CANADIAN NORTHERN RAILWAY DEVELOPMENT

1914

Canadian Northern Railway Construction, Betterments, Etc.

James Bay and Eastern Ry.—The first section of this railway is under construction from Roberval, Que., the northerly terminus of the Quebec and Lake St. John Ry., 30 miles northerly. We are officially advised that grading upon this is well advanced. J. P. Mullarkey, Montreal, is the contractor, and A. F. Stewart, Chief Engineer of Construction, Mackenzie, Mann & Co., Ltd., is in charge of the work.

Canadian Northern Quebec Ry.—The extensions and branch lines located, but not yet finally passed for construction are:—Huberdeau Argenteuil county, Que., to St. Remi, 11 miles, and from Rawdon to St. Donat, 40 miles. These lines are projected for the purpose of opening up new territory lying between the old Great Northern Ry. and the old Montford Colonization Ry., both of which are now part of the C.N.Q.R. Another charter also amalgamated with the C.N.Q.R. is the Quebec, New Brunswick and Nova Scotia Ry., under which it is proposed to build a line from Quebec Bridge to Woodstock, N.B.

Canadian Northern Montreal Tunnel and Terminal Co.—The headings of the tunnel being driven under Mount Royal, to give the C.N.R. an entrance into Montreal, were joined on Dec. 10. The heading is 8 by 12 ft., and the work of enlargement to 22 by 30 ft. is being gone on with.

Plans have been filed in Montreal showing a revision of the location of the line to connect the tunnel with the St. Lawrence water front. These have been approved by the Board of Railway Commissioners.

4 of the statutes of 1909; and in chap. 8 of the statutes of 1912. Sec. 6 of the recent act authorizes the Government to guarantee the bonds for any surplus mileage on the lines mentioned in the several acts over the mileage specifically guaranteed at $13,000 a mile, or in the event of there being a shortage of mileage the Government may authorize the application of the surplus of guaranteed bonds to be used in respect to the construction of other lines to be built.

A second act provides for the payment of interest on these securities at 4½%, and for the building of the following lines:—In further extension of the line mentioned in par. 1, second part of the schedule to chap. 3, statutes of 1908-09, westerly from mileage 210 for 60 miles; in further extension of the line mentioned in par. 3 of the same schedule from mileage 50 from North Battleford northwesterly for 39 miles; from mileage 100, on the Thunder Hill branch west of the eastern boundary of the Province, westerly for 40 miles; and any extension of any lines authorized to be built in Saskatchewan, as may be designated by the Government, not to exceed 40 miles in any one instance.

A third act deals with the guarantee of the bonds of the C.N. Saskatchewan Ry. The amount of the bonds to be guaranteed is increased to $15,000 a mile, the rate of interest is fixed at 4½%, and an extension of time for construction granted. It is also provided that the route of the line set out in par. 5 of the schedule to chap. 11, statutes of 1912, may be changed so as to be routed from Handsworth on the company's authorized line from Lampman

January
1914

The Central Ontario Ry. is asking the Dominion Parliament for an extension of time within which to complete the line from its present northerly terminus to a junction with the C.P.R. at some point between Sudbury Jct. and Callander station, Ont.

Canadian Northern Ontario Ry.—A mixed freight and passenger service has been put in operation on the Ottawa-Sydenham section of the Ottawa-Toronto line which has recently been completed. A regular freight and passenger service has been operated for some time between Toronto and Sydenham, and these services will be run through to Ottawa early in the spring.

The Board of Railway Commissioners has authorized the opening for traffic of the branch from Oshawa station to the material yard south of William St., 2.75 miles, and the building of a transfer track between the C.N.O.R. Oshawa spur and the Oshawa Ry.

Montreal-Ottawa-Port Arthur Line.—Track was laid during 1913, on 536 miles of this line, distributed as follows:—Between Montreal and Hawkesbury, Ont., 10 miles; between Ottawa and Capreol, Ont., 120 miles; between Ruel and Port Arthur, 406 miles. The line is being built, under special guarantees by the Dominion Government, under the charter of the Canadian Northern Ontario Ry. Ballasting and other work are reported well forward from Ruel west. Ballasting is also reported to be completed up to 200 miles easterly from Port Arthur, and one lift has been given to mileage 244, where the bridge work is not completed. Another bridge at mileage 253 is also incomplete. All the stations, section houses and other buildings up to mileage 200 have been erected.

Canadian Northern Ry.—The Saskatchewan Legislature has increased the amount of securities previously guaranteed by $2,000 a mile, making the guarantee $15,000 a mile. The lines in respect to which the guarantee apply are set out in sec. 9 of the act passed in 1908, as it is amended by chap.

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northerly, westerly or northwesterly.

In a statement made to the House in connection with these measures it was mentioned that the Government had guaranteed bonds for the building of 1,155 miles of line. The sale of the bonds had realized so far $9,703,668.98, of which $8,577,067.76 had been released to the company for work done.

The Saskatchewan Legislature has been informed that surveys for the proposed branches from Lampman northerly through the territory lying north westerly from Moose Mountain have been completed, but have not yet been approved by the Provincial Minister of Railways. The company has agreed that construction on these lines, the bonds for building which have been guaranteed by the Legislature, will be started early in 1914. The construction programme for 1914 had not been finally agreed upon between the Government and the company. The extension of the branch southerly from DeLisle, would probably be gone on with, but the final location plans had not been approved.

The line from North Battleford which has hitherto been in operation to Edam, Sask., 38 miles, has been extended to Mervin, Sask., 11 miles, tracking being reported to have been laid into that place Dec. 8.

The first through train on the branch line from Radville into Moose Jaw, Sask., ran into the temporary station on South Hill, Dec. 5. For some time previously the trains had only been operated to a point three miles out of the city. The line goes into the city on a trestle bridge over the river and the C.P.R., which is to be replaced early in the year by a steel structure. It was reported in Moose Jaw, Dec. 13, that an arrangement had been made under which the C.N.R. will join with the G.T. Pacific Ry. in building a union station at Moose Jaw, and will have running rights over the latter company's line to Regina. The Saskatchewan Legislature was asked, Dec. 12,

January
1914

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to consider a measure guaranteeing bonds for $1,000,000 for aiding the construction of terminals and bridges in Moose Jaw. The bill provides that the works shall be immediately put in hand, and that when completed they shall be used jointly with the G.T. Pacific Ry. or any of its allied companies.

Moose Jaw press reports also state that a line is projected from that city southwesterly between Lakes Johnston and Chaplin to a junction with the line to Lethbridge, near Maple Creek, and for a line from Moose Jaw to Chamberlin on the line from Regina to Prince Albert.

The line from Camrose, Alta., southeasterly, on which grading is reported to have been completed for 60 miles, has been located through to Sibbald, at the Saskatchewan-Alberta boundary, on the Saskatoon-Drumheller line, 165 miles. This piece of grading is stated to be a 58 mile tangent. A new town, Alliance, is being laid out at mileage 59.5.

Canadian Northern Pacific Ry.—The Dominion Government Inspector went over the line out of Port Mann as far east as Hope, B.C., Nov. 20, for his final inspection. It is expected that this section of the line will be taken over by the operating department. The end of track easterly was reported to be at mileage 129, and ballasting has been completed to mileage 120. The grading is practically completed from this point to Kamloops. East of Kamloops 90 miles of track is reported to have been laid, and grading is well forward to the Albreda Summit. Eight of the bridges have been completed; three others are reported to be well forward as far as the steel work is concerned; and the substructures for the others are being progressed with. It is also reported that the section which is being built from the west to the Albreda Summit, is 90% completed so far as the grading is concerned.

The locomotive house at the Port Mann terminal is under construction, and the foundations are being piled for the machine

January
1914

January 1914

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Canadian Northern Ontario Ry.—		
Between Montreal and Hawkesbury	10.00	
Between Ottawa and Capreol	120.00	
Between Ruel and Port Arthur	406.00	
Between Sydenham and Ottawa	54.00	
		590.00
Canadian Northern Ry.—		
Manitoba—		
Greenway extension	15.33	
Oakland extension	11.48	
Gross Isle extension	22.80	
Deerfield spur	12.50	
Saskatchewan—		
Delisle Jct. westerly	31.48	
Delisle southerly	5.61	
Swift Current line	55.85	
Prince Albert-Battleford line	51.95	
Moose Jaw extension	1.85	
Battleford north westerly	17.10	
Alberta—		
Main line to Yellowhead Pass	143.31	
Onaway north westerly	30.40	
Saskatoon-Calgary line	26.09	
Vegreville-Calgary line	12.64	
Brazeau line	42.57	
		480.9
Canadian Northern Pacific Ry.—		
Yellowhead westerly	5.00	
Cisco to Hope	62.00	
Portions between steel bridges, Cisco to Kamloops	9.00	
Cottonwood to Kamloops	123.00	
New Westminster to Steveston ..	12.00	
		211.
Canadian Pacific Ry.—		
Campbellford, Lake Ontario and Western Ry., Glen Tay to Agincourt, Ont.	182.60	
Manitoba—		
Snowflake west	10.00	
McAulay line	23.00	

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The locomotive house at the Port Mann terminal is under construction, and the foundations are being piled for the machine shop and other buildings.

The question of the route of the tunnel, which will give an entrance from the north arm of the Fraser River to the terminal on False Creek, Vancouver, is still undecided, two routes being under consideration.

An area of about 80 acres has already been reclaimed from the False Creek flats, for the company's terminal. About 600,000 cubic yards of material were reported to have been deposited Dec. 4, and this is stated to represent about a sixth of the work to be done.

Vancouver Island Lines.—It was reported Dec. 9, in Victoria, that about 85% of the work on the Victoria-Alberni line had been completed, and that considerable progress had been made with the line from Victoria along the Saanich Peninsula. It is expected that steel will be delivered in order to start track laying in February. (Dec., 1913, pg. 584.)

January
1914

Canadian Northern Railway Construction, Betterments, Etc.

Mount Royal Tunnel and Terminal Co.—Supplemental letters patent were granted to the Canadian Northern Montreal Tunnel and Terminal Co., Jan. 10, changing the name of the company to the Mount Royal Tunnel and Terminal Co.

The Quebec Court of Appeal, Jan. 11, decided that the owners of property under which the tunnel is being constructed may bring actions for damages to property other than those which are taken cognizance of by the arbitrators dealing with the question of price. The original action was brought by the owner of a property at the corner of Bellingham and Maplewood Avenues, the sum claimed being $9,000. The company claimed that the whole amount of the damage should be estimated by the arbitrators. This exception was dismissed in the lower court, and the judgment is now upheld on appeal.

The Board of Railway Commissioners has reserved judgment on the application of the company to expropriate the whole of the Rainville property, including a small strip not included in the original application. The company subsequently took only an easement for the tunnel, but the owner claimed damages to the property. The company said the property might be useful for station purposes in the future.

Canadian Northern Ontario Ry.—A through fast freight service was inaugurated between Toronto, Ottawa, Montreal and Quebec, Jan. 8, over the Toronto-Ottawa line, the last section of which was recently completed; thence over the old Great Northern Ry. and the old Chateauguay and Northern Ry. into Montreal, and over the old Great Northern Ry. to Quebec. A regular train service is operated from

construction work started early in 1912. The line has a gradient of 0.4%, with an almost perfect alignment, the final location being made over a period of four years by H. K. Wicksteed, Chief Engineer of Surveys.

Work has been suspended on the line for the winter, but it is expected that ballasting gangs will be put on in the spring in order to get the line in running condition by the fall. One lift of ballast has already been put on. Station buildings have been completed to mileage 183 out of Port Arthur.

Canadian Northern Ry.—The Board of Railway Commissioners has authorized the opening for traffic of the revised line across Rainy Lake, Ont., mileage 224.3 to 226.4.

The Lieut.-Governor of Manitoba, in his speech at the opening of the Provincial Legislature, referring to the building of the railway to Hudson Bay by the Dominion Government said:—"It is the fixed policy of my Government to extend the Oak Point line northward to intersect the same in such time as will guarantee our ability to take advantage, when the main line of the railway is ready for operation, of this through route to the markets of the world for the products of the farms of Manitoba. My Government believe that the opening of such a through route will prove of great benefit to the agriculturists of this Province." This line is being built by the C.N.R. and is in operation from Winnipeg to Gypsumville, 162 miles.

The Board of Railway Commissioners has authorized the opening for traffic of the extension of the Oakland Branch from mileaged 24, for a further distance of 12 miles.

The C.N.R. is carrying on its construction work in Manitoba, Saskatchewan and Al- not only under its own charter, but

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February
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A bylaw will shortly be submitted to the ratepayers of St. Catharines, Ont., providing for a bonus of $100,000 to aid in building the company's Toronto-Niagara line through that city. The agreement provides for the completion of the line from Hamilton to St. Catharines within three years, and its completion from Toronto to Niagara in five years.

Montreal-Ottawa-Port Arthur Line.—Track laying has been completed easterly from Capreol to North Bay, Ont., and construction trains are being operated over it. Track has also been laid to between 50 and 60 miles east of North Bay. Out of Ottawa, track is laid nearly to Pembroke.

The last spike on the section of this line terminating in Port Arthur, Ont., was driven near Little White Otter River, 254 miles east of Port Arthur, Jan. 1, by Sir William Mackenzie, who, accompanied by an official party, left Toronto by a special train and travelled over the line via Parry Sound to Capreol, which is the point at which the Montreal-Ottawa-Port Arthur line connects with the line from Toronto; thence to Ruel, where present permanent operation ceases, and then over the newly completed line to the point where the track laying was completed on New Year's morning. The journey was then resumed and the special ran on to Port Arthur, which was reached at midnight. The party was entertained at dinner immediately afterwards, and speeches were delivered by the Mayor of Port Arthur, Sir William Mackenzie, President; Sir Donald Mann, Vice President; D.

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The C.N.R. is carrying on its construction work in Manitoba, Saskatchewan and Alberta, not only under its own charter, but also under the charters of the Canadian Northern Saskatchewan Ry., the Canadian Northern Western Ry., and the Canadian Northern Alberta Ry. The construction work done under the charters of these companies for 1913 is as follows:—

Grading was done on 23 lines and track laying on 19 lines. The main line out of Edmonton is being built under the Canadian Northern Alberta Ry. charter, and on this 34.28 miles of grading were done, and 143.36 miles of track laid to the provincial boundary. A 5 mile spur, known as Huffs spur, was also laid.

The work done on the various branch lines, arranged according to provinces, is as follows:—

	Grading. Miles.	Track laid. Miles.
C.N. Ry.	107.37	271.72
C.N. Sask. Ry.	4.00	—
C.N. Western Ry.	87.54	74.53
C.N. Alberta Ry.	34.28	148.31
Total	233.19 Miles graded.	494.56 Miles track laid.
Manitoba—		
Winnipeg cut off	3.98	3.34
Winnipeg & Northern Ry.	7.45	—
Deerfield (Oak Point line)	12.50	12.50
Greenway extension	2.94	15.33
Oakland extension	—	11.60
Grosse Isle extension	14.28	22.80
	41.15	65.66
Saskatchewan—		
Bienfait to Estevan	8.20	—
Canora northerly	1.90	—
Goose Lake branch	—	25.78
Jackfish line		17.10
Macrorie east	2.26	8.59
Macrorie west	34.83	31.57
Moose Jaw line	0.30	1.85

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February
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Montreal-Ottawa-Port Arthur Line.—Track laying has been completed easterly from Capreol to North Bay, Ont., and construction trains are being operated over it. Track has also been laid to between 50 and 60 miles east of North Bay. Out of Ottawa, track is laid nearly to Pembroke.

The last spike on the section of this line terminating in Port Arthur, Ont., was driven near Little White Otter River, 254 miles east of Port Arthur, Jan. 1, by Sir William Mackenzie, who, accompanied by an official party, left Toronto by a special train and travelled over the line via Parry Sound to Capreol, which is the point at which the Montreal-Ottawa-Port Arthur line connects with the line from Toronto; thence to Ruel, where present permanent operation ceases, and then over the newly completed line to the point where the track laying was completed on New Year's morning. The journey was then resumed and the special ran on to Port Arthur, which was reached at midnight. The party was entertained at dinner immediately afterwards, and speeches were delivered by the Mayor of Port Arthur, Sir William Mackenzie, President; Sir Donald Mann, Vice President; D. B. Hanna, Third Vice President, and others.

The building of this section of the line was entrusted to Foley, Welch and Stewart and the Northern Construction Co., in 1911, under the terms of a special agreement with the Dominion Government. Actual

February 1914

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C.N. Alberta Ry.	34.28	148.31
Total	233.19 Miles graded.	494.56 Miles track laid.
Manitoba—		
Winnipeg cut off	3.98	3.34
Winnipeg & Northern Ry.	7.45	—
Deerfield (Oak Point line)	12.50	12.50
Greenway extension	2.94	15.33
Oakland extension	—	11.69
Grosse Isle extension	14.28	22.80
	41.15	65.66
Saskatchewan—		
Bienfait to Estevan	8.20	—
Canora northerly	1.90	—
Goose Lake branch	—	25.78
Jackfish line	—	17.10
Macrorie east	2.26	8.59
Macrorie west	34.83	31.57
Moose Jaw line	0.30	1.85
Prince Albert-Battleford line	1.15	51.95
Swift Current line	7.10	55.85
Vonda, northerly	8.20	—
Wroxton, westerly	4.00	—
	67.94	192.69
Alberta—		
Vegreville-Calgary line	0.23	13.20

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Calgary, southerly	1.60	—
Strathcona-Camrose	0.45	0.17
Brazeau line	26.77	42.60
Camrose south east	53.45	—
Peace River line	6.50	30.65
Strathcona-Calgary line	0.30	1.28
Red Deer spur	0.52	—
Main line	34.28	148.31
	124.10	236.21
Total for three provinces	213.19	494.56

The three measures with respect to the guaranteeing of the company's bond issues by the Province of Saskatchewan mentioned in our last issue, have received final assent. The question of the construction programme for the year, under these acts, is now under consideration by the government.

Canadian Northern Pacific Ry.—The C.N. Ry. construction department at Winnipeg is supervising the Canadian Northern Pacific Ry. construction from the Alberta-British Columbia boundary to the Albreda Summit. During 1913 grading was completed for 67.8 miles westerly from the provincial boundary, and 6.07 miles of track laid.

The remainder of the line in British Columbia is being built under the Vancouver construction department, T. H. White being Chief Engineer. Track was laid from Sumas to Hope, 41.75 miles, in 1912, and during 1913 an additional 206 miles of track was laid. Of this 12 miles was on the branch from New Westminster to Steveston, leaving 194 miles of track laid on the main line. Track has been laid from Hope to Cisco, 62 miles, and nine miles between the steel bridges under construction between Cisco and Kamloops; for 123 miles from Kamloops to Cottonwood. The distance from Cisco to Kamloops is 103 miles, and from Cottonwood to Yellow-

February
1914

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February
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Considerable progress is being made with the construction of the terminals at Port Mann. It is expected that the locomotive house will be completed early in February.

Sir Donald Mann, Vice President, arrived in Vancouver, Jan. 5, when he is reported to have said that the company's line would enter Vancouver by a tunnel three miles long, the exact location of which had not been settled. (Jan., pg. 29.)

February
1914

Dominion Railway Subsidy Agreements.

February
1914

Canadian Northern Railway Construction, Betterments, Etc.

Mount Royal Tunnel and Terminal Co.—Supplemental letters patent were granted to the Canadian Northern Montreal Tunnel and Terminal Co., Jan. 10, changing the name of the company to the Mount Royal Tunnel and Terminal Co.

The Quebec Court of Appeal, Jan. 11, decided that the owners of property under which the tunnel is being constructed may bring actions for damages to property other than those which are taken cognizance of by the arbitrators dealing with the question of price. The original action was brought by the owner of a property at the corner of Bellingham and Maplewood Avenues, the sum claimed being $9,000. The company claimed that the whole amount of the damage should be estimated by the arbitrators. This exception was dismissed in the lower court, and the judgment is now upheld on appeal.

The Board of Railway Commissioners has reserved judgment on the application of the company to expropriate the whole of the Rainville property, including a small strip not included in the original application. The company subsequently took only an easement for the tunnel, but the owner claimed damages to the property. The company said the property might be useful for station purposes in the future.

Canadian Northern Ontario Ry.—A through fast freight service was inaugurated between Toronto, Ottawa, Montreal and Quebec, Jan. 8, over the Toronto-Ottawa line, the last section of which was recently completed; thence over the old Great Northern Ry. and the old Chateauguay and Northern Ry. into Montreal, and over the old Great Northern Ry. to Quebec. A regular train service is operated from

construction work started early in 1912. The line has a gradient of 0.4%, with an almost perfect alignment, the final location being made over a period of four years by H. K. Wicksteed, Chief Engineer of Surveys.

Work has been suspended on the line for the winter, but it is expected that ballasting gangs will be put on in the spring in order to get the line in running condition by the fall. One lift of ballast has already been put on. Station buildings have been completed to mileage 183 out of Port Arthur.

Canadian Northern Ry.—The Board of Railway Commissioners has authorized the opening for traffic of the revised line across Rainy Lake, Ont., mileage 224.3 to 226.4.

The Lieut.-Governor of Manitoba, in his speech at the opening of the Provincial Legislature, referring to the building of the railway to Hudson Bay by the Dominion Government said:—"It is the fixed policy of my Government to extend the Oak Point line northward to intersect the same in such time as will guarantee our ability to take advantage, when the main line of the railway is ready for operation, of this through route to the markets of the world for the products of the farms of Manitoba. My Government believe that the opening of such a through route will prove of great benefit to the agriculturists of this Province." This line is being built by the C.N.R. and is in operation from Winnipeg to Gypsumville, 162 miles.

The Board of Railway Commissioners has authorized the opening for traffic of the extension of the Oakland Branch from mileaged 24, for a further distance of 12 miles.

The C.N.R. is carrying on its construction work in Manitoba, Saskatchewan and Alberta, not only under its own charter, but through fast freight service was inaugurated between Toronto, Ottawa, Montreal and Quebec, Jan. 8, over the Toronto-Ottawa line, the last section of which was recently completed; thence over the old Great Northern Ry. and the old Chateauguay and Northern Ry. into Montreal, and over the old Great Northern Ry. to Quebec. A regular train service is operated from Toronto to Sydenham, Ont., and a limited service from Sydenham into Ottawa.

A bylaw will shortly be submitted to the ratepayers of St. Catharines, Ont., providing for a bonus of $100,000 to aid in building the company's Toronto-Niagara line through that city. The agreement provides for the completion of the line from Hamilton to St. Catharines within three years, and its completion from Toronto to Niagara in five years.

Montreal-Ottawa-Port Arthur Line.—Track laying has been completed easterly from Capreol to North Bay, Ont., and construction trains are being operated over it. Track has also been laid to between 50 and 60 miles east of North Bay. Out of Ottawa, track is laid nearly to Pembroke.

The last spike on the section of this line terminating in Port Arthur, Ont., was driven near Little White Otter River, 254 miles east of Port Arthur, Jan. 1, by Sir William Mackenzie, who, accompanied by an official party, left Toronto by a special train and travelled over the line via Parry Sound to Capreol, which is the point at which the Montreal-Ottawa-Port Arthur line connects with the line from Toronto; thence to Ruel, where present permanent operation ceases, and then over the newly completed line to the point where the track laying was completed on New Year's morning. The journey was then resumed and the special ran on to Port Arthur, which was reached at midnight. The party was entertained at dinner immediately afterwards, and speeches were delivered by the Mayor of Port Arthur, Sir William Mackenzie, President; Sir Donald Mann, Vice President; D.

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The Board of Railway Commissioners has authorized the opening for traffic of the extension of the Oakland Branch from mileage 24, for a further distance of 12 miles.

The C.N.R. is carrying on its construction work in Manitoba, Saskatchewan and Alberta, not only under its own charter, but also under the charters of the Canadian Northern Saskatchewan Ry., the Canadian Northern Western Ry., and the Canadian Northern Alberta Ry. The construction work done under the charters of these companies for 1913 is as follows:—

Grading was done on 23 lines and track laying on 19 lines. The main line out of Edmonton is being built under the Canadian Northern Alberta Ry. charter, and on this 34.28 miles of grading were done, and 143.36 miles of track laid to the provincial boundary. A 5 mile spur, known as Huffs spur, was also laid.

The work done on the various branch lines, arranged according to provinces, is as follows:—

	Grading. Miles.	Track laid. Miles.
C.N. Ry.	107.37	271.72
C.N. Sask. Ry.	4.00	—
C.N. Western Ry.	87.54	74.53
C.N. Alberta Ry.	34.28	148.31
Total	233.19	494.56
	Miles graded.	Miles track laid.
Manitoba—		
Winnipeg cut off	3.98	3.34
Winnipeg & Northern Ry.	7.45	—
Deerfield (Oak Point line)	14.50	12.50
Greenway extension	2.94	15.33
Oakland extension	—	11.60
Grosse Isle extension	14.28	22.80
	41.15	65.66
Saskatchewan—		
Bienfait to Estevan	8.20	—
Canora northerly	1.90	—
Goose Lake branch	—	25.78
Jackfish line	—	17.10
Macrorie east	2.26	8.59
Macrorie west	34.83	31.57
Moose Jaw line	0.30	1.85

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The building of this section of the line was entrusted to Foley, Welch and Stewart and the Northern Construction Co., in 1911, under the terms of a special agreement with the Dominion Government. Actual

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Manitoba—		
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Oakland extension	—	11.69
Grosse Isle extension	14.28	22.80
	41.15	65.66
Saskatchewan—		
Bienfait to Estevan	8.20	—
Canora northerly	1.90	—
Goose Lake branch	—	25.78
Jackfish line	—	17.10
Macrorie east	2.26	8.59
Macrorie west	34.83	31.57
Moose Jaw line	0.30	1.85
Prince Albert-Battleford line	1.15	51.95
Swift Current line	7.10	55.85
Vonda, northerly	8.20	—
Wroxton, westerly	4.00	—
	67.94	192.69
Alberta—		
Vegreville-Calgary line	0.23	13.20

February 1914

anadian Northern Railway Terminals at Port Mann.

adian Northern Ry. for one of its
ast terminals of its transcontin-
now nearing completion, has open-
ract of land on the Fraser River,
niles from Vancouver, where it is
ng extensive terminal facilities.
as been named Port Mann, after
D. Mann, Vice President. As a
general scheme, and as a means
ng the work, the property back
river, along which the railway
will be situated, was secured by
y as a townsite, was subdivided,

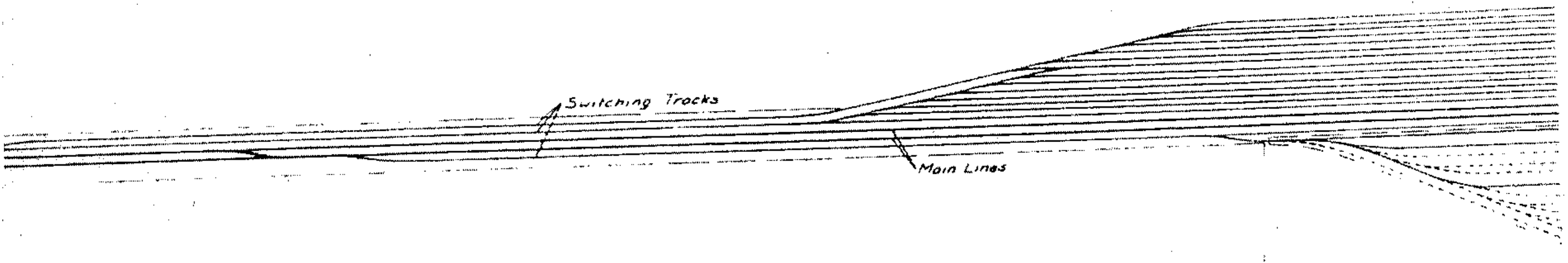
been on the market for some time.
layout is of considerable extent,
anticipated that with the extensive
and shipping facilities which will
ded it will become a point of con-
importance.
raser River is navigable up to this
large, ocean going vessels, and in
nce, it is expected to become a

tracks, over which the made up trains may be taken from or into the yards. On the north of the east end of the easterly yard, there will be three caboose tracks, between which and the yard, will be a scale track. To the north of this, a large coal storage space has been reserved.

The centre of the projected town will be Bon Accord Square, Centre St. leading directly from the river into it. Stub tracks leading from ladder tracks east and west of this street, will form an extensive system of storage and team tracks; there will be 14 of these to the west, and 7 to the east of the street, the latter being the entry thoroughfare to the teamways. Along the south side of the yards, there will be a service track, from which stub team tracks will branch off, terminating at Railway St., 8 tracks to the west and 4 to the east of Centre St. Immediately to the west of Centre St. there will be 4 local freight with a freight shed, 40 by 200 ft.,

ing of rolling stock repairs on all the company's Pacific Coast lines, has also been planned, only a small portion of which will be completed at present. Provision has been made for the addition of all the buildings required in a complete shop layout, some of which will be built in sections, and extended as required.

The general shop scheme consists of a central midway served by a 60 ft. transfer crane, at right angles to the main line tracks. The locomotive shop will be to the east of the midway, and will ultimately be 150 by 600 ft., with 24 locomotive pits. The initial section now being built, is 250 ft. long, containing 10 pits. This shop will be served by an 80 ft. transfer table along the east side, extending the full length of the shop. Only the portion corresponding to the part of the shop now being completed, is being built at present. On the east side of the transfer table, there will be a corresponding number of storage tracks, served by the transfer table. The locomotive shop, like all the buildings of the plant, will be of concrete construction, divided into by a central row of



Canadian Northern Railway Port Mann Terminal Layout (Section 1).

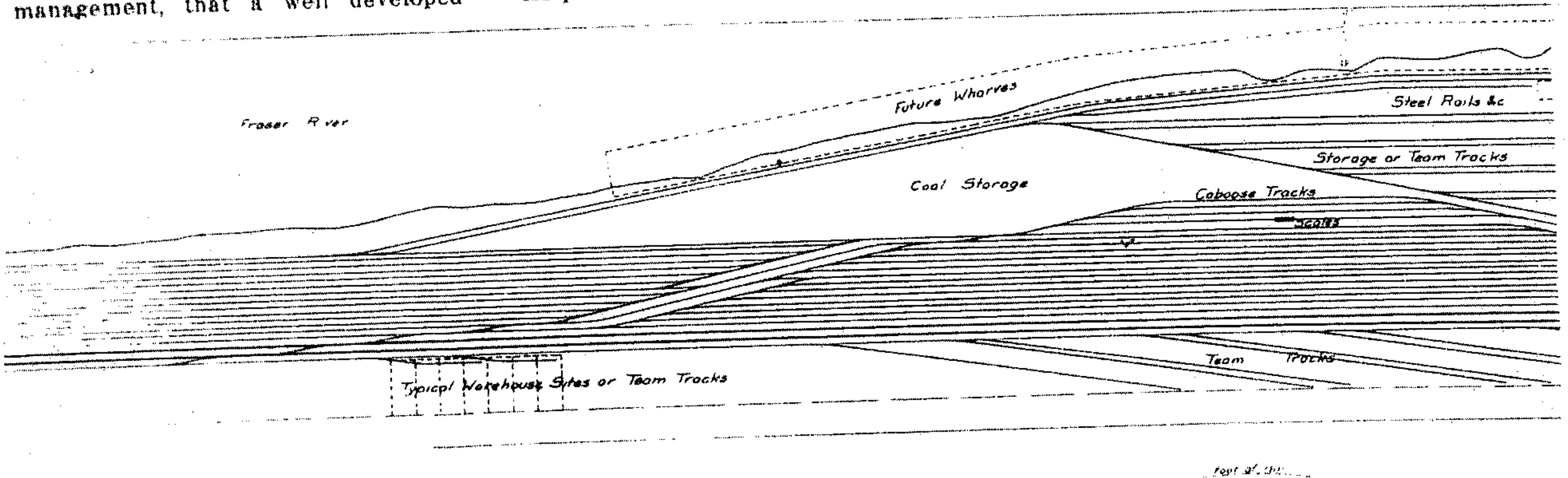
MARCH 1914

for large, ocean going vessels, and quence. It is expected to become a of importance for the transhipment of it for the Orient; a possible traffic in ranshipment of grain, etc., by way of Panama Canal, is another phase of e development. Considering all these points, the prospect of the place deing seemed so imminent to the railmanagement, that a well developed

Centre St. there will be 4 local freight tracks, with a freight shed, 40 by 200 ft., abutting on the street. Provision has been made for the extension of this shed to double its original size. The southerly two tracks of the team track layout will be spanned by a transfer crane, with a team scale in the roadway nearby.

