowing the middle of the channel span to descend, and as the holes in the gusset plate came to a match with those in the web of the bottom chord the bolts were entered, and, the span being lowered still more, the diagonal connection and top chord splices were bolted. As soon as the top chords touched at the center the loosening of the anchorage was stopped and the span was left partially suspended until all the splice rivets were driven in the bottom chord. This method insured tight joints in the bottom chord splices and secured a very satisfactory camber. The ends of the anchor spans were then jacked up and the erection links removed. The top chords, being now in compression, were riveted under the best possible condition. All the end bottom struts were designed to permit of jacking, so that the pier members may be repaired or renewed at any time. The deck steel was put in the anchor spans as they were erected, but the stringers and stringer bracing of the channel span were omitted until the anchor spans were jacked up, and the cantilever condition removed, thereby minimizing the erection stresses. In the meantime, these stringers were placed on the ends of the anchor spans, giving additional counterweight, as it was considered advisable to keep the strain on the erection anchors in the concrete piers as low as possible.

After the trusses were completed the 40 ft. deck plate girder span was removed from the trestle posts, fitted with new pier members and placed in position at the east end of the bridge. Traffic was carried across the opening thus created in the old structure by 3 beam spans supported on a timber tower, which was built before the girders were removed. Moving the two 100 ft. girder spans was accomplished on Sunday, April 14, trains being run over the old bridge on the Saturday and over the new one on the Monday. These spans, being too heavy to be handled as a whole, were cut apart, and the separate girders removed by means of two 30-ton derrick cars, which have a capacity of 16 tons at 25 ft. radius. One car worked on the west end of the old bridge, and the other on the new truss spans. The girders weighed 31 tons each and special care had to be taken in hitching to these so that the cars would not be overloaded. The first steel was erected on Feb. 1, the channel span was connected

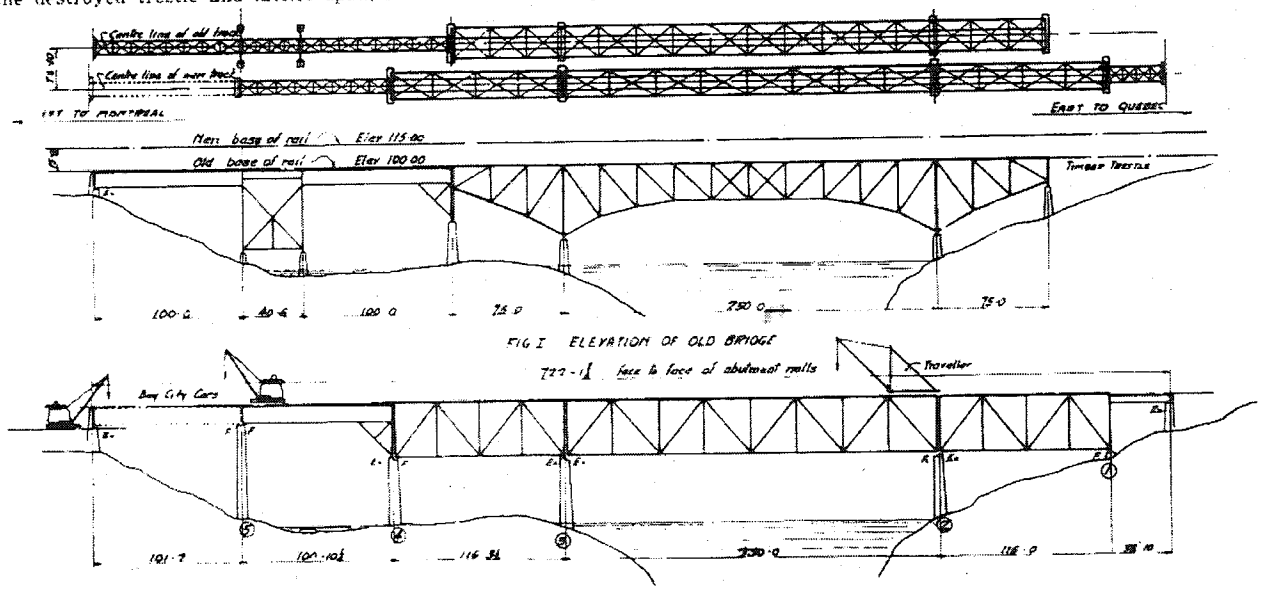


FIG I ELEVATION OF OLD BRIDGE

727-1 face to face of abutment walls

FIG II ELEVATION OF NEW BRIDGE

Canadian Northern Railway's Old and New Bridges Over St. Maurice River at Grand Mere, Que.

OCTOBER 1918

at the center on April 2, and riveting of the trusses was completed about June 3. The steel on the two 115 ft. trusses weighed 616,650 lb., in the 250 ft. span 936,000 lb., and the total steel in the structure, including girder spans, about 1,890,000 lb. The superstructure was designed and built by the Dominion Bridge Co., the writer having special charge of the design and the development of the erection scheme. The whole work was subject to the approval of W. P. Chapman, Engineer of Bridges, C.N.R., and C. H. Connell, Engineer, Quebec Division, C.N.R.—By H. M. White, of Dominion Bridge Co., in Contract Record.

October 1918

firewall dividing. The interior is divided by terra cotta hollow block walls and the exterior walls are furred with the same material, all surfaces of walls and ceilings being plastered and painted.

Lavatories and lockers are provided in each building for a full complement of workmen. Ample storage spaces for steel, wheels, lumber, etc., have been allowed for and the layout generally has been planned with special attention to economical working. The transfer table is 80 ft. long, designed to carry a 96 ton car. It will be operated by electricity. Electrical energy for lighting and operation of machines will be supplied by the Port Huron Electric Power Co. Provision has been made for fire protection by the erection of a 100,000 gal. steel storage tank, 100 ft. above the ground line, with a complete system of piping and fire hydrants situated at convenient points.

The buildings have been planned and erected under the direction of the company's Chief Engineer, H. R. Safford, Montreal.

Canadian Northern Railway Terminal Buildings in Montreal.

The temporary station being built by the Canadian Northern Ry. at the corner of Lagauchetiere and St. Monique Street, Montreal, was fully described and illustrated in Canadian Railway and Marine World for July, 1917, and some additional information and plans were published in our November issue. The progress of the work on the temporary station is now so far forward that a fair idea of the completed work can be had. The whole of the brick, tile, concrete and steel work is finished, and the building is ready for the plasterers, the finished wood work, painting, etc. Following is a resume of what has been done and what is required to complete the structure:

After excavating for the foundation and piers, which were carried down to a rock foundation, the reinforced concrete work was proceeded with. The whole of the structural parts, including the walls, floors and roof are formed of that material, making an absolutely fireproof building. The inside of the outer walls and dividing partitions are of fireproof tile, which are ready for the plaster finishing. The roughing for the plumbing and heating is completed, including all pipe mains, and all the conduits for electric wiring, etc. The heating will be on the vacuum principle and the waiting rooms and lavatories will be heated under thermostatic control.

The work remaining to be completed is the plaster work of the walls and ceilings, the cement plaster of train level portion of building, baggage room and lavatories ,and the plaster finish of the waiting room, vestibule, etc. Then will follow the carpenter trim, and the fixtures, which will be of Georgia pine throughout, finished with a fumed oak flat finish. The marble work, plumbing fixtures and radiators will be proceeded with immediately after the plaster work is completed, and the wiring for power and light, and electric fixtures, etc., and finally the finishing by the decorators. Beside the finish of the wood work, the waiting room and vestibule walls will be painted with lead and oil paint, and the ceilings and walls of baggage room, lavatories ,and train space will be treated with cement paint in suitable and harmonious colorings. Provision is being made for telephone and telegraph, and a system of time clocks controlled by the Great North Western Telegraph Co.

Express Building, Garage and Boiler Room.

The Canadian Northern Express Co.'s building being erected on Mansfield St. is also nearing completion, but owing to the retaining walls of the railway cutting not being ready, a portion of the rear of the building has to be left incomplete until the retaining walls are finished. The building proper has approximately 100 ft. frontage by 80 ft. depth, with boiler room and freight elevators adjoining in the rear. The building is divided into three parts, viz., express room, garage and boiler room. Facing Mansfield St. the building shows as one story and a half and basement, but on the rear appears much higher, owing to the deep cutting, which is 46 ft. below the level of Mansfield St. The main floor will be occupied as the express room, with shipping doors on the northwest side and there will be offices for the agent, clerks, records and also lavatory accommodation. Underneath the express room the whole space will be utilized as a garage for delivery trucks and will be approached by a driveway from Mansfield St. Connecting both express room and garage to the railway tracks will be two freight elevators, run by electric power and capable of carrying 4,000 lb. each. Adjoining the entrance to the elevators on the track level will be a car siding.

Rear Elevation, Canadian Northern Express Co.'s Building, Montreal.

The boiler room is on the level of the tracks, where coal trucks can run right alongside the coal bunkers and unload directly into them, and cinders can be loaded from boiler direct to cars. The boiler room will not only supply steam for heating the express building, but also for the terminal station, 300 ft. away, and will supply steam to car points for heating cars which will be disconnected from the steam locomotive at Cartierville and brought to the terminal by electric locomotives.

The building is being constructed of brick, with concrete foundations, reinforced concrete floor in express room and reinforced concrete ceiling of garage with flat timber roof. The exterior will be cement stucco plaster and have decorative flat pilasters and iron cornice. The shipping driveway will have an overhanging steel and corrugated iron roof.

The completion of the work may be looked for early in the new year. It is being carried out under the supervision of Geo. C. Briggs, Supervisor of Buildings, C.N.R.

Railways Authorized to Advance Freight and Passenger Rates.

Sir Henry Drayton, Chief Railway Commissioner, delivered judgment Dec. 26, on the application of Canadian railways for a recommendation to the Governor in council, under the War Measures Act, for a general advance in freight and passenger rates. The judgment, which was concurred in by D'Arcy Scott, Assistant Chief Commissioner, Hon. W. B. Nantel, Deputy Chief Commissioner, and Commissioners McLean and Goodeve occupies 76 fooiscap pages of typewritten matter. It is officially summarized as follows:

Subject to the limitations of the Crowsnest Pass agreement and to the specific limitations contained in the judgment, freight rates are permitted to be increased, in general, approximately 10% in the west and 15% in the east.

While the Grand Trunk Pacific and the Canadian Northern are not included in this agreement, they are to be treated as if included.

With a view to lessening the disturbances as between territories, now established, of western distributing centres, and having also in mind the increase in the all rail rate already allowed, a 15% increase west of Port Arthur, and a 10% increase on the eastern balance of the through rate is permitted, but again subject to the limitations worked by the Crowsnest agreement.

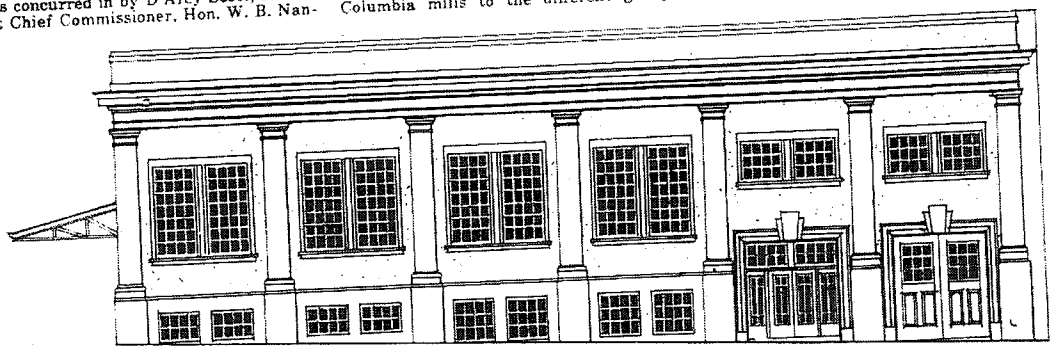
On coal, an increase of 15c a ton is allowed, it being considered that this will bear less harmfully on the consumer than a percentage increase. In the western hearings the evidence was that a flat increase was preferable to the percentage increase asked for by the railways.

An increase of 5c a ton is permitted on clay, gravel and crushed stone.

On grain to Lake Superior ports, an increase of 2c per 100 lb. is allowed; this is approximately 10%.

Grain and grain products, etc., in the west, other than for movement to Fort William, and also on the movement of these from Fort William east, are permitted an increase of 15% subject to a maximum of 2c per 100 lb.