Ample accomodation is being made for

will be of concrete construction, divided into two longitudinal bays by a central row of cast iron columns. It will contain two 10 ton travelling cranes, and a 200 ton electric jack for wheeling locomotives. This building will be the only part of the shop layout to be completed at present, all the other buildings being projected.



Canadian Northern Railway Port Mann Terminal Layout (Section 3).

eme for extensive facilities has been ertaken, as shown in the accompanying ns.

he yard accommodation will consist of ee yards of equal size, each containing body tracks, 2,800 ft. long in the clear, ing a capacity in each of 1,000 cars, or total capacity of 3,000 cars. (These ds are on the north side of the double ck main line, along the river bank. To h end of each yard, there will be two der tracks, each of these serving 7 cks. To the intermediate body tracks, re will be cross overs from the main line. om the west, the westerly ladder tracks l be approached by two 1,600 ft. switching

future warehouses on sites 50 by 100 ft., both to the east and to the west of Centre St. The station will adjoin Centre St. At the foot of Centre St., there has been built a 1,000 by 102 ft. wharf, with freight storage shed adjacent. The extension of the wharf to four times its present capacity is contemplated as traffic increases, and the freight storage shed can be increased to three times its present capacity. The water along the frontage is being deepend so that the largest vessels may dock there, and with the double track that has been laid along the rear of the wharf, will make a convenient transhipment arrangement.

A very complete shop layout for the handl-

All the remaining buildings of the plant will be situated to the west of the midway. Abutting the midway will be the pattern shop, 50 ft. square; foundry, 100 by 200 ft.; coal and iron shed, 50 by 200 ft.; blacksmith shop, 100 by 200 ft., and stores, 50 by 150 ft. The latter building will be surrounded by a platform, 75 by 350 ft., for the rough stores. To the rear of the stores will be the scrap bins, with track scales in one of the stores service tracks, and with the oil storage tank nearby. The passenger car shop, 100 by 200 ft., will be directly to the rear of the blacksmith shop. The woodworking department, consisting of the planing mill, 100 by 150 ft.,

MARCH 1914

MARCH 1914

shed and kiln, will be direct- of the coal and iron shed, orage space to the rear of d. The freight car shop, will be to the rear of the e power house, 50 by 100 ft., he pattern shop. All these e approached from the west track, which will leave the long the south of the main r the west end of the main dder, in addition to leading service tracks, will serve a t car repair yard, and a 5 r car storage yard, to the rear tive shops.

otive house at this point will st of the locomotive shop, and

Canadian Society of Civil Engineers Annual Meeting.

The annual meeting was held in Montreal, Jan. 27 to 29. The reports of committees, and which are of interest to railway engineers, were published in Canadian Railway and Marine World for February.

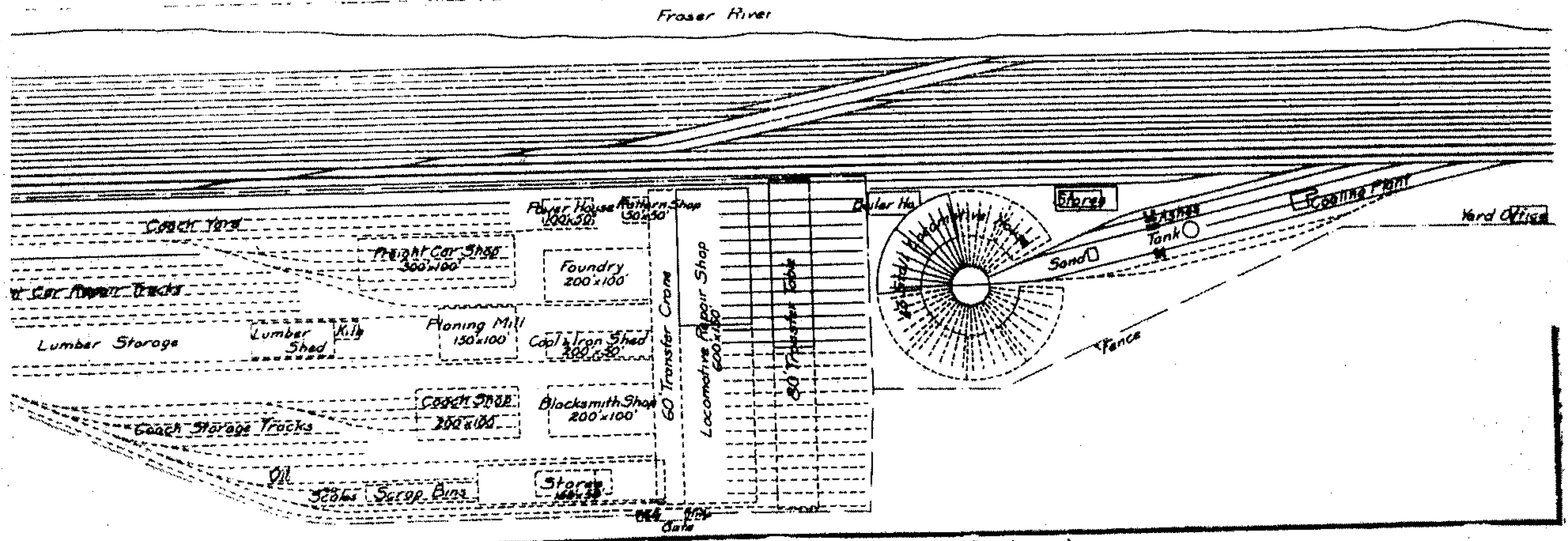
The following officers were elected:—President, M. J. Butler, Montreal; Vice President, R. A. Ross, Montreal; Members of Council, J. M. R. Fairbairn, Montreal; Prof. H. M. Mackay, Montreal; R. McColl, Halifax, N.S.; A. R. Decary, Quebec; R. F. Uniacke, Ottawa; W. A. Bucke, Toronto; F. Lee, Winnipeg, and G. R. G. Conway, Vancouver.

The society has 2.794 members and as-

Dominion Government Railway to Hudson Bay.

Replying to a question in the House of Commons, Feb. 2, the Minister of Railways said the length of this railway from Pas to Port Nelson, Man., is 418.5 miles. The whole mileage is under contract, viz.—Pas to Thicket Portage, 185.5 miles; Thicket Portage to Split Lake Jct., 68 miles; Split Lake Jct., to Port Nelson, 165 miles. The state of construction is,—Miles of steel laid, 86; miles surfaced, 56; grading fairly completed with the exception of a few cuts at miles, 110, 121 and 133 and some cross laying, 137.

In a discussion on the project in the House of Commons, Feb. 11, the Minister of



Canadian Northern Railway Port Mann Terminal Layout (Section 2).

Canadian Northern Railway Port Mann Terminal Layout (Section 2).

re house at this point will of the locomotive shop, and be a 43 stall unit. Only a is being built now, and with mechanical yard accomoda-omotive house will be ap-he east. Of the mechanical nts, only the northerly half icted at first, the southerly

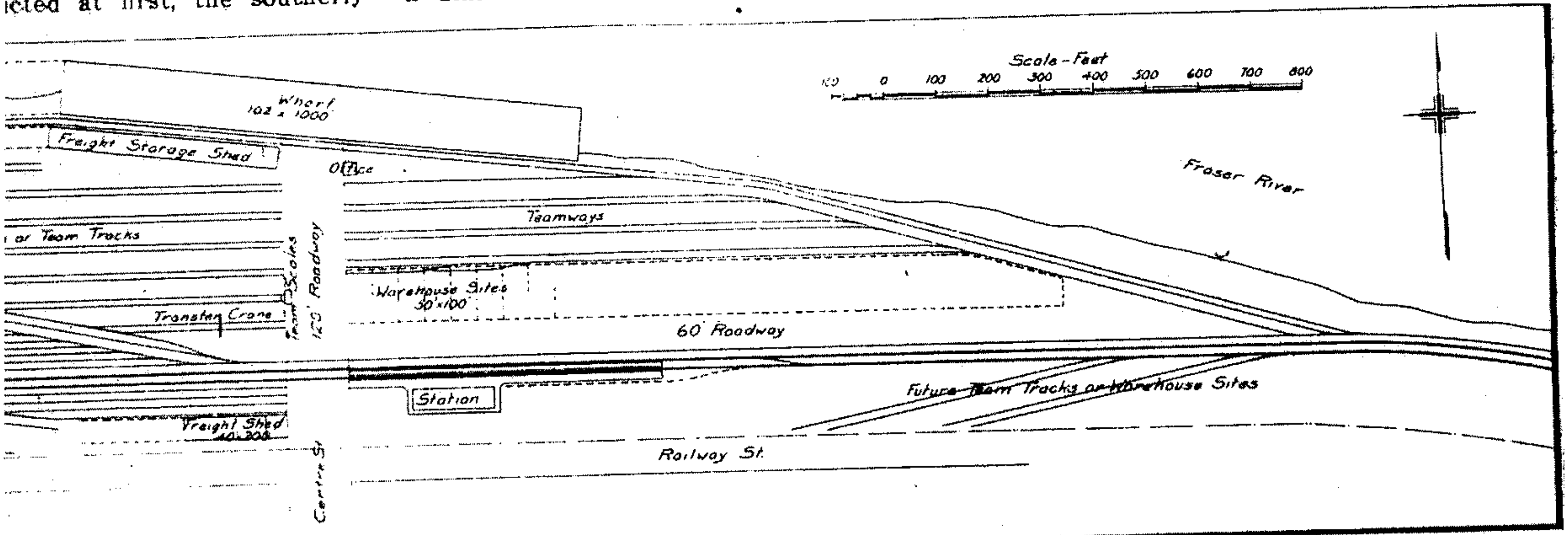
F. Lee, Winnipeg, and G. R. G. Conway, Vancouver.

The society has 2,794 members and assets of $108,300, including the new premises on Mansfield St., Montreal, valued at $90,000.

The features outside the business meeting included a luncheon tendered by the Montreal members; a smoking concert and a dinner at the Engineers Club, presided

ing, 137.

In a discussion on the project in the House of Commons, Feb. 11, the Minister of Railways stated that while Port Nelson is not an ideal harbor for the seaboard terminal of the railway, it is superior to Fort Churchill. To reach the latter port it would be necessary to carry the line across 70 miles of "badlands." The misadventures of



MARCH 1914

Canadian Northern Railway Port Mann Terminal Layout (Section 4).

the completion of the loco- Adjoining the locomotive will be a boiler and engine the east, a stores building. ldings will be of concrete, the buildings of the shop layout, hem have been, or are being Imperial Construction Co., To-are indebted to J. Montgomery any for the data, on which this ed.

over by the Vice President, H. H. Vaughan, Assistant to the Vice President C.P.R., in the absence of the President, Phelps Johnson. A visit was paid to the St. Lawrence Bridge Co.'s plant at Rockfield, and also to the Canadian Northern Ry.'s Mount Royal tunnel.

Dominion Railway Subsidy Agreement.—The Dominion Government entered into an agreement, Jan. 20, under the act granting aid in the construction of railways, with the Esquimalt and Nanaimo Ry., for lines

vessels during the last season of navigation were due to various causes but the loss and damage had not been anything like so serious as was reported. As much progress has been made with the terminal work as could reasonably be expected. It is intended to send in a strong force of men overland, so as to make an early start on the work, and make as much progress as possible during the open season this year. (Feb., pg. 70.)

The Canadian Northern Ex. Co. has opened an office at Hafford, Sask., and has closed its offices at Barton, Ladysmith, Neelin

Canadian Northern Railway Construction, Betterments, Etc.

Mount Royal Tunnel and Terminal Ry.—The Board of Railway Commissioners has approved revised location of the tunnel line from St Antoine St. to its main line at Montreal and rescinded order made Nov. 27, 1913.

Preliminary plans for the passenger terminals in Montreal have been prepared. They will be located between Cathcart and Lagauchetiere, St. Monique and Mansfield streets, and it is said they will comprise a group of buildings of sonsiderable architectural attractiveness; that the platforms will be 1,200 ft. long, and will be 45 ft. below the upper level at Dorchester St., and 20 ft. above the general level of the city. Press reports, Feb. 13, stated that excavation has been started for the station and terminal buildings, and that the erection of a temporary station will be undertaken as soon as the weather permits. It is expected that passenger trains will be running through the tunnel early in the autumn.

Toronto-Hamilton Line.—A bylaw, submitted to the ratepayers of St. Catharines, Ont., to give a bonus of $100,000 towards the building of the projected railway from Toronto to the Niagara River, was defeated by a vote of 744 to 324, Jan. 31.

Canadian Northern Ontario Ry.—It has been announced that the branch on the Toronto-Sudbury line from Uhthoff into Orillia, will be opened for traffic, Mar. 1.

Montreal-Ottawa-Port Arthur line.—The Board of Railway Commissioners has approved of revised location plans of the line at Grand Lake, in Nipissing District, mileage 126.37 to 129.94 from Ottawa.

We have been officially supplied with the following information with regard to the work done on this line during 1913:—Average force employed for every working day in the year, 6,880 men, and 808 horses;

be approved from time to time by the Lieutenant-Governor-in-Council. The provisional directors are:—H. Sutherland, P. C. Andrews, E. Langham, O. G. Clark, K.C., C. W. Jackson, Winnipeg.

Sir William Mackenzie, President, is reported to have stated at Winnipeg, Feb. 12, that construction will be proceeded with at once on the new line from Grand Marais to Victoria Beach, and the line from Deerfield to Lake Manitoba. The Manitoba Legislature has passed an act guaranteeing the company's bonds for $13,000 a mile for the building of these two lines, 15 and 12.5 miles long, respectively.

Plans have been deposited in the Land Titles office at Moose Jaw, Sask., showing revised location of the Maryfield branch through tps. 5 and 6, ranges 25-29, west of the 2nd meridian. In connection with this line, Sir Donald Mann is reported to have recently said:—"Our present entrance to Moose Jaw is by the Maryfield branch—a round about route It is likely that we shall come to some arrangement with the G.T. Pacific Ry. in order to secure a more direct entrance, but it will not be yet."

It was understood that the line into Calgary, which, from near Drumheller, Alta., carried traffic coming off the line through from Saskatoon, and the traffic from the line south from Vegreville, would have been opened for traffic Feb. 1. The Board of Railway Commissioners, however, refused to sanction its opening until the temporary bridges east of the city are strengthened. It is expected that operation will be started early in March.

The company has secured, D. B. Hanna, Third Vice President, is reported to have recently said, a site in Calgary for its station, and is going ahead with the preparation of plans for building it.

In connection with the building of a line

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MARCH
1914

day in the year, 6,880 men, and 808 horses; largest force employed in any month, 8,736 men and 1,195 horses; smallest force employed in any month, 3,838 men and 298 horses; outlay in wages, $720,000, equal to about $20,000 each working day; yardage moved, about 11,000,000 cubic yards, equal to 366 miles of completed grade, allowing 30,000 cubic yards a mile, or 1.9 miles of grade for each working day. There were 15¼ million feet of timber built in trestles; 4½ million feet in culverts; 43,399 cubic yards of concrete were put in culverts and bridge foundations; and 2,900 tons of steel were put into the superstructures of bridges. Track was connected upon the Sudbury-Port Arthur section of the line, 550 miles, on Dec. 31, 1913, just 29 months after the grading was commenced.

Canadian Northern Ry.—In a recent interview at Winnipeg, Sir Donald Mann, Vice President, is reported to have said, that the company, before undertaking any new construction, would complete its main line and branches now under construction.

Press reports state that contracts will shortly be let for the construction of a number of large steel bridges on western lines, at a total estimated cost of $4,000,000. These include bridges at Snarling River, Minette, and at Athabaska.

The Manitoba Legislature has passed an act incorporating the Canadian Northern Manitoba Ry. Co. to build the following lines:—From the Oak Point branch of the C.N.R., in tp. 27 or 28, westerly to the eastern shore of Lake Manitoba; from the Oak Point branch near Gypsumville, northerly to the authorized line of the C.N. Ry., between Shevlin and Grandview on the C.N. R., southeasterly to Portage la Prairie; from Portage la Prairie southerly and southeasterly to the C.N.R. between Emerson and Sprague, and such other lines as may

In connection with the building of a line into Macleod, Alta., press reports, Feb. 9, stated that engineers have been going over the route, on which some grading has been done, between the C.P.R. tracks and the Old Man River, and have been locating a site for the construction of a bridge there.

The proceeds of the bond issue recently placed on the London, Eng., market will be used in the construction of the following lines under agreement between the C.N.R.'s subsidiary, the Canadian Northern Western Ry., and the Alberta government:—From Oliver northeasterly to St. Paul de Metis; from Bruderheim via Vermillion, Wainwright and Medicine Hat to the International boundary, with a branch northeast of Vermillion to the eastern boundary of the province; from Camrose to Alsask; from Calgary northwest to the Brazeau line; from Strathcona southwest via Cochrane to Pincher Creek, and from Athabaska north of Lesser Slave Lake to Peace River Crossing.

The annual report of the Minister of Railways for Alberta for the calendar year 1913, shows that during the year the company built 249 miles of railway in the province. There had been built, or were in process of completion under provincial guarantee the following lines:—

	Guarantee per mile.	Mileage Guaranteed.
CANADIAN NORTHERN RAILWAY—		
Strathcona via Camrose and Calgary to Lethbridge	$15,000	355
Camrose to Vegreville	15,000	45
Crossing of second above line and Little Bow River, south via Macleod to the International boundary	15,000	110
Near Macleod to the Western Boundary	15,000	65
Morinville to Athabasca Landing	15,000	72.3
Mile 175 of the Goose Lake line to Munson	15,000	127.5

MARCH
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Etc.

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D. B. Hanna,

CANADIAN NORTHERN WESTERN RY.—

Onoway northwest to Pine River Pass	$20,000	100
Oliver northeast to St. Paul de Metis	13,000	100
Bruderheim via Vermilion, Wainwright and Medicine Hat to International boundary, with a branch northwest of Vermilion to Eastern Boundary	13,000	30
Calgary northeast to Brazeau line	13,000	100
Camrose to Alsask	13,000	80
Strathcona via Cochrane to Pincher Creek	15,000	20
Blackfalds to Goose Lake line	13,000	118.5
Total		1.323.3

Steel is reported to have been laid on the Brazeau line to about 45 miles west of Rocky Mountain House, and grading is said to be in progress right through to the Brazeau coal fields. The bridge across the Saskatchewan River on this line, it is reported, will be built jointly with the C.P.R., whose Alberta Central Line parallels the C.N.R. line for a considerable distance.

Canadian Northern Pacific Ry.—The British Columbia Legislature passed an act, Feb. 13, affecting the guarantee of bonds of the company. The Premier stated that it had not been found a workable plan to rank the 4½% securities as provided by the act of 1912, with the 4% securities which were provided for under the original act. The amendment now carried provides that the 4½% securities shall be applied only for the construction of the lines specially mentioned in the act of 1912, viz.:—From the 100-Mile post on the Vancouver Island line to Duncans; from Kamloops to Kelowna, in the Okanagan, with a spur line to Lumby; the branch from New Westminster to Steveston; the line from Patricia Bay to Victoria; the line from New Westminster to Vancouver.

It is reported that there are only about five miles of grading south of the Albreda

MARCH 1914

line for a considerable

Canadian Northern Pacific Ry.—The British Columbia Legislature passed an act, Feb. 13, affecting the guarantee of bonds of the company. The Premier stated that it had not been found a workable plan to rank the 4½% securities as provided by the act of 1912, with the 4% securities which were provided for under the original act. The amendment now carried provides that the 4½% securities shall be applied only for the construction of the lines specially mentioned in the act of 1912, viz.:—From the 100-Mile post on the Vancouver Island line to Duncans; from Kamloops to Kelowna, in the Okanagan, with a spur line to Lumby; the branch from New Westminster to Steveston; the line from Patricia Bay to Victoria; the line from New Westminster to Vancouver.

It is reported that there are only about five miles of grading south of the Albreda Summit, B.C., on which no work has yet been done, along the whole line. At this point several routes have been laid out, but a definite decision has not been arrived at as to which will be followed. The remaining portions of the grading, on which track had not been laid up to Dec. 31, 1913, is well advanced to completion. It is expected to have the track laid through early in the fall. (Feb., pg. 73.)

A Victoria, B.C., dispatch of Feb. 21, said that the Premier had introduced a bill in miles, principal and interest at 4½% until 1950, the total amount being $12,360,200 the Legislative Assembly providing that the Province guarantee Canadian Northern Pacific Ry. bonds for $10,000 a mile for 511 The time for the completion of the line is to be extended to 1916.

MARCH 1914

Government Grain Elevators.—The Minister of Trade and Commerce in response to a letter from the Member of Parliament for North Grey, stated recently, that the

Canadian Northern Railway Construction, Betterments, Etc.

Canadian Northern Quebec Ry.—Press reports state that the company is preparing to erect a large coal discharging plant at Quebec and to extend its coal wharf 150 ft.

Mount Royal Tunnel and Terminal Co.—Work was started Mar. 10 on Cathcart St., Montreal, sinking a shaft to the level of the tunnel for the purpose of assisting to get in construction material.

The clearing of the buildings on the blocks bounded by Cathcart, Ste. Monique, Lagauchetiere and Mansfield Streets is being pushed forward. The tenants of the buildings on the north side of Dorchester St., which have been acquired by the company for its terminals in the city, have been notified to leave. It is expected that excavation for the terminals will be started at an early date. The area will be excavated to 50 ft. below the ground level, involving the moving of over 500,000 cubic yards of earth and 95,000 cubic yards of rock. It is estimated that there will be required in the construction of the terminal buildings 100,000 cubic yards of concrete, 3,500,000 lbs. of reinforcing steel, and 8,000,000 lbs. of structural steel.

Montreal-Ottawa-Port Arthur Line.—Press reports state that grading on the unfinished portion of the Ottawa-Capreol section of the line is expected to be completed about Sept 1 and the track laying finished Dec. 30.

Canadian Northern Ontario Ry.—The New York State Legislature has under considera-

placed on the London, Eng., market. A press report states that a contract for building branch lines in Alberta has been let to Foley, Welch and Stewart, Spokane, Wash.

A train service has been put in operation out of Calgary on the newly completed line south from Vegreville, which is joined near Drumheller by a line from Saskatoon, Sask. At present only one station has been opened between Calgary and Drumheller.

Press reports state that it is expected to have about 20 miles of the line south from Calgary to Lethbridge open for traffic this year.

The line from Onoway, Alta., to the Peace River country is completed to the Pembina River, over which a large bridge is under construction. Grading has been completed for a considerable distance beyond the Pembina River. A. T. Fraser, district engineer in charge of construction, was in Edmonton, Mar. 14, and is reported to have stated that considerable further grading will be done during this year.

Canadian Northern Pacific Ry.—The British Columbia Legislature has granted further aid, by means of a guarantee of bonds, for the construction of this railway. The act sets out that in addition to the bonds guaranteed under chap. 3 of the statutes of 1910, the Government is authorized to affix the provincial guarantee to the company's bonds as to principal and interest for $10,000 a mile for the line from the south end of

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Canadian Northern Ontario Ry.—The New York State Legislature has under consideration a bill for the incorporation of the Niagara-Ontario Connecting Bridge Co, to build a bridge across the Niagara River from Lewiston, N.Y., to the Canadian shore, for electric and steam railways. The incorporators are:—E. G. Connette, H. Holden, C. L. Ingham, F. A. Dudley, L. Albright. It is reported that Canadian Northern Ry. interests are associated with this project.

Canadian Northern Ry.—H. K. Wicksteed, M. Can. Soc. C.E., Chief Engineer of Surveys, Mackenzie, Mann & Co., and a representative of the company's legal staff had an interview with the Port Arthur City Council, Mar. 10, to discuss and settle various matters connected with the eastern entrance of the railway and the closing of certain street ends. An agreement is said to have been arrived at as to the closing of the streets, but the matter of the eastern entrance is to be further considered.

Press reports state that the company has under consideration plans for the erection of a new storage shed for incoming freight in the south section of Port Arthur.

It is reported that a new station is to be erected at Kakabeka Falls, Ont., during the summer.

The new station at St. Boniface, Man., has been opened for business.

Press reports state that a number of new sidings are to be put in at the quarries of the Manitoba Gypsum Co. at Gypsumville, Man., during the summer.

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In support of the act the Premier informed the Legislature, Feb. 27, that 16 of the steel bridges across the Fraser and Thompson Rivers, having a total length of 12,214 ft., have been completed. There are still 19 bridges, having an average length of 224 ft., to be completed. The total construction cost of the line is now put at $33,029,200, or about $8,000,000 more than the original estimates. This is accounted for by the high standard of construction required and the increased cost of labor and materials. The extension of time granted applies only to the Okanagan and another branch line, as it is expected to have the main line finished this year.

T. G. Holt, executive agent, is reported to have stated at Ottawa, Mar. 12, that track would be laid on the entire line from the Yellowhead Pass to Vancouver by August.

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It is reported that a spur line is to be built from Radville, on the Maryfield branch, northerly to Weyburn, Sask.

Plans have been deposited in the Land Titles offices at Moose Jaw, Sask., and at Saskatoon, Sask., showing the right of way of the C.N.R. as located through tps. 26-28, ranges 26-29, west of the 3rd meridian.

Press reports state that the company will start construction this year on a line from Brudetheim to Vermillion, thence to Wainwright, and through Medicine Hat to the International boundary between Alberta and Montana. This line is one of the projected lines of the C.N. Western Ry., for the building of which an issue of bonds, guaranteed by the Province of Alberta, was recently bonds guaranteed under the act of 1910. The act also grants an extension of time to July 1, 1916, for the completion of the lines.

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Vancouver Island Lines.—Referring to the construction of the line on Vancouver Island, the Premier is reported to have said in the Legislature, Feb. 27, that the line from Patricia Bay to Alberni is expected to be completed by the end of this year, although, under the act, the time for completion has been extended to July, 1915. (Mar., pg. 126.)

April
1914

The ninth annual dinner of the G. T. R. apprentices at the Stratford locomotive shops was held in the G.T.R. Assembly Hall, Stratford, Ont., Mar. 23, R. Patterson, Master Mechanic, occupying the chair. H. G. Kelley, Vice President, and W. D. Robb, Superintendent of Motive Power, were also present.

courtesy, zeal, loyalty, ambition, and knowledge marks them out as above the ordinary, and likely material for advancement."

A Canadian Pacific and Canadian Northern Joint Section in Alberta.

The Alberta Central Ry., a C.P.R. subsidiary, and the Canadian Northern Western Ry., a C.N.R. subsidiary, both of which are building lines west of the Red Deer River to Rocky Mountain House and the Brazeau River coal fields, have agreed that a certain portion of the line is to be jointly owned, and the Dominion Parliament is being asked to confirm this agreement, which is dated June 15, 1913. The lands on which the joint section is to be built extend from the s. e. ¼ of Sec. 22, tp. 29, range 7, west of 6th meridian, to the west limit of sections 18 and 19 in the same tp. and range, and these lands, together with the lines, buildings, etc., to be laid out thereon, are to be known as the joint premises. The C. N. W. Ry. is given joint user of the entire joint premises, with the exception of a spur track to the banks of the North Saskatchewan River; but all maintenance and repairs are to be done by the A. C. Ry. The cost of all works, including a bridge across the North Saskatchewan River, is to be carried to capital account, and the C. N. W. Ry. is to pay interest on 50% of the same at 4½%, and the C. N. W. Ry. will also pay such a proportion of the total of maintenance as is represented by its proportion of the total traffic. The

April 1914

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Supervision of Officials and Employes on C.P.R. Western Lines.

An apparently supplied, or at least inspired, article has been published in some western papers, which mentions the large number of officials and employes on the lines west of Port Arthur, Ont., with some details of the organization, and then says:—

"With a view to bringing the management in as personal touch as possible with

C. N. W. Ry. proposes to extend its line from the westerly end of the joint premises to the westerly limit of range 19 west of the 5th meridian, and it is understood that this extension, or any portion, may be used by the A. C. Ry. on the same terms and conditions as the joint premises. The agreement provides for arbitration in case of differences as to terms.

Standard Rules on the Intercolonial

April 1914

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anadian Railway and Marine World

May, 1914.

Location and Construction of the Canadian Northern Pacific Railway in British Columbia.

By J. V. Nimmo, B. Sc., M. Can. Soc. C. E., Division Engineer, C. N. P. R., Vancouver.

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main physical features of British

APHY.—In broad outline the
Cordillera may be divided into
nces: (1) The Rocky Mountain
) The Middle or Interior Range,
the Purcell, Selkirk, Columbia,
nd Cassiar Mountains; (3) The
terior plateaus; (4 The Coastal
including the Coast, the Cas-
the Vancouver-Queen Charlotte

trenches, and on the south by the loop of the Kootenay River in Montana and Idaho. A third depression extends from near latitude 52 degrees, where the Columbia River leaves the Rocky Mountain trench and flows south in a wide valley 310 miles long to the Columbia lava fields of Washington State, passing through the Arrow Lakes on its way. This depression is sometimes referred to as the Selkirk Valley. East of the Selkirk Valley, and west of the two master trenches, is the Selkirk Mountain system, which, like the Rocky Mountain and Purcell systems, extends into the United States. The rugged mountains to the west of the Selkirk Valley have been grouped under the name of the Columbia Mountain system. Between the 54th and 56th parallels the western wall of the main Rocky Mountain trench is much less prominent than it is either to the south or the north, where it is formed by the Cassiar Mountain Range, so much so that between these two parallels the interior plateaus might be said

cades. The main alternatives are by the way of:—The Fraser River to Burrard Inlet; Nomathco to Bute Inlet; the Bella Coola to the North Bentinck Arm; the Salmon River to Dean Inlet; the Kemano River to Gardner Inlet; the Skeena River to Prince Rupert. Of these only the first and last are routes that pass through major breaches in the Cascade Range, and the only ones that do not offer gradients somewhere in their course which would be a serious obstacle to transcontinental traffic. The Coast Range is less mountainous towards the north than it is in the south, hence, although the Skeena in reality is not as great a river as the Fraser, yet it is so relatively to the country through which it passes, and provides almost an equally suitable approach to the Pacific. The second condition of the problem, viz., the satisfactory connection between the Rocky Mountain pass and these breaks in the Cascades, is wonderfully fulfilled by both routes. Instead of the great trenches being obstacles, as is the case in the southern routes, they

MAY 1914

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Mountain trench is much less than it is either to the south or the north, where it is formed by the Cassiar Mountain Range, so much so that between these two parallels the interior plateaus might be said to extend right up to the trench. The various ranges to the west of the Rocky Mountain trench and south of the 52nd parallel concentrate into one north of the Selkirk Valley. The single range has its narrowest width and lowest pass at Albreda Lake, almost opposite the Yellowhead Pass.

In so far as this generation is concerned we may consider latitude 56 degrees as the northernmost limit of the territory across which a transcontinental railway would be constructed. Between this latitude and the International Boundary there are seven main passes through the Rocky Mountain chain, as follows:—The Crows Nest, at an elevation of 4,449 ft.; the Kicking Horse, at an elevation of 5,200 ft.; the Howse, at an elevation of 4,500 ft.; the Athabasca, at an elevation of 5,710 ft.; the Yellowhead, at an elevation of 3,718 ft.; the Smoky River, at an elevation of 5,400 ft.; the Pine, at an elevation of 2,850 ft.

The Crows Nest and the Kicking Horse passes have been taken by the C.P.R. They cross the Rocky Mountain and Selkirk groups of mountains at its widest and lead to routes which inevitably cut square across the great trenches enumerated above, and pass over intervening summits of magnitude. There is only one suitable route open to them across the Cascade and Coast Ranges, viz., the Fraser River Valley, to enter which involves, not only a circuitous route, but heavy gradients. The Howse offers no suitable approach from the east, and leads to the same difficulties as the Kicking Horse. The Athabasca and the Smoky are too high, and the approach to them from the west and the east is too rapid for easy grades. The Pine is good, but the geographical situation places it at a disadvantage as compared with the Yellowhead, which alone complies with the necessary requirements of:—Easy approach from the west and the east, access to an

tory connection between the Rocky Mountain pass and these breaks in the Cascades, is wonderfully fulfilled by both routes. Instead of the great trenches being obstacles, as is the case in the southern routes, they now form part of the connecting link. The northern route through the Skeena follows the Rocky Mountain trench until the western wall of the latter comes to an end, whence there is an easy way across the great interior plateau by the Nechako and Buckley Rivers. For the southern route there is the providential opening through the Columbia Mountain system at the Albreda summit, from which flows a branch of the Thompson, the main tributary to the Fraser. Here is another illustration of how railways must, as far as possible, follow nature's highways, the rivers. Seldom, however, does nature put her great waterways in as suitable a position for the use of railway locators as she has done in this case. Of these two routes the northern is followed by the Grand Trunk Pacific, and the southern by the Canadian Northern Pacific.

THE GEOLOGICAL HISTORY of the Canadian Cordilleras is yet largely a matter of mystery. The formation is chiefly sedimentary, and there is little evidence of volcanic action. There appear to have been several sedimentary periods alternating with periods of upheaval; and the evidence tends to show that the sediment was from detritus from mountains to the northeast. Probably the Rocky Mountain Range is younger than the Selkirks. There is no doubt that the region of interior plateaus was covered during the Pleistocene period by the cordilleran ice cap. With the waning of this ice cap it gradually gave place to alpine, cirque and valley glaciers, which slowly retreated until the time of maximum extension of the Keewatin ice sheet on the east, when the second period of valley glaciation took place. These glacial conditions, followed by eons of disintegration and slow (and probably discontinuous) land upheaval, appear to have modified the original form of the Cordilleras to their present condition. By what exact process the wonderful rift was made,

MAY 1914

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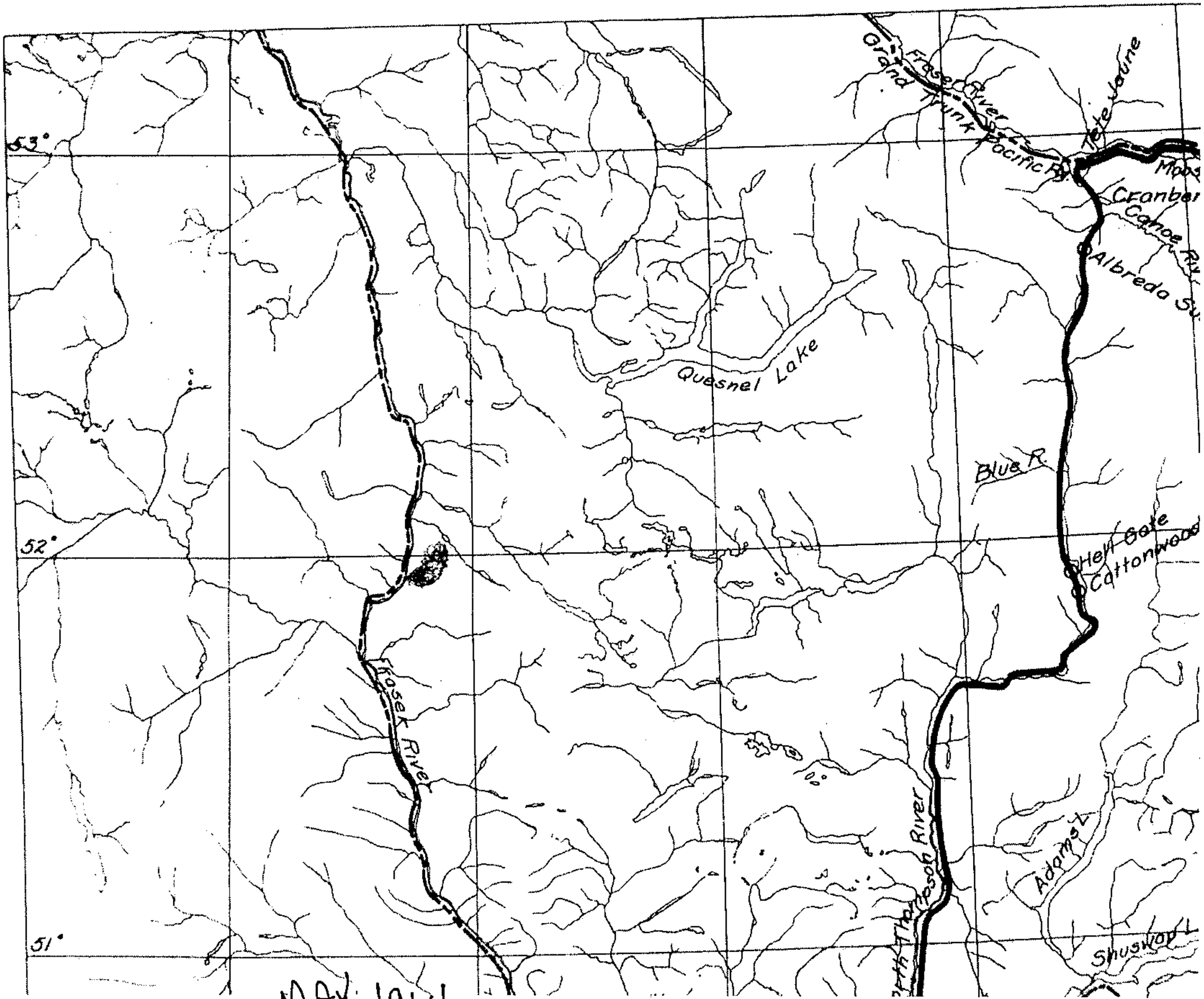
MAY 1914



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52°
51°

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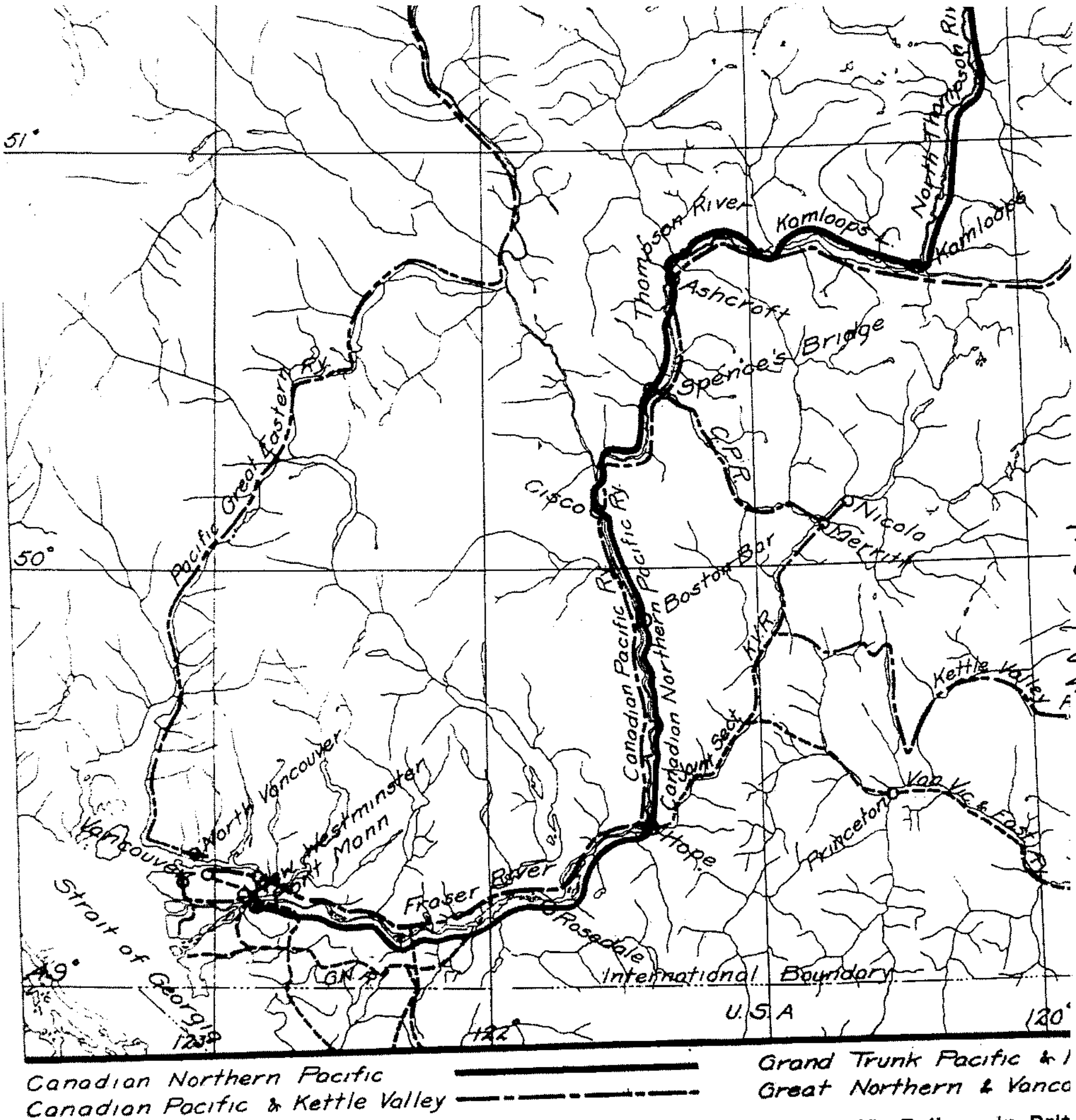

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Route of the Canadian Northern Pacific Railway in Brit

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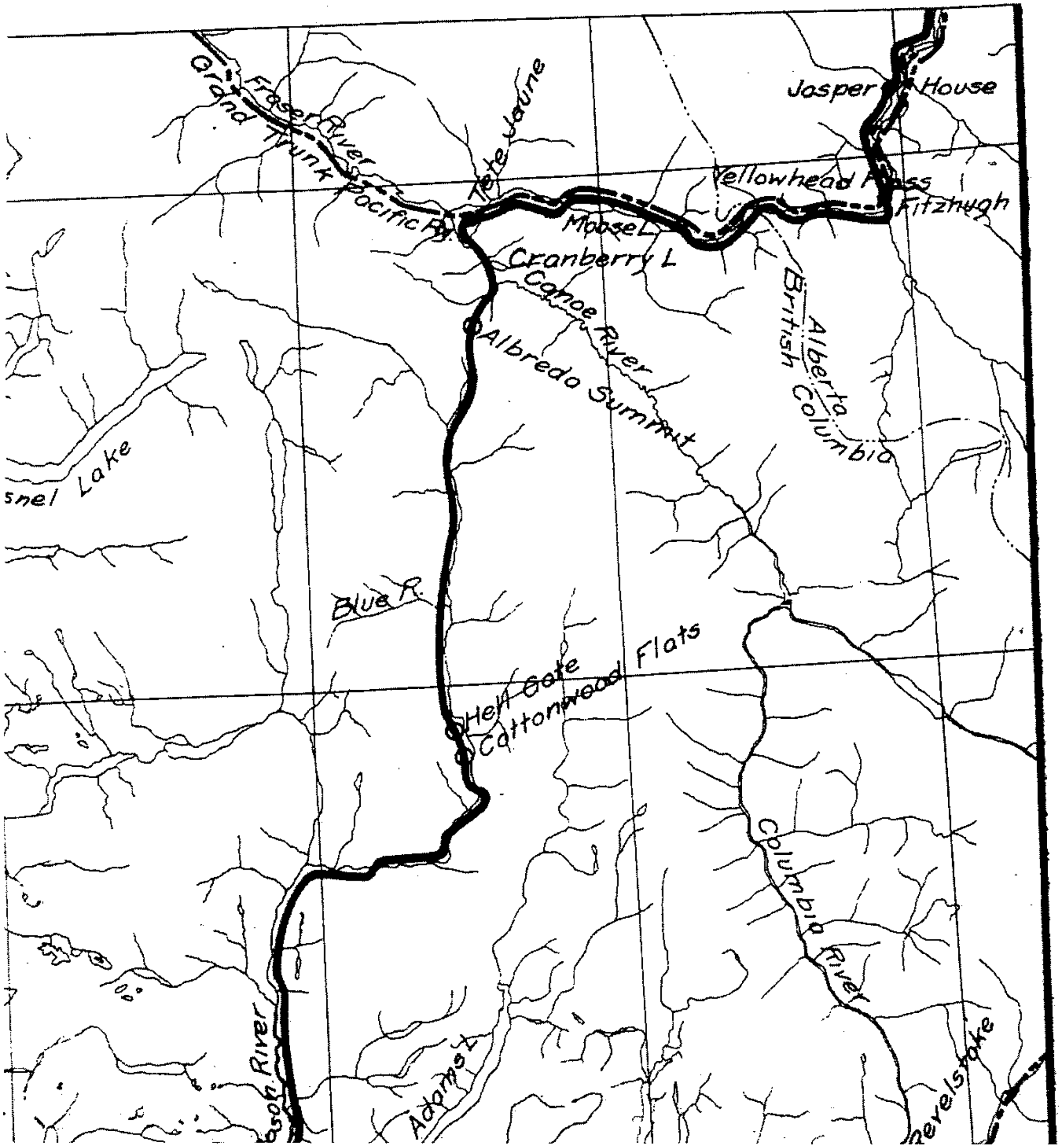
Jasper House to Blue River. This secti traverses the Rocky and Selkirk Mountai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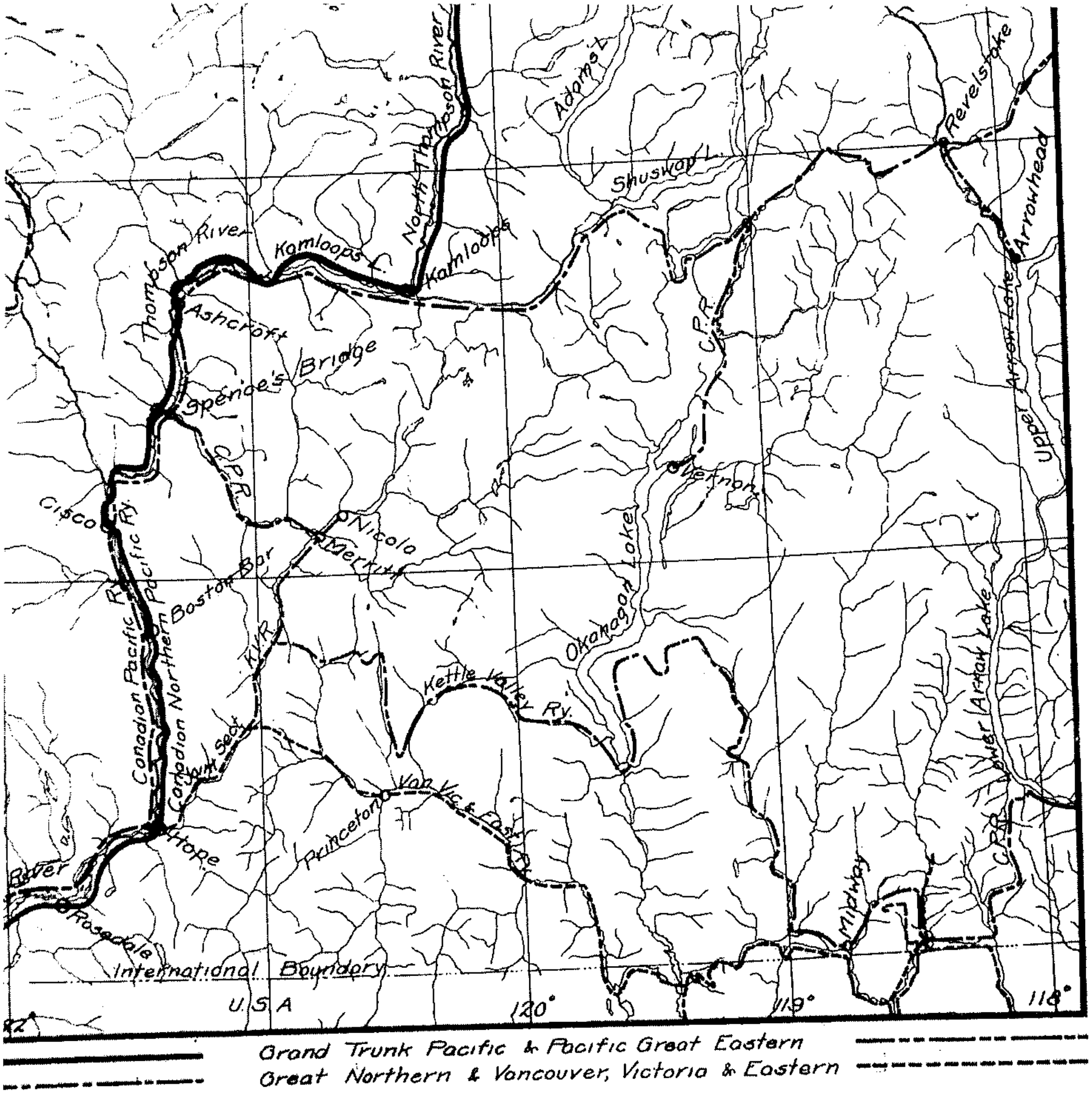

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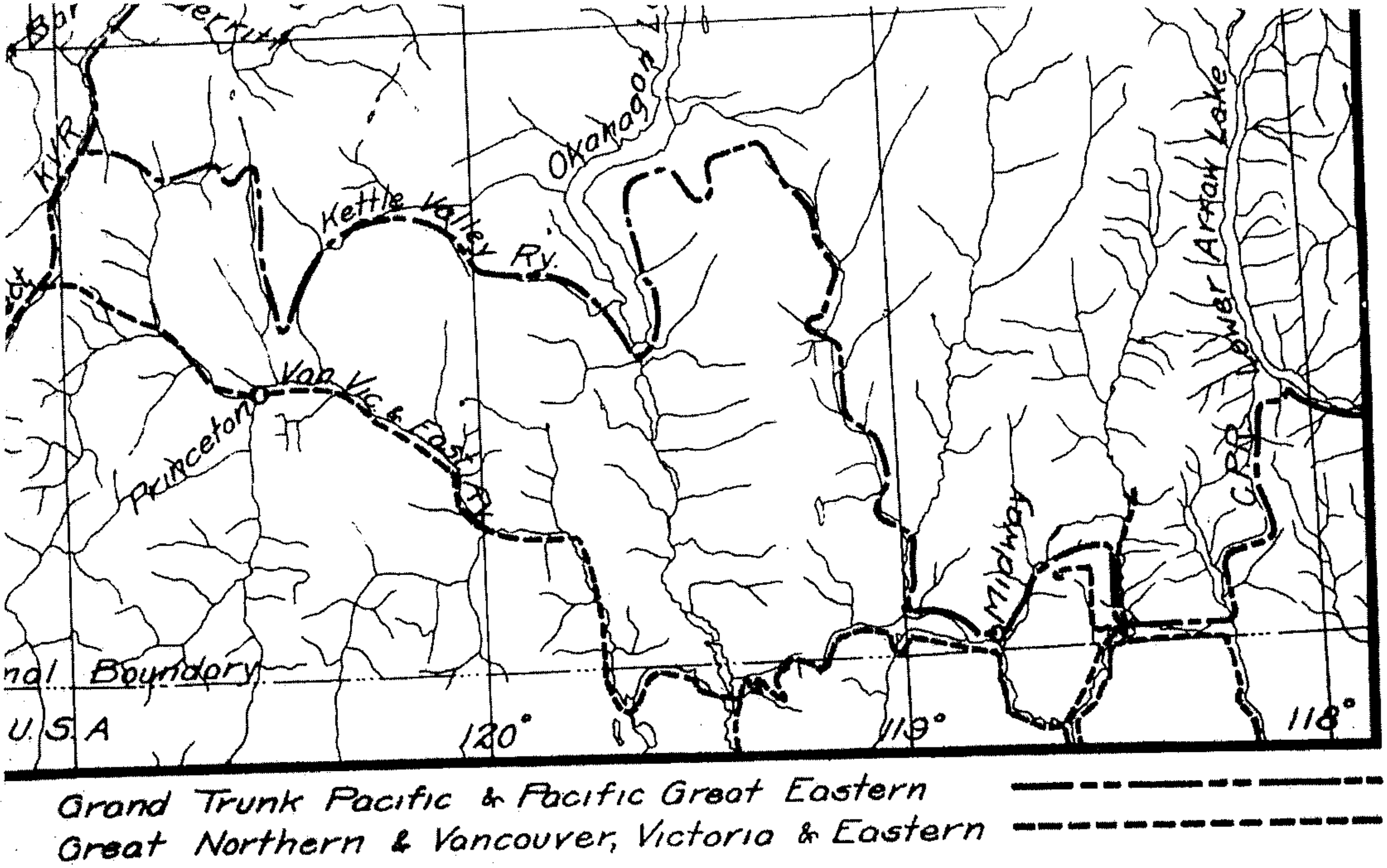
MAY 1914



lorthern Pacific Railway in British Columbia.

ıe to Blue River. This section e Rocky and Selkirk Mountains, rt of the distance lies in the ıtain trench; 2, from Blue River . This section is through the belt of the interior plateaus; 3, from Ashcroft to Rosedale. Traversing the Coast Range; 4, the Fraser Delta from Rosedale to Vancouver. The formation through the first of these sections consists of sandstone,

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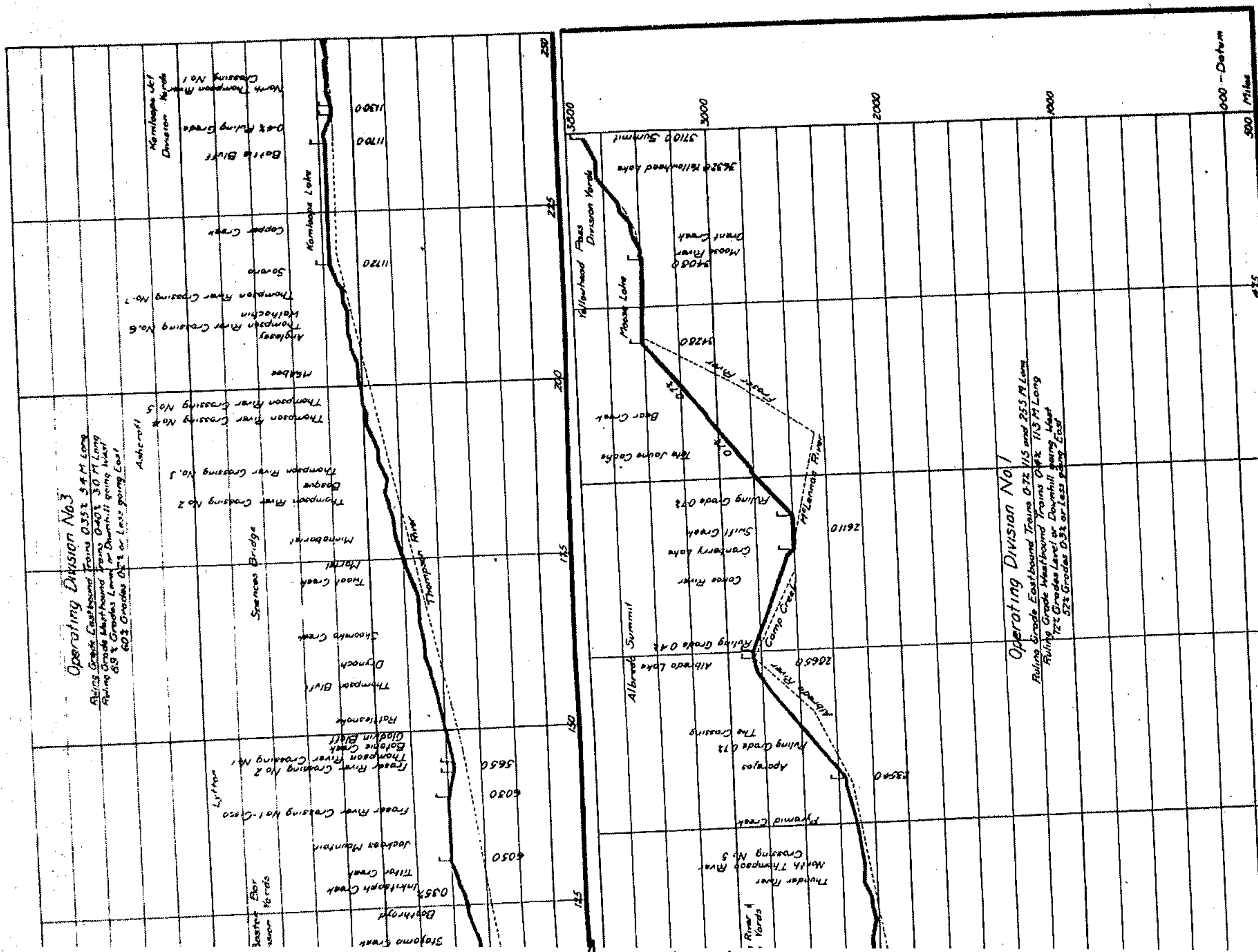

MAY 1914

Yellowhead Pass.

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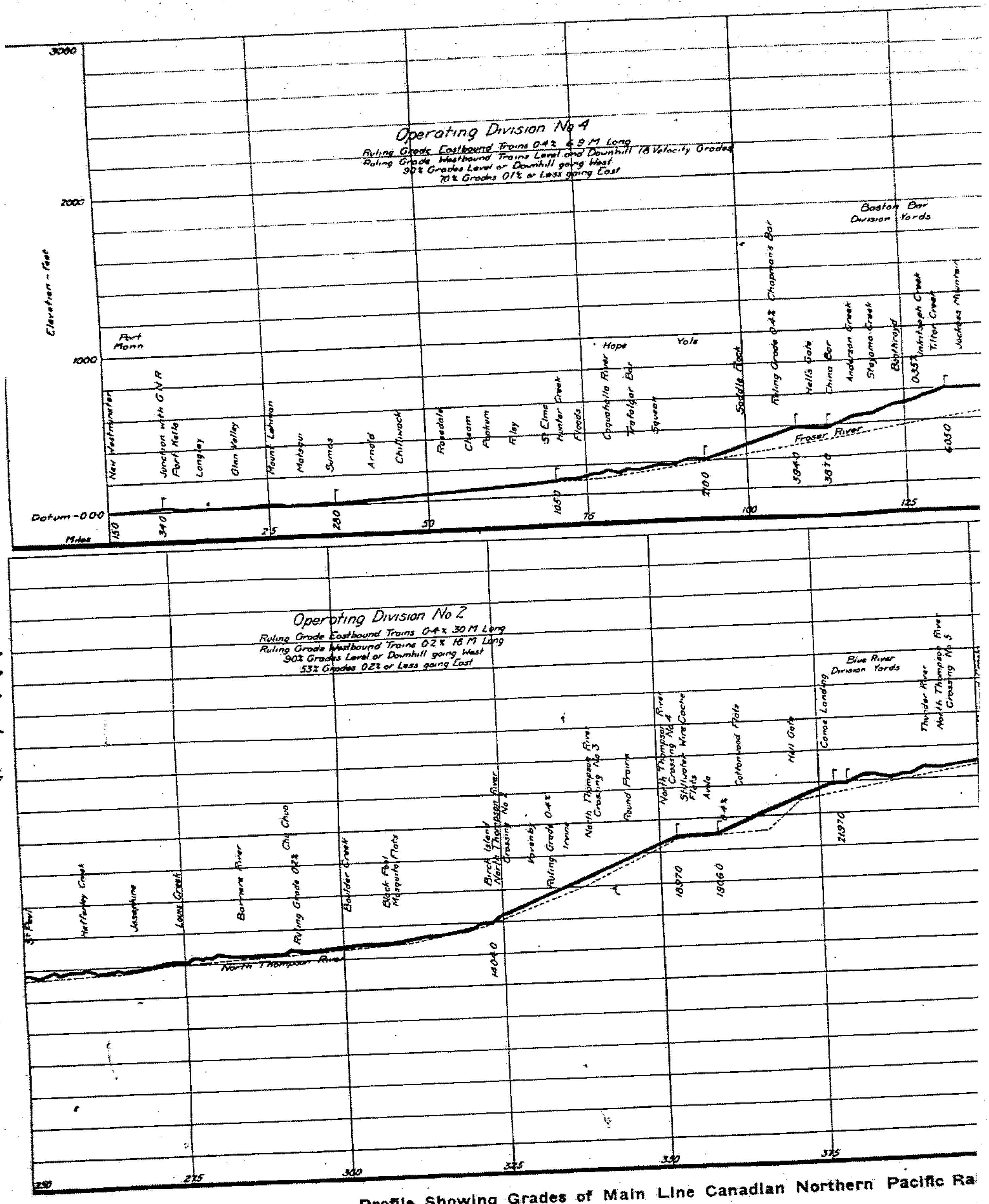

Profile Showing Grades of Main Line Canadian Northern Pacific Ra

ite, etc., but the predominating features Spences

limestone, argillaceous and siliceous shales are the gravel and boulder formations and striking

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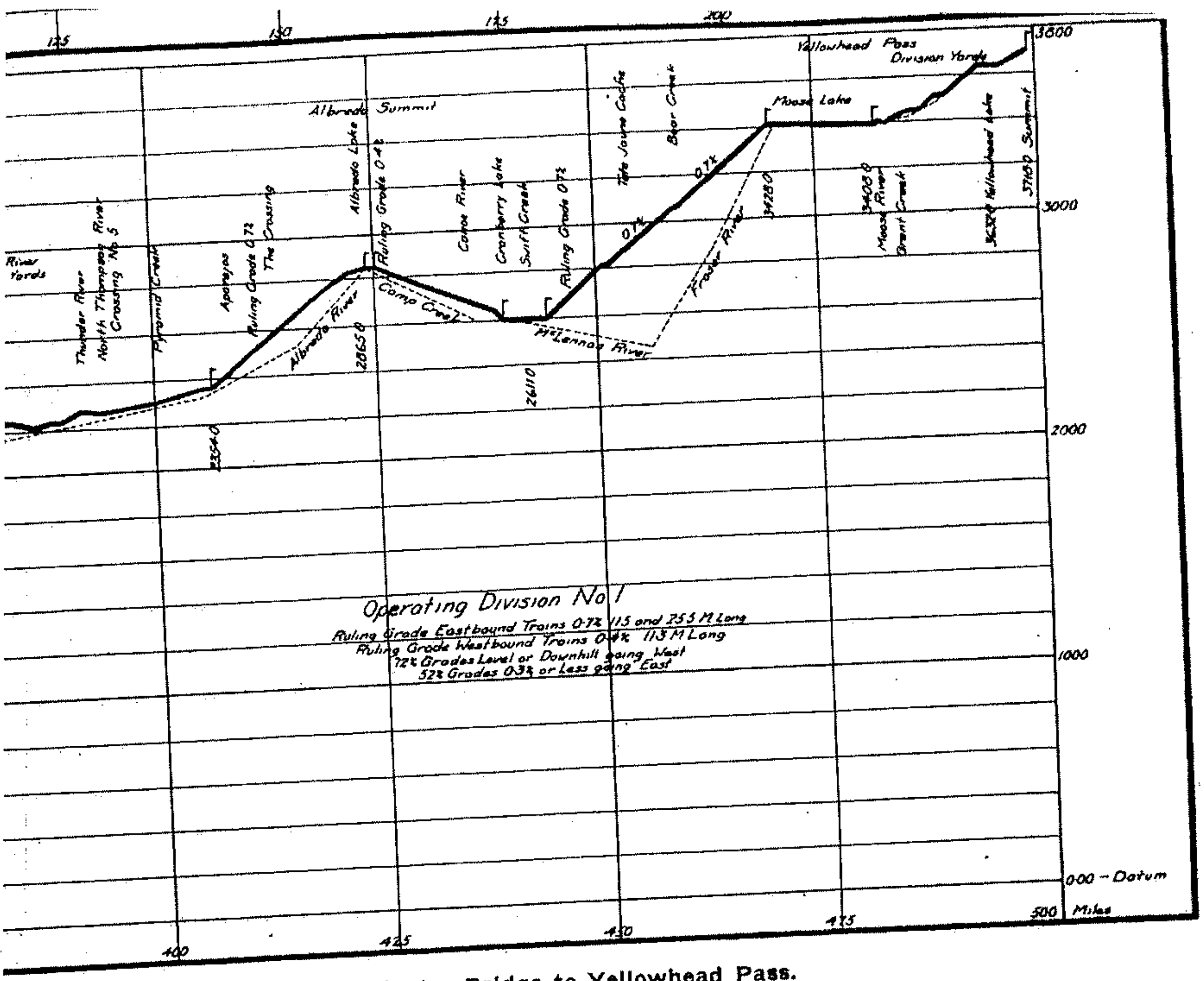

n Pacific Railway, New Westminster Bridge to Yellowhead Pass.