The existing lumber rate basis in the west has been built up by agreement between the mills and the railways, the important matter bein gthe extent of the rate differences between different groups of producers. A percentage arrangement would create disparities. From British Columbia mills to the different groups the railway management. They are very largely represented in wage increases, which have had the approval of the public at large. Public bodies and public sympathy have been with the men in the increases which they have obtained. No objection whatever has been made by any contestant on the ground that the railways have improvidently increased



Mansfield St. Elevation, Canadian Northern Express Co.'s Building, Montreal.

increases of from 3 to 5c, according to distance, are allowed. From Northern Alberta and Saskatchewan spruce districts 15%, with a maximum of 3 to 4c, according to distance. From British Columbia to Eastern Canada, 10%. From Lake-of-the-Woods and Rainy River, 3 to 4c, according to distance. From Port Arthur west 3 to 5c, according to distance. Between points in Eastern Canada a 15% increase, which works out a maximum of 3c.

Transcontinental class rates may be increased 10%. No increase allowed in transcontinental commodity rates.

In British Columbia an increase of 10% on freight rates is allowed; no rates to be lower than the prairie rates, as increased.

Railway tolls incidental to transportation, switching, demurrage, reconsignment, sleeping or parlor car accommodation, weighing, refrigeration, heating, car diversion, or other special services, are not allowed any increase.

No increase in passenger rates is allowed in British Columbia. A 15% increase is allowed in the territory where the maximum rate is 3c. It is at the same time pointed out that in the public interest, with a view to conserving coal, railway facilities and man power, that passenger travel should be as light as possible, so as to faciltate efficient freight movement.

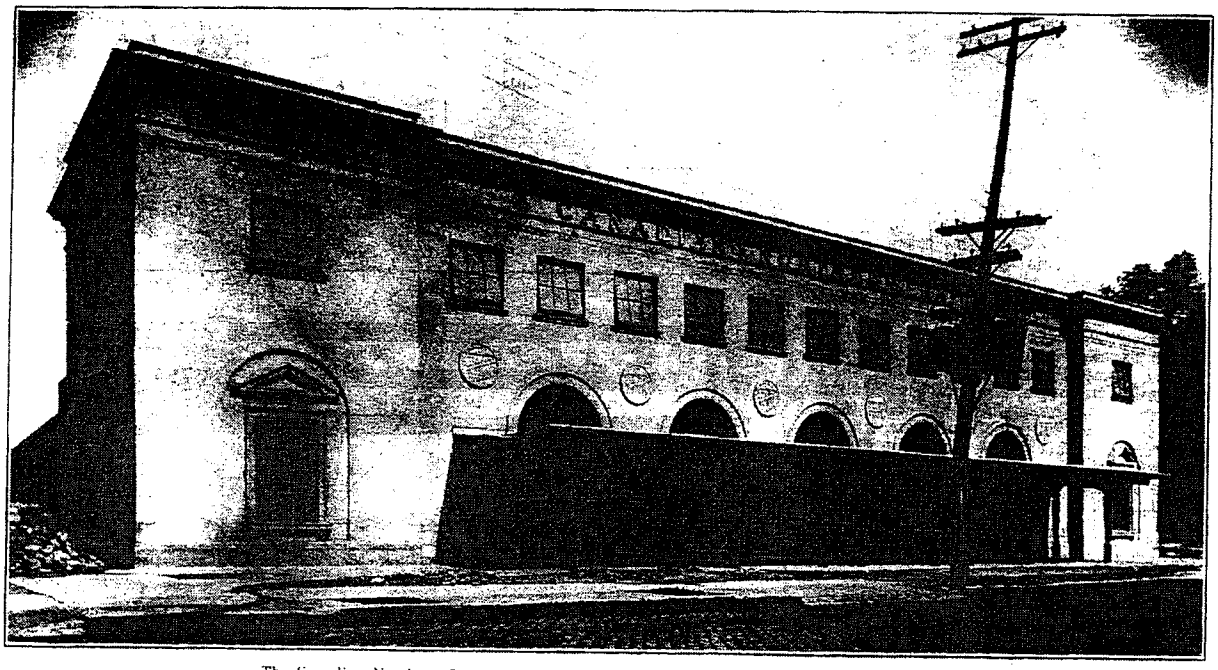
It is set out that no greater profits will be obtained by the railways under the new rate scheduled than in the past. The increased rates allowed will certainly not equal the increase in costs to which the railways are subject. These increased costs are not in any way attributable to wages. The other items of cost increases are chiefly the result of today's prices of coal, steel material and railway supplies. The railways suffer in this regard in common with other users of these necessities. The increased cost can certainly not be said to be the railways' fault. While there was difference of opinion among trade organizations, a considerable number hold that reasonable increases, within the discretion of the board, were justifiable. As to the representations made regarding aid by loans, as well as change in ownership the board has no right to express an opinion, as its powers are concerned with rate matters.

Canadian Northern figures show a steadily declining net revenue. In Sept., 1917, the net revenue was 41% less than in 1916, October, with 6% increase in gross, shows 51% decrease in net. Maintenance charges have been cut down with a view to economy. As a result, efficiency has decreased and accumulated maintenance charges will have to be met later. At the same time, costs of labor, coal and materials, have been increasing. In September, the Canadian Pacific's net decreased 28.3%. In 10 months, ended Oct. 1917, the gross revenue of the Grand Trunk increased 11%, while expenses increased 22%. In October gross increased less than 2%, while net earnings decreased 49%.

It is found that there can be no question, in view of the actual results, that the railways require greater revenues, and must have them if proper efficiency is to be maintained, and the demands of the country for transportation at all adequately met.

Canadian Northern Railway's Temporary Passenger Station, etc., in Montreal.

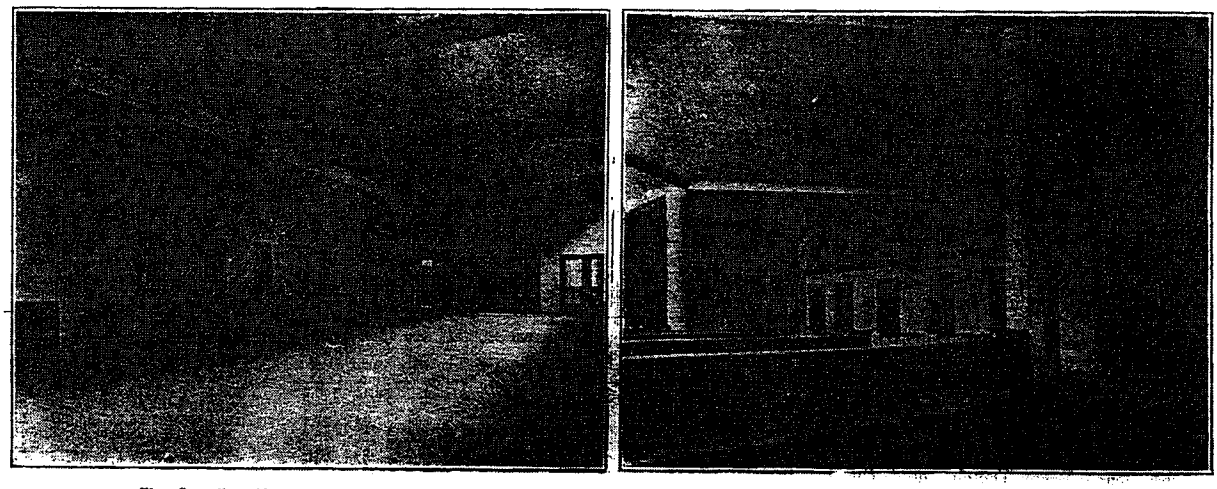
The Canadian Northern Ry.'s temporary passenger station at the corner of Lagauchetiere and St. Monique Streets, Montreal, is practically completed. It is a reinforced concrete structure, with two stories above grade and one below. The



The Canadian Northern Railway's Temporary Station in Montreal, Lagauchetiere St. front.

exterior walls are lined with 6 in. terra cotta blocks, with an air space between the concrete outer wall and the lining. The main facade faces Lagauchetiere St. The building is of classic design, the passenger entrances being five large arched openings above which are medallions containing the C.N.R. Co.'s insignia. A dignified entablature in cement surmounts the building on all facades. Over the passenger entrances on Lagauchetiere St. is a marquise, protecting the sidewalk from rain and snow. To the right of the building is a court, formed on its outer side by a retaining wall 18 ft. high, which is run back for 50 ft. The court is 33 ft. wide and is paved with brick. It will serve as a wagon approach to the incoming baggage room, which has two wide doors opening directly on the court.

A passenger entering the building from Lagauchetiere St. will go immediately into the entrance vestibule, which is about 30 x 80 ft. It will be the heart of the building, from which all its activities will radiate. It will also be used, in some degree, as a waiting room for those who have not the time nor inclination to go back to the main waiting room, which will immediately adjoin it at the rear. Upon this entrance vestibule, on the side opposite the entrance, open four windows of the ticket office. At its end, to the left, is the baggage counter and parcel room. At its right descends a broad staircase, leading directly to the trains. There is also an entrance to the women's waiting room from the entrance vestibule and it contains space for telegraph office and news stand. The arrangement of the entrance vestibule has been made with the idea of saving the traveller as many unnecessary steps as possible; he may transact all his business here, check his baggage, purchase his tickets, obtain his newspaper, check parcels and proceed directly to his train without traversing the main waiting room. If he arrives well ahead of train time and wishes to sit down for a while, he may cross the entrance vestibule to the main waiting room, which is immediately behind it, and is 50 x 80 ft. The beamed ceiling of this latter room is supported by two columns,



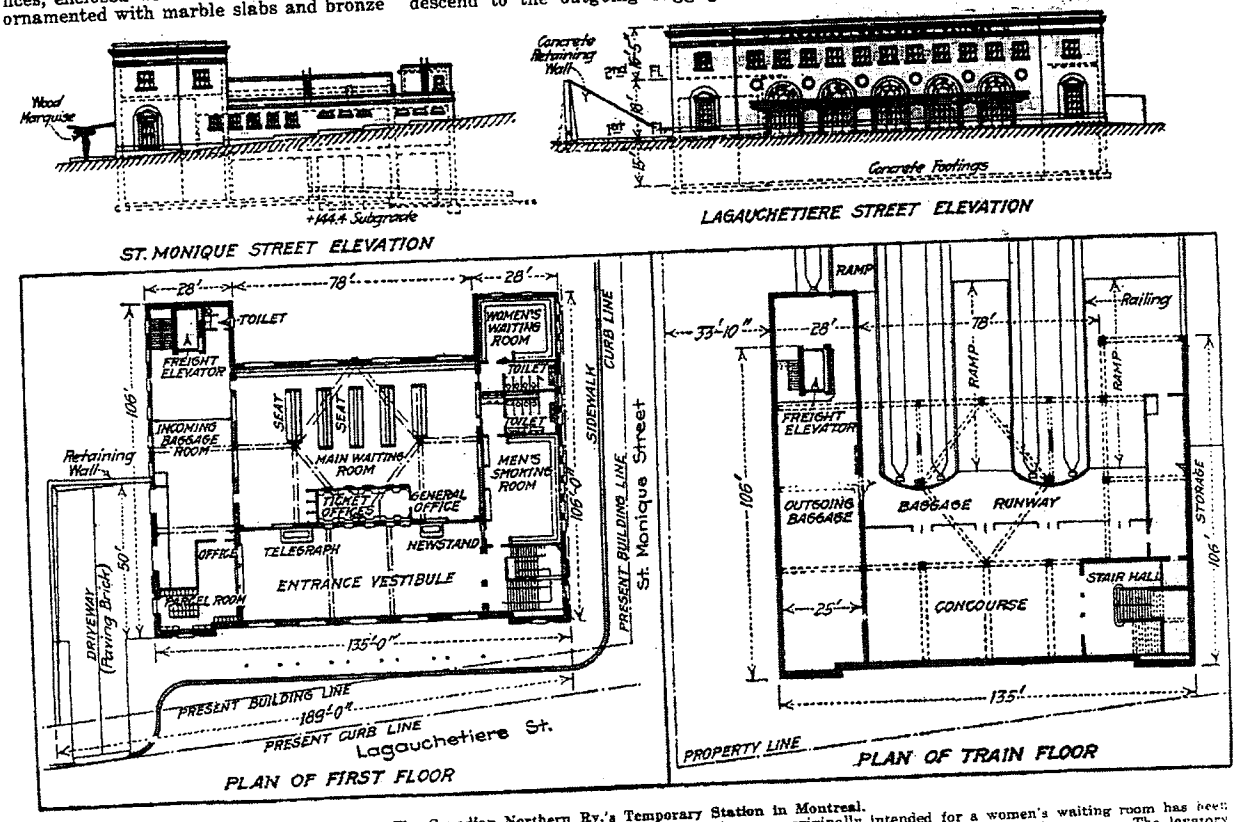
The Canadian Northern Ry.'s temporary station in Montreal. Rotunda and ticket wickets to left, waiting room to right.

the beams of the ceiling radiating from the column heads, forming a diamond pattern. Between the main waiting room and the entrance vestibule are ticket offices, enclosed with terra cotta walls and ornamented with marble slabs and bronze grilles. In the main waiting room the seats are of the latest model, placed back to back, with a radiator between each pair. This will give an efficient heating system and at the same time all the radiators are concealed. Along the tops of the seats are lines of electric lights with reflectors.

At the left of the main waiting room is the incoming baggage room, with an area of 2,100 sq. ft. As before stated, this room has two large doors opening out on the wagon court, and at the extreme rear there is a freight elevator, large enough to receive trucks, which will descend to the outgoing baggage room, immediately below, at the train level. There is a staircase in the incoming baggage room, which also leads down to the train level.

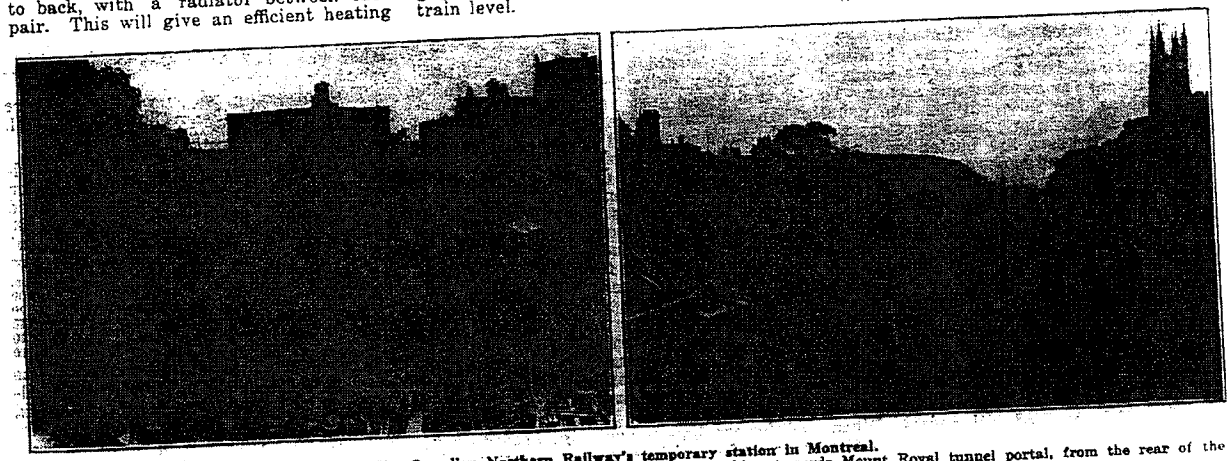
Opposite the incoming baggage room, at the right of the main waiting room, are the men's smoking room and the women's waiting room, with lavatories between. Both of these rooms have windows facing on St. Monique St. They are good sized compartments, with seats arranged around the walls, the radiators being concealed in recesses behind the seats. There are drinking fountains in the main waiting room, women's waiting room, and the men's smoking room, to supply iced water.

From the women's waiting room are doors leading to the entrance vestibule and to the staircase hall. This hall, at the right hand end of the entrance vestibule contains broad concrete stairs, leading to the train level, and a narrower staircase to the offices on the second floor. Descending the staircase, the passenger will arrive in the lower staircase hall, which in turn opens to the concourse. The con-



The Canadian Northern Ry.'s Temporary Station in Montreal.

Since the plan shown above, in the lower left hand corner of the group, was made, the space originally intended for a women's waiting room has been made into a men's smoking room, and the space originally intended for a men's smoking room has been made into a women's waiting room. The lavatory arrangements, as shown on the plan, have been reversed.



The Canadian Northern Railway's temporary station in Montreal.

The left view shows the rear of the station, from Dorchester St. Bridge, the right view is looking towards Mount Royal tunnel portal, from the rear of the station.

course contains approximately 3,500 sq. ft., and is separated from the train room by an iron and glass screen, immediately inside of which is the baggage runway, connecting to the outgoing baggage room at the left. The outgoing baggage room is immediately below the incoming baggage room on the first floor, and is of the same dimensions, and as previously stated, is connected with it by a staircase and large freight elevator.

There are five tracks arranged in the present construction. From the baggage runway, ramps with a grade of 5% descend to the platform level.

To the right of the baggage runway are the machinery and storage rooms, and here are installed the apparatus for heating the water supply to the lavatories and cooling the drinking water. The heating plant for the building is installed in a separate structure behind the outgoing baggage room.

Along the Lagauchetiere St. front, on the second floor level, is approximately 4,000 sq. ft. of office space, which is to be subdivided later when its uses are determined. On this floor are lavatories and other facilities required for use of the office staff.

Passenger Car Cleaning on the Canadian Pacific Railway.

Canadian Railway and Marine World

January, 1919

The Canadian Northern Railway's Montreal Tunnel From an Economic Point of View.

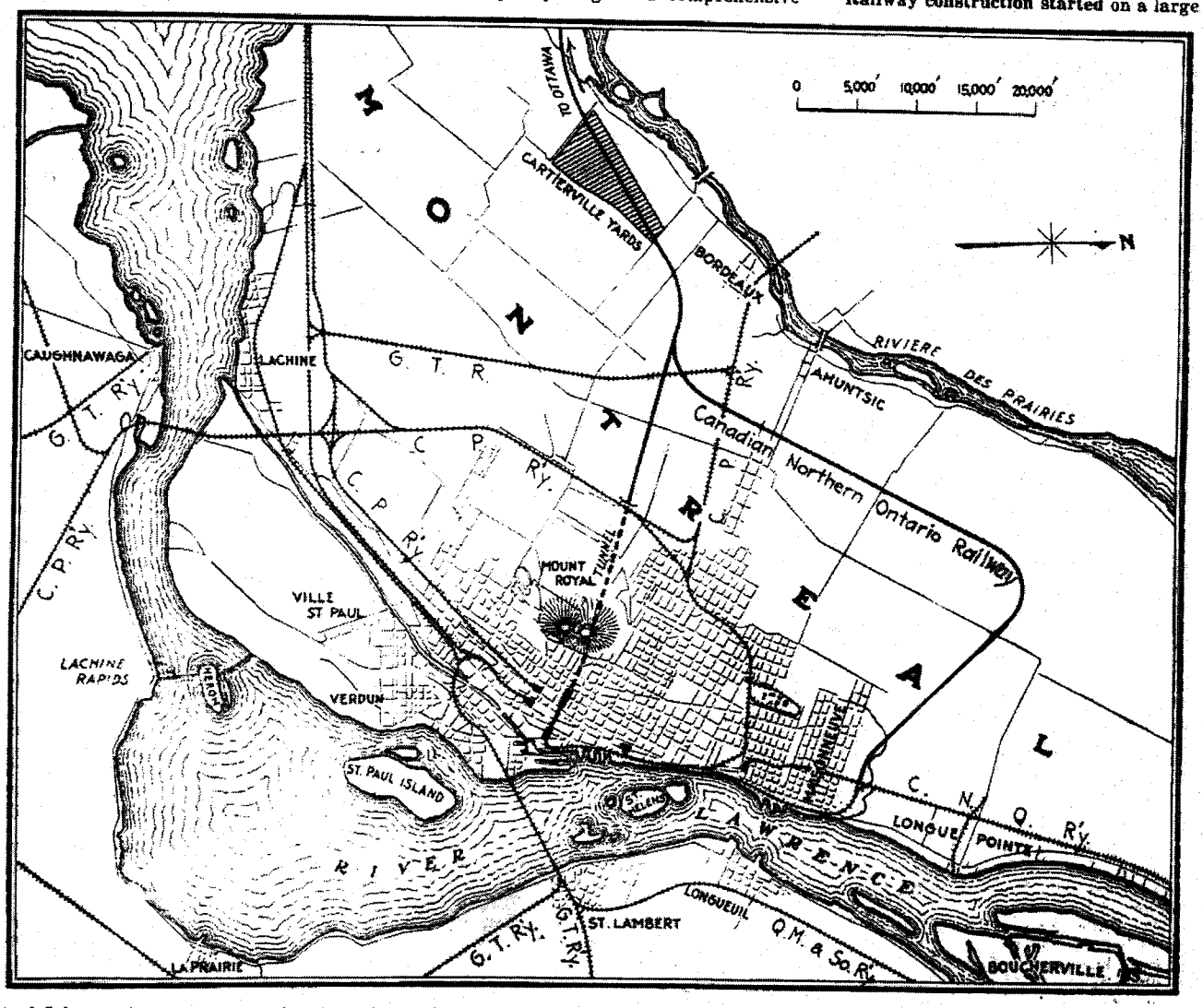
By H. K. Wicksteed, B.A.Sc., C.E.

This paper has been written in response to a very kind invitation to give something of interest in connection with the history of the Montreal tunnel. What were the considerations which led up to it, and made it seem a practical scheme? As the Canadian Northern Passenger Department has put it in its window dressing, "Why was the tunnel built?" And I have given my paper the title of "The Montreal tunnel from an economic point of view."

With the actual construction of the tunnel I do not propose to deal to any greater extent than is necessary to enable you to understand the problem, not because there were not a great number of intensely interesting points about it, and not because I was not in the tunnel a great many times during its progress, but because the construction side has been dealt with very ably by my colleague, S. P. Brown, and I believe is to be dealt with further by one of his assistants, J. L. Busfield, and they are both better posted in details of it than I. Mr. Brown has made tunnelling a specialty, and his whole soul was in his work, and I may say that it is a pretty large and comprehensive soul.

Both by temperament and training, it is the economic side of things which has always appealed to me most. Railways are commercial concerns, and the tunnel is an essential part of a great railway. If it cannot be justified in a commercial sense, if it cannot pay interest on its cost, it has no right to exist. This economic aspect of engineering works has come into great prominence of late years, and notably since the introduction of railways. Nearly all our great tunnels have been built to carry railways past, or under, obstructions of one kind or another, so that the history of tunnelling is almost altogether confined to the last 70 or 80 years, and most of the great tunnels are much younger than that.

Railway construction started on a large scale first in England, where population was already dense, and traffic was waiting to be carried in large volume. A railway once built, even on what we should now consider very crude lines, was practically sure of paying its way from the very start, and the cost was a minor consideration as soon as the potentialities of the steam railway came to be understood. It was when the building of railways extended to this continent of great dis-



tances, and at the same time sparse population, that it was found that not only were fixed charges a very heavy drain on railway earnings, but that capital was very hard to get in any case, and had to be brought in from outside, hence the difference in cost between the early American roads and the English ones, and the expedients of sharp curvature, heavy grades, and cheap construction, which were used to reduce the capital cost; and hence the fact that so much English capital went into American roads. As time went on, and the traffic became heavier, and as, too, other lines were built between the same termini and competition became keen, there came the era when the balancing of cost against more perfect location and construction began to be a regular study, and while I think a good many of the earlier engineers, Latrobe, for instance, had thought a good deal about these matters (their works shewed that they did), it was Wellington who first committed his ideas to paper, and his writings are still useful as well as monumental.

The element of location, which conduces more than any other to reduce the cost of haul, is, of course, that of gradients, and in reducing gradients in rough country there is very often a strong temptation, less often an absolute necessity, to resort to tunnelling. Hence nearly all our tunnels are in the two great mountain ranges of the continent, one east and the other west of the Mississippi River. There are a few, however, on this continent, for the construction of which there are other or contributing causes; and a great many on the other side of the Atlantic, cases where property damage was to be avoided at almost any cost, or where navigation interests were paramount, and a tunnel was more practicable than a high level bridge. The Detroit-Sarnia and Hudson River tunnels are instances of the latter class, and the Baltimore and Washington tunnels are instances of the former, and to this class our own Montreal tunnel also properly belongs.

Towards the close of 1906, more than 12 years ago, I was instructed to commence surveys and location for the Canadian Northern Ry. from Montreal westward, primarily to the Georgian Bay, and eventually, as it turned out, to Port Arthur, to connect with the western system, which had already developed to very considerable proportions. My headquarters were at that time in Montreal, so that it was natural that a great deal of my spare time should be devoted to what was in any case the problem of greatest interest and best worth studying out. Montreal and its problems and growth were not a new matter to me, for I had spent three years of my earlier life at McGill University, had geologized on Montreal Mountain with Sir William Dawson, and one of my closest friends was a prominent business man and an ex-mayor of Westmount.

The Canadian Northern, two or three years before, had purchased and completed the Chateauguay & Northern Ry. from Hochelaga to Joliette, and about the same time acquired the Great Northern Ry. of Canada, extending from Hawkesbury to Riviere a Pierre on the Quebec & Lake St. John Ry., which constituted a sort of overflow system by which part of the grain brought from Parry Sound by the Canada Atlantic found its way to an elevator in Quebec. The Superintendent of this eastern system was offered one of the farms near Longue Pointe, and we combined to purchase this for the railway, and by this means secured an approach to the river front, and within a very short time thereafter, a connection with the Harbor Commissioners' tracks. This had already secured for the road an ocean terminal, and it developed later that from this farm, now the Longue Pointe yard (and a very busy yard indeed), there extended a very marked depression clear across the island to the Riviere des Prairies, and the only one of its kind between Racine and Bout de l'Isle. Everywhere else there was a high, broad-backed ridge of limestone to the north of the mountain itself, and to the south a long talus slope of sand and glacial drift.