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Spences Bridge to Boston Bar. The most striking feature of this territory is the predominating occurrence of gravel and boulders. The slope of the valley for miles consists of unknown depths of this material, sometimes running up the mountain side for several thousand feet. The rock, of which a good deal is encountered, consists chiefly of shale, sandstone and limestone.

2, Boston Bar to Hope. This comprises the Fraser Canyon proper, and is almost entirely in rock, which consists of grano-dyar-

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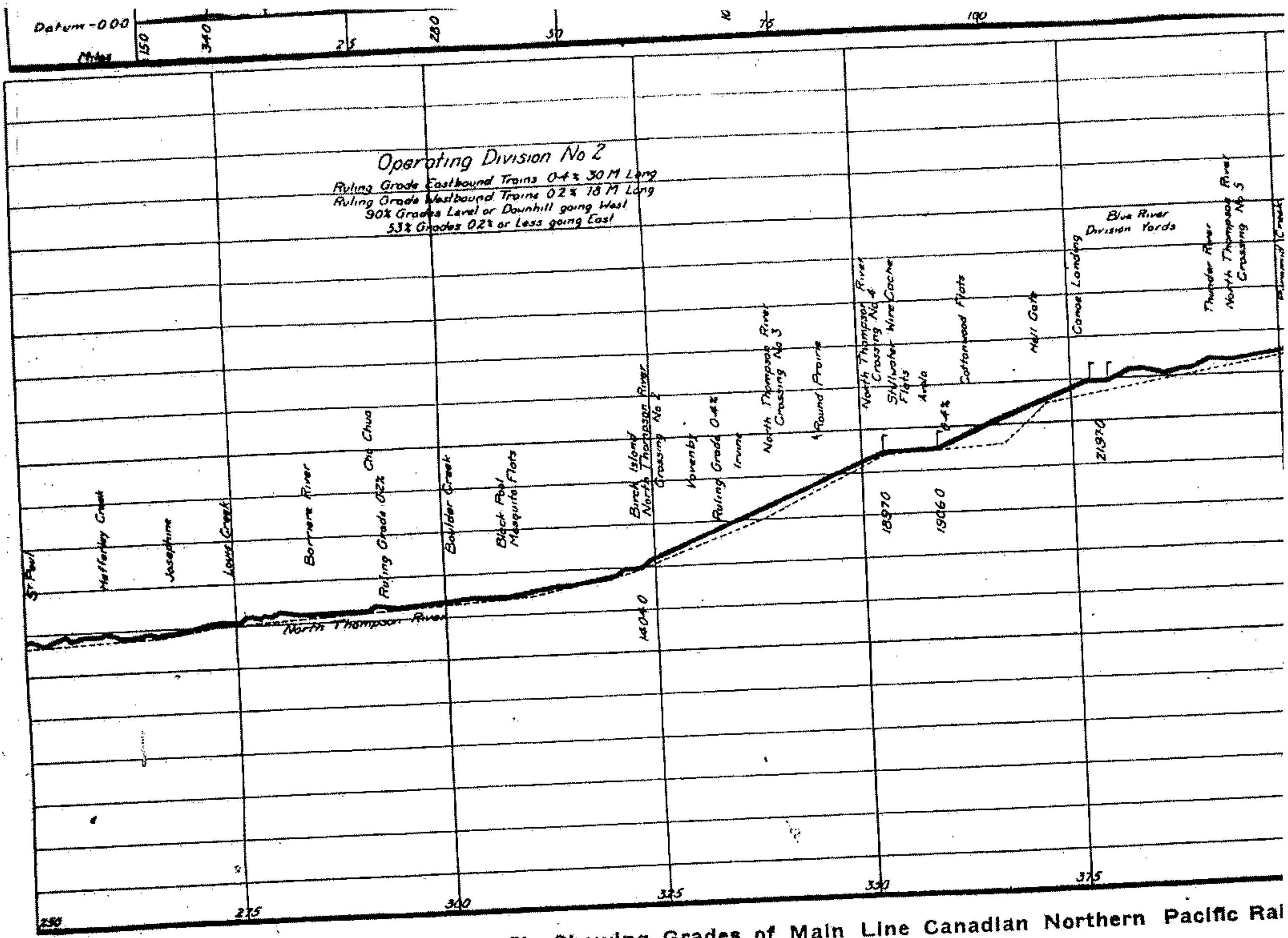

Profile Showing Grades of Main Line Canadian Northern Pacific Ral

limestone, argillaceous and siliceous shales and quartzites, mica, schist, some granite and gneiss, a great deal of gravel and boulders and some glacial clay. The rock in the second section is composed largely of shales, conglomerate sandstone, limestone, quartzite, etc., but the predominating features are the gravel and boulder formations and glacial clay. This latter forms the principal material met from the west end of Kamloops Lake to Spences Bridge. The third section may be subdivided into:—1,

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ite, sandstone, limestone and shale. 3, Hope to Rosedale. The railway here passes on the benches consisting largely of gravel and sand. 4, The Fraser Delta. This is alluvial formation.

LOCATION.—For the consideration of the location in greater detail, the route will be followed in a general direction of east to west. The principal features of the route have long been well known, by reason of the very able and exhaustive surveys made under the direction of Sir Sandford Fleming from 1872 to 1880, both reconnaissance and in detail, on behalf of the Dominion Government, in order to find the best route for a transcontinental railway, which had been promised on British Columbia entering Confederation. One cannot pass this subject without expressing one's admiration for the ability and energy displayed by Sir Sandford and his able assistants, as is evidenced by the monumental reports on their work, which were published by the Dominion Government, and to which the author owes much of the information in the early part of this paper. Amongst others, an instrumental survey of the route now followed by the Canadian Northern was made, and Sir Sandford recommended that route to the Government. Why this advice was disregarded, and the C.P.R., the outcome of the Confederation policy,

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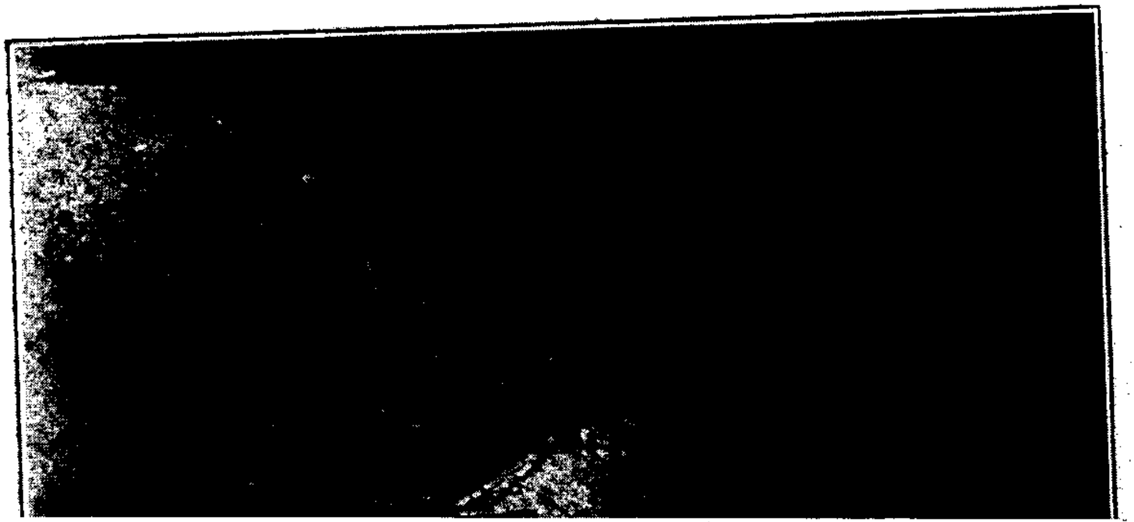

Tilton Creek Concrete Culvert, Mile 130.5, Before Fill Had Been Made.

Cisco Brid

was built over the Kicking Horse Pass will, no doubt, be disclosed some day. But however surprising such a choice may appear to the engineer, there can be no doubt that this selection has been of great benefit to the country as a whole, inasmuch as it has opened up the southern portion of British Columbia more efficiently and earlier than otherwise could have been done. Moreover, this choice left open to its younger, and consequently less vigorous rival, a route without which the latter could hardly have become a transcontinental railway as soon as it now promises to be; while the broad back of the C.P.R. is well able to carry, and its financial strength to surmount, the difficulties which the Kicking Horse route is responsible for.

The approach to the Yellowhead Pass from the east is gradual and easy; and the crux of the whole problem lies in the part between the Yellowhead and the Albreda summit, which is a water shed for the Columbia River system on one side, and the Thompson River system (that is, the Fraser River system) on the other. Hence the route leaves the Fraser only to eventually return to it again, but a glance at the map shows the gain that this gives in distance. The water flowing north from the Albreda summit is called Camp Creek, and empties into the Canoe River, a tributary of the Columbia, at a point only about four miles south of Cranberry Lake, the

due compensation is made for cur
and passing tracks, and was conside
be the economic grade for that cc
Thus was fixed the ruling grade fo
bound traffic for the operating d
whose eastern extremity is at the
head Lake, mile 495, and the weste
tremity at Blue River Flat, mile 384.
Cranberry Lake the line rises with
tenths compensated grade to Albreda
mile 425, at an elevation of 2,854 ft.
the Albreda falls at the rate of 43 ft.
mile, a supported grade going sou'

inevitable, but for the sake of ecor
construction it was desirable to re
North Thompson Valley bottom as
possible, hence a seven tenths gra
introduced, striking the valley bo
mile 406, or 10 miles below the m
the Albreda. From this point to
Gate, mile 372, the Thompson falls
the mile and the line follows the ri
tom. Thus the first operating divisi

FROM	TO	Miles	Rul gra
Port Mann	Boston Bar	119	.40%-6.
Boston Bar	Kamloops Jct.	124	.35%-3.
Kamloops Jct.	Blue River	141	.4 %-3
Blue River	Yellow Head	111	.7%-25.

MAY 1914

McLennan River, a tributary
. The divide between Cran-
ıd Canoe River, that is, the
tween the Fraser and the
em, is only a few feet high;
an Creek, Cranberry Lake and
orm one continuous wide val-
t in another way:—Cranberry
the bottom of an enormous
bowl, which is broken, as it
our quarters, by the Canoe
d west, and McLennan Creek
eek, north and south. Hence
the Rocky Mountain trench,
by the Canoe River, Cran-
McLennan Creek and the Fra-
he key to the situation. From
ad, the Rocky Mountain Pass
Albreda, the Selkirk Mountain
gently falling valleys connect
ch; and Cranberry Lake Flat.
be crossed, is the governing
e connection. From the Yel-
mit to Cranberry Lake, mile
a fall of about 1,100 ft. in 60
portion of this distance, how-
governs the grade, lies between
mile 473, and Cranberry Lake
39. From Moose Lake to the
Cranberry Lake Flats is 25
he total fall is 816 ft. This
nuous seven tenths grade, when

ing at Blue River, has long ruling grades compensated for curvature and passing tracks, of seven tenths for eastbound, and four tenths for westbound traffic. From Hell's Gate, mile 372, to Cottonwood Flats, mile 367, the Thompson falls at the rate of 37 ft. to the mile, while the railway is again supported, dropping with a continuous four tenths compensated grade. At mile 367 it once more strikes the river bottom, which it follows to mile 353 along the Stillwater Flats, the river falling at the rate of 1.4 ft. to the mile. From the west end of Stillwater Flats to Birch Island, mile 322, a four tenths supported and compensated grade is again followed, as the river falls over the first part this distance at the rate of 18½ ft. to the mile. From Birch Island to Kamloops, mile 243, the river, whose average fall is only 3 ft. to the mile, is followed closely. From the Blue River, mile 384, to Kamloops Jct., mile 243, the starting point of the Vernon branch, is the second operating division, the eastbound grade being governed by the long supported four tenths grade referred to before. Against west bound traffic the ruling grade is two tenths per cent., less than two miles long. From the west end of Kamloops Lake, mile 218, to Lytton, mile 145, the main Thompson River is followed, the average fall being 9 ft. per mile. From Lytton,

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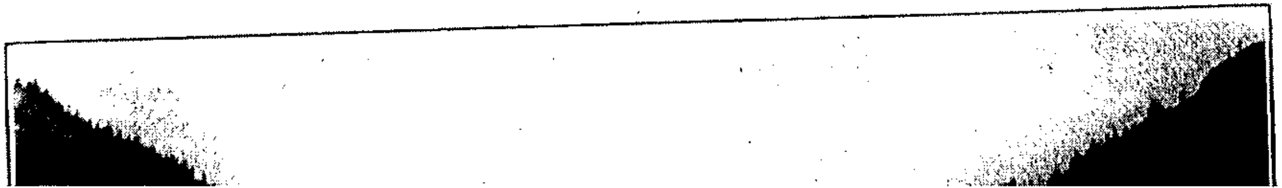

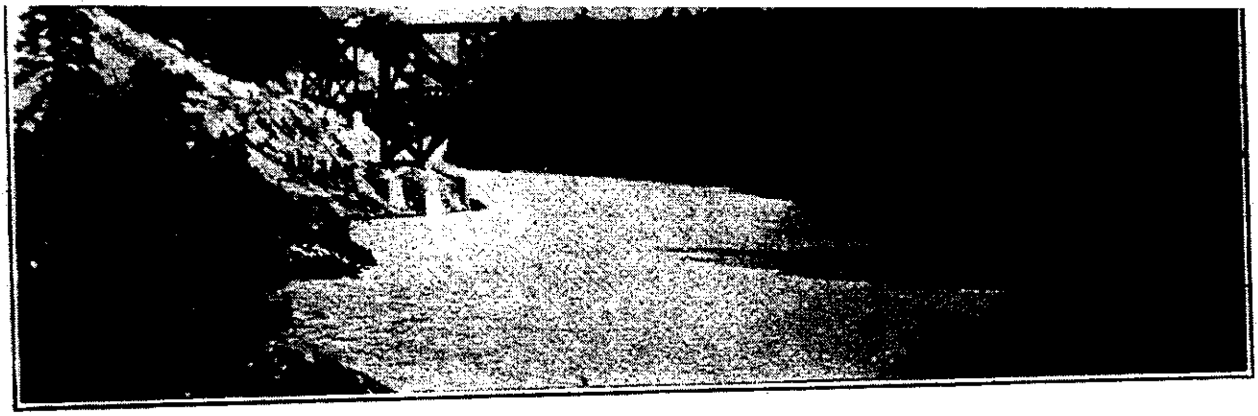

Made.

Cisco Bridge Over Fraser River, Near Lytton, Mile 140.

May 1914

ation is made for curvature
:racks, and was considered to
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n extremity is at the Yellow
nile 495, and the western ex-
ue River Flat, mile 384. From
ıke the line rises with a four
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:alls at the rate of 43 ft. to the
›orted grade going south was
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it was desirable to reach the
ıpson Valley bottom as soon as
nce a seven tenths grade was
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: 10 miles below the mouth of
ı. From this point to Hell's
372, the Thompson falls 7 ft. to
d the line follows the river bot-
the first operating division, end-

mile 145, to Hope, mile 77, the Fraser River has an average fall of 5½ ft., and from Hope to Rosedale, mile 47, 3 ft. per mile. The third operating division is from Kamloops Jct. to Boston Bar, mile 119, over which distance there are short ruling grades against eastbound traffic, of four tenths compensated for curvature. Against westbound traffic there is a four tenths grade compensated for curvature, about three miles long, at the east end of Kamloops Lake. This grade, however, if traffic demands it, can be replaced without much difficulty, by an easier one. The true ruling grade is that between the two crossings of the Fraser River south of Lytton, for this is a fixture. It is three tenths compensated and 3⅓ miles long. The fourth operating division is from Boston Bar to Port Mann. Against westbound traffic there are virtually no grades. While the ruling grade eastbound is fourth tenths compensated, 1.3 miles long. In the 500 miles from

TO	Miles	Eastbound trains		Westbound Trains	
		Ruling grades	Other grades	Ruling grades	Other grades
Boston Bar	119	.40%-6.9 Miles	.70% .1% or less	8 vel. grades level and down hill	90% level or down hill
Kamloops Jct.	124	.35%-3.4 "	.60% .2% " "	.40%-3 miles	80% " " " "
Blue River	141	.4 %-30 "	.53% .2% " "	.2%-1.8 (Vel.)	90% " " " "
Yellow Head	111	.7%-25.5 "	.52% .3% " "	.4%-11.3 "	72% " " " "

the Yellowhead summit to Port Mann
there are only 22.3 miles of adverse grades,
or 4½% of the total distance. The maxi-
mum curvature throughout is eight degrees,
and this has been used as sparingly as pos-
sible.

There were no particular engineering dif-
ficulties encountered in the surveys but
plenty of hard work, and even danger. The
procedure was that customarily in vogue.
The crux of the problem lay between Birch
Island and the Yellowhead Pass. Even here
the main lines are well defiled, and the
alternatives few, the paramount difficulty
being one of transportation and supplies.
The country west of the Albreda summit
was, at the time of the surveys, most read-
ily accessible from Kamloops. This in-
volved a pack train about 100 miles long.
The physical difficulties in keeping a sur-
vey party equipped with supplies, quite
apart from the strenuous work of the sur-
vey itself, makes this piece of location a
most praiseworthy one. During the winter
months communication was entirely cut off,
except for the monthly trips of the mailman.
The records of these trips are a story in
themselves. The difficulties, however, were
not over on the disappearance of the snow,
for between that time and the rise of the
rivers, which during high water are un
fordable and covered large portions of the
trail, there was only sufficient time for one
trip of the pack train, and continuous pack-
ing could only be carried on after the floods

Rosedale, mile 47, the grading is largely
prairie work, although spurs from the main
mountain range give rise to heavier work
at intervals. From Rosedale to Hope, mile
77, the work becomes heavier as the val-
ley narrows, and still more so from Hope
to Yale, mile 91; but so far there is noth-
ing calling for special comment. At Yale
the canyon proper is entered, and the heav
iest work on the whole railway is encoun-
tered, the heaviest mile costing $326,300,
without fence, telegraph or track. From
Yale to Boston Bar, 26 miles, the rock work
is extremely heavy, and there are 15 rock
tunnels, aggregating 8,321 ft. The rock is
mostly granite, and bluff follows bluff, all
with almost perpendicular faces. A great
deal of this rock was shot into the river,
but a surprising number of fills were suc
cessfully constructed. As the rock was
largely in huge masses, partly owing to its
rough nature, and partly owing to the fact
that it was often separated into large blocks
by natural seams, these fills are well cal-
culated to stand even the Fraser floods.
This piece of line was perhaps the most
difficult one to locate and cross section.
From Boston Bar eastward, gravel is fre-
quently encountered; indeed, from mile 128
to Savona, mile 218, there is almost more
steam shovel work than anything else. The
heaviest yardage is in the neighborhood of
Tilton Creek, mile 130. Here cuttings
aggregating 414,000 cu. yds., were led to one
large fill. Jackass Mountain, extending from
mile 124 to 134.5, consists of massive con-

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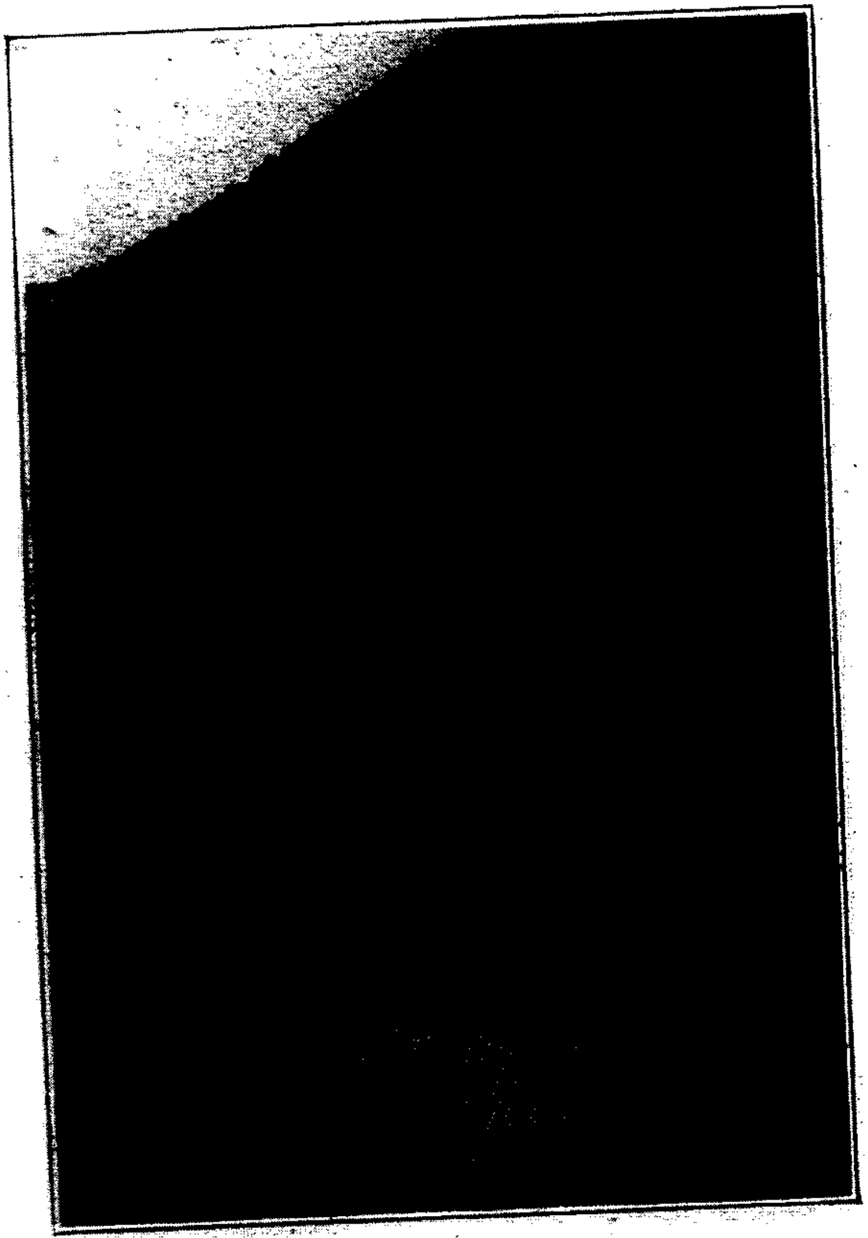
except for the monthly trips of the mailman. The records of these trips are a story in themselves. The difficulties, however, were not over on the disappearance of the snow, for between that time and the rise of the rivers, which during high water are unfordable and covered large portions of the trail, there was only sufficient time for one trip of the pack train, and continuous packing could only be carried on after the floods had subsided and ceased in the autumn. Much credit is due to those who faced and



Gladwin Bluff, Above Lytton, Mile 151.

surmounted these difficulties. The first survey parties were sent out in May, 1909; construction was started from Port Mann to Hope in July, 1910: from Hope to Kam-

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glomerate and shale, the
half mile was 182,000 cu.
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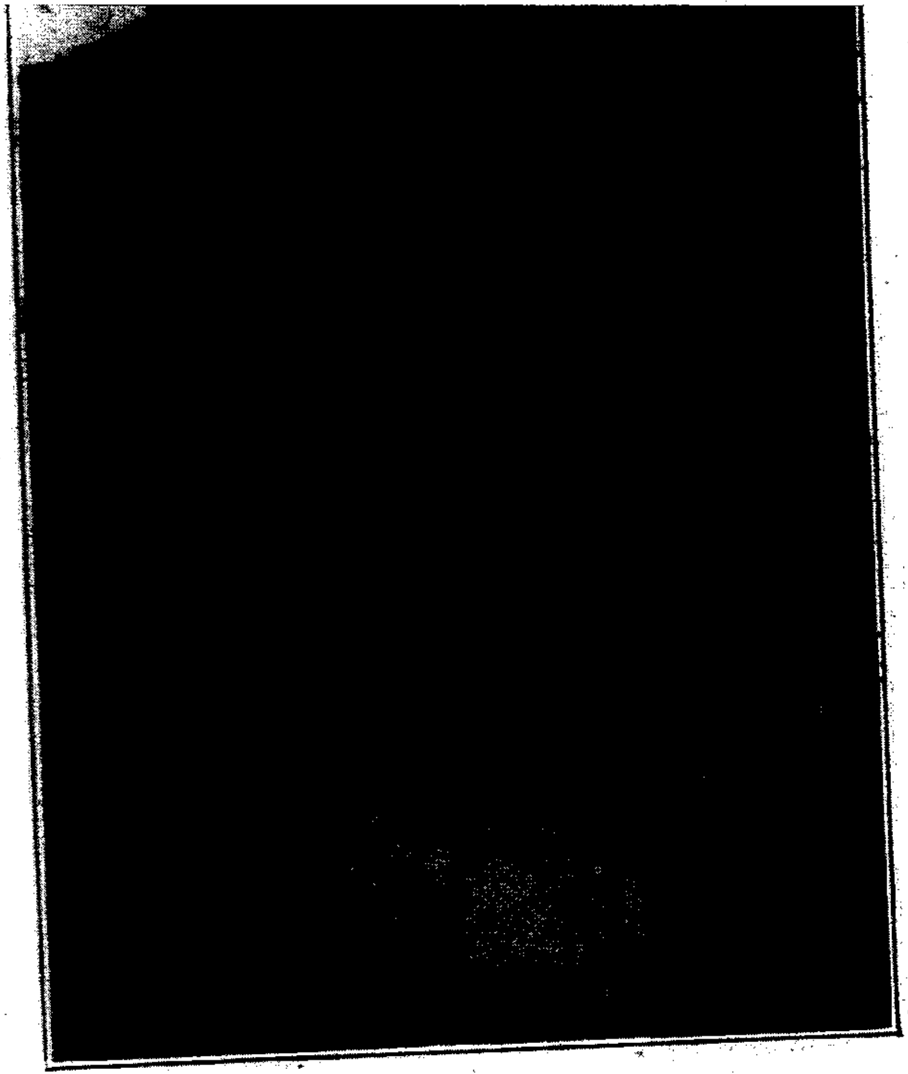

Gladwin Bluff, Above Lytton, Mile 151.

surmounted these difficulties. The first survey parties were sent out in May, 1909; construction was started from Port Mann to Hope in July, 1910; from Hope to Kamloops in Aug., 1911; from Kamloops to Birch Island in Oct., 1911; from Birch Island to the Yellowhead Pass in May, 1912; from the Yellowhead to Albreda in Aug., 1912, and from Blue River to the Albreda in May, 1913. The line should be open for operation by next autumn.

CONSTRUCTION.—We will now reverse our direction, and consider ourselves as going from west to east. For a railway passing through one of the main mountain regions of the world the work is, on the whole, extremely light. From Port Mann to

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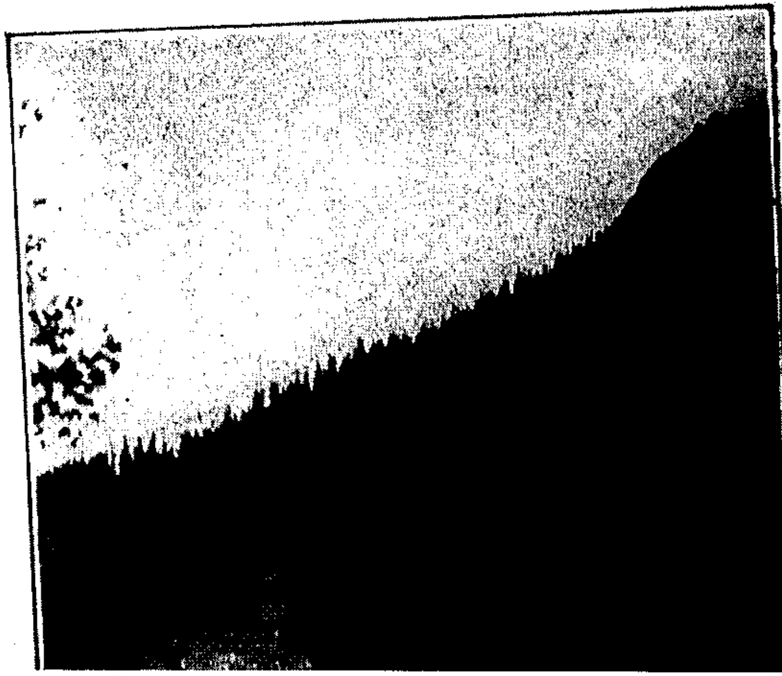
Rosedale, mile 47, the grading is largely prairie work, although spurs from the main mountain range give rise to heavier work at intervals. From Rosedale to Hope, mile 77, the work becomes heavier as the valley narrows, and still more so from Hope to Yale, mile 91; but so far there is nothing calling for special comment. At Yale the canyon proper is entered, and the heaviest work on the whole railway is encountered, the heaviest mile costing $326,300, without fence, telegraph or track. From Yale to Boston Bar, 26 miles, the rock work is extremely heavy, and there are 15 rock tunnels, aggregating 8,321 ft. The rock is mostly granite, and bluff follows bluff, all with almost perpendicular faces. A great deal of this rock was shot into the river, but a surprising number of fills were successfully constructed. As the rock was largely in huge masses, partly owing to its rough nature, and partly owing to the fact that it was often separated into large blocks by natural seams, these fills are well calculated to stand even the Fraser floods. This piece of line was perhaps the most difficult one to locate and cross section. From Boston Bar eastward, gravel is frequently encountered; indeed, from mile 128 to Savona, mile 218, there is almost more steam shovel work than anything else. The heaviest yardage is in the neighborhood of Tilton Creek, mile 130. Here cuttings aggregating 414,000 cu. yds., were led to one large fill. Jackass Mountain, extending from

track, telegraph or fence. Just beyond the Gladwin Bluffs the line is constructed along the top of a rock cliff and at the foot of immense gravel slopes, which rise at an angle of between 1¼ and 1½ to 1 to a height of some 700 ft. This gravel, which was well cemented, was excavated by the hydraulic method; excess roadbed width being allowed, depending on the height of the face. The faces have stood splendidly, although the debris naturally accumulates at the foot of the slope, but not to a greater extent than such maintenance forces as must necessarily be employed by a railway through such mountanous country, will be able to cope with. Bad bluffs were encountered at Thompson and Drynoch. The rock



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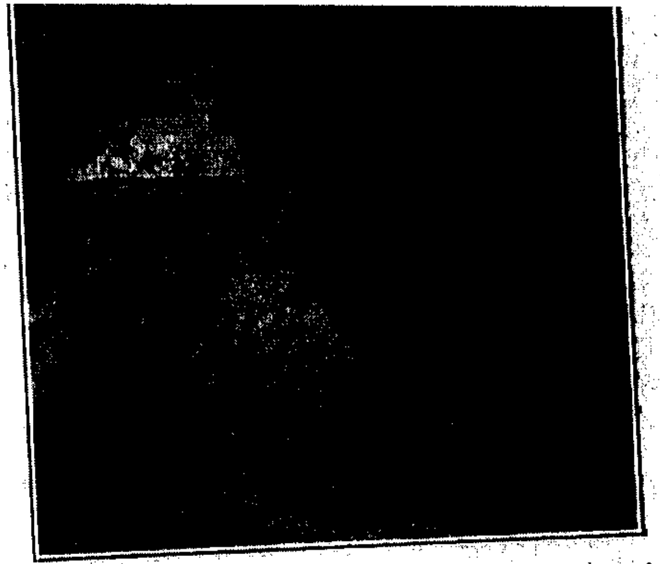
arge fill. Jackass Mountain, extending from
mile 134 to 134.5, consists of massive con-
glomerate and shale, the yardage for this
half mile was 182,000 cu. yds., with two
tunnels aggregating 548 ft. One of these
tunnels was, however, carried out in an
enormous slide in the hill side on the night
of Nov. 18, 1912, which followed a period
of heavy rain about six weeks after the
tunnel was finished. The formation through
which the tunnel was driven was very
broken. A large black shale seam about
2 ft. wide, which made an angle of about
20 degrees with the vertical, and 30 degrees
with the centre line of the tunnel, crossed
the line of the tunnel about one third way
through from the east end, separating the
country rock on the upside from an overlying
rock formation on the other. This over-
lying material was very broken, and inter-
spersed with soft clay. It seemed to be
debris from the mountain side above, and
bore no relation to the country rock.
Whether the hill slid on the shale seam,
or whether the clay, swollen by the heavy
rains, exerted excessive pressure on the
tunnel timbers, causing them to collapse,
thus releasing the toe of the hill, it is im-
possible to say. The whole slide had been
removed, and the hill side dressed to an
apparently safe slope, when three weeks
later, on Aug. 25, 1913, another slide of con
siderable magnitude occurred. This was in
turn removed, and the slope redressed, leav-
ing now an open cutting, probably safer
than any other part of the mountain.