The Northern Colonization Ry., afterwards the Quebec, Montreal & Occidental Ry., and now part of the C.N.R., climbed over the top of the limestone at Mile End, at an elevation of 200 ft. above the river, and down again with a very strenuous grade of 90 ft. to the mile, to Hochelaga. The Ontario & Quebec Ry., the C.P.R.'s entry from the southwest, climbed over talus debris, and dropped similarly, although not so viciously, to the Windsor St. Station.

Our discovery gave us an entry somewhat circuitous, it is true, but with a short maximum grade of 30 ft. to the mile.

This, then, was the obvious route for a freight line from the west to Montreal harbor, and it must be remembered that the C.N.R. was at that time purely a granger road and interested almost exclusively in the hauling of wheat to the seaboard. Here, therefore, was the starting point of the survey to Port Arthur, and we still hope to see this line built at a very early date. The surveys west showed that an excellent line could be had north of the Great Lakes to Port Arthur at moderate cost; in proportion to cost probably the best long distance one in the world. The Pacific coast extension also gave wonderful results, and the system promised to be easily the best of all the transcontinental lines on this continent or any other. While, however, this arrangement was entirely satisfactory as regards through freight traffic to and from the west, it did not meet the requirements of the local traffic, both passenger and freight, of the city itself. Moreover, a transcontinental, such as that described, must of necessity have a suitable terminal in the eastern metropolis to make it complete and well balanced, and this became the new study of the location staff.

Montreal proper, as everyone knows and many have said, is wedged in between the river and the mountain, on a narrow strip of territory consisting first of a river flat half a mile wide, and farther back a terrace 70 ft. higher, and of about the same width, extending to the mountain slope. Up to 30 years ago the site was an ideal one for a city of moderate size, although even then it was remarkable among American cities for its density of population. While Toronto was building up, with detached houses with lawns and gardens, Montreal adhered to long terraces of houses of grey limestone, built right up to the street, and extending for miles almost without a break. Only on the slopes of the mountain the "seats of the mighty," of the Allans, the Redpaths, the Angus's, and other merchant princes showed more attractive surroundings, even if built on a sharp slope. Westmount was then in its infancy and was deterred in its growth by the long distances from the commercial center of the city.

Thirty years ago was marked by the advent of the C.P.R. and the selection of Montreal as its headquarters. Montreal began to grow very rapidly indeed, and is said to be increasing in population nearly 10% a year, and has now a population of over 800,000. Montreal a few years ago had an area of 19 square miles, and a population of 580,000. Cleveland, with about the same population, occupied 45 square miles; Boston, with 670,000, covered 43 square miles. Between 1900 and 1910 Montreal added 10,000 people to each square mile, New York only 4,000, and Chicago only 2,500. Montreal, to use the words of a writer in an American paper, was "choking to death for want of room." In its efforts to find this it has extended down the river almost to Bout de l'Isle, and upward almost to Lachine, and answers much more closely even than Duluth itself, to the Eastern Yankee's description of that city as being "25 miles long, a mile wide, and pretty nearly a mile high."

The long-sighted men, my business friend for one, and Sir Wm. Van Horne for another, had repeatedly cast wistful and prophetic eyes towards the hinterland, "the great beyond" on the other side of the mountain. The Montreal Tramways Co. built a line around it, and Sir William suggested a tunnel of about 1,000 ft. to reduce the extreme summit of the Cote des Neiges hill. Only at one point had any actual expansion in this direction taken place, and this was largely due to the C.P.R. Mile End station and the Tramways Co.'s extensions to it. This was along the extensions of St. Lawrence, Main and St. Denis Streets, and later of Park Ave. This question of city expansion was one consideration which led to the conception and inception of the Montreal tunnel, but it was not by any means the only, or the principal one.

Topography.—To most Canadians the mention of the St. Lawrence suggests a river running east and west. It carries east and west commerce, and Sault Ste. Marie is pretty nearly due west of Montreal, and Port Arthur only three degrees farther north; but the St. Lawrence proper, from Lake Ontario to the sea, flows northeast, and at Montreal it runs almost due north and south. It is the Ottawa which is the east and west river, and it is the Ottawa valley which has been in the past the great highway of commerce, and which has resumed this place as the route of the two transcontinental roads. The result is that the direct route from the heart of Montreal to the west, lies directly through the mountain, and almost at right angles to the river and the great thoroughfares of St. Catherine, St. James and Notre Dame Streets, which parallel it. As grade separation was an essential feature of any terminal scheme, this was a very important consideration.

Three railways had already entered Montreal from the west. The Grand Trunk entered it when the problem was a comparatively simple one. The Victoria bridge was located at what was considered the best point for a bridge, as was the St. Anne's bridge over the Ottawa. The intermediate line was built as directly as possible between them, and one of the pioneer roads of Canada, the Lachine Portage Ry., was used as an approach to a dead end station in the outskirts of the city at that time. The main line did not touch Montreal as it then existed.

Thirty years later, the Northern Colonization Ry. was built from Ottawa, and it climbed over the northern toe of the mountain as already described, and entered the extreme northern end of the city, and, after absorption by the C.P.R.,

the Place Viger station. Ten years later still came the Ontario & Quebec Ry., which paralleled the Grand Trunk from Vaudreuil to Dorval, and then rose over the terrace and followed along its edge to the present Windsor St. station. What the governing ideas were in selecting this location I can only guess, having never met the designer, but a desire to eliminate property damages and grade crossings as far as possible is evident, and the solution has been accomplished in a very clever way. It is on the whole a very satisfactory entry, but the C.P.R. is under the disadvantage, with the double approach, of having to keep up two separate terminals and a great number of passengers have to travel across town from one to the other, in coming, for example, from Quebec to Toronto. It may almost be said that there are three terminals, for the Mile End station is getting to be very popular with short distance passengers to and from the north and west. The Windsor St. approach is very interesting, not only as a very good piece of work, but as showing the development of railway ideals, and the demands of the public in respect of abolition of crossings and concealment and suppression of smoke and noise.

Advent of C.N.R.—Nearly 30 years after the C.P.R. comes the Canadian Northern. Thirty years makes a great difference in a problem of this kind. Land values have grown prodigiously in the meantime, due to the ever increasing congestion. And the education of the public, assisted by a railway commission anxious to please it, has gone on apace. Grade separation has become absolutely essential, and the absolute abolition of smoke and noise almost so. At the same time, and from the railway point of view, passenger trains have become longer and heavier, and harder to haul, so that grades must be flattened to the utmost, especially in regard to starting and stopping. Maintenance of way and operating expenses have been increasing in a much faster ratio than the corresponding passenger rates and receipts. Only the increasing volume of traffic, offset the growing discrepancy, and served to stave off the bankruptcy of the railways.

The passenger business alone was not the only thing to be considered. The Grand Trunk, during its 60 years of occupancy, and the C.P.R. during its shorter term of existence, had surrounded and honeycombed Montreal with a network of industrial spurs, sidings, and yards, in every direction. The Canadian Northern had only one small yard in the extreme north end, and its connection on the same terms as the other lines with the Harbor Commissioners' tracks for overseas business. But business to and from the local industries, the wholesale houses, cold storage plants, etc., etc., has to be hauled from 3 to 5 miles by motor trucks to Moreau St. The handicap is altogether too great. In the district bounded by McGill St., the Lachine Canal, Windsor St. produced, and Lagauchetiere St. alone, there are something like 150 of these smaller industries and plants, and a great many more within a mile radius of the Haymarket Square. Passenger business may perhaps be described as the spiritual and intellectual function of the railway body corporate, but freight is the wholesome and nourishing food which enables it to do its work and carry on its functions. The passenger service is the side which appeals to the ordinary layman passenger, just as a man's face and bearing does to a new acquaintance, but he cannot keep up the prepossessing appearance unless he has his stomach full, and some little money in his pocket.

We have here a number of essentials to be provided for and a still greater number of desiderata, also many things to avoid. The most important necessity of all at the moment perhaps was the finding of the necessary capital. Railway terminals are expensive things at the best, and this was an era of extravagance in this respect. The Pennsylvania had spent many millions on its New York entry. The New York Central was following suit with a magnificent scheme, better balanced financially, but still enormously expensive. Kansas City was building a joint $45,000,000 terminal, and St. Paul was considering a scheme which involved encroachment on the rights of its very respectable and oldest citizen, the Mississippi River—almost as old and respectable as the Montreal mountain itself, although somewhat dirtier. But these were all in connection with roads of long standing and financial strength. They were improvements and consolidations rather than new schemes. The Canadian Northern, while it had been earning at a great rate, was also extending and building equally fast, and had largely discounted its future in its borrowings. Even in a growing northwest, it takes some months before a new piece of road can earn its own living, and some of the C.N.R. construction was of a nature and through such country as could not be expected to yield any adequate income except as part of the completed system.

The most obvious route was to parallel the two older roads and it was very seriously proposed, but the writer for one never took to the proposition. It was neither the inexpensive route of the older Grand Trunk, nor could the very neat grade separations which the C.P.R. effected 30 years ago be repeated and duplicated. The C.P.R. line had been badly bent in order to effect its entry. Everything pointed to the north, instead of the south shore of the Ottawa, as being the Canadian Northern's proper route, and in this case the bend would become a right angle elbow. The right of way would be absolute destruction for 2 miles or more, and grade separation could be effected only by a continuous track elevation for the same distance. It would have been plagiarism of the worst and most expensive type. It was proposed to join with the Grand Trunk, but this would merely have mitigated some of the evils of parallelism, not removed them, and the Canadian Northern would have lost its identity and its independence at a most important point, and neither of these propositions would have been any solution of the freight problem.

The tunnel was the obvious solution of the whole question, and it was adopted by the writer at a very early stage, but how was the money to be found? Here came in the question of expansion, of a greater Montreal. The piercing of the mountain, the inauguration of a fast and frequent electric service through it, would vastly enhance the value of the inaccessible lands beyond. Thousands of acres, sloping gently towards the Back River, were available, if they were once brought within easy reach of the business and shopping district. As soon as the programme was announced, real estate men would quickly absorb all the available land, subdivide it and sell at enormous profit. Why should not a syndicate be formed which would take this part of the business out of the hands of the real estate men, buy up the land and out of the prospective profits finance the construction of the tunnel? The idea once suggested took root, and some of the great financiers of the world became directly interested in it, and the idea of the tunnel entrance became an established one.

But this merely fixed the principle of the tunnel, not the line of it, and there were several lines suggested other than that adopted. A line just south of Park Ave. was strongly advocated, the reason given being that it would be closer to the surface and much of it could be built by the cut-and-cover method. It was pointed out in rebuttal that this would disorganize all the underground economy of the district, sewers, water pipes, and gas, and that the streets would be impassable and the abutting properly uninhabitable during the whole time of construction, unless the enormously costly methods of of the New York subway were adopted. So far from being an extravagance, the bold line under the highest part of the mountain was the cheapest, in that it avoided all property damage, except for about 2,000 ft. on the city end.

This argument prevailed finally and the bolder line was adopted, but there was still a good deal of latitude in the choice of line. At the west end a long strip of property was offered, reaching nearly to the Back River. It so happened that on this property was the best point at which to cross the C.P.R.'s Atlantic and North Western line, so this end was promptly and satisfactorily settled. The east end was the subject of longer debate and some warmth of argument. Most English-speaking people think of Montreal as extending from the mountain to Dorchester St., and from Park Ave. to the confines of Westmount, with an addition for business purposes extending east and south for half a mile from the Place d'Armes, and of St. Catherine St. as being the main and only important artery. This is only a small part of Montreal in reality, but the conviction in the Anglo-Saxon mind that this is Montreal the whole of Montreal, and nothing but Montreal, is almost as fixed and ineradicable as the Englishman's idea that the whole world is centered about his own tight little island. As a result of this obsession, it was difficult to get any site off St. Catherine St. even seriously considered. A line near University Ave. was actually adopted, and abandoned only when it was shown that this was of no use except for purely passenger business, that there was no chance for extension eastward, and that it must for all time to come remain a dead end branch 6 miles long, and worse in this respect than either the C.P.R. or the G.T.R.