The line crosses the Fraser at Cisco to
follow the north or left hand bank, thus
avoiding the C.P.R. It recrosses again at
Lytton, and three quarters of a mile fur-
ther on crosses the mouth of the Thompson
River, since it was considered less costly to
build these two crossings than one large one
across the Fraser, above the mouth of the
Thompson. A piece of heavy work is met
... at Gladwin's Bluffs, mile 149 to 151.



Grading Chutes, Mile 30 West of Yellowhead Pass.

at Thompson was even more broken than
that at Gladwin, and a huge slide has oc-
curred which is still being removed. At
mile 162 there is a heavy clay slide, which
is still moving, although 350,000 cu. yds.
have been removed to date (Feb. 3). There
is no evidence of water seepage, and there
is nothing to do but to keep on excavating
until the material reaches its angle of repose.
Drynoch Bluff, mile 163, was a most dan-
gerous place on which to locate, and offered
the usual difficulties in construction. It
has three short tunnels and the open slope
is very high, surmounted by a good deal of
gravel and other debris. Crib traps have
been installed at various points on this
slope, but here, as in other places, constant
watch must be kept by the maintenance
organization. At mile 184 the line crosses
on to the C.P.R. side of the Thompson River
and recrosses at mile 188.5, passing direct
from the bridge into a tunnel, 1,319 ft. long,
in the famous Black Canyon. This forma-
tion is a black cretaceous shale and sand-
stone. Just east of this tunnel there is a
slide similar to the one on the C.P.R. side,
west of its Black Canyon tunnel. A spring,
which made its appearance about one third

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Grading Chutes, Mile 30 West of Yellowhead Pass.

at Thompson was even more broken than that at Gladwin, and a huge slide has occurred which is still being removed. At mile 162 there is a heavy clay slide, which is still moving, although 350,000 cu. yds. have been removed to date (Feb. 3). There is no evidence of water seepage, and there is nothing to do but to keep on excavating until the material reaches its angle of repose. Drynoch Bluff, mile 163, was a most dangerous place on which to locate, and offered the usual difficulties in construction. It has three short tunnels and the open slope is very high, surmounted by a good deal of gravel and other debris. Crib traps have been installed at various points on this slope, but here, as in other places, constant watch must be kept by the maintenance organization. At mile 184 the line crosses on to the C.P.R. side of the Thompson River and recrosses at mile 188.5, passing direct from the bridge into a tunnel, 1,319 ft. long, in the famous Black Canyon. This formation is a black cretaceous shale and sandstone. Just east of this tunnel there is a slide similar to the one on the C.P.R. side, west of its Black Canyon tunnel. A spring, which made its appearance about one third of the way down the slide, was tapped by a water tunnel and led to an adjacent gully. At every high water, however, the slide moves and has moved for some 120 ft. since the records were first taken. It is thought that this is due partly to saturation from the melting snow, and partly from the action of the high water in the river, although what

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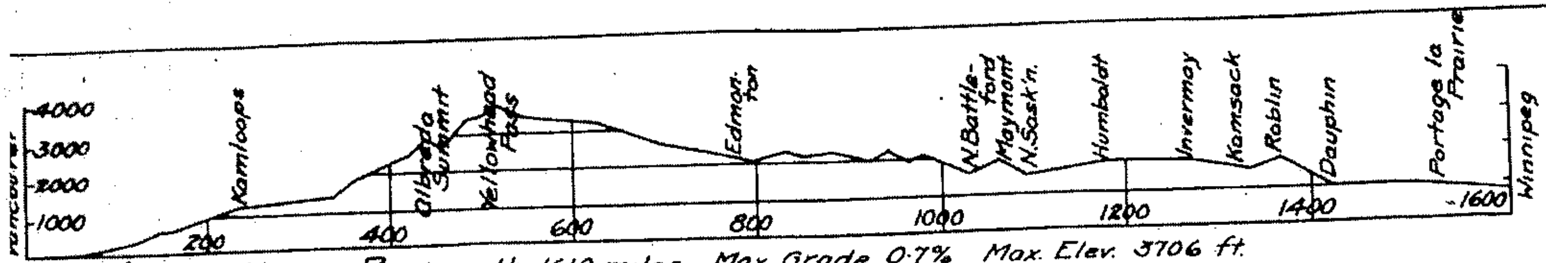
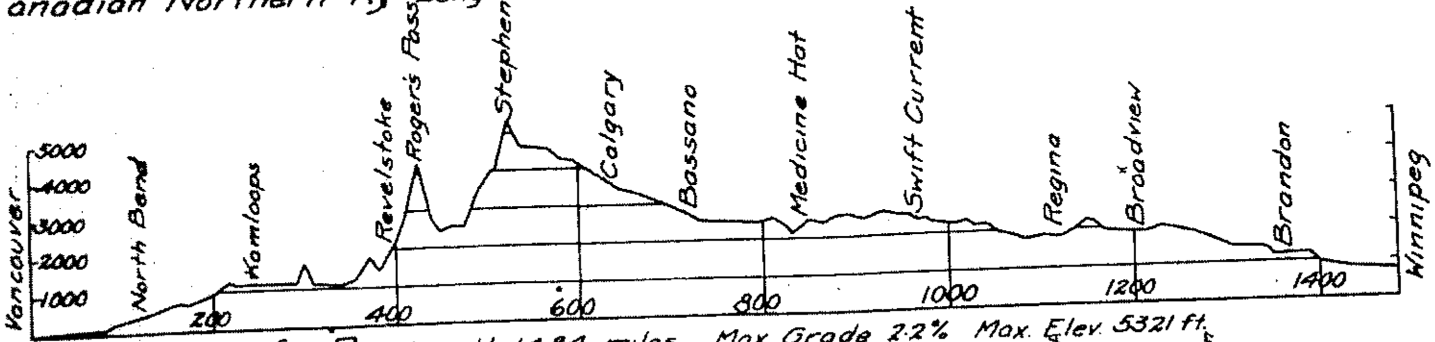
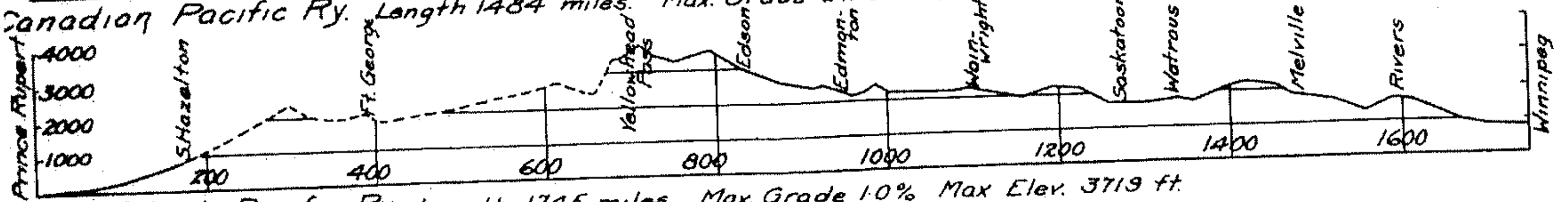


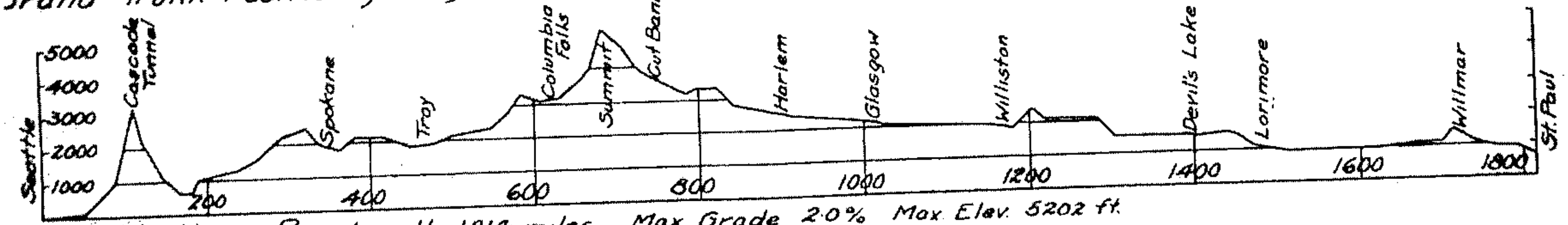
anadian Northern Ry Length 1610 miles. Max Grade 0.7% Max. Elev. 3706 ft.



Canadian Pacific Ry. Length 1484 miles. Max. Grade 2.2% Max. Elev. 5321 ft.



Grand Trunk Pacific Ry. Length 1745 miles. Max. Grade 1.0% Max Elev. 3719 ft.



Great Northern Ry. Length 1814 miles. Max. Grade 2.0% Max Elev. 5202 ft.

MAY 1914

ıs exactly is not yet understood. Bor- howed 26 ft. of clay and then gravel, ey were not taken down through the .

ıe two miles further east the grade irst constructed at the foot of the partly in cut and partly in fill, the lat- anding well until the flood of 1913. tensive crib is now being constructed s place. From Ashcroft, mile 194, to ıa, mile 218, it is almost all steam l work in glacial clay. Rock work ıin encountered along Kamloops Lake, ling a tunnel at Battle Bluffs, 2,835 ft.

At mile 244, the line crosses to the bank of the North Thompson. Immedi- east of the bridge is the Kamloops ion yard. Between Lytton and Kam- there are three crossings and recross- of the Thompson River, to avoid heavy bluffs, the work on the C.P.R. side at places being generally very light. Kamloops Jct., mile 243, to Birch d, mile 324, the work is easy on the e, although occasionally the line hits k slope with some severity. From Birch ıd to the third crossing of the Thomp- River at mile 339 there is heavy steam el work along the supported grade. n mile 330 to the fourth crossing at 351, although the work was large.y m shovel material, it was entirely car out by hand, owing to the difficulty of ing in machinery. There is little to call comment from here on, except to refer he extraordinarily light work across Still- er Flats, until the supported grade is hed at mile 360 to 376 (Canoe Landing). s is the heaviest portion of the North mpson River work, particularly at Hell's

a group of 32 piles, capped by a three course grillage of 12 by 12 timbers. This in turn is topped by a 1 in. steel plate, bored to receive the anchor bolts from the girder bearings. Placed about the piling is a timber crib pointed on the up stream and square on the other end. These cribs are not attached to the piling, but form a sleeve, and are sufficiently free of the piling to permit their sinking, as they are built up from the water surface. The tops are completed to about 5 ft. above high water and then are

particularly great for the last ten of these miles, owing to the fact that the grade had to be constructed immediately above the G.T.P.R., then in operation. The two lines run on the north shore of Moose Lake, side by side as double track. From Moose Lake the G.T.P.R. falls with a 1%, and the C. N.R. with a seven tenths compensated grade. Hence the two lines rapidly diverge in elevation but remain very close in alignment. All mucking over this portion from the C.N.R. had to be carried across the

Hells Gate, Fraser Canyon, Mile 110.6.

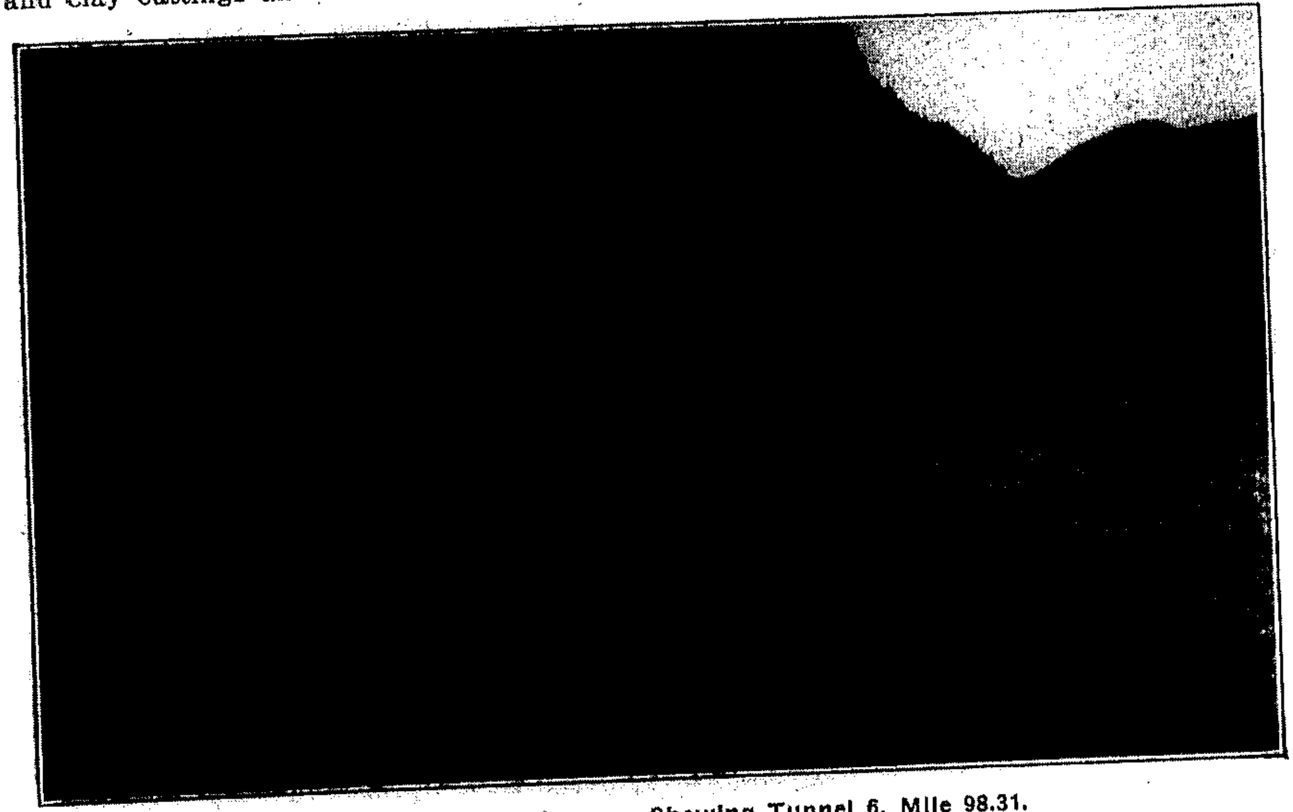
G.T.P.R. on trestles and shot direct into the

MAY 1914

water Flats,
reached at mile 360 to 376 (Canoe Landing). This is the heaviest portion of the North Thompson River work, particularly at Hell's Gate, where the river passes through a minature Fraser canyon, involving heavy rock cutting and two small tunnels. From mile 376 to the next supported grade at mile 406, the work is extraordinarily light for a mountain railway. From mile 406 to 417 extends a region of heavy sand, gravel and clay cuttings and tunnels, one of these latter being 1,000 ft. long. All this work is done by hand, as it is not practicable to take in machinery. From mile 417 to the Albreda Summit, the work is again very light, indeed at the summit itself it would be cheap for prairie country. The two crossings and recrossings of the North Thompson are to avoid heavy work, and to get better alignment. The first two of crossings are 80 ft. deck plate gir-

Hells Gate, Fraser Canyon, Mile 110.6.

rock filled. The third crossing is a temporary pile bridge below the permanent crossing, which will be of concrete piers. The other two crossings are low and short, and are over wooden pile bridges. From mile 425 to Canoe River crossing at mile 436 the rock work is fairly heavy, although there are a good many gravel cuttings also. Canoe River is crossed on a steel viaduct. From this point to mile 445 the work would be light even on the prairies. No really heavy work is encountered until the Fraser Valley is entered at mile 453. From this point the Grand Trunk Pacific is paralleled and the two roads are never more than a few hundred yards apart. From mile 456 to Moose Lake, mile 472, there are some heavy rock cuttings. Difficulties were



Mullen Bluff, Fraser Canyon, Showing Tunnel 6, Mile 98.31.

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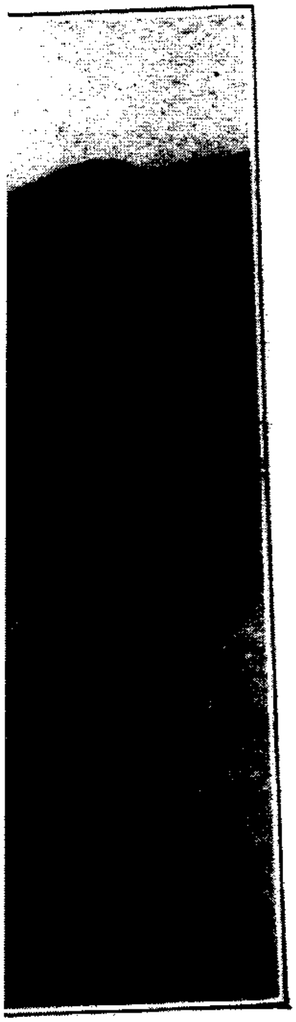

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G.T.P.R. on trestles and shot direct into the Fraser River. Six of these trestles and chutes were constructed. From Moose Lake to Yellowhead the work calls for no special comment, as it is light, and the valley wide and uniform enough to provide an easy route for both railways.

There is not much in this work of interest to railway engineers, except the bridging; the steam shovel work in gravel and clay, and the resulting slopes; the rock blasting; the classification. As the steel bridges were designed and entirely under the supervision of Waddell and Harrington, consulting engineers, the author does not propose to make any reference to them, beyond showing some views in the hope that a paper will be read some day before the Canadian Society of Civil Engineers by a member of Waddell and Harrington's firm.

In regard to the steam shovel work in gravel and clay, and the resulting slopes, no one would deny the value of steam shovels, or their necessity, if such work as is now being described, is to be carried on economically and expeditiously. At the same time the engineer would be delighted to dispense with them, were that possible, unless the material was being excavated to a final angle of repose. In some cases this was done, but speaking generally such a plan is a counsel of perfection, and not economically practicable. The difference in yardage between 1 to 1 slopes and 1½ to 1 slopes, on side hills that extend upwards for hundreds of feet, is self evident. Moreover, in most gravel cuttings, a 1 to 1 slope, if not permanent, would give very little trouble for a number of years, when it could be economically handled by steam shovels with mainline equipment. But when 1 to 1 quantities are dug by steam shovel and the slopes left standing nearly plumb, it means that the company has frequently to face comparatively heavy further excavation expenditure after the line is opened. Sometimes a portion of the slopes

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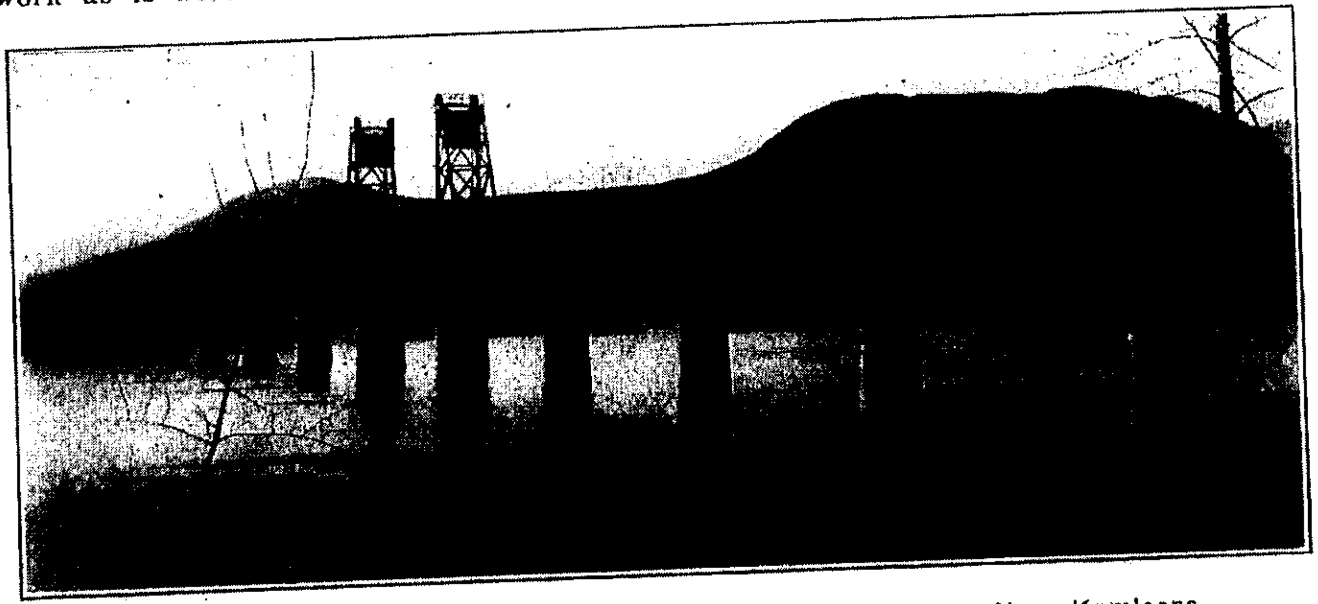

Deck Girder Bridge, With Lift Span, Over North Thompson River, Near Kamloops.

in steam shovel work was lightened by having the top hand sloped, but in the more cemented gravels and harder clays, the slope was left as dug by the steam shovels. Undoubtedly, all things being equal, unless the quantities to be excavated in the first instance are those contained by slopes at the angle of repose, hand slope work is infinitely more satisfactory than steam shovel work. Most of the gravel and clay lies in the dry belt, otherwise it may be supposed there would be little left. Hence the conditions on this construction were unusually favorable for the safety of undressed slopes.

One of the main difficulties the railway engineer encounters is to prevent the contractor from using too much powder. Such work as is here described is usually carried out by stationmen working under sub or sub-sub contractors of the main contracting company. The stationman, who seems to live in a state of perpetual hope,

his warnings and instructions are neglected. From the experience of this work the author is strengthened in his convictions that more than from 1 lb to 1¼ lbs. of explosive to a cubic yard of excavation is needed only in very rare cases; and in ordinary sandstone and limestone, if at all seamed, ¾ lb. per yard would generally be sufficient. For shales ½ lb. or less is plenty.

From Port Mann to Hope, and from Kamloops to the Yellowhead Pass, four classifications were used in accordance with the C.N.R. standards, as to which no special comment is necessary, except as to the definition of solid rock, which is the same through the whole work. From Hope to Kamloops there are only two classifications, which read as follows:—"All stones or boulders found in excavation measuring more than 27 cu. ft., and all solid quarry stone requiring blasting in order to remove it shall be termed 'solid rock.'" "All

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Deck Girder Bridge, With Lift Span, Over North Thompson River, Near Kamloops.

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The foregoing paper was read before the Canadian Society of Civil Engineers, Vancouver branch, recently. We are indebted to T. H. White, M. Can. Soc. C.E., Chief Engineer, C.N.P.R., for the diagrammatic profiles accompanying the paper, and for the photograph of the Kamloops bridge; also to the author of the paper, Mr. Nimmo, for the photographs from which the other illustrations have been made.

Comparitive Profiles. — Following are figures relating to the comparative diagrammatic profiles given of eight transcontinental railways:—

	Maximum Grade.	Maximum Elevation.	Length Miles.
Canadian Northern .	0.7%	3,706 ft.	1,610
Canadian Pacific ...	2.2%	5,321 ft.	1,484
Grand Trunk Pacific.	1.0%	3,719 ft.	1,746
Great Northern	2.0%	5,202 ft.	1,814
Northern Pacific ...	1.6%	5,500 ft.	1,907
Union Pacific	1.8%	8,200 ft.	1,800

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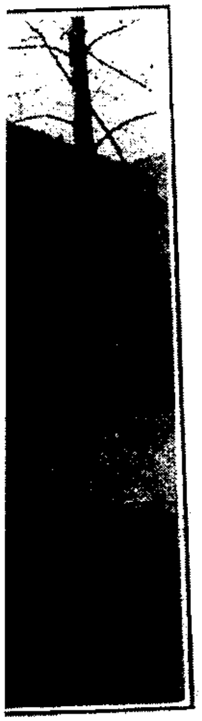

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Chicago, Milwaukee and Puget Sound..	2.5%	6,322 ft.	1,770
Atchison, Topeka and Santa Fe	2.6%	7,421 ft.	1,927

Tilton Creek Culvert. — Mr. Nimmo has given us the following data about this culvert:—Height from grade to top of culvert at the junction with the tunnel, 137 ft. The culvert is 21 ft. 7 ins. wide, 19¾ ft. high, giving an opening of 312 sq. ft. The tunnel was taken out a foot wider than the culvert to allow for future lining. The length of tunnel is 300 lin. ft., and of the culvert, 226 ft. There are 3,150 cu. yds. concrete in culvert, and 90 cu. yds. in tunnel lining. The total cost of the water tunnel and culvert was about $70,000.

Kamloops Bridge.—This structure, over the North Thompson River at Kamloops, is a deck girder bridge, 1,209 ft. long, and has a deck girder lift span 93 ft. long. There are 12 fixed spans, also of 93 ft. length. Approaches at both ends of the bridge, of timber trestle construction, total about 1,100 ft. The lift span weighs 118 tons, and is fully counterweighted. The sixteen 1¼ in. lifting cables are equalized in the attachment to the span. Centring castings provide for keeping the span in proper alignment as it comes down to bearing, and also take the longitudinal braking thrust. The lift of the span is 53 ft., giving a 55 ft. clearance above high water. The motor is capable of raising the span in 100 seconds. The lifting power is a gasoline engine, which, with all the machinery, except the operator's levers, is located below the deck, at the middle. Limit switches coming into operation near the ends of travel of the span control the igniter circuit of the engine.

The bridge was designed by Waddell and Harrington, of Kansas City, Mo. The lift span is built with the arrangement and details used by them in their various lift bridges built in recent years.

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The Dominion Parliament has incorporated a company with this title to build a railway from Naas River, on the Pacific Coast, to Prince Albert, Sask., by a route described in a former issue. (Mar., pg. 121.)

Pacific and Hudson Bay Ry.—The Board of Railway Commissioners has approved location plans for this projected railway from Bella Coola, easterly to Hagensborg, B.C., 10.00 miles. (Jan., pg. 22.)

Pacific Great Eastern Ry.—The first portion of the line, viz.: from Vancouver to Fort George, B. C., has been under construction for nearly two years, and two sections are in operation. The first is from North Vancouver to Dundarave, 4.5 miles, and the second is from Squamish, the new name given to Newport, to Cheakamus, 13 miles, which includes the seven miles of track laid by the old Howe Sound and Northern Ry. The recent decision of the British Columbia Legislature to extend the line from Fort George to the Peace River country and to have the extension ready to handle traffic through to the Alberta boundary in 1916, has apparently given a great impetus to construction. It has been announced that 10,000 men will be distributed along the line between Vancouver and Fort George. The construction is well advanced to Kelly Lake, 200 miles from Vancouver, and we are officially advised that contracts have been let for the line southerly from Fort George, to Kelly Lake, to H. E. Carleton & Co., 25 miles; A. E. Griffin & Co., 25 miles; and Burns, Jordan & Co., 50 miles. These contractors have just completed subcontracts on the G. T. Pacific Ry. west of Fort George, and it was reported, April 3, that their outfits were being transferred to the P. G. E. route. The points between which these contractors will work had not been decided at the date

MAY 1914

being transferred to the P. G. E. route. The points between which these contractors will work had not been decided at the date of our advice. The construction on the 280 miles between Kelly Lake and Fort George is reported to be light. The main points on the route with distances from Vancouver are:—Squamish, 43 miles; Pemberton Meadows, 100 miles; Lillooet, 163 miles; Clinton, 210 miles; Lac la Hache, 285 miles; Quesnel, 395 miles; Fort George, 480 miles.

In connection with the extension of the line from Fort George to the Peace River Valley, where a junction would be made with the Edmonton, Dunvegan and British Columbia Ry., preliminary surveys have been completed, and locating parties are going over the 330 miles of the route. The location for some miles out of Fort George has been settled, and it is expected that contracts for grading the first 100 miles will be let at once. The line will start at the confluence of the Salmon and Fraser rivers, following the first named to Summit Lake, thence along the Crooked River valley to Fort McLeod, and McLeod Lake, thence along the Missinchurka River through Pine Pass and along the Pine River to Hudson's Hope, following the Peace River to the Alberta boundary. The distance from Fort George to Pine River Pass is 142 miles, and from Fort George to the Alberta boundary, 330 miles.

In preparation for the construction of docks for ocean going vessels and railroad terminals at Squamish, which is the point in Howe Sound where the line leaves tidewater, the company is reclaiming a tract of land about a mile long. Foreshore rights along the waterfront were recently granted to the railway company by the Dominion Government, conditional on the expenditure by the company of $2,000,000 in improving the harbor. The dredging and refilling to be carried out this year at Squamish are to cost about $200,000. (April, pg. 166.)

Peace River Ry.—The Dominion Parliament is being asked to incorporate a com-

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the transfer is completed, the buildings which they at present occupy will be torn down and the area utilized for other purposes. (April, pg. 171.)

Aid Granted to Canadian Northern Railway.

J. H. Burnham, M.P., asked in the House of Commons April 1:—"What aid has been promised, given or otherwise arranged for, directly or indirectly, by the Government to or with the Canadian Northern Ry. Co., or any of its subsidiary lines, or propositions or any part thereof, since the inception of the same?"

In reply the acting Minister of Railways submitted the following statement:—

Canadian Northern Railway.