Finally, the present line was adopted mainly for the reasons that it gave a continuous line from the mountain to the water front, with opportunity to connect with the Harbor Commissioners' tracks and through them with the system extending to Quebec and Chicoutimi; that in doing this it passed through some of the best freight producing districts in Montreal, and that it did all this with a minimum of property damage and with an absolute avoidance of grade crossings or even distortion of street grades. There is, further, an avowed intention on the part of the Harbor Commission to build a dam across the river to St. Helen's Island and a bridge from it to the east shore, which will furnish a route for such roadways and railways as care to avail themselves of it. It is more than probable that the Quebec, Montreal & South-

ern and the Intercolonial will avail themselves of the chance, for the Grand Trunk's great bridge is already congested and overcrowded, but this is a matter for the future.

The choice of a station site on this route was another matter of debate, which it is somewhat irrelevant to go into now. The choice, for the present at any rate, is on Lagauchetiere St. within easy reach of Dorchester St., but not so far below the surface as the latter.

Grades Through Tunnel.—Closely allied to the question of alignment and in some respects even more important is that of grades. I have already alluded to the increasing length and weight of passenger trains. The C.N.R.'s standard transcontinental train averages 11 cars, and with this its Pacific type locomotives get over the 1% grades of the Lake Superior Division with reasonable ease. On the other hand, if the grade is flattened too much, on a long tunnel and approach such as this, trouble with drainage is apt to occur, especially in winter. The grade through the tunnel is 6/10 of 1%, or 32 ft. per mile, and is continuous from end to end; the west portal being thus 100 ft. higher than the east. From the west portal the same rate of grade carries us down through the Model City for nearly the same distance. The long cutting on the west approach, was introduced with a purpose, viz.: to allow the civic expansion to go on overhead without too much distortion of street grades.

In consideration of the electrical operation, the headroom required under the bridges was reduced from the regulation 22½ ft. to 16½ ft., and the problem of grade separation rendered so much the easier of accomplishment. Near Cartierville the Montreal Park & Island Ry., and a main road alongside it, have been carried underneath. Absolute grade separation is thus secured, not only through the city itself and its transmontane annex, but for the entire length of the electric zone, nearly 9 miles, and Cartierville, a promising suburban settlement on the bank of the Riviere des Prairies, is now brought within 18 or 20 minutes of the heart of the city.

The tunnel itself is a very interesting one and ranks among the great tunnels of the world, being 3.25 miles long. Only the three great Alpine tunnels, the Mount Cenis, the St. Gothard, and the Simplon, completely eclipse it in length, and there is only one in Canada which is longer, the C.P.R. Rogers Pass tunnel. It was predicted beforehand that the difficulties would be comparatively few, and so it turned out. Very little water was met with, and this where it was expected, near the west portal, at the contact between the limestone and the older rocks on which it rests unconformably. The core of the mountain was almost exclusively Essexite, a basaltic volcanic rock, somewhat hard to drill, but otherwise quite unobjectionable.

It was at first thought that most of it would not require lining, and had it been a steam operated road in the open country, it is quite probable that very little lining would have been put in, but its nearness to the terminal, and the adoption of the trolley system, which meant support from the roof, made even a small fall a very serious matter, as it would both delay and endanger the traffic. Some little seaminess and disintegration showed itself after exposure to the air, and in the end it was all lined with a thin sheeting of concrete, except about 1,000 ft. This applies to the rock section.

For something over half a mile at the city, or east, end, the roof ran into clay, although the bottom and most of the wall remained in limestone. This clay was known beforehand to exist, and it is of a very plastic and semifluid formation and contains numerous shells such as now exist in northern seas. On account of its semi-fluid nature, and because this section led under streets and close to the foundations of buildings, it was decided to take this out under a shield protection, the shield being followed up with an arch of concrete blocks pre-cast in voussoir shape.

Practically no leakage, even of water, was ever visible during the progress of the work, and yet considerable settlement of the street overhead took place. Probably the moisture evaporated and escaped as invisible vapor. A great many of the houses had been set down on this soft clay and had suffered from settlement before the work was started; the further settlement was therefore of less consequence than it would otherwise have been. Through this section the individual tracks are carried in separate tunnels with a thin wall between them. The same is true of a few hundred feet at the West Portal, but the body of the tube is a single opening.

The heading was a "bottom" one 8 x 12 ft. and was put through with very good speed. For a time, in fact, the American record for hard rock tunnelling was broken by an average advance of 26 ft. a day for a whole month. As soon as a sufficient advance had been made, the enlargement to full section was commenced, the arch being taken out first, and the two "benches" afterwards.

As the east end is in the city and there was no means of getting rid of large quantities of material except by teaming for several miles, this work had to be done from the west end, and for this reason the heading was driven faster from this end, and this meant working down hill. Under these circumstances the small flow of water was particularly fortunate, as the amount of pumping was small.

Shafts.—In order to expedite the work, a shaft was sunk 250 ft. one mile from the west end. This made it possible to follow up with the enlargement on the westerly mile without interference from the heading from the shaft, but as a matter of fact the rapid progress of the heading was to a large extent wasted, because the war intervened, and work on the enlargement was impeded by the difficulty in finding the necessary capital to carry it on. The shaft was, however, designed to carry an elevator in the future to a substation at its foot, and with this in view, was sunk to one side of the center line of the tunnel. This, as may be imagined, greatly increased the difficulty of alignment of the tunnel. To offset a line on the surface, to two plumb lines, only some 12 ft. apart and 250 ft. long, and then offset this line again at the bottom of the shaft, was an operation requiring care and patience, but it was accomplished without appreciable error by H. T. Fisher and his staff. A second shaft was sunk, some 70 ft. just to the north of Sherbrooke St., and at the bottom of this the shield was put together. A third shaft was projected at Pine Ave., but considerable opposition was met with from the wealthy residents of the neighborhood, and it was abandoned, and undoubtedly the advantage from it would merely have expedited the driving of the heading, not of the completed tunnel. A fourth shaft was sunk on Dorchester St., and it was from this that a large quantity of material was removed, because there happened to be a very large and almost vacant piece of property at this point, on which material could be wasted for the time being, until the tunnel became available for hauling it away.

Anecdotes.—Mr. Brown, in his enthusiastic belief in and support of everything connected with the tunnel working, got into some rather amusing situations which he relates himself with considerable humor. On one occasion he was dining in a house almost over the line of the tunnel, and his host took occasion to remonstrate against the heavy blasting which sometimes shook the house and made his women folk nervous. Brown assured him that this had been stopped altogether and only the lightest of charges were being used, and especially at night. Just then a tremendous shot was fired, and all the front windows were smashed. It was a very embarrassing moment, and Brown had some difficulty in preserving his dignity and his host's respect.

On another occasion a discussion arose with reference to the effect of the vibration, occasioned by moving trains on some of the delicate instruments in McGill University, which is almost immediately over the line of the tunnel; the seismograph, for instance, which is intended expressly for recording terrestrial vibrations. Brown stoutly maintained that there would be no effect whatever, and that in New York a similar instrument near the subway had taken less notice of the blasting and the subsequent train running, than it had of the San Francisco earthquake 3,000 miles away. He suggested that the instrument be set up in a basement on McGill College Ave. while a blast was being fired, and they would see for themselves how absurdly small the effect was. The suggestion was acted on, the instrument set up, the blast was fired, and the seismograph went out of business altogether.

Reasons for Electrification.—As mentioned previously, the tunnel was planned from the beginning for electric traction. No effort was made to avoid the inevitable in this respect. It was felt that while very much cheaper in initial cost, a steam service through such a long tunnel would not be popular with the public; fans and artificial ventilation would have to be installed, and that even outside the tunnel, on the city end, there would be a strong opposition to steam operation over the streets, and justly so, for Montreal is already more saturated with coal smoke than even Toronto.

Some will remember the fatal disaster in the St. Clair tunnel, when it was operated by steam locomotives, although this is not much more than one-third the length of the Montreal one. Some minor mishap necessitated a stop at the lowest point in the tunnel, and some of the train hands were asphyxiated by the waste gases from the locomotive before help could be got to them. Even on a passenger train, although the trip lasted a very few minutes, there was a certain sense of suffocation and a feeling of relief when the trip was over. This accident precipitated the inevitable change to electric traction, and in the case of the Pennsylvania and Detroit tunnels, electricity was installed from the very first.

In the Montreal tunnel, in actual experience, the air is just as fresh as it is outside, and there is quite a marked natural circulation through it. The air at the city end is nearly always warmer than that at the west, or country, end, and

side of these machines. The shunt fields of the d.c. generators and the synchronous motor fields are arranged for 125 volt excitation. Each of the synchronous motors is started by a 3 phase, 11,000 volt compensator. This auto transformer has one coil per phase, with suitable starting taps brought out.

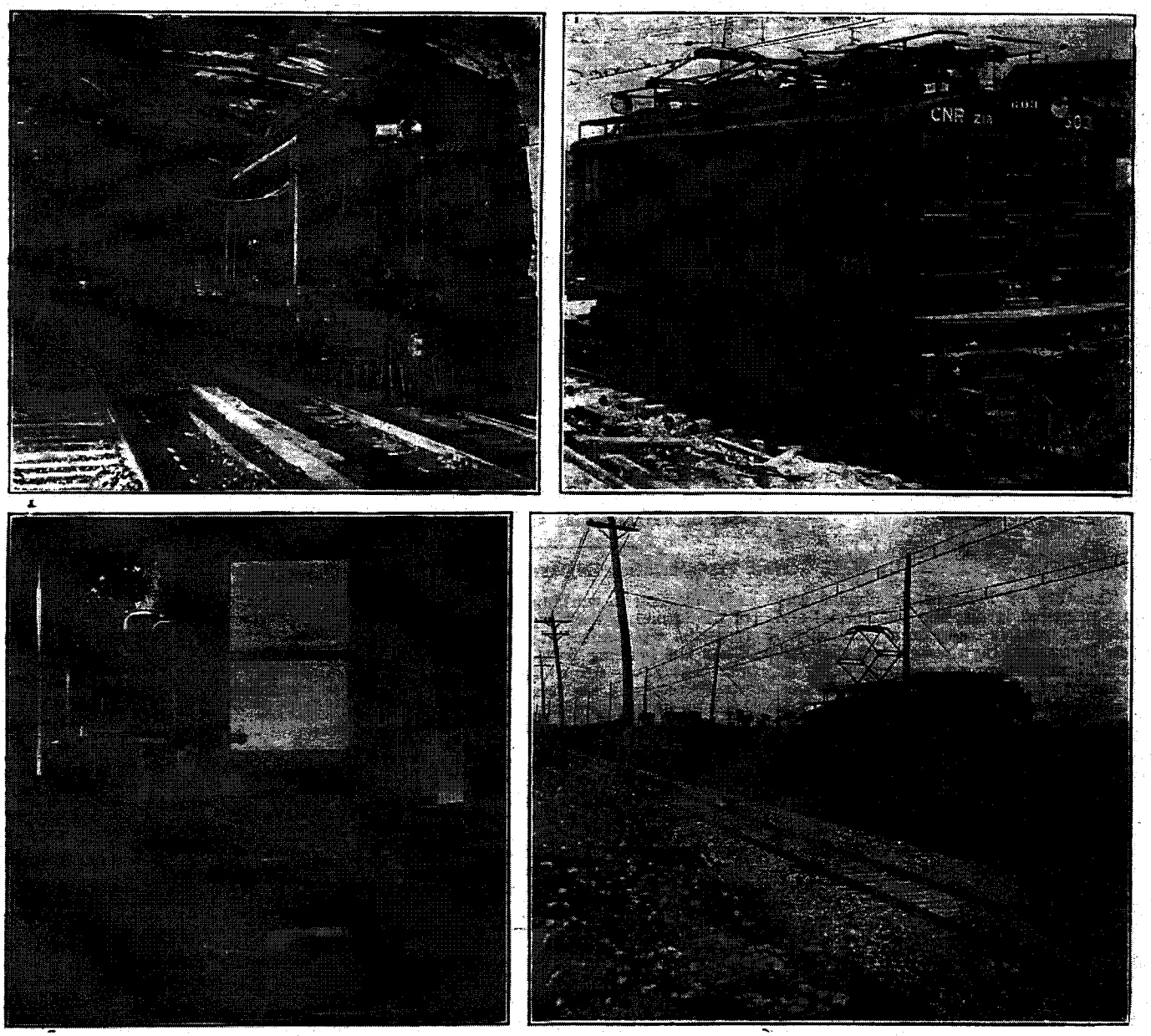
The 3 exciter sets each consist of a 50 k.w., 125 volt, d.c. generator, driven by induction motor. The generators are commutating pole type, flat compounded for the specified voltage, and are especially adapted for exciter work and voltage regulator control. A bank of six 100 k.w. single phase transformers supply the induction motors of the exciter sets and miscellaneous station requirements.