CASH SUBSIDIES	Granted.	Paid to Dec. 11, 1913.
Swan River section	$ 374,606	$ 374,606
O. & R.R. Ry.	1,534,526	1,534,526
E.Y. & P. Ry.	91,200	91,200
	$ 2,000,332	$ 2,000,332
Canadian Northern Alberta Ry.	$ 3,120,000	$ 2,832,024
Canadian Northern Ontario Railway.		
Toronto-Sudbury	$ 1,872,960	$ 1,872,960
Toronto-Ottawa	1,600,000	1,363,122
Hawkesbury-Ottawa ...	369,872	369,872
Ottawa-Port Arthur	10,920,000	6,518,516
	$14,762,832	$10,124,470
Canadian Northern Quebec Railway.		
Garneau-Quebec	$ 523,820	$ 523,820
St. Jerome branch	97,280	97,280
Rawdon branch	86,468	86,468
	$ 707,568	$ 707,568
Canadian Northern Pacific Ry.	$ 6,300,000	$ 4,349,930
Halifax and South Western Ry.	$ 1,364,210	$ 1,364,210
Total	$28,264,942	$21,378,534

GUARANTEES.	Granted.	Paid to Dec. 31, 1913.
Canadian Northern		

May 1914

May 1914

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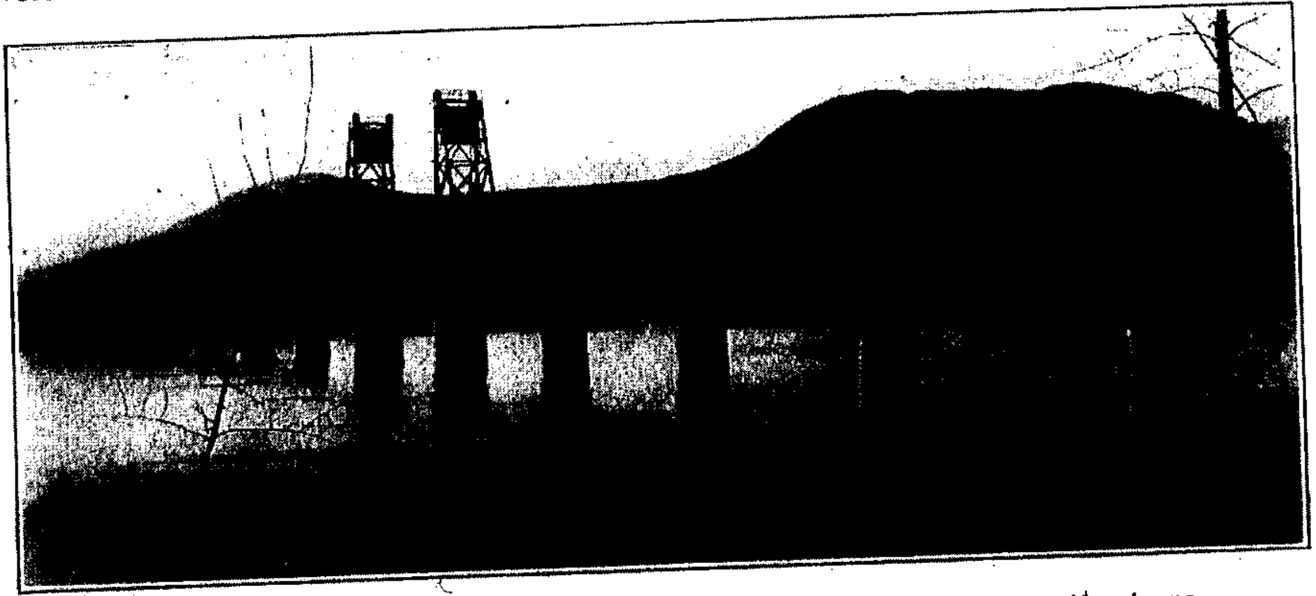
One of the main difficulties the railway engineer encounters is to prevent the contractor from using too much powder. Such work as is here described is usually carried out by stationmen working under sub or sub-sub contractors of the main contracting company. The stationman, who seems to live in a state of perpetual hope,

his warnings and instructions are neglected. From the experience of this work the author is strengthened in his convictions that more than from 1 lb to 1¼ lbs. of explosive to a cubic yard of excavation is needed only in very rare cases; and in ordinary sandstone and limestone, if at all seamed, ¾ lb. per yard would generally be sufficient. For shales ½ lb. or less is plenty.

From Port Mann to Hope, and from Kamloops to the Yellowhead Pass, four classifications were used in accordance with the C.N.R. standards, as to which no special comment is necessary, except as to the definition of solid rock, which is the same through the whole work. From Hope to Kamloops there are only two classifications, which read as follows:—"All stones or boulders found in excavation measuring more than 27 cu. ft., and all solid quarry stone requiring blasting in order to remove it shall be termed 'solid rock.'" "All



Deck Girder Bridge, With Lift Span, Over North Thompson River, Near Kamloops.

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Deck Girder Bridge, With Lift Span, Over North Thompson River, Near Kamloops.

ried out by stationmen working under sub or sub-sub contractors of the main contracting company. The stationman, who seems to live in a state of perpetual hope, is strongly tempted to over shoot, with a view to breaking up his rock as small as possible, and to save handling, where, as was largely the case on this work, the material was wasted direct into the river, whose course the railway is following. That this may result in over-break the stationman is well aware, but his faith and hope in the engineer's charity will induce him to chance the disallowing of the over-break. If allowed, he stands to gain heavily. Besides there are seams, which with a little flattery and talk about the experience of the engineer, etc., etc., he may hope to pass off as the cause of the over-break. Indeed the engineer will often be in a quandary to know whether the rock, even though lightly shot, would not have broken to a clearly indicated seam. The sub contractor has little inducement to check the stationman from overshooting, for the more powder the stationman uses, the more profit the sub contractor stands to make. If no more than the estimated yardage is paid for, the sub contractor makes at least as much profit as he set out to make, and if over-break is included he is that much to the good. Thus with blarney and bluster pressure is brought to bear on the engineer on all sides, which it is frequently very hard to resist, especially by the younger members of the profession. The Canadian Society of Civil Engineers excludes in its Standard Specifications the use of powder in large blasts in seams, drifts, shafts and coyotte holes. This again is merely a counsel of perfection, nor would its strict enforcement tend to economy. The remedy must always be in the judgment and experience of the engineer in charge, who should make a point of at once warning the contractor against the results of heavy shooting, as soon as he sees any signs of such a course being proceeded with and hold him strictly to account if which read as follows:—"All stones or boulders found in excavation measuring more than 27 cu. ft., and all solid quarry stone requiring blasting in order to remove it, shall be termed 'solid rock.'" "All other materials other than solid rock as described above, shall be termed 'all other materials,' and paid for at the schedule rate for 'all other materials.'" The solid rock definition is a great deal more definite than most, and leaves very little room for the questioning of engineers' decisions. It may be thought at first sight that this solid rock definition and the two material classifications would remove many of the classification difficulties, which all engineers have to face. In practice, however, even through country where as in this case the material can be broadly classed as rock and gravel or clay, grades of rock are met with, which although strictly coming under the "other material" classification, must in equity, be allowed for in part as solid rock, and one is again left with the conclusion that no specification can be drawn up which does not require to be interpreted on the broad grounds of professional intelligence and common sense.

The foregoing paper was read before the Canadian Society of Civil Engineers, Vancouver branch, recently. We are indebted to T. H. White, M. Can. Soc. C.E., Chief Engineer, C.N.P.R., for the diagrammatic profiles accompanying the paper, and for the photograph of the Kamloops bridge; also to the author of the paper, Mr. Nimmo, for the photographs from which the other illustrations have been made.

Comparitive Profiles. — Following are figures relating to the comparative diagrammatic profiles given of eight transcontinental railways:—

	Maximum Grade.	Maximum Elevation.	Length Miles.
Canadian Northern .	0.7%	3,706 ft.	1,610
Canadian Pacific ...	2.2%	5,321 ft.	1,484
Grand Trunk Pacific.	1.0%	3,719 ft.	1,745
Great Northern	2.0%	5,202 ft.	1,814
Northern Pacific ...	1.6%	5,500 ft.	1,907
Union Pacific	1.8%	8,200 ft.	1,800

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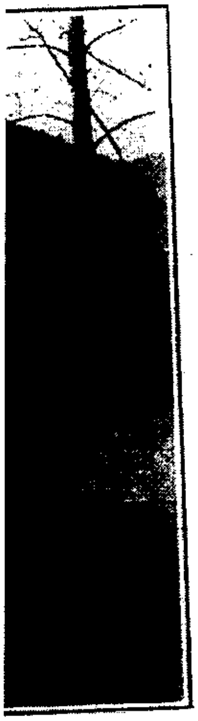

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Chicago, Milwaukee and Puget Sound..	2.5%	6,322 ft.	1,770
Atchison, Topeka and Santa Fe	2.6%	7,421 ft.	1,927

Tilton Creek Culvert. — Mr. Nimmo has given us the following data about this culvert:—Height from grade to top of culvert at the junction with the tunnel, 137 ft. The culvert is 21 ft. 7 ins. wide, 19¾ ft. high, giving an opening of 312 sq. ft. The tunnel was taken out a foot wider than the culvert to allow for future lining. The length of tunnel is 300 lin. ft., and of the culvert, 226 ft. There are 3,150 cu. yds. concrete in culvert, and 90 cu. yds. in tunnel lining. The total cost of the water tunnel and culvert was about $70,000.

Kamloops Bridge.—This structure, over the North Thompson River at Kamloops, is a deck girder bridge, 1,209 ft. long, and has a deck girder lift span 93 ft. long. There are 12 fixed spans, also of 93 ft. length. Approaches at both ends of the bridge, of timber trestle construction, total about 1,100 ft. The lift span weighs 118 tons, and is fully counterweighted. The sixteen 1¼ in. lifting cables are equalized in the attachment to the span. Centring castings provide for keeping the span in proper alignment as it comes down to bearing, and also take the longitudinal braking thrust. The lift of the span is 53 ft., giving a 55 ft. clearance above high water. The motor is capable of raising the span in 100 seconds. The lifting power is a gasoline engine, which, with all the machinery, except the operator's levers, is located below the deck, at the middle. Limit switches coming into operation near the ends of travel of the span control the igniter circuit of the engine.

The bridge was designed by Waddell and Harrington, of Kansas City, Mo. The lift span is built with the arrangement and details used by them in their various lift bridges built in recent years.

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the transfer is completed, the buildings which they at present occupy will be torn down and the area utilized for other purposes. (April, pg. 171.)

Aid Granted to Canadian Northern Railway.

J. H. Burnham, M.P., asked in the House of Commons April 1:—"What aid has been promised, given or otherwise arranged for, directly or indirectly, by the Government to or with the Canadian Northern Ry. Co., or any of its subsidiary lines, or propositions or any part thereof, since the inception of the same?"

In reply the acting Minister of Railways submitted the following statement:—

Canadian Northern Railway.

CASH SUBSIDIES	Granted.	Paid to Dec. 11, 1913.
Swan River section	$ 374,606	$ 374,606
O. & R.R. Ry.	1,534,526	1,534,526
E.Y. & P. Ry.	91,200	91,200
	$ 2,000,332	$ 2,000,332
Canadian Northern Alberta Ry.	$ 3,120,000	$ 2,832,024
Canadian Northern Ontario Railway.		
Toronto-Sudbury	$ 1,872,960	$ 1,872,960
Toronto-Ottawa	1,600,000	1,363,122
Hawkesbury-Ottawa ...	369,872	369,872
Ottawa-Port Arthur	10,920,000	6,518,516
	$14,762,832	$10,124,470
Canadian Northern Quebec Railway.		
Garneau-Quebec	$ 523,820	$ 523,820
St. Jerome branch	97,280	97,280
Rawdon branch	86,468	86,468
	$ 707,568	$ 707,568
Canadian Northern Pacific Ry.	$ 6,300,000	$ 4,349,930
Halifax and South Western Ry.	$ 1,364,210	$ 1,364,210
Total	$28,254,942	$21,378,534

GUARANTEES.	Granted.	Paid to Dec. 31, 1913.
Canadian Northern		

MAY
1914

June
1914

Canadian Northern Railway Construction, Betterments, Etc.

Nova Scotia.—A press dispatch from Sydney, N.S., May 14, stated that H. J. McKenzie, with a staff of Canadian Northern Ry. engineers, was making surveys in Cape Breton, with a view of connecting the Inverness Ry. and Coal Co.'s line in Inverness county, with Sydney and Louisburg, and through the Bras d'Or country with the Cape Breton Ry. at St. Peters.

Canadian Northern Quebec Ry.—We are officially advised that nothing has been definitely decided as to building a cooling plant at Quebec.

A press report states that a portion of the terminal property south of the Hay Market, Montreal, is to be immediately developed, by the erection of a substation for freight to and from the west end, that the building will be 100 ft. square, and that the distribution will be by motor trucks.

Mount Royal Tunnel and Terminal Co.—Excavation for the C.N.R. station in Montreal is reported to be in progress, and work is also reported to be under way at the site for the Mount Royal Heights station and at the site for the electrical substation in the Model City. The work on the tunnel itself is progressing rapidly, and the tunnel is now well advanced to its full dimensions, 30 ft. wide by 22 ft. high. The lining will be of concrete, but near the Dorchester St. end a steel roof is to be provided. The lining is expected to be completed in the autumn, and the entire tunnel, with its equipment, to be ready for operation in about a year.

Montreal-Ottawa-Port Arthur Line.—The bridge construction on the line from Montreal to Hawkesbury is reported completed,

statement is said to have been made:—"Work will be started at Toronto and at both the east and west sides of Hamilton, also in the centre of the city at St. Catharines, Niagara Falls and Buffalo simultaneously. The ground has been thoroughly surveyed, and is said to offer no serious obstacles to a line between the Falls and Toronto. The city of St. Catharines is going to give material financial aid for the new high level bridge that will cross the canal valley. West of Hamilton the line will divide near the Junction cut. The west line will run between the present city limits and the McKittrick survey, and will parallel the T. H. & B. line to Brantford. Beyond that there is some uncertainty about it. It is said that negotiations are now being carried on for the purchase of the old Pere Marquette local line from London to Windsor, but that this line will only be purchased in the event of the company being unable to buy links of various local lines giving a more direct route to the border."

Canadian Northern Ry.—Plans are reported to have been prepared for the erection of a station, 143 by 24 ft., at Port Arthur, Ont., and for the building of a modern coal plant at Fort Frances, Ont.

It is reported from Winnipeg that work is to be started at once under the charter of the Winnipeg River Ry., on a line from Lac du Bonnet, and Little Bonnet Falls.

A press report states it is expected that the new bridge across the Assiniboine River, at the junction with the Red River at Winnipeg, will be opened for traffic early in June. The bridge is to be used for freight traffic only.

ready for the steel work, and the erection of this is expected to be finished by July 31. The line is in operation from Hawkesbury to Ottawa, and from Ottawa to Pembroke the grading and bridge work is well advanced. Three spans of the 1,800 ft. bridge across the Ottawa River at Portage du Fort have been erected, and preparations are going on for the erection of the 1,600 ft. bridge across the same river at Fitzroy harbor. It is expected to have this stretch of 170 miles completed this year. The Pembroke-Capreol section is also expected to be completed this year. The line is in operation from Capreol to Ruel, and a service is also being given from Ruel to Port Arthur. The finishing up operations on this latter section are in progress, ballasting and other gangs having been at work since early in April. The whole line is expected to be put in operation in the autumn.

Canadian Northern Ontario Ry.—The first through train from Quebec, run entirely over the C.N.R. lines, arrived in Toronto, May 1, and was sent on to the west, over the company's Toronto-Sudbury line. By this route the company is enabled to give connections from Quebec through to west of Edmonton, Alta.

In connection with the opening for through traffic of the Toronto-Ottawa line, a passenger service, mainly for tourist purposes, is to be operated by a gasoline electric car, from Ottawa to Chaffey's Locks, 79 miles.

With regard to the lines to be built under some one or other of the charters controlled by the C.N.R. interests, press reports state that arrangements will be completed for starting operations if Parliament decides to give the aid by way of guarantees asked by the company. The following ment. A summary of the agreement is given on another page, under the heading of Grand Trunk Pacific Ry. Construction.

The Attorney-General of Manitoba is reported to have said at Neepawa recently that the Government is ready to guarantee the company's bonds for the building of a line northerly from McCreary or Laurier northerly to connect with the Gypsumville extension.

We are officially advised in respect to the extension of the line to Grand Marias and Victoria Beach that grading has been completed from the present track end of the Birds Hill line for 50 miles to Grand Marias, and that tracklaying on the same is now in progress. It is intended to extend this line for a further distance of 14 miles to Victoria Beach. This will provide convenient access for the people of Winnipeg to the various summer resorts along the eastern shore of Lake Winnipeg.

A press report states that grading is to be started this year on the first 25 miles of the line from Melfort, Sask., to Pas, Man. John Mackenzie, of the company's engineering staff at Winnipeg, was at Melfort recently, and representatives of several contracting firms have since been over the route.

The operating department has taken over the extension of the line from Avonlea to Gravelburg, 78.5 miles, and put on a train service. It is expected that this branch will ultimately be extended to Swift Current, Sask.

A press report states that surveys have been completed for a branch line from east of Radville, on the Maryfield branch, into Weyburn, Sask., and that some grading may be done this year.

The Board of Railway Commissioners has

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approved location plans for the extension of the Swift Current line from mileage 124.96 to 142.53.

Press reports from Edmonton, Alta., state it is expected that about $10,000,000 will be expended by the C.N. Ry. upon construction in Alberta during this year. This includes the $6,500,000 realized on the recent sale in England of the bonds, guaranteed by the Province, of the Canadian Northern Western Ry. The following statement has been issued by the Provincial Department of Railways, showing the lines aided by the Province and the mileage constructed:—

Edmonton by way of Strathcona, Camrose and Calgary to Lethbridge—Guaranteed for 335 miles at $15,000 a mile, 258 miles completed. Camrose to Vegreville—Guaranteed for 45 miles at $15,000 a mile, completed. From crossing of Edmonton-Lethbridge line and Little Bow River, south to Macleod—Guaranteed for 110 miles at $15,000 a mile, will in all probability be built this year. From near Macleod to western boundary—Guaranteed for 65 miles at $15,000 a mile, 30 miles of grade completed. Morinville to Athabasca—Guaranteed for 72.3 miles at $15,000 a mile, completed. From Mile 175 of the Goose Lake line to Munson—Guaranteed for 127.5 miles at $15,000 a mile, completed. From Little Bow, south of Calgary to Macleod—Guaranteed at $15,000 a mile, the Government insists on this being built this year.

The lines authorized to be built under guarantee by the Canadian Northern Western Ry., with the work done to date, are:—

Onoway northwest to Pine River Pass—Guaranteed for 100 miles at $20,000 a mile.

June
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line of the C.N.R. to the

try. Pine River Pass is northwest of Grand Prairie City. Grading has been completed to Whitecourt, 32 miles of steel have been laid, and the rest will be laid this year.

Oliver northeast to St. Paul de Metis—Guaranteed for 100 miles at $13,000 a mile. The whole of the right of way has been cut and 14.5 miles of grade completed. No steel has been laid.

Bruderheim, by way of Vermilion, Wainwright and Medicine Hat, to the international boundary, with branch northwest of Vermilion to eastern boundary. Guaranteed for 30 miles at $13,000 a mile. The building of this road has hitherto been held up on account of the failure to locate a feasible route. The right of way has been partly cleared, and a few miles of grade completed.

Calgary northeast to Brazeau Line—Guaranteed for 100 miles at $13,000 a mile. This road leaves the Edmonton-Calgary line near Calgary and runs due north to the Brazeau line. Some construction has been done north of Red Deer. The company is stated to be anxious to build this line.

Camrose to Alsask—Guaranteed for 80 miles at $13,000 a mile. This road runs form Camrose to meet the Saskatoon-Calgary line at Alsask, 30 miles of grade completed. Some litigation over the Battle River crossing has delayed operations, but suitable arrangements, it is stated, have now been made, and the work will likely go ahead.

Edmonton, by way of Cochrane, to Pincher Creek—Guaranteed for 200 miles at $15,000 a mile. Some grading done.

Blackfalds to Goose Lake—Guaranteed for 118.5 miles at $13,000 a mile. This runs to Warden, which is south of Stettler, on the Strathcona-Calgary line, and then southeast to Hanna, a divisional point on the Saskatoon-Calgary line, 61 miles completed to Warden. Plans have been filed from Warden to Hanna, but no work has been done on this stretch.

June
1914

It is reported that the line from Edmonton to Tollerton, 137 miles, is to be reballasted this year, and a train service placed in operation.

Plans for the route of the Peace River line, the grading of which has reached White Court, near the confluence of the Macleod and Athabasca Rivers, have been filed, and show a route following the Athabasca River valley for about 50 miles, then crossing to the Macleod River valley, and on to the Smoky River valley, crossing the latter river about three miles from the mouth of the Wapiti River.

We are officially advised that some clearing and grading has been done on the branch line from Oliver towards St. Paul de Metis, Alta. What additional work may be done this year has not been decided.

Canadian Northern Pacific Ry.—S. H. Sykes recently completed a trip of inspection over the line, and is reported to have stated that 60% of the grading had been completed on the 20 mile section west of Albreda Summit, the last piece of grading to be undertaken. Track laying is reported to have been started May 1 from the end of steel 110 miles west of Yellowhead Pass. The bridge construction along the line was well forward. Track is laid to mileage 122 north of Kamloops, and it is expected that the track laying gangs would meet some time in August.

The Premier of British Columbia, and a party of officials made a trip of inspection over the line recently from Port Mann to Cisco bridge, at mileage 140.

M. H. MacLeod, Chief Engineer and General Manager, is reported to have stated that construction on the branch from Kamloops to Okanagan will be started during the summer.

The reclamation work at the False Creek flats, Vancouver, is being rapidly proceeded with. The material raised from the area being dredged by the Dominion Government

June
1914

loops to Okanagan will be started during summer.

The reclamation work at the False Creek flats, Vancouver, is being rapidly proceeded with. The material raised from the area being dredged by the Dominion Government is being deposited on the portion of the flats being developed by the C.N.P.R. The dredging company has agreed to supply 3,750,000 cubic yards of material, and this is being carried by a pipeline about 4,000 feet long.

Vancouver Island.—It is expected that the branch line from Victoria along the Saanich Peninsula will be ready for track laying early in July. The British Columbia Government has issued the following statement as to work on the Island lines to April 30:—GRADING.—Location, Patricia Bay, total mileage, 15¼; 11 miles completed; date of completion, Aug. 1, 1914. Location, Victoria to mile 50, total mileage 50; 45 miles completed; date of completion, Aug. 1, 1914. Location, mile 50 to 100, total mileage, 50, 45 miles completed; date of completion, July 1, 1914. Location, mile 100 to 142, total mileage, 42, 25 miles completed; date of completion, Jan. 31, 1915. BRIDGING.—Patricia Bay branch, 35% completed, date of completion, Aug. 1, 1914. Victoria to mile 50, 97% completed, date of completion, Aug. 1, 1914. Mile 50 to 100, 60% completed, date of completion, July 15, 1914. Mile 100 to 142, nothing done; date of completion, Jan. 31, 1915. There are several steel structures which cannot be erected until the track reaches the bridge site, one of which, the crossing of the Koksilah River, will be a large structure. (April, pg. 170.)

June 1914

The Canadian Locomotive Co., has delivered 4 mogul locomotives to J. D. McArthur and Co., Winnipeg; 1 six wheeled locomotive to Robt. McNair Shingle Co., Vancouver, B. C.; 3 consolidation locomotives to Intercolonial Ry., and one six-wheeled locomotive to Baldry, Yerburgh and Hutchison, St. Catharines, Ont.

Electric Railway Department

June 1914

trical Equipment for Mount Royal Tunnel, Canadian Northern Railway.

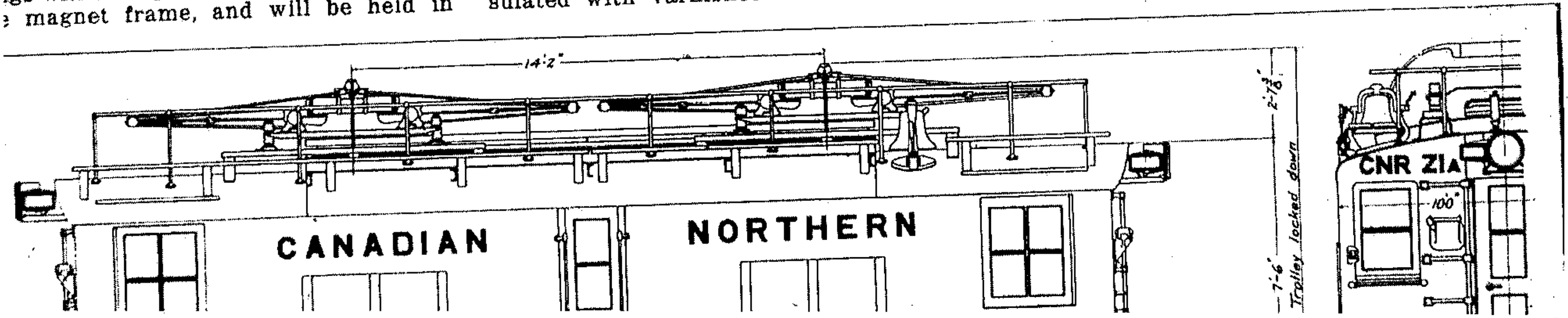
dian Railway and Marine World, for
913, contained a general description
electric locomotives for Mount Royal
and the Montreal terminal. Follow-
more detailed account of some of the
tus on the locomotives, and also a
tion of the 8 multiple unit car equip-
and substation apparatus:

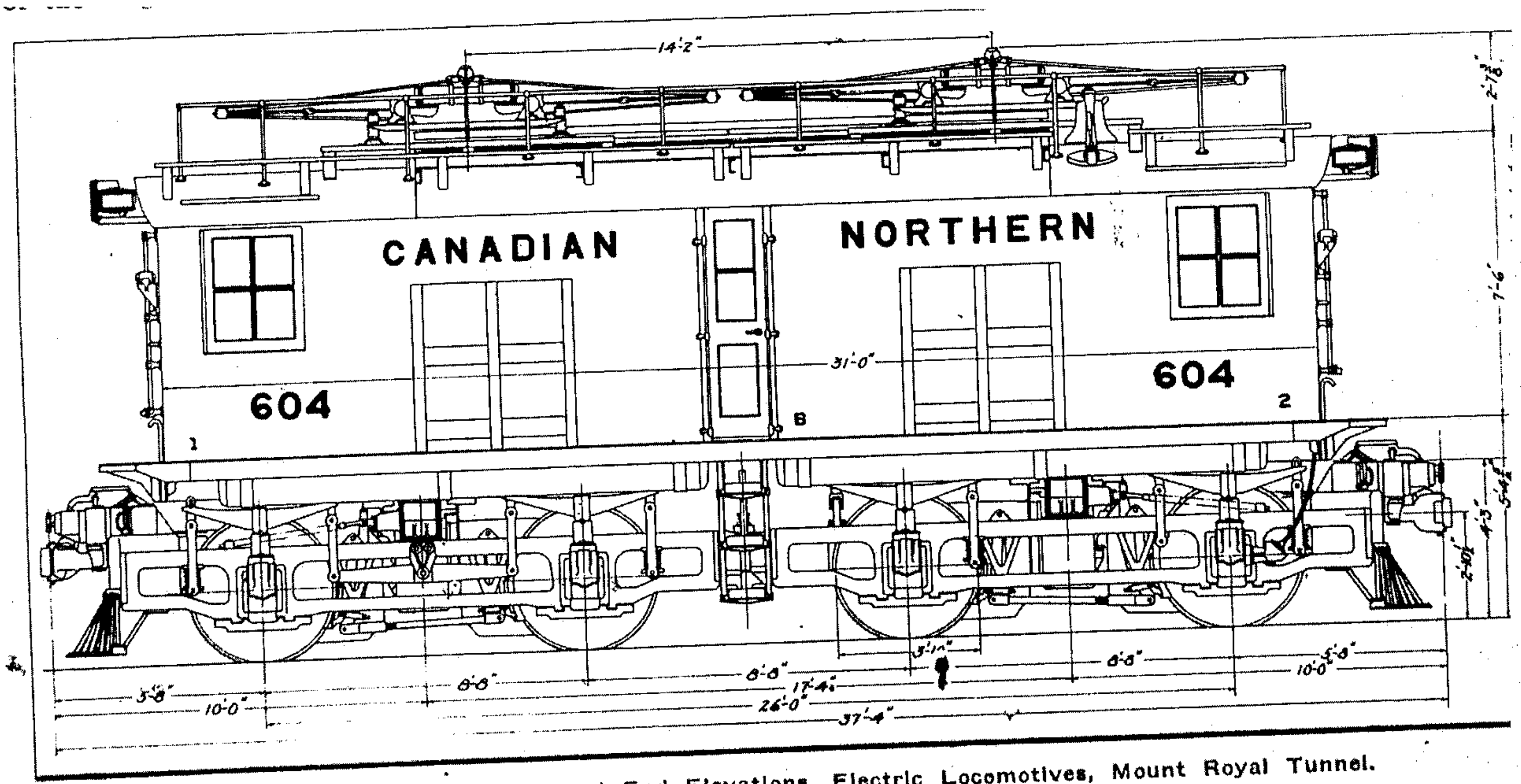
OMOTIVES.—The motors on each
tive will consist of 4 CGE-228 com-
ng pole type motors. These have a
rd rating of 315 h.p. each, or a total
0 h.p. per locomotive. The magnetic
will be practically octagonal in shape,
the box type construction. The frame
vided with bored openings at each end
h which the armature, pole pieces, and
oils can be inserted or removed. The
heads carrying the armature shaft
gs will be supported in the recess ends
magnet frame, and will be held in of bearing metal with a thin layer of babbit sweated to the bearing shell. The armature bearings will be lubricated by means of oil and waste, and the waste will be held against the shaft on the low pressure side of the bearing. Waste oil from the armature bearing will be prevented from entering the interior of the motor by a series of oil deflectors which will throw it into grooves in the heads from which it is conducted away. Axle caps will be tongued and bolted to machined surfaces on the frame, which will be inclined at an angle of 60 degrees to the horizontal. The bearings will be lubricated by means of oil and waste, and the caps will be provided with auxiliary oil wells. The motor will provide a 7 in. diameter of axle in the motor bearings.

The field coils will be all wound with strip copper, the whole being mummified and insulated with varnished cambric and heavy

Each brush holder will rest on a support which will consist of two mica insulated studs pressed into a drop forging. The support will be secured to the frame against accurately machined seats by tap bolts accessible from the outside of the motor frame. The brush holder bodies will be secured to the brush holder supports on accurately machined seats. The brushes will slide in finished ways and will be pressed against the commutator by fingers which will give a practically uniform pressure throughout the working range of the brushes. The arrangement of springs actuating the fingers is such that there will be but slight pressure on the pins on which the fingers pivot. This will prevent any tendency of the fingers to stick on the pins and will reduce wear to a minimum.

The magnet frame will carry an opening for a flexible connection to a low pressure





Side and End Elevations, Electric Locomotives, Mount Royal Tunnel.

June 1914

Department

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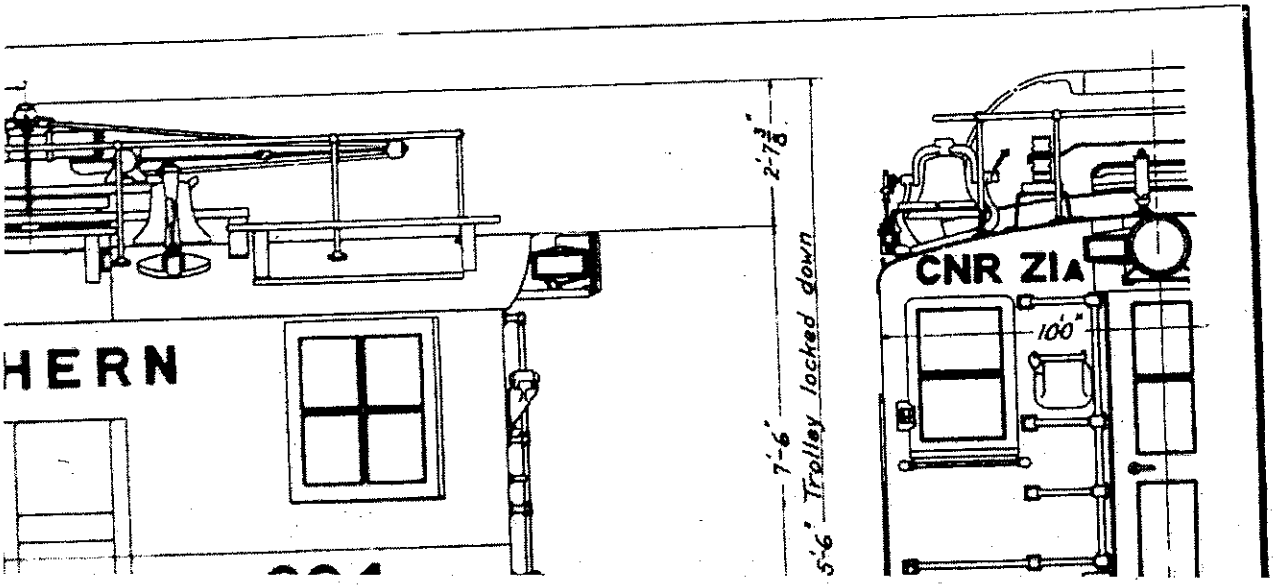
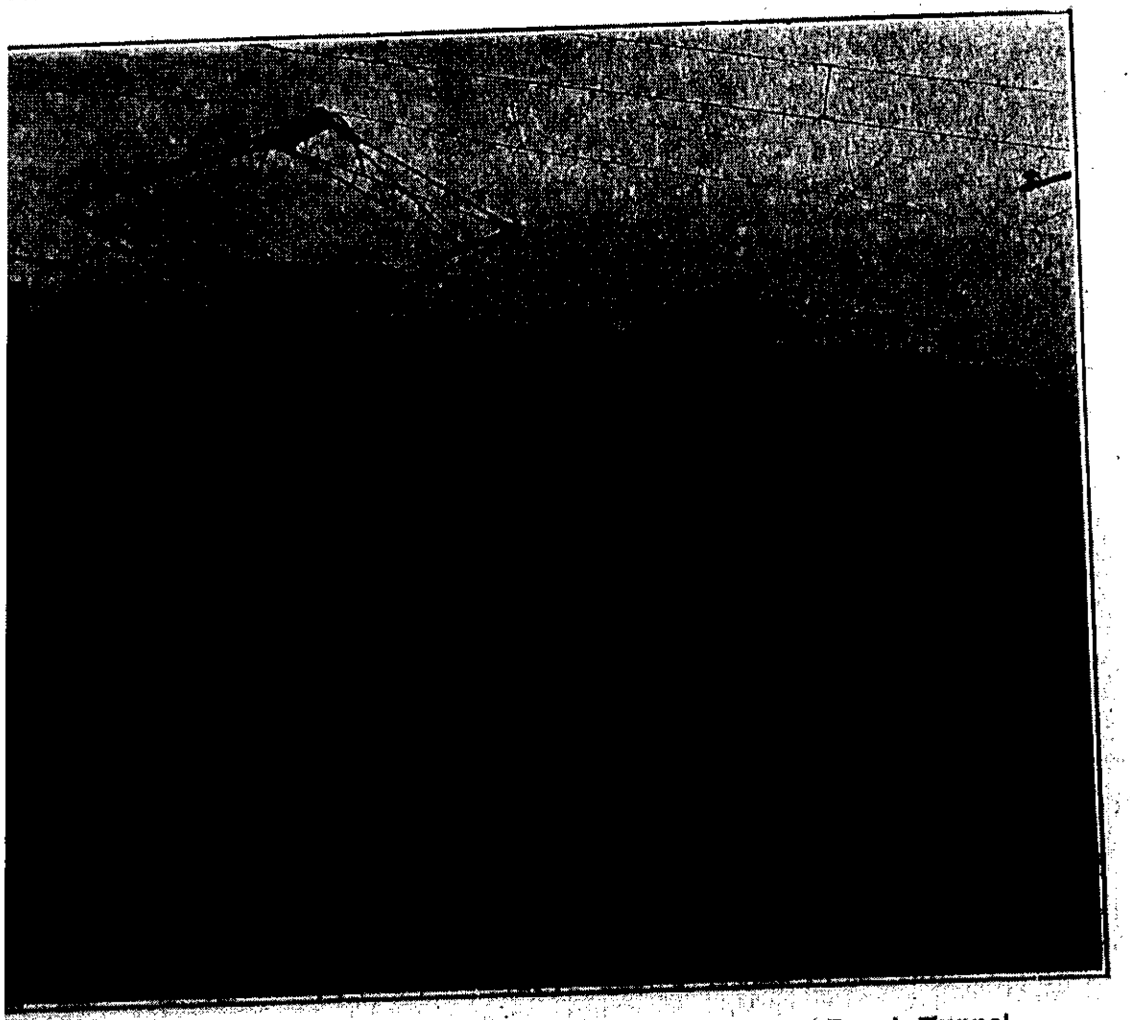


r and auxiliary fuse boxes led with a very effective t, which will be energized ssing through the fuse, and rs to facilitate fuse renew- be of the copper ribbon le in the centre to localize ese fuse boxes will be all

tribution of hot air secured. The heating equipment will consist of a heating unit, blower and regulating mechanism, the controlling switch and thermostat of the regulating mechanism being arranged for operation from the 600 v. supply. Air will be forced over the heating unit and distributed to the car through air ducts along the sides



Locomotive of Similar Type to those ordered for Mount Royal Tunnel.

1914 June

direct connected to 11,000 v. synchronous motor. The generators will be provided with pole face windings, and will be capable of carrying extremely heavy overloads, the overload capacity of each set being 200% load for one half hour and 300% load for 5 minutes. Three bearing 125 v. motor generator exciter sets will be supplied, each 125 v. 50 k.w. compound wound commutating pole generator being driven by a 550 v. 3 phase induction motor. The switchboard will consist of 32 panels of natural black slate and be 58 ft. long over all. The switchboard will make provision for considerable future extension.

All the apparatus above mentioned is being furnished by the Canadian General Electric Co.

Electric Railway Finance, Meetings, Etc.

Brantford St. Ry.—Grand Valley Ry.—The matters connected with the settlement of the litigation arising out of the affairs of the company in which the City of Brantford, Ont., is interested, were mentioned in the Second Appellate Division of the Ontario High Court, May 4. It was reported that the settlement negotiations were proceeding satisfactorily, and the cases were further enlarged.

The Brantford City Council, on May 4, finally passed the bylaw to raise $270,000 by debentures for the purchase of these lines.

British Columbia Electric Ry., and allied companies.—Gross earnings for March, $717,251; operating expenses, maintenance, etc., $516,007; net earnings, $201,244, against $720,493 gross earnings; $520,667 operating expenses, maintenance, etc.; $199,826 net earnings, for March, 1913. Aggregate gross earnings for nine months ended Mar. 31, $6,752,082; net earnings, $1,828,859, against $6,402,921 aggregate gross earnings; $1,826,-

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Canadian Northern Railway Construction, Betterments, Etc.

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It is reported that as soon as ballasting is completed on the Vegreville-Calgary line a daily train service will be put in operation.

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July
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Canadian Northern Pacific Ry.—The Premier of British Columbia is reported to have said in a recent speech that this line is being built to a higher standard than called for in the specifications. When the construction of the line was under consideration three routes were looked into, one over the Hope Mountains, one from Howe Sound, and the present one. The latter was selected as offering the best gradients, and furnishing transportation facilities where most required. The fact that the C.P.R. is proceeding with its important second track work, and gradient reduction work, shows

July
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Canadian Northern Ontario Ry.—It was announced that a regular through passenger train service would be put in operation between Toronto and Ottawa, June 29, replacing the previous services.

A passenger train service was put in operation on the spur line, completed four years ago, from Udney, on the Toronto-Sudbury line, into Orillia, June 13. The line is about 10 miles long. Press reports state it is intended to build an extension of this line from Orillia, round the west side of Lake Couchiching, rejoining the Toronto-Sudbury line at Hamlet, thereby enabling the company's trains to run through Orillia.

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S. K. Sykes, of the company's engineering staff, completed an inspection of the line to the Albreda Summit, June 12. The principal grading yet to be done is along the North Thompson River, where about 80% has been completed. The bridge building is being delayed by scarcity of labor.

Vancouver Island.—It is reported that grading on the Alberni line has been completed to mileage 135. Two routes are under construction from mileage 135 to 140, and grading will be gone on with as soon as it has been decided which route will be adopted. The substructures for the bridges are being put in, and the steel work is being assembled. It is expected that tracklaying will be started on an early day. (June, pg. 272.)

July
1914

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Canadian Northern Ry.—While no official announcement has been made as to the season's work, it is said that all the construction work in hand will be pushed forward to completion. Arrangements are being made, it is said, to accelerate all the construction work on the branch lines, and to push forward ballasting and other finishing up work on the lines on which track was laid last year. The transcontinental line work to the Albreda Summit is being pushed. The details of the betterment works to be done on the various lines west of Port Arthur, Ont., are being settled.

Application is being made to the Board of Railway Commissioners for authority to build a spur line from between Harold and

JULY 1914

ment upon which the bridge rolls, the terweight and the truss spanning the channel are rigidly riveted together, forming a distance. This makes it unnecessary to have a journal or axle."

Brick Arch for Canadian Northern Railway Locomotives.

The accompanying illustration shows a brick arch arrangement used on the C.N.R. eastern lines for locomotives having narrow fireboxes set on top of the locomotive frames. It contains many points of excellence over the more elaborate arch types, and is used on fireboxes having widths up to 66 ins. The most apparent changes between this type and the more usual design, lie in the elimination of the arch bars, the bricks being of such size and shape as to form the arch in themselves. Each arch consists of 10 bricks, in a row of 5 on each side, slightly arching towards the centre on each side of the firebox. There are two arch studs, fitted to clear the staybolts, on which rest two arch supporting bars, the outer ends of the brick being so formed as to fit on the narrow shelf thus provided. crevices, the stud and bar are protected from direct contact with the fire. From its construction, it is a very simple matter to apply the arch, and, if required, to remove it, leaving the firebox in its former condition. To date 16 sizes of brick have been used, on two classes of locomotives.

The C.P.R. "better farming" special trains, operated in connection with the Manitoba Government, which went on duty recently, contain specimens of noxious weeds most troublesome in the province, and lectures are given to teach the effectual methods of eradication. There are models of weed seeds, so that identification is easy; Manitoba birds, with instructions as to their habits, whether destructive or beneficial; injurious insects are illustrated

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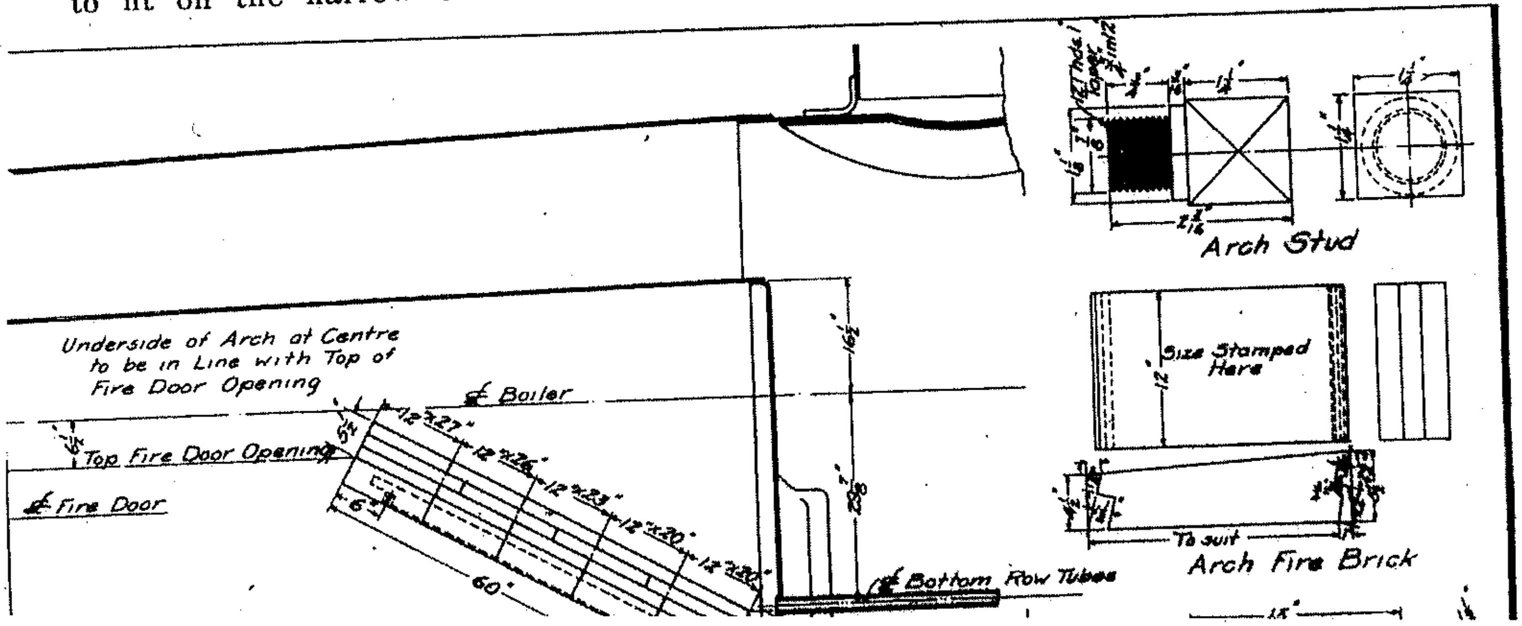

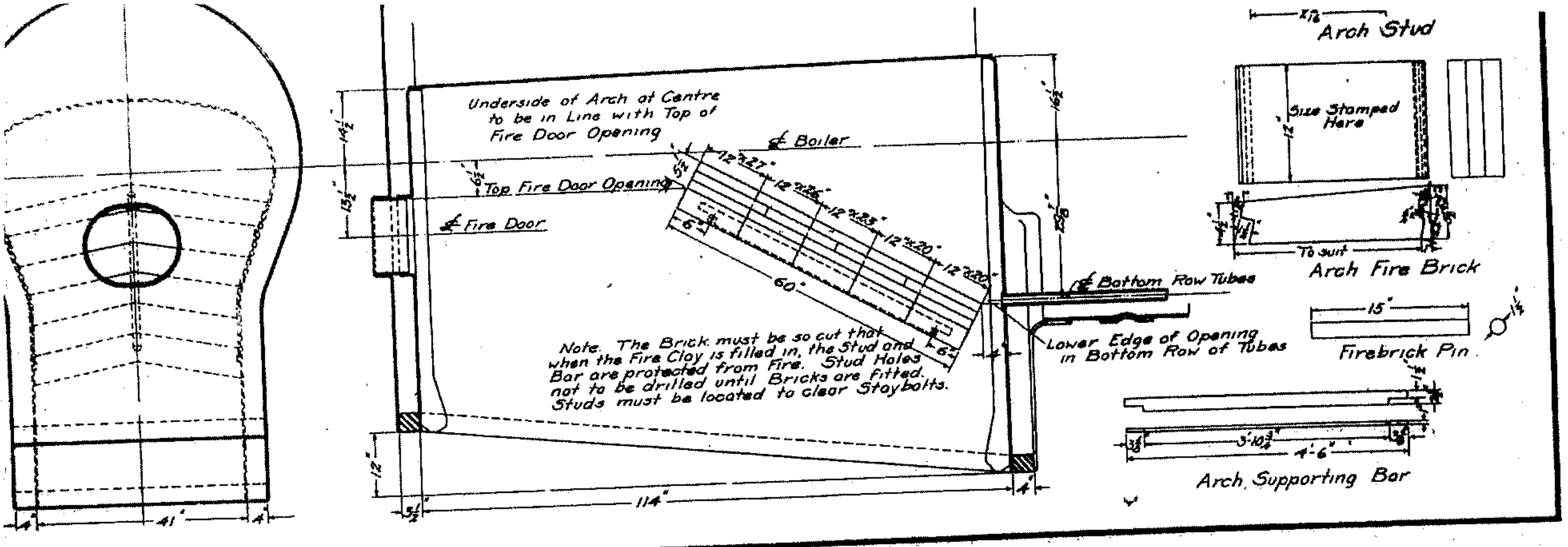

Brick Arch for Canadian Northern Ry. Locomotives, Showing Details of Construction.

e current for operating the bridge is
ned from the Kaministiquia Power Co.
is 2,200 volts, 3 phase, 60 cycle a.c.,
ed down to 550 volts for use on the
e,

e electrical control apparatus described
oused in an operator's house on one
of the bridge. The bridge is also
pped with a hand operating mechanism
ise in case of an emergency.

e total weight of the steel work and
hinery is approximately 660 tons. The
ge was designed by the Scherzer Roll-
Lift Bridge Co. of Chicago, under the
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ineer of Bridges, C.P.R. It was fabri-
d by the Bridge Department of Cana-
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ks and all calculations in regard to
terweight, etc., were worked out in its
ineering department after the shop draw-
were made. The entire electrical
ipment was furnished and installed by
Canadian General Electric Co.

The inner end of each brick is channeled to receive the half of a 1½ in. firebox pin, securely locking the arch together by its own weight. The bricks have a width of 12 ins., forming an arch 60 ins. deep. The locking pins are 15 ins. long, locking each pair of pins to its adjoining mates. Another type of central mating joint is employed in special cases, of the tongued and grooved type, dispensing with the locking pins. This tongue and groove are of the same dimensions as the locking pin.

The good points claimed by the railway officials for this type of arch are that flat bricks are used, which are easily made, have a low initial cost, pile readily and are easily packed in cars without damage in transit. The same bricks are used on all locomotives, apart from the length, which varies. The arch is supported on each side by a bar, and two studs instead of four, reducing the risk of leaking to a minimum. It is 15% lighter in weight than the usual arched type, and it is easily applied and maintained.

on the moving films; a car with cattle, sheep and pigs in connection with which lectures will be given to young men, especially; a car devoted to home economics for women, where lady demonstrators teach nursing, sewing, and so forth. Field crops and miniature lay-outs of farm buildings are shown in two cars, while instruction is given as to the protection of such buildings. In Saskatchewan two large cars are devoted to stock, and instruction will be given in everything practically appertaining to farm life.

The Pennsylvania Rd. has issued an order prohibiting train employes from manipulating the lower hand brakes on freight cars by means of brake clubs, investigation having proved that the careless use of clubs on the lower brakes, or "tunnel" brakes as they are called in railway parlance, resulted in one employe being killed.

The C.P.R. pension fund now has at its credit nearly $750,000, and there are 60
pensioners. Last year the payments t
pensioners were $169,329, and during th
year the C.P.R. contributed $125,000 to th

JULY 1914

Steel Multiple Unit Cars for Mount Royal Tunnel.

The C.N.R. has ordered 8 all-steel, electrically operated, multiple unit cars for suburban service through its tunnel under Mount Royal, Montreal.

In the underframing, a plan of which is given herewith, the central box girder construction will comprise two 9 in. 15 lb. channels, 64 ft. 4¼ ins. long, spaced 16¾ ins. back to back, and fitted with a top cover plate, 28 by ¼ ins. by 62 ft. 11⅞ ins. long, a main bottom cover plate 24 by ⅜ ins. by 60 ft. 8½ ins. long, and two platform cover plates 24 by ⅜ by 13 ft. 11¾ ins. long. This box girder will extend from end to end of the car, with cast steel buffer castings on the ends. Where the webs of the channels are cut, the cross-sectional area of the original girder will be maintained by the use of four 2¾ by 2¾ by ⅜ in. angles. This construction is all shown in the plan. The centre filler at the centre plate is to be of cast steel, and the centre plate is to be of C.N.R. standard contour, to take the standard malleable iron centre plate used on C.N.R. passenger trucks. This centre girder will be assembled with the bottom of the sills upwards, and allowed to deflect, so that when reversed the camber will be allowed to straighten out by the weight of the metal. The body end sills will be built up of structural shapes.

which are to be 1¾ by 4⅛ in. long leaf yellow pine, B.C. fir or white ash. At the belt rail, the sheeting is to be further stiffened and tied in conjunction with the 3-16 in. pressed steel sash rests, by a 4 by ½ in. bar, extending the full length of the body in one place. Above the belt rail, the main piers will be fitted with steel casings, with the outer end portions rivetted on and formed to serve as sash stops. The window posts are to be encased on the outside with a U-shaped plate of ⅛ in. steel, forming the sash stop.

The corner posts are to be built of 3 by 3 in. angles, with 3-16 in. pressed steel cover plate, extending around and over the side and end sheets. The door posts will consist of 4 in. channels, having casings of 3-16 in. pressed steel, which will include and secure the end sheets and door finish inside the car. The belt rail will be of 3-16 in. pressed steel plate. The side plate will be of 3 by 3 by 3-16 in. angles, continuous in one piece, the full length of the body, each side, and fitted with extensions each end, to include and form the vestibule face carline. The letter board is to be ⅛ in. steel plate, rivetted to the side plates, and stiffened on the lower edge by a 1 by 1⅜ by ⅛ in. angle.

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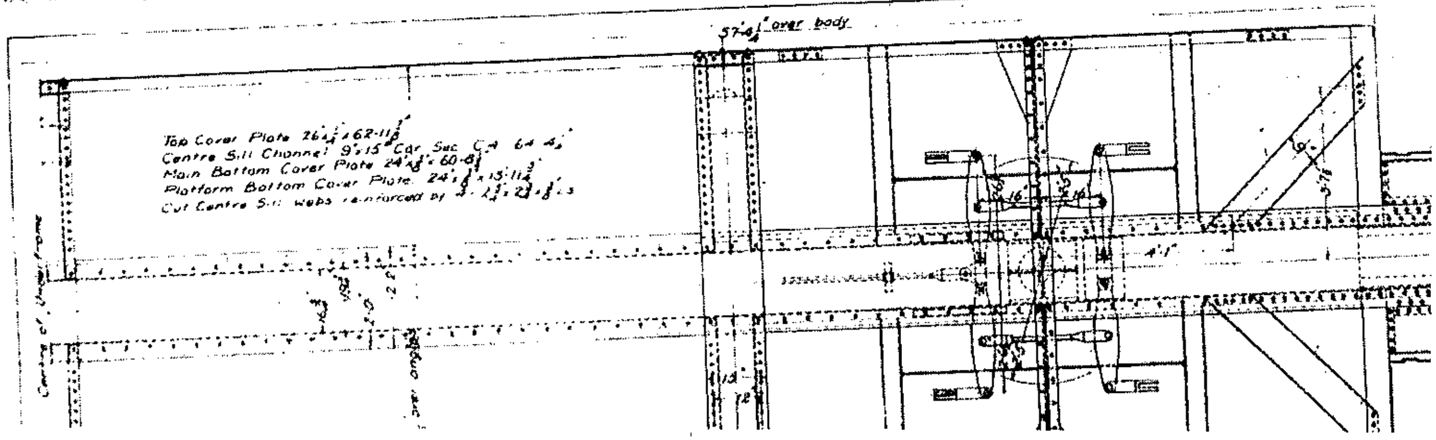

42·9' truck 49·9 centres 67·5½' over buffers

Underframe of Multiple Unit Steel Cars for Mount Royal Tunnel.

The body bolsters will have a web plate, 9½ by ⅜ ins., and double top stiffener angles 2½ by 2½ by 5-16 ins., and bottom angles of 2 by 2½ by 5-16 ins., with top cover plate extending across top of centre girder, 6½ by ¼ by 103 ins., and a bottom one, 6½ by ⅜ by 78 ins., with the stiffener angles cut and bent around to form angle connection to the side sill angles and centre sill channels.

The cantilevers, of which there will be three, are to be located at 14 ft. centres, and will be formed of double pressed steel diaphragms, ¼ in. thick, with flanges formed to take a top cover plate, 15 by ¼ by 111 ins., and a bottom cover plate, 15 by ⅜ by 96½ ins., with the rivet gauge set at 12 ins. There will be about 35 cross supports of 5 in. 6½ lb. channels, to support the electrical and air brake apparatus under the car.

The side sills, of 5 by 3½ by 5-16 in. angles, will extend from end sill to end sill, and form a connection for the sheeting, bol- sters, cantilevers and equipment supports. A pressed steel channel brace, ⅜ in. thick by 9 ins. wide, secured to the end and centre sills, will be located at each corner of the underframe.

In the side framing, the main side posts, which are to be continuous from side sill to the plate, will be 3 by 2 by 5-16 in. angles, acting as stiffeners for the side sheeting, suitably connected to the wooden side posts, ing a continuous stiffener the full length of the body in one piece of 4 by ½ in. steel bevelled on the top edge to suit the slope of the sash rest. The side sheets or plates are to be 0.11 in. thick, preferably cold rolled, and to be coated with a layer of cork paint on the inside when applied. The outside roofing is to be of steel plate, 0.09 in. thick, coated inside with cork paint, and supported on channel shaped pressed steel carlines ⅛ in. thick, except the three carlines supporting the pantograph, which will be of 3-16 in. pressed steel. The roof plates will be secured by ¼ in. rivets, with the plate edges butted and welded together, and all the rivets sweated and soldered so as to be watertight. The eaves moulding will be of ⅛ in. pressed steel. The roof frame will be braced longitudinally by seven stringers, 1 in. thick by 1¾ in. wide. There will be a stringer, 2 by 3 in., in the roof framing, 2¾ ft. each side of the car centre line, to form a support for the lamps. The end plates, extending from side plate to side plate in one piece, will be of 4 in. channels. There will be safety chain hooks, links and brackets in accordance with C.N.R. standards.

The vestibule corner posts and diaphragm post casings will be 3-16 in. pressed steel, and the vestibule end sheeting will be the same as the body sheeting, as will

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August 1914

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also the body end sheets. The floor plates will be ¼ in. thick. The diaphragm posts will be 5 in. 9 lb. channels. The vestibule floor covering will be of 5-16 in. pebbled dot rubber. The vestibule windows will be circular, of double thickness, 19 ins. diam., 7-16 in. thick, of heat resisting clear glass.

There will be 8 windows per car. The two end doors will be fitted with round stationary sash, the glass in which is to be heat resisting and wired, 19½ ins. diam.; two body end doors, with drop sash and double lights of heat resisting glass, 15 by 17 ins.; and four vestibule side doors with drop sash and two lights of ¼ in. plate glass, one 10¼ by 25 ins., and the other 23½ by 25 ins. The door trimmings will be C.N.R. standard. The car lighting will be from a 600 volt generator under the car, the lighting circuits from which will be divided into five lines.

The cross seats of the cars are to be of the C.N.R. low back style, with corner diagonal style of grab handles, and upholstered in canvas backed rattan. The interior woodwork is to be birch natural finish, with the ceiling of 3 ply poplar veneer, canvas faced. The end finish will be of 0.06 in. steel plate.

Each of the cars will be supplied with 4 CGE-239 motors, of the commutating pole

August 1914

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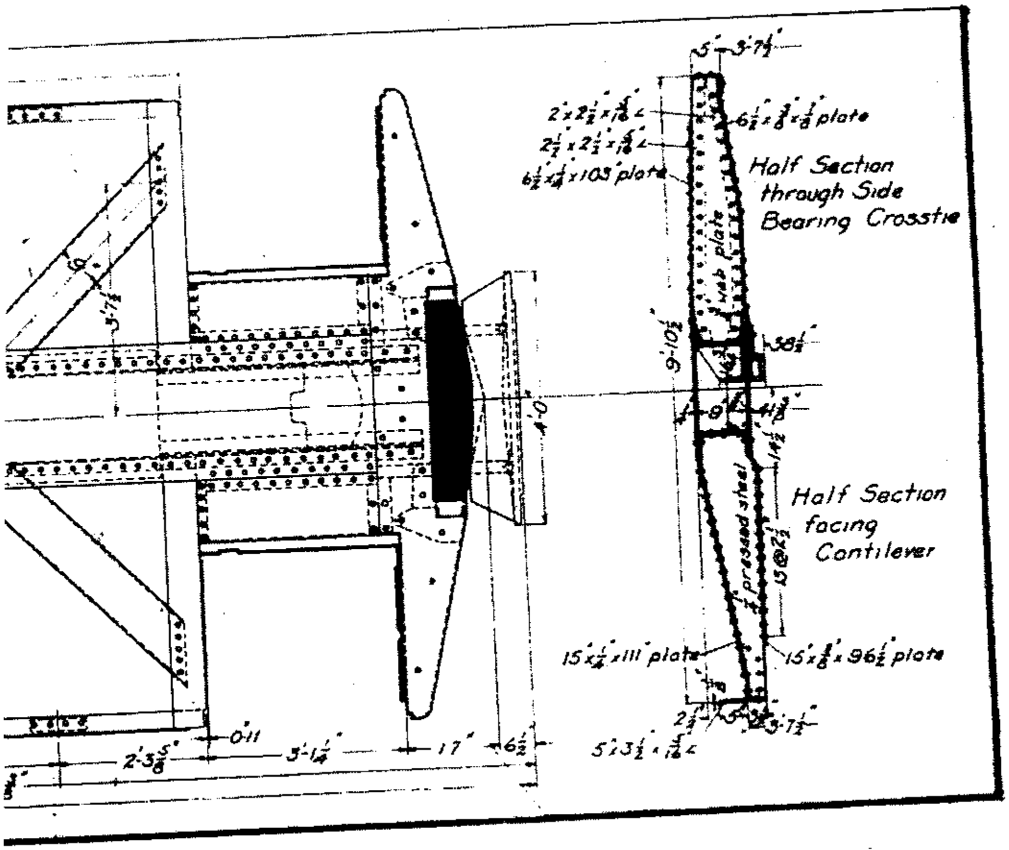

. Royal Tunnel.

2,400 v. operation. will be 125 h.p. each, or a total of 500 h.p. per car. In the construction of these fully ventilated motors, the pinion end frame will be provided with a ring which will divert the air discharge from the armature fan through the openings in the head, while the incoming air will be drawn through a screened intake. This construction will insure a definite longitudinal circulation of air through the whole interior of the motor.

The Sprague GE type M multiple unit control will be provided, the design arrangement and construction being such that it will be equally well adapted for either single car or train operation. The control equipment will include a motor generator set for supplying 600 v. current for the control circuits, air compressor and lights. This set will consist of two 1,200 v. motors, operating in series at 2,400 v., direct connected to a 600 v. generator. The construction of the motors and the control apparatus will be essentially of the same general type as for the corresponding items used on the electric locomotive equipments, which were fully

August 1914

lating mechanism being arranged for operation from the 600 v. supply. Air will be forced over the heating unit and distributed to the car through 4 by 10 in. air ducts along the sides of the car.

The following will be the principal dimensions of the cars:—

Length over buffers	67 ft. 5¾ ins.
Length over body corner posts	57 ft. 6¼ ins.
Length over body	57 ft. 4¼ ins.
Truck centres	42 ft. 9 ins.
Cantilever centres	29 ft. 6 ins.
Width over side sill angles	9 ft. 10½ ins.
Width over cantilevers	9 ft. 10¾ ins.
Width over eaves	10 ft. 2¾ ins.
Height, top of rail over roof	13 ft. 0 ins.
Height, top of rail to underside of side sill	3 ft. 7½ ins.
Height, top of rail to underside of centre sill channels	3 ft. 5¾ ins.
Height, top of rail to underside of body centre plate	3 ft. 2½ ins.
Height, underside of side sill to top of side plate angle	7 ft. 3 5-16 ins.
Centre to centre of body side bearings	4 ft. 10 ins.
Centre to centre of deck sills	5 ft. 6 ins.
Approximate weight of car under working conditions	120,000 lbs.