All oil switches on the 11,000 volt circuits, except the synchronous motor, magnetizing and starting switches, are enclosed in masonry cells, and have 2 breaks per pole, each break in a separate tank. These switches have a rupturing capacity of 16,000 arc amperes at 11,000 volts. They are motor operated and will open automatically on overload, the incoming line switches excepted, either instantaneously or with a time limit action as desired. The incoming line switches operate automatically on the reversal of power only. The synchronous motor starting switches are remote control, solenoid operated, mounted in cells, and have a rupturing capacity of 2,000 arc amperes at 11,000 volts.

The main switchboard is of three section panels of natural black slate, 90 inches high. The 2,400 volt direct current circuit breakers and lever switches are mounted on a panel, back of and above the main switchboard. They are operated by insulated handles on the front of the main board, so as to eliminate any possibility of the operator coming in contact with the 2,400 volt circuit. The circuit breakers are mounted between fireproof barriers and are equipped with powerful magnetic blowouts. The field switches are mounted on a base back of the panels with the operating handles on the front of the main board.

There are 6 locomotives in operation. Each locomotive has 4 axles, with all the weight of the locomotive upon the 8 driving wheels. The running gear consists of two 4-wheel trucks, articulated together by a heavy hinge. The equalization of the trucks is accomplished by a semi-elliptic leaf spring over each journal box, connected through spring hangers to the frame and to the equalizer bars. The equivalent of a 3-point suspension is thus obtained through the side equalization of one of the trucks and both side and cross equalization of the other truck.

The friction draft gear is mounted in the end frame casting of the truck. This type of construction restricts the hauling and buffing stresses to the truck side frames and articulated joint, thus relieving the cab and apparatus from the effects of severe shocks. The cab, which is of the box type, is divided into 3 compartments, the center one for the apparatus, and the two end ones for the operator. Each operator's compartment is supplied with controller, control switches, ammeter, air brake and pantograph control, air gauges, 2,400-volt cab heater, bell rope, and control for the whistle and



Montreal Terminals Electrification, Canadian Northern Railway.

Upper row: Left, locomotive pulling in messenger and taking current from opposite track. Right, locomotive with low catenary construction. Lower row: Left, control apparatus in operator's cab. Right, catenary construction tangents.

sanders, thus providing the locomotive with complete double end control. The motors are nose-supported in the usual way, and geared to the axle by twin gears, each of 4 in. face.

The motor equipment consists of 4 GE-229-A commutating pole motors, wound for 1,200 volts and insulated for 2,400 volts, 2 of these motors being permanently connected in series for operating on the 2,400 volt trolley circuit. The one hour rating of each motor is 320 h.p. at 1,200 volts. The motors are designed for forced ventilation, which is obtained by a blower in the locomotive cab. Either pair of motors may be cut out, by a special handle on the change-over switch. The locomotives are geared for a free running speed on tangent level track of approximately 45 m.p.h., and are operated as 2-speed machines, with 10 points in series and 9 points in series and 9 points in series-parallel. The master controller used is of the non-automatic type, and has 2 handles, one regulating the applied voltage at the motors and the other for controlling the direction of rotation of the motors. The rheostats, which form the external motor resistance, are placed near the roof of the cab and provided with ample natural ventilation.

The master controller and contactor energizing circuits are designed for 125 volts. Each contactor is easily accessible, without any disturbance to adjacent contactors. A special electro-pneumatic, change-over switch is used for making the transition between series and series-parallel connection of the pair of motors. The 125 volt current for operating the contactors and for lighting the cab and headlights is obtained from a motor-generator set, the motor of which has two 1,200 volt windings and two 1,200 volt commutators in series for operation on 2,400 volts. This set is mounted in the center cab and also drives the blower for providing forced ventilation to the main motors.

Fuses of the copper ribbon type, placed in fuse boxes, provide protection for each individual circuit, as well as the main circuit from the trolley. These fuse boxes are all arranged to blow into a common chamber, designed to take care of the arc. In addition to the fuse on the main circuit, a main switch is also provided. This is of the knife blade type, being opened and closed by a handle, in a position for easy operation in case of emergency, or when it might be necessary to open the circuit while carrying current. This main switch blows into the chamber provided for the fuses, and has a powerful magnetic blow-out.

The trolleys are of the slider pantograph type, pneumatically operated and mounted on insulated bases. Two pantographs are used per locomotive.

A speedometer, similar to the type largely used on automobiles, but especially designed for locomotives, is located in each operating cab. These are connected to the driving wheels of the locomotive by flexible shaft and gearing.

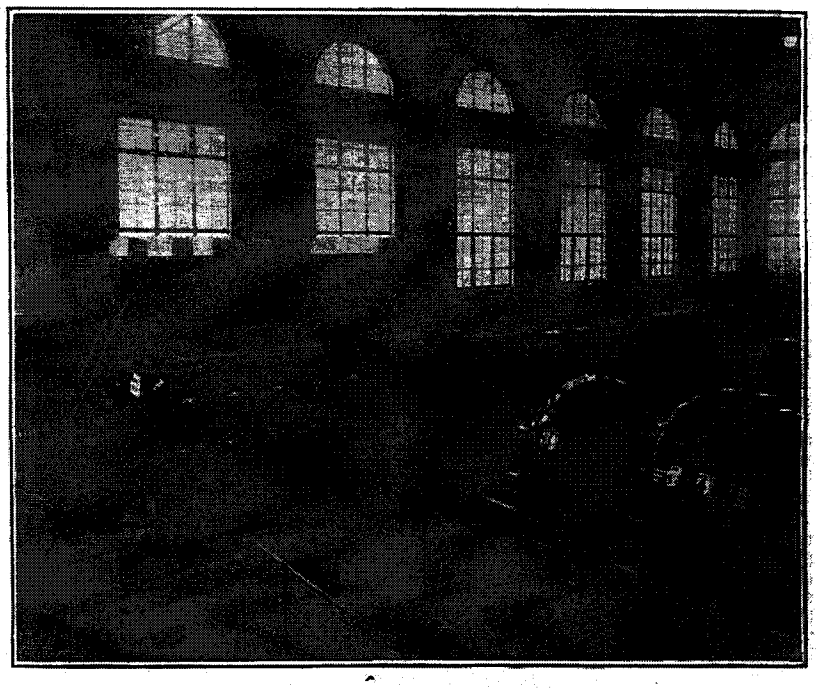
A combined straight and automatic air-brake equipment is provided on each locomotive. It includes a 2,400 volt motor driven air compressor, the set consisting of two 1,200 volt motors, operating in series on 2,400 volts, and direct connected to an air compressor having a displacement of 100 cu. ft. of free air a minute. The approximate total weight of each locomotive is 83 tons. Some of their principal dimensions and characteristics are given in the following table:

Length inside knuckles	37 ft. 4 in.
Length over cab	31 ft. 0 in.
Overall height, pantograph down	15 ft. 8 in.
Height over cab	12 ft. 10 in.
Overall width	10 ft. 0 in.
Total wheelbase	28 ft. 0 in.
Rigid wheelbase	8 ft. 8 in.
Total weight, all on drivers	83 tons
Wheel diameter	46 in.
Tractive effort at 30% tractive co-efficient	49,800 lb.
Tractive effort at one-hour rating	20,300 lb.
Tractive effort at continuous rating	16,200 lb.
Speed at rated amperes, one-hour rating	23.4 m.p.h.
Total horse power, one-hour rating	1280 h.p.
Speed at rated amperes, continuous rating	24.5 m.p.h.
Total horse power, continuous rating	1090 h.p.

Gearing, 80-25. Reduction, 3.2.

The multiple unit motor cars for handling local traffic are not yet in operation. The principal dimensions of these cars are given in the following table:

Length over buffers	67 ft. 5⅜ in.
Length over body corner posts	57 ft. 6¼ in.
Truck centers	42 ft. 9 in.
Width over side sill angles	9 ft. 10½ in.
Width over eaves	10 ft. 2⅝ in.



Switchboard in Substation, Mount Royal Tunnel.

Height top of rail over roof	13 ft. 0 in.
Height top of rail to underside of side sill	3 ft. 7½ in.
Center to center of body side bearings	4 ft. 10 in.
Center to center deck sills	6 ft. 6 in.
Approximate weight loaded and equipped	160,000 lb.

The electric hot air system of car heating is used. One complete heater is placed underneath each car and receives its energy direct from the 2,400 volt supply. The heater has a capacity of approximately 25 k.w. and is constructed for 2 heat combinations, so as to provide for changes in temperature conveniently and economically. The complete heating equipment consists of the heating unit, blower and regulating mechanism, the controlling switch and thermostat of the regulating mechanism being arranged for operation from the 600 volt supply. Air is forced over the heating unit by the blower, and distributed to the car through the air ducts along the sides of the car. The blower used for the circulation of the air is operated by a motor, which is connected in series with the heating unit on the ground side. The capacity of the blower is approximately 1,000 cu. ft. of air a minute.

The motor equipment consists of 4 fully ventilated GE 239-a, 125 h.p., 1,200 volt, commutating pole motors insulated for 2,400 volts. Two of these motors are permanently connected in series for 2,400 volt operation. Ventilation of the motor is accomplished by drawing air into the armature at the pinion end by the fan on the armature shaft. The air passes longitudinally through the whole interior of the motor and is expelled through an opening in the frame at the commutator end, protected by wire mesh.

The control is of the non-automatic type for multiple unit operation. The equipment includes a motor generator set for furnishing 600 volt current for the control circuits, the air compressor and lighting circuits. This set consists of two 1,200 volt motors, operating in series on 2,400 volt, direct connected to a 600 volt generator. The master controller, contactors, switches, reverses and pantograph are essentially the same construction and appearance as those already described for the locomotives. The controller has 5 steps in series and 4 steps in parallel. It differs from the locomotive controller in having the usual motorman's operating handle, instead of a lever. This handle is provided with the so called "dead man's" feature, for cutting off power and applying the air brakes in case the motorman removes his hand. Copper ribbon fuses, similar to those on the locomotive, are used, and an aluminum cell lightning arrester is installed on each car.

[EDITOR'S NOTE.—The multiple unit cars have not yet been built, so the description must be taken as applying to what is intended.]

Special local conditions and extremely low temperatures introduced features, making the design of the catenary system for this electrification somewhat out of the ordinary. The present electrified track is about 10 miles long and in this distance there is a passenger terminal station and passenger car yard in the city, a double track tunnel, double tracks in a cut with low clearances under highway bridges, a long stretch of single track, both tangent and curve, and a large freight yard with repair shops and storage tracks. The

temperature in the coldest winter weather reaches 35 deg. below zero; while in the hottest summer weather it will go as high as 110 in the sun. In the early spring severe sleet storms sometimes occur.

The poles are of eastern white cedar. The specifications for these poles, and also for the creosote oil used as a preservative, were based upon those of the National Electric Light Association. Steel poles are used in the terminal yard in the city, on account of their more sightly appearance. The wood poles are set 7 ft. in the ground and are all back-guyed. They are long enough to carry 2 cross arms for feeders, signal circuit and a 3-phase transmission line for supplying the shops in the Cartierville yard with electric power. On top of the poles there is a no. 000 copper ground wire, which serves both as a protection against lightning for the circuits on the poles, and also as a preventive against any trouble that might be caused by breakage of the rail bonds, which latter are of the welded V-type. The poles throughout the single track construction are spaced 150 ft. on tangents and 120 ft. on the 2-deg. curve. On the double-track portion, where the overhead clearance is limited, the spacing is reduced to 105 ft. on tangents.

The messenger for the electrification outside the tunnel consists of a ½ in., 7-strand Siemens-Martin steel cable, with an ultimate strength of 11,000 lb. and an elastic limit of 6,600 lb. Two no. 0000 copper feeders are installed, one the full length of the electrification outside the tunnel, and the other for about a mile west of the substation. The messenger is anchored every half mile by running the end of one half mile length past the end of the next for a distance of one span. It is then made fast to an anchor eye on the bracket, through an insulator and turn-buckle, and the same point of the bracket is guyed back to the next pole, which in turn is guyed against this strain. The two messengers, where they pass each other, are kept from 8 to 10 in. apart. By anchoring the trolley wire on the same bracket, the anchorage becomes a section insulation, the air space between the messenger and trolley wires forming the insulation. Where a section insulator is not required, a copper jumper is placed between the messenger and trolley wires. For the double track portion of the line, cross-span construction is used, the cross-span being a ⅜ in., 7-strand Siemens-Martin steel cable. The messenger is fastened to this by a small malleable clamp. This cross-span is made up with a turnbuckle, strain insulator, and wedge grip in each end, and fastened to the poles by means of eyebolts.

In yard work spanning more than 2 tracks, the construction is similar, but with the addition of a cross messenger of ½ in. cable above the ⅜ in. cable. This cross messenger is made fast to the poles directly, without insulators or turnbuckles, and carries the weight of the spans below through lengths of ¼ in. steel cable. These fasten to eyes in the tops of the messenger hangers, and to to the cross messenger, by Crosby clips. There is a strain insulator in each of these lengths.

Pull-offs are used on curves, for holding the contact wire and messenger in the correct position over the track, and at intervals on long tangents, for steadying the contact wire. The pull-offs are made of sherardized steel tubing, bent to avoid fouling the pantograph. Each pull-off is fitted with a clamp ear at one end and an eye at the other. Adjustable links are sometimes required with the pull-offs, to keep the trolley wires the right distance apart at certain points, such as where the trolley wire for a turn-out approaches the main trolley wire at an angle. Each link is composed of 2 malleable iron brackets, with clamp ears, connected by a ½ in. pipe, the length of which is adjusted between the brackets and held by set screws.

Egg type insulators are used in two sizes. The larger, used with a ½ in. and ⅝ in. steel cable, withstands a wet flash-over test of 14,000 volts, and has a breaking strength of 22,000 lb. The smaller, used with ⅜ in. and ¼ in. steel cable, withstands the same voltage test, and has a breaking strength of 12,000 lb. The insulator used on the bracket construction is of the ordinary glazed porcelain, double petticoat, pin type, 4¼ in. in diameter. It has a wet flash-over test of 20,000 volts. The messenger rests in the groove in the top of this insulator, and is not tied, except on curves.

The contact wire is of special bronze composition, size 0000, with a breaking strength of 65,000 lb. a sq. in. and an elastic limit of 39,000 lb. a sq. in. Its section is American Electric Railway Association's standard 0000 grooved trolley wire. The use of this wire, instead of hard drawn copper, was thought advisable, both because of its longer life, when subjected to the wear caused by sliding pantographs, and also because it could be pulled up tighter than copper, on account of its greater streigth. This latter reason was considered of special importance, because of the wide variation in temperature in Montreal, with the consequent great variation in the sag of ordinary copper trolley wire between winter and summer.

The trolley wire is hung straight over the center of the track, as the natural side sway of the pantograph is sufficient to prevent wearing grooves in the contact strips. The height of the trolley wire above top of rail is ordinarily 23 ft., except along the double track construction and in the tunnel, where it is 16 ft. In this section 2 wires are used over each track. They hang side by side, supported from the same messenger, the hangers of one wire being staggered with those of the other. These double wires do not raise the hanger loops as high as would a single wire, when a pantograph passes along, which is an obvious advantage where the head room is limited. Sparking and consequent wear, both of the contact shoes and contact wires, is reduced to a minimum, as there is always good contact between the slider strips and one of the contact wires. The hangers are all of the long-loop type, having a malleable iron, single bolt, clamp ear, and a strap varying in length to suit its position in the span. All parts are sherardized. In spans of all lengths from 150 ft. to 90 ft. the hangers are spaced 15 ft. apart.

Lightning arresters of the magnetic blow-out type are installed at half mile intervals. The arrester is placed near the top of the pole, and the ground wire run down the pole to a ¾ in. iron pipe driven about 10 ft. into the ground. Before driving this pipe, a 2 in. pipe was driven down about 5 ft., then withdrawn and the hole filled with rock salt. The ¾ in. pipe was driven down through the salt. In addition to these arresters on the poles, aluminum cell arresters are installed in the substation on the positive busbars and on each feeder.

In order to string the messenger cable with the proper tension, a dynamometer was used. It was therefore necessary for the foreman of the line gang to know what the tension should be at different atmospheric temperatures. The right sag at any given temperature was also of importance, as a check on the tension. This information was supplied in tables to which the line gang worked, the sags and tensions being given at 5 deg. intervals. In the tunnel the overhead clearance was so limited that the catenary had to be very flat. This meant pulling the messenger up very tight for spans of reasonable length. A cable of phosphor bronze was decided upon, composed of 19 wires, and having an overall diameter of 0.888 in. This cable has an ultimate breaking strength of 22,000 lb., and an elastic limit of 18,600 lb. This messenger is supported every 90 ft. from the roof of the tunnel by a combination of iron yokes held in the concrete by four 1-in. bolts. The cross yoke carries the messenger insulator, and is supported on two insulators carried on the 2 end yokes, so that there are 2 insulators between the messenger and the ground. The insulators are of glazed porcelain, and have a wet flash-over test of 20,000 volts. All clamps and small parts of the messenger supports are of malleable iron sherardized. The yokes are of 2 x ⅝ in. and 1½ x ⅞ in., mild steel, painted with an asphaltum compound as a protection against rust.

Two no. 0000 phosphor-bronze contact wires hang side by side from the messenger. The hangers for each contact wire are spaced 15 ft., or 7½ ft. between adjacent hangers. The hanger lengths very from 6 in. to 13¾ in., with 90 ft. span. The 2 hangers nearest the messenger support, viz., those 11¼ and 13¾ in. long, are made with 2 loops, one sliding inside the other, where the clearance to the roof is small. The remaining hangers are similar to those used outside the tunnel, except that the loop is wider, in order to take the larger messenger. It was found that the 2 messenger cables and the 4 contact wires over the 2 tracks in the tunnel would give ample conductivity, so that no feeders through the tunnel were required. Both the messenger and contact wires are anchored every half mile. Two bridles of ½ in. steel cable are fastened to the messenger by six ⅞ in. Crosby clips, and the ends of the bridles are fastened each way, through 2 cemented-type strain insulator in series, a turnbuckle and wedge grip, to roof plates. The contact wire is anchored by lapping the ends for one span and then carrying each end up and slightly to one side of the center, making fast to a roof plate through 2 insulators, a turnbuckle and a wedge grip.

At the only curve in the tunnel, one of 2-deg., 2 pull-offs are placed in each span, over each track, one for each of the contact wires. The pull-offs are fastened to the tunnel arch through 2 strain insulators in series by an expansion bolt. The 2 pull-offs are placed 7½ ft. apart, and this arrangement prevents hard spots and at the same time keeps the 2 contact wires close enough together for satisfactory operation.

The United States Court, sitting at Grand Rapids, Mich., on Dec. 27, refused to grant the Grand Rapids, Grand Haven & Muskegon Interurban Ry.'s application to prevent the state from enforcing the 2c a mile railway rate. This is a matter in which the G.T.R. is interested.

Vancouver, B.C., merchants are asking the railways running into the city to abandon the 5c arbitrary rate, and a report states that the Board of Railway Commissioners may be appealed to upon the matter by the Vancouver Board of Trade.

Donnacona Cutoff.—Tenders were received to Sept. 15, for building a cutoff between Donnacona, Grand Mere Subdivision and mile 16, La Tuque Subdivision, Quebec District, Central Region. Donnacona is at mile 32 from Quebec on a line built by the Canadian Northern Ry. and connecting with the old Quebec & St. John Ry. at Grand Mere; and mile 16, La Tuque Subdivision, is near St. Augustine, on the National Transcontinental Ry. The two lines run comparatively close together from Quebec, and near Donnacona are only about 2 miles apart. The old Canadian Northern line is reported to be subject to landslides, and to cost a good deal to keep open in winter, owing to snow. The reason for building the cutoff is to do away with the necessity of maintaining two lines serving practically the same area, and by diverting the traffic to the National Transcontinental Ry., to make use of the better of the two lines. The diversion will start about half a mile east of Donnacona, mile 30.92, Grand Mere Subdivision, and run to about a mile east of Domburg, mile 15.82, La Tuque Subdivision, and will be 6.30 miles long. The gradients will be 1% uncompensated, with a short stretch of 1.8% momentum; with a minimum of 2 degrees, and a maximum of 4 degrees of curvature. The structures will consist of four concrete box culverts and one overhead crossing of the Montreal highway. The contractor will be required to complete all the work necessary for a single track railway, except tracklaying, ballasting, train fill and buildings, which will be done by the railways' own forces. The construction of the diversion will permit the abandonment and save the maintaining of about 19 miles of track.

October
1921

The Quebec Development Co. is reported to have started work on the construction of a railway from Hebertville, mile 198 from Quebec, on the old Quebec & Lake St. John Ry., for use in the building of a dam at the Grande Descharge of Lake St. John. Contracts are reported to have been let for grading and trestlework on the line from Hebertville to St. Joseph D'Alma, for a bridge across the Little Descharge, and for another one over a small branch of the Saguenay River, as well as for piers, foundations and other works. Arrangements are also reported as being made for contracts for the construction of the dam at the Grand Descharge. Hebertville is three miles south of Hebertville station, so that the railway will run northerly from Hebertville station to St. Joseph D'Alma, which is on the shore of the Little Descharge. Alma Island separates the outflow of Lake St. John into two branches, the Little Descharge and the Grande Descharge, which farther on becomes the Saguenay River.

The Premier of Quebec is reported to have announced, Dec. 9, that an order-in-Council had been signed ratifying a contract between the Government and the Quebec Development Co. for the building of two dams at the Grande Descharge. The first part of the project would, it was stated, be started immediately, and was expected to be completed in about three years, at a cost of about $12,000,000. The first development is expected to produce 200,000 h.p., and

January 1928

St. Charles River Bridge.—Work on the superstructure of the new St. Anne bridge across the St. Charles River, Quebec, was reported to have been started Jan. 2. One half of the superstructure is being put in at present, and it is said that as soon as this is completed the Quebec & Lake St. John Ry. and the Canadian Northern Ry. trains will be diverted from the old bridge to the section of the new bridge; that the old bridge will then be demolished and the second section of the new bridge built. The work is being done by the Dominion Bridge Co., Montreal, under contract with the Dominion Public Works Department, as part of the work for the improvement of the St. Charles River.

February 1919

Donnacona Cutoff.—In Oct., 1923, arangements were made for building 6.30 niles of line from half a mile east of Donnacona, Grande Mere Subdivision, n the old Canadian Northern Ry., to bout a mile east of Domberg, mile 15.88 n the La Tuque Subdivision, National Transcontinental Ry., the construction of which would permit the abandonment f about 19 miles of line most of which as very expensive to maintain. When ir Henry Thornton, President, C.N.Rys., as in Quebec, on Feb. 1, he met the oard of trade council which urged that he abandoned line be not taken up, owg to the proposed establishment at Cap ouge, of some lumbering and cement lants. Sir Henry, in reply, stated that he maintenance of the line involved an utlay which was not justified by existg conditions. The starting of the cemnt plant had been talked of for two ears and nothing had come of it. The ien at the head of these industries hould come to the railway management ith their projects, and if they satisfied is directors of their bona fides they ould get all the sympathy and consider- bion the management could give them. ome assurances having been given as the establishment of the industries in ie near future, Sir Henry stated that

MARCH
1924

Donnacona-Allenby Jct. Line. — The Minister of Railways, Mr. Graham, stated in the House of Commons recently, in answer to questions by G. Parent, Quebec West, that the C.N.R. management had decided to remove the line from a point near Donnacona to Allenby Jct., a part of the old Canadian Northern Ry., and to build a branch line of 6.3 miles from near Donnacona to connect with the National Transcontinental Ry., for which a contract has been given Federal Construction Co., the estimated cost being $280,400. The estimates for the work were voted by Parliament 1923-24.

Ottawa Freight Yard.—The C.N.Rys. are reported to have acquired a plot of land at a cost of $57,500 for the purpose of enlarging the Ottawa freight yards.

JUNE 1924

Belle River Bridge.—We are advised officially in connection with the Board of Railway Commissioners' order 37,752 of June 18, authorizing the renewal of bridge over the Belle River, mile 190 from Quebec, Jonquiere Subdivision, Saguenay Division, Quebec District, that, as built originally in 1891, it consisted of a 153 ft. through Pratt truss span and 2 deck plate girder approach spans of 54 ft. each, carried on 2 masonry piers and 2 masonry abutments. The truss span was renewed in 1921 by the placing of a new truss complete. The present plans provide for the renewal of the north and south approaches. The existing girders at the north approach will be removed and replaced by a complete new span, and the south approach will be renewed by adding to it the 2 girders released from the north approach, thus making it a 4 girder span. All existing bracing is to be replaced with new material. No substructure work is involved.

Jonquiere Yard, Etc.—We are advised officially that the grading and track work for the new yard at Jonquiere, Saguenay Division, Quebec District, 217.1 miles from Quebec, will be done by the railway's forces, that a contract for the buildings has been given to Atlas Construction Co., Montreal, and that it is expected that work will be started immediately. At first the yard will have a capacity for 250 cars, but will be arranged so that its capacity can be increased to 800 cars when required. The buildings will comprise a 6-stall brick locomotive house, 85 ft. turntable, frame store house, concrete ashpit, and a 200-ton coaling plant. (Aug., pg. 407.)

Rat River Bridge.—We are advised officially in connection with the Board of Railway Commissioners' order 37,782 of June 22, approving revision of Rat River bridge, at Price St., Chicoutimi, Saguenay Division, Quebec District, that the work includes the complete removal of the existing structure, a timber framed trestle about 200 ft. long, built in 1892, and its replacement by a steel and concrete structure, and a fill. The new structure will consist of 3 spans of reinforced concrete slab construction each 28 ft. long, and 1 through plate girder 60 ft. span, all carried on new concrete piers and abutments. Under an agreement with Chicoutimi Town Council, provision has been made for a subway under the steel span, and by road diversion on Price and Morin Sts., both these tracks will be carried through the subway; upon completion of this work the present subway east of the bridge will be eliminated by filling. The plans also provide for the excavation of a new opening for Rat River, which at this point divides into 2 channels; and they will be turned into the one new bed, passing under the centre slab span. At the east abutment, to keep the north slope clear of Morin St., a concrete retaining wall, approximately 75 ft. long, will be built as part of the east abutment. Work

September 1926

p466

Lake St. John District Railway Development.

Attention is again directed to the great industrial developments in progress in the Lake St. John district of Quebec by the fact that the Quebec Government has decided to make available the subsidies authorized at the Legislature's last session for the completion of the belt line round the lake, which for years has been the dream of the men who have been active in the development of the area. The Quebec and Lake St. John Ry., the original line opening up the district, for some years extended from Quebec to Chambord Jct., at the foot of the lake, with a branch round the southwesterly portion of the lake to Roberval, which was later extended under the James Bay Ry. charter to St. Felicien, and a branch easterly to Chicoutimi on the Saguenay River. The next company to come in, the Roberval and Saguenay Ry., started to aid in the industrial development of the area south of the Saguenay River, and subsequently absorbed the Ha Ha Bay Ry., another industrial line, and in 1926 passed under the Aluminum Co. of Canada's control. It extended from Ha Ha Bay, on the Saguenay River, to Hebertville on the Q. & L.S.J. Ry., and has been extended by the present owners across the Saguenay River to Chute a Caron, and its charter powers authorize its extension to the Peribonka River. The latest company chartered to build into the district is the Quebec and Lake Chibougamau Ry., which was reorganized in 1927 with strong British support, and is authorized to build a line from Quebec to Chicoutimi and round the north of Lake St. John, and on to Lake Chibougamau; from the Mistassini River to a junction with the old James Bay Ry., and from Garnier up to the Canadian National Ry., in Labarre Tp.

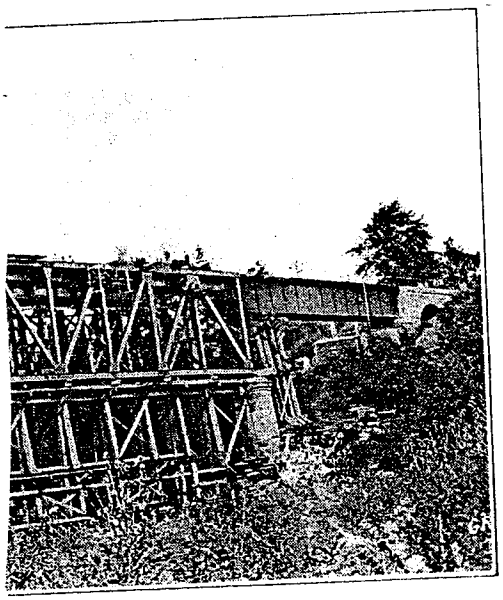
The Dominion Parliament in 1927 authorized the Canadian National Ry. to build a line from St. Felicien to the Mistassini River, and also a line from the old Quebec and Lake St. John Ry., at Hebertville, across the Saguenay River to the Savanne Falls on the Grand Peribonka River, the two most important sections which remained to be built in order to complete the belt line. The line from St. Felicien to Dolbeau, on the Mistassini River, where a large pulp and paper mill and a power plant are under construction, has been placed in operation recently by the C.N.R. The Quebec Legislature at its last session voted subsidies as follows:—To a railway company, $6,000 a mile, for not more than 32 miles, from at or near St. Felicien, to or near Mistassini, both in Lake St. John County; to a railway company, $5,000 a mile, for not more than 75 miles, from or near Mistassini, Lake St. John County, to or near Chute a Caron, Chicoutimi County, or to or near Hebertville station in Lake St. John County, or to or near Chicoutimi in Chicoutimi County. These subsidies cover the mileage from St. Felicien to Dolbeau, built by the Canadian National Ry., and Dolbeau (Mistassini) to Hebertville, or Chute a Caron, about 75 miles. We are advised officially that the subsidy for the St. Felicien-Mistassini line will be given to the Canadian National Ry., and that the second subsidy is available for the Quebec and Chibougamau Ry., an arrangement being made under which the line is to be located on a route, and built to a standard to be approved by the Canadian National Ry.; that a traffic agreement shall be made with the C.N.R., and that an option shall be given the C.N.R. to buy the line at a fixed price, or a price to be arrived at by arbitration. The line is to be built within three years.

The Quebec and Chibougamau Ry. directorate as reorganized consists of:—Baron Gainford (Joseph Alfred Pease), London, England, President; Sir George L. Courthope, M.P., London, Vice President; Hon. Adelard Turgeon, President Legislative Council of Quebec, Vice President and chairman of the executive committee; Hon. G. E. Amyot, Hon. Phillippe Paradis, Henri Bray and G. E. Taschereau, Quebec; William Phillips, Manager Industrial Department, Canadian National Ry.; W. T. A. Proctor, Montreal; R. A. Pease, and James McConnell, London. The company is interested in some mining developments in Gaspe peninsula, as well as in the regions north of Lake St. John, and is reported to have under consideration a project for the erection of a smelter to deal with the ores, the location of which will depend largely on obtaining cheap power. The railway from Dolbeau to Hebertville is, we are advised, to be built within two years, a survey for it having been made by J. E. Grenon, of Chicoutimi.

Quebec, Saguenay and Chibougamau Ry.—We are advised officially that work is proceeding on the section under construction from Riverbend, Ile Maligne, to the Grande Peribonka River, 25 miles. The line has been ballasted as far as the Peribonka River. At River Bend a bridge has been practically completed by the Dominion Bridge Co. This bridge, over the Saguenay River, has a total length of 1,036¼ ft. from back wall to back wall, 658 ft. of which consists of 3 truss spans, and crossing the river proper the spans from the Riverbend end are 190¾ ft., 276½ ft. and 190¾ ft. respectively. The approach at the Riverbend end consists of 2 deckplate spans of 40 ft. each, and that from the other end consists of 260 ft. of deckplate girder spans. The substructure consists of concrete abutments and 2 concrete piers to carry the 3 central spans, with concrete pedestals carrying steel work for the support of the spans at the approaches to the central spans. The contract for the superstructure was carried out by A. Deslauriers, Ltd., Quebec. When the bridge is completed it is intended to proceed with the laying of ties and rails across it. The spring was rather late in

November 1929

visions of the Statutes of 1927, chap. 3, sec. 2, and of the subsidy contract entered into thereunder, for four years from the date of the coming into force of the act provided for in the bill, which is to go into force on the day of its sanction. The act of 1927 provided for a subsidy of $5,000 a mile for not more than 75 miles, starting from at or near Mistassini, in Lake St. John County, to or near Chute à Caron, in Chicoutimi County, or at or near Hébertville, or at or near Chicoutimi, it being provided that the Statutes of 1912, chap. 5, regarding railway subsidies, should be applicable as regards specified sections. The 1912 act provides that a subsidized railway must be begun within two years of the passage of the act granting the subsidy, and must be completed within four years of such passage. The Statutes of 1930-31, chap. 4, increased the subsidy for the line from Mistassini from $5,000 a mile to $10,000. The act of 1912, sec. 9, provides that subsidies shall lapse for the portion of a subsi-



ific Railway, during reconstruction. See also opposite

...of business ...over an interchange between the railways in Humboldt would not be sufficient to pay for its construction, maintenance and operation.

Quebec, Saguenay and Chibougamau Railway Co.'s Position.

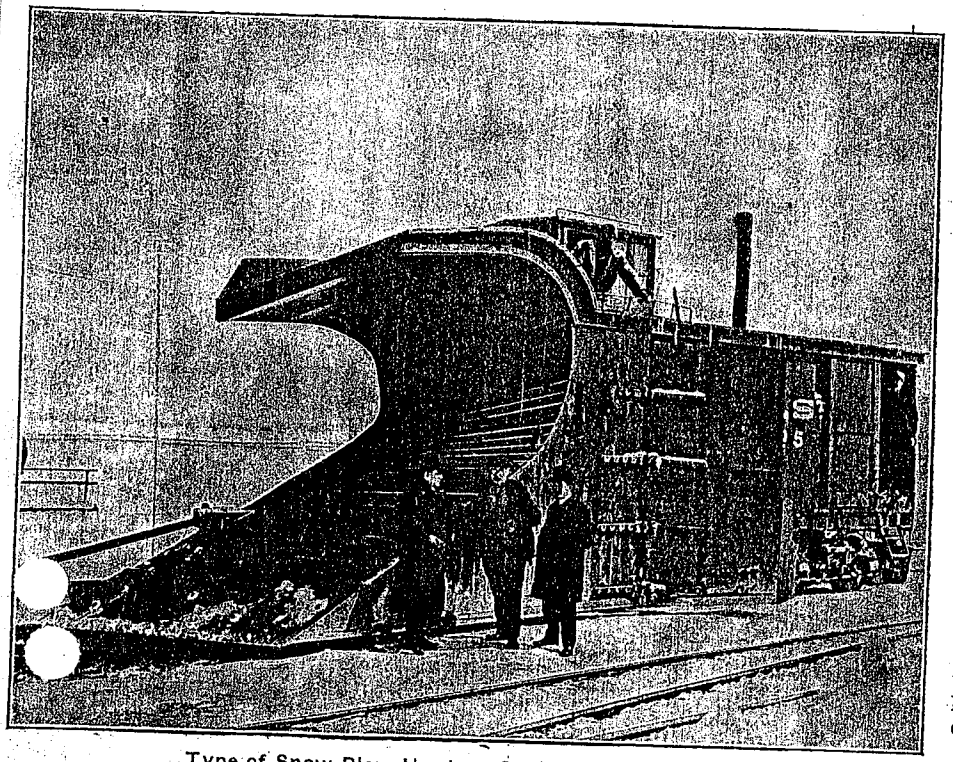
Notice has been given by the Quebec, Saguenay and Chibougamau Ry. Co.'s Secretary, C. E. Taschereau, under the Quebec Railway Act, that the directors adopted a resolution, Dec. 18, 1931, providing for a call upon the holders of the company's preferred shares, of $20 a share, to be paid at the company's office at Mount Royal Hotel, Montreal, on Feb. 1, 1932.

A bill was introduced in the Quebec Legislative Assembly recently to provide for extension of the time within which the company's proposed line from Mistassini may be completed. It provides that the delay for the completion of the railway contemplated in the act of ... paragraph b, as amended dized railway remaining incomplete after four years from the passage of an act providing for a subsidy. The act of 1927, providing for a subsidy for the line from Mistassini, was assented to April 1, 1927. The object of the bill introduced recently is to extend for four years the time within which the company may qualify for subsidy in respect of its line from Mistassini. The bill was passed by the Legislative Assembly Dec. 17, 1931.

When construction work on the line ceased, in Nov., 1928, the grading, culverts, bridges, fencing, trestle work, etc., was completed from Riverbend, the proposed junction with the Alma-Jonquiere Ry., to the east side of the Peribonka River, 25 miles, and track has been laid and ballasted for 6 miles. (April, 1930, pg. 204.)

...ms of the sta-

MARCH 1932



Type of Snow Plow Used on Quebec & Lake St. John.

Type of Snow Plow Used on Quebec & Lake St. John.

The Quebec & Lake St. John runs from Quebec north to Lake St. John, and from there east to the Saguenay river, crossing on the way several high ranges of hills. In this part of eastern Canada the winters are sometimes very severe. During the winter of 1907, for instance, there were very heavy snow falls, some great storms and almost continual drifting winds throughout most of the winter, yet through it all, while neighboring railroads were closed for days at a time, the Quebec & Lake St. John maintained its regular service.

This was accomplished by the efficiency of the snow plows used. One of these plows is shown herewith. They were designed and built by men on the road. They are built very solidly of heavy timbers. The wings and flanges are operated from the interior and thus form a combined head plow, wing plow and flanger. These plows exclusively have been used during the last 20 years and have done fine work.

For this information we are indebted to J. G. Scott, General Manager of the Quebec & Lake St. John, who built that road, as well as the Great Northern of Canada, now the Canadian Northern Quebec, which early in 1907 bought control of the Quebec & Lake St. John.

Railroad Gazette

vol XLIV