The cars will be built by the Pressed Steel Car Co. We are indebted to A. L. Graburn, Mechanical Engineer, C.N.R., and W. G. Gordon, Transportation Engineer, Canadian General Electric Co., for the data on which this article is based.

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A Canadian Northern Ontario Ry. Arbitration.—The Imperial Privy Council has given its decision in the appeal of the old James Bay Ry., now C. N. Ontario Ry., against the arbitration awards in respect of the value of the land of R. Davies, of the Don Valley brickyards, Toronto, taken for railway purposes. The proceedings were started in 1905, the company first offering $3,000 and finally $15,000 for the land. Mr. Davies claimed that the shale should be paid for at the value to him for his brick yards. The arbitrators put the value at $230,820, but the Court of Appeal reduced this to $110,000 on the ground that the railway ought not to be made to pay for the shale until the brickyard was ready to develop it. When first argued in the Privy Council the court disagreed, but on the present occasion they decided that the railway company should pay the larger sum with 5% interest.

August 1914

Canadian Northern Railway Construction, Betterments, Etc.

The new trust deed, provided for by the act passed last session of the Dominion Parliament, securing the $45,000,000 of securities to be guaranteed by the Dominion, was signed at Ottawa, July 15. The Department of Finance issued a statement, July 16, setting forth that all the requirements called for by the act had been complied with, the various agreements made, and the several stocks transferred, in accordance with the various provisions of the act. The trustees are the National Trust Co., Toronto, and the British Empire Trust Co., London, Eng. The amount of securities to be issued at any one time is subject to the approval of the Minister of Finance.

Canadian Northern Quebec Ry.—Press reports state that the company is negotiating for the purchase of several properties in the Jacques Cartier and Maisonneuve districts of Montreal, in order to extend and improve its lines and yard accommodation.

Mount Royal Tunnel and Terminal Co.—The lease of the company's property has been filed with the Secretary of State at Ottawa, as required by subsection 3, section 1, chap. 78, or the statutes of 1914.

The work on the tunnel is progressing rapidly and it is expected that it will be possible to have trains running through it by May, 1915. The plans for the lines in Montreal call for a viaduct 1,600 yards long from the tunnel portal to the waterfront, where there will be a yard for light and perishable freight, with tracks connecting with the Harbor Commissioners' lines. A temporary station on Lagauchetiere St. will, it is said, be built at once. When the big station on Dorchester is built, this temporary station will be utilized for express and other offices. The main yards will be located on the Back River, where the elec-

stored on the dock. The rails are being recovered from the water, and pending reconstruction of the dock they are being unloaded from steamships direct into cars.

An agreement has been entered into with Port Arthur, by which the city gets possession of no. 5 dock and the company obtains possession of a number of street ends at the water side. The company will build a spur line to no. 5 dock.

The 300 ft. timber bridge at Bare Creek, about 20 miles west of Port Arthur, was burned June 28. Pending reconstruction, trains are run to the bank of the creek and connection is made by a gasoline launch.

Work was reported to have been started on the Deloraine, Man., branch line, July 15.

It is reported that the branch from Canora to Sturgis, 22 miles, will be completed and put in operation this year.

An arrangement was reported to have been completed, July 14, with the C.P.R., by which the latter grants a right of way over a piece of land at Bienfait, Sask., which will enable the completion of the line into Estevan. The construction of the branch has been held up for two years.

A press report states that the company's programme includes the grading for the Hanna-Medicine Hat line, and a line from Alsask, on the Saskatoon-Calgary line, through Empress, to a point on the Hanna-Medicine Hat line.

A press report states that an arrangement is under consideration by which the C.N.R. will secure running rights over the C.P.R. high level bridge between Strathcona and Edmonton in exchange for running rights by the C.P.R. over the C.N.R. Camrose-Edmonton line.

Canadian Northern Pacific Ry.—Steel rails are being delivered in large quantities at Port Mann and are being rushed forward.

August 1914

station on Dorchester is built, this temporary station will be utilized for express and other offices. The main yards will be located on the Back River, where the electric transfer yard will also be situated. There will also be a delivery yard at Mount Royal, and an elevated yard in the commercial part of Montreal.

Canadian Northern Ontario Ry.—The Board of Railway Commissioners has authorized the C.N.O.R. to make a connection with the G.T.R. at Ottawa. The line between Ottawa and Toronto has been opened for traffic, and also the portion of the Montreal-Ottawa-Port Arthur line from the junction with the line from Toronto, this latter being operated as a through line from Toronto to Edmonton.

The Board of Railway Commissioners has approved location plans of the proposed entrance into Toronto, mileage 251.84 to 253.73, Queen St. East.

A press report states that work has been started in Hamilton, removing the 300 houses from the right of way in that city acquired for building the line from Toronto to Niagara. Some of the houses have been sold for removal, while others will be demolished. Press reports state that other arrangements are being made with a view of an early start on construction on the line. Another press dispatch from Hamilton to the Toronto Globe, July, 23, says that the city has been notified that the C.N.R. has ordered Ewan Mackenzie to at once start work on the Toronto-Niagara line, that Mr. Mackenzie has taken in considerable plant and that work will be started on either side of Hamilton. We are officially advised that there is no foundation whatever for these reports, and we have every reason to believe that no work will be done on the Toronto-Niagara line this year.

Canadian Northern Ry.—About 100 ft. of the C.N.R. steel dock at Port Arthur, Ont., collapsed July 4, doing damage estimated at $23,000. The accident was caused by the heavy load of steel rails which had been

Camrose-Edmonton line.

Canadian Northern Pacific Ry.—Steel rails are being delivered in large quantities at Port Mann and are being rushed forward. About 35,000 tons are said to be on the way, either overland to the Yellowhead Pass, or to Port Mann. Grading is practically completed right through, and the bridge building is being pushed ahead as fast as possible. As soon as sufficient quantities of rails have been got forward, tracklaying will be rushed from several points.

In connection with the Vancouver terminals, it is said that general consideration will be given to the whole matter during Sir Donald Mann's forthcoming visit to the West.

We are officially informed that there is nothing definite at present arranged in the way of establishing a car ferry service between the mainland and Vancouver Island. Press reports stated that this ferry connection would be made from Woodwards Landing, near Steveston, the island landing being at Patricia Bay.

Vancouver Island.—Steel rails for about 120 miles of line are being delivered, and as grading has been practically completed from Victoria to Patricia Bay and to Alberni, tracklaying can be pushed ahead.

The Minister of Railways for British Columbia has approved of the general location of a branch line from mileage 222.06 on the main line from Victoria to Duncan Bay, Sayword District, Vancouver Island, 8.2 miles. (July, pg. 322.)

Railway Mileage of the World. —A compilation of the world's railway mileage for 1912 shows a total of 670,997. The country with the largest mileage is the United States, which has 249,789 miles. Other countries having railway mileage of over 20,000, are as follows:—Russia, 49,419; Germany, 38,950; France, 34,200; India, 33,400; Austria-Hungary, 28,400; Canada, 26,700; Great Britain, 23,400; Argentina, 20,600.

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Canadian Northern Ry. Orders.

The C.N.R. has, as foreshadowed in our July issue, ordered passenger train cars for service on its Toronto-Ottawa line, which is already operating a day passenger service and freight service, and which will have a fast night service put on before the next parliamentary session, and also for its line from north of Sudbury to Port Arthur, which will have a through passenger service put on about Dec. 1. The orders, which are for 66 cars, have been given as follows:—Canadian Car and Foundry Co., 11 standard sleeping, 2 compartment sleeping, 7 compartment sleeping and observation, 7 dining, 7 tourist; Crossen Car Co., 7 colonist; National Steel Car Co., 5 first class, 15 baggage and express; Preston Car and Coach Co., 5 mail.

The cars will be 72½ ft. long, with 6 wheel trucks, steel underframes, steel ends and platforms, and electric lighting. The steel underframes will have self supporting side frames, cantilevered to transmit the entire half load to each bolster. The centre sills will be of the channel type, designed to resist 400,000 lbs. compression end load. The vestibules, entirely of steel, will be of C.N.R. standard design, with the end frame incorporating an anti-telescoping device of Z bar construction. The underframe finish will be the same as on the wooden equipment. The roof frame will be the same as on the wooden equipment, except for the mail cars, which will have pressed steel carlines in the roof. The flooring will be of cement, laid on steel sectional chanarch flooring, no. 22 B.w.g. The 6 wheel trucks will be of the all metal type, with cast steel centre plate support, and will be 80,000 lbs. capacity. The lighting will be provided through an axle generator, with a storage battery, and the heating will be by hot water circulation, except in the mail and baggage cars, which will have straight steam. The plans and specifications have been prepared under the direction of A. L. Graburn, Mechanical Engineer, C.N.R., and most of the draughting has been done in Montreal by the Canadian

August
1914

Steel Underframe for Canadian Northern Railway Passenger Cars.

The type of steel underframe adopted by the C.N.R. is shown in the accompanying illustration, and is intended for use under all classes of passenger equipment. It is practically the same as the Barney and Smith standard design for equipment exceeding 70 ft. in length over end sills. The principal differences lie in the refinement in the method of insulation, etc., to care for the more severe climatic conditions to be encountered in the north country, and they are also arranged, as regards the height of body centre plate, to suit trucks now in use under the company's wooden passenger equipment, which has been found to be a difficult feature to embody in steel underframes of any design. The principal di-

web plate, reinforced at the top by 5 by 3 by ⅜ in. angles, inside and outside, and at the bottom by 3 by 3 by ⅜ in. angles, inside and outside, with a 30 by ⅜ in. cover plate, running the full length of the car. The side girder is composed of a main member, consisting of a 24 by 5-16 in. plate, with a 3 by 3 by ¼ in. centre angle, 3 by 3 by ⅝ in. top angle, 2 by 2 by ¼ in. angle stiffener at the side posts, and a 5 in. 11.6 lb. bottom Z bar. The top angle of the side girder has a ¾ in. camber, the side girder plate being run straight, with the top and bottom edges parallel to the rail. The rivet gauge in the top angle is 2 ins., beginning 1⅞ in. down on the web plate at each end, rising to 1⅛ in. at the centre of the car.

of 4 in. 13.8 lb. Z bar posts, by ½ in. end plate angles co Z bar posts with 5 by 5 by

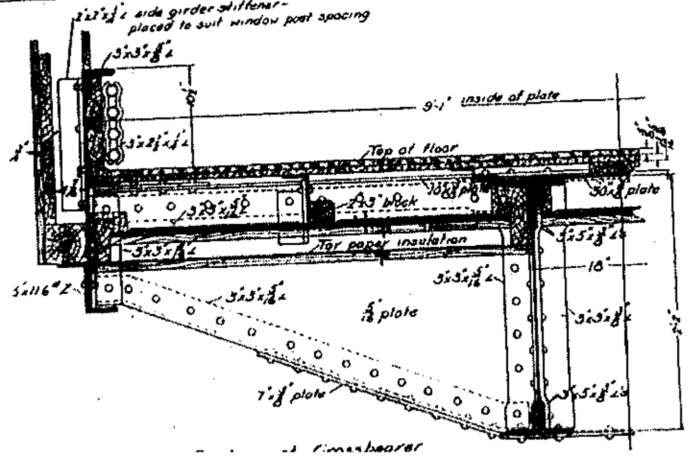
The following weights and the basis of the design calcula

Assumed weight of car ......
Assumed live load ....

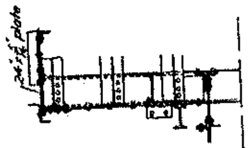
Total ....
Deduction for two trucks ......

Total weight of body ....

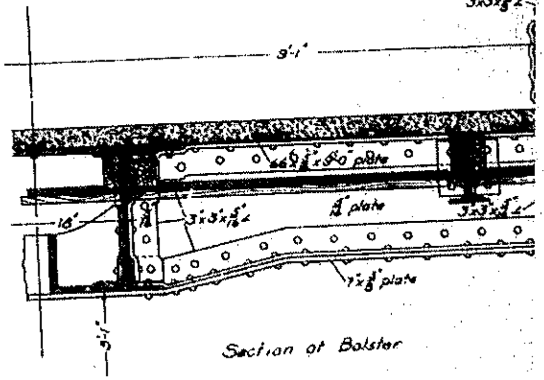
This load of 105,000 lbs. w be evenly distributed over th and only the portion of the l between the truck centres the overhang being neglect the overhang being neglecte had it been taken into acco somewhat reduced the de stresses at the centre of the



... at Crossbearer



Half Section at End Sill



Section at Bolster

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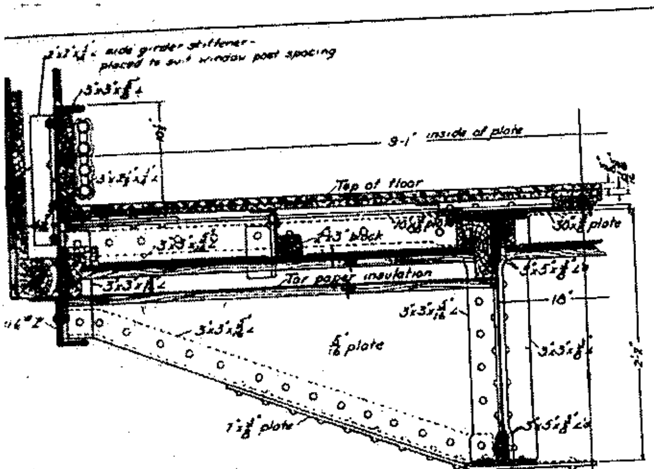
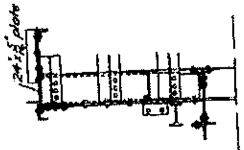


Section at Crossbearer



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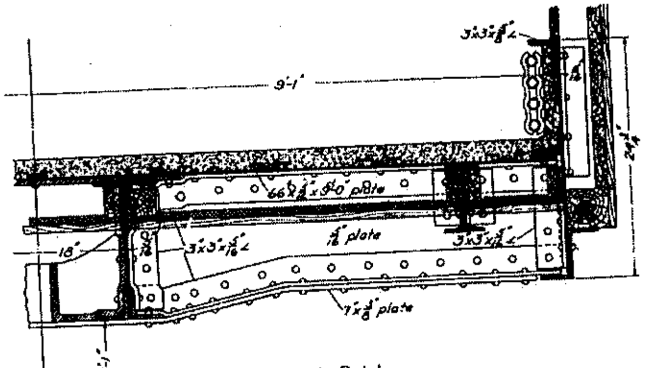

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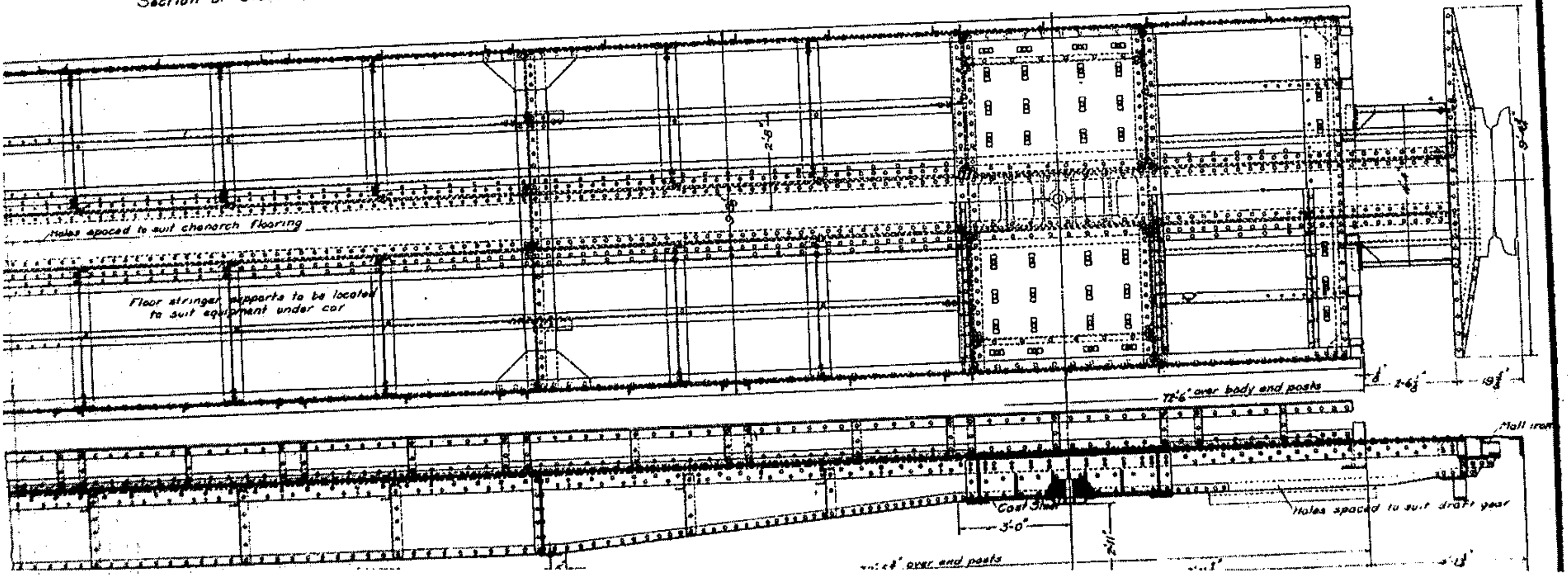

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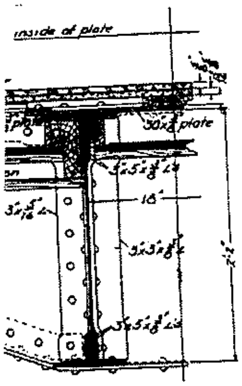
web plate, reinforced at the top by 5 by 3 by ⅜ in. angles, inside and outside, and at the bottom by 3 by 3 by ⅜ in. angles, inside and outside, with a 30 by ⅜ in. cover plate, running the full length of the car. The side girder is composed of a main member, consisting of a 24 by 5-16 in. plate, with a 3 by 3 by ¼ in. centre angle, 3 by 3 by ⅝ in. top angle, 2 by 2 by ¼ in. angle stiffener at the side posts, and a 5 in. 11.6 lb. bottom Z bar. The top angle of the side girder has a ¾ in. camber, the side girder plate being run straight, with the top and bottom edges parallel to the rail. The rivet gauge in the top angle is 2 ins., beginning 1⅞ in. down on the web plate at each end, rising to 1⅛ in. at the centre of the car.

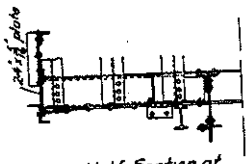
of 4 in. 13.8 lb. Z bar posts, with 8 by 3½ by ½ in. end plate angles connected to the Z bar posts with 5 by 5 by ⅜ in. angles.

The following weights and loads formed the basis of the design calculations:—

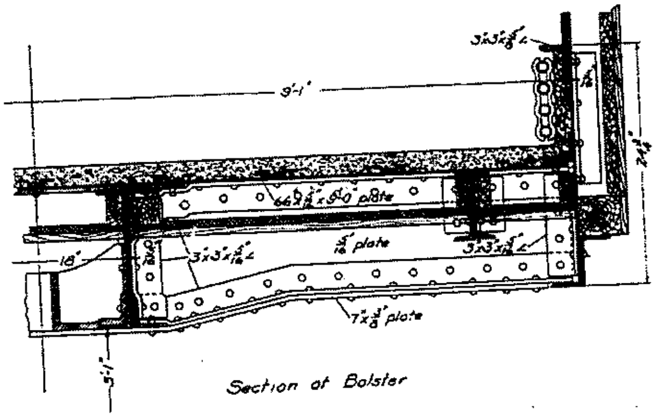
Assumed weight of car	140,000 lbs.
Assumed live load	5,000 lbs.
Total	145,000 lbs.
Deduction for two trucks	40,000 lbs.
Total weight of body	105,000 lbs.

This load of 105,000 lbs. was assumed to be evenly distributed over the entire length, and only the portion of the load which came between the truck centres was considered, the overhang being neglected. The latter, had it been taken into account, would have somewhat reduced the determined fibre stresses at the centre of the car, as the vir-

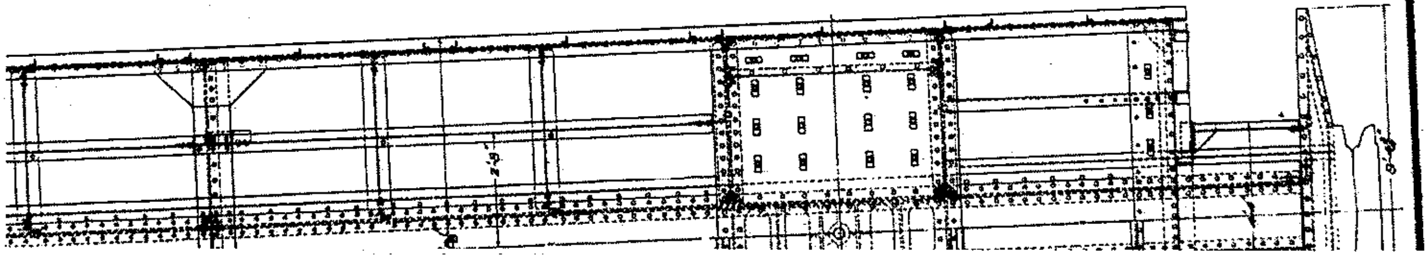


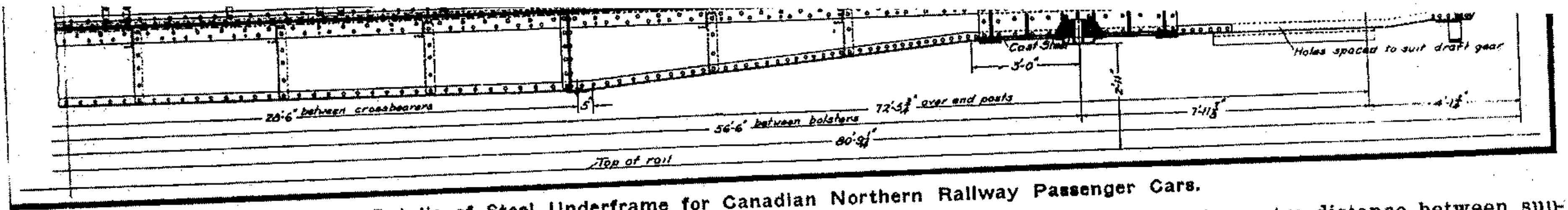


Half Section of End Sill



Section of Bolster





Details of Steel Underframe for Canadian Northern Railway Passenger Cars.

mensions of the steel underframe are as follows:—

Length over buffer angles	80 ft. 9¼ ins.
Length over wooden end posts	72½ ft.
Length over steel end posts	72 ft. 5¾ ins.
Length between crossbearers	28½ ft.
Width over side sill stringers	9 ft. 10½ ins.
Width over side sill Z bars	9 ft. 8⅛ ins.
Width over steel buffer beam	9 ft. 4¾ ins.
Width between side girder plates	9 ft. 1 in.
Width over platform step stringers	4 ft. 4 ins.
Truck centres	56½ ft.
End of car (steel frame) to centre line of bolster	7 ft. 11⅞ ins.
Height, top of rail to underside of centre sill angles at bolster	3 ft. 1 in.
Height, top of rail to underside of body centre plate	2 ft. 11 ins.
Height to centre line of coupler	3 ft. 1 in.
Height, top of rail to top of platform buffer angle	4 ft. 2 11-16 ins.

The underframe is of structural steel throughout, in accordance with the American Society of Testing Materials latest specifications. The centre sill is of the fish belly girder type, with a 25½ by 5-16 in. web plates, with 10 by ⅜ in. top plates, 7 by ⅜ in. bottom cover plates connected to the side girders with 12 by 5-16 by 30 in. gussets and 3 by 3 by 5-16 in. angles, and to the centre sills with 3 by 3 by 5-16 in. angles, and having 3 by 3 by 5-16 in. top and bottom angles. The body bolsters are built up on 13½ by 5-16 in. web plates, with 66 by 5-16 in. top cover plate and 7 by ⅜ in. bottom cover plate, the centre filler and centre plate being of cast steel.

The crossbearers are built up on 25¼ by

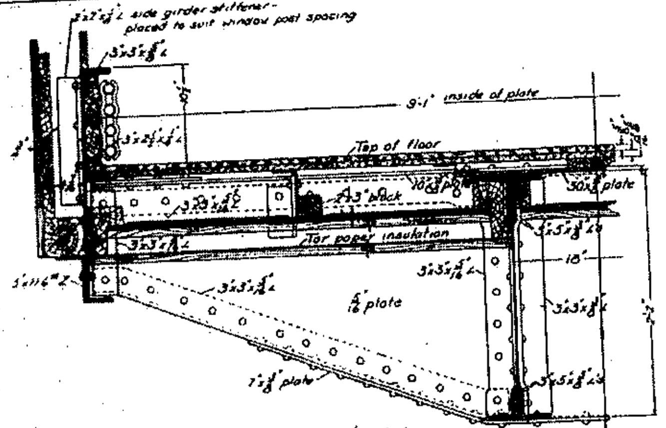
The body end sills are of 8 in. 16.25 lb. channels, with 12 by 5-16 in. top cover plate and 8 by ½ in. bottom cover plate, connected to the side girder by ⅜ in. gusset plates and having malleable iron centre filling stop to suit the buffing device. The buffer beams are composed of 6 in. 8 lb. channels inside, and 6 in. 14.75 lb. I beams outside, and fitted with 8⅝ by 5-16 in. top and bottom cover plates. The end construction is composed

tual centre to centre distance between supports in an overhanging beam is less than in an end supported beam.

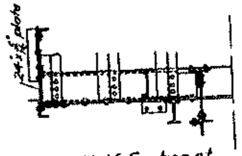
With these assumptions, the maximum bending moment at the centre of the car was found to be 6,900,000 inch pounds. The side girder was calculated to have a section modulus on the compression side of 181 and on the tension side of 184. The centre sills at the centre gave a section modulus of 383 on the compression side and 420 on the tension side. The total section modulus on the tension side for the combined side sills and side girders is 604, with 564 as the section modulus for the combined members on the compression side. With the maximum bending moment of 6,900,000 inch pounds at the centre, these section moduli give a fibre stress on the tension side of 11,520 lbs. per sq. in., and on the compression side of 12,230 lbs. per sq. in. This is based on the assumption that there is no

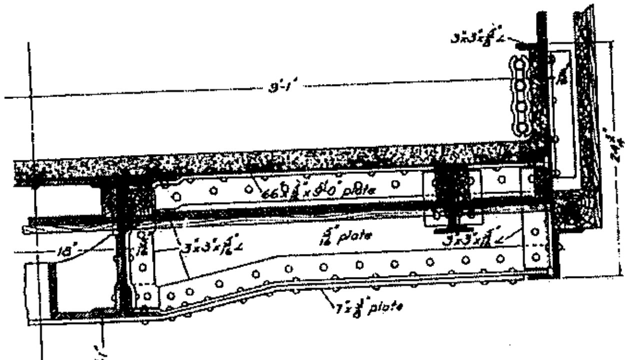
September 1914

difficult feature to · · · 1⅞ in. at the cente-
frames of any design. The principal di-



Section at Crossbearer


Half Section at End Sill



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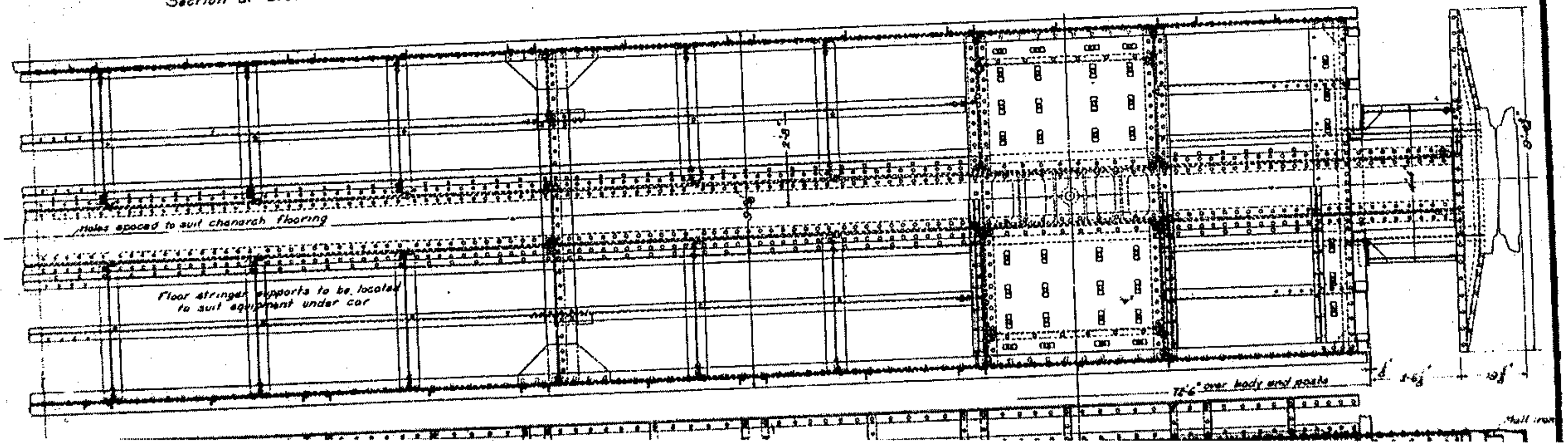


September 1914

'he Break in a Canadian Northern Railway Wharf at Port Arthur.

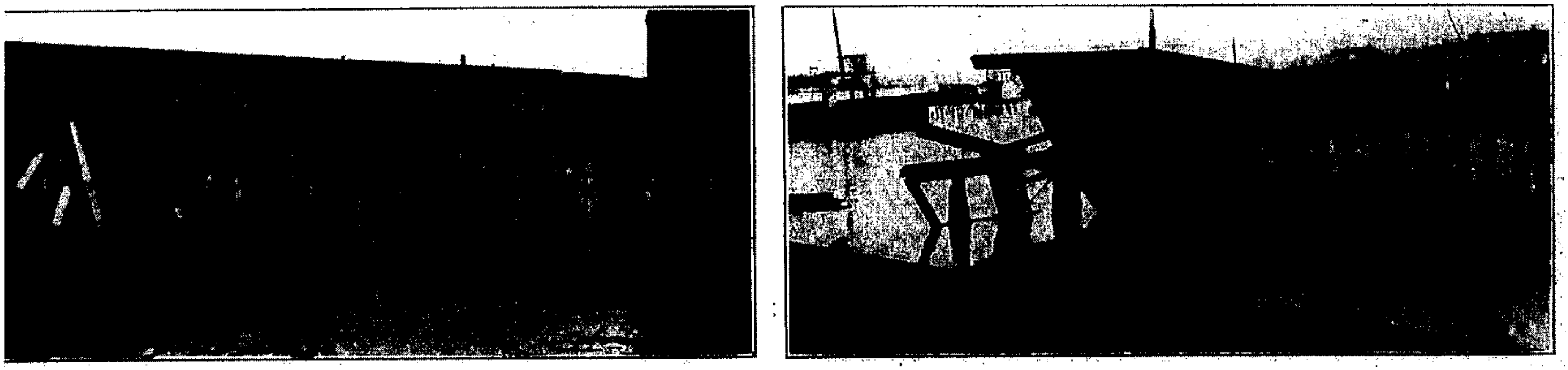
As stated in Canadian Railway and larine World for August a section of the .N.R. wharf at Port Arthur, Ont., sank on ight July 4 under a load of about 2,100 ons of steel rails. The s.s. McKee had ompleted unloading a cargo of rails in the fternoon and had left a short time before ne accident occurred. The rails were 80-b. A.S.C.E., 33 ft. long, and had been placed n three piles, each pile being about 33 by 6 ft., with transverse spaces a few feet ride between piles. The section that failed

where the stringers were sheared off. This is proved by the manner in which the rails laid in the water. The diver who removed them states that they slid toward the east end of the break.

The foregoing information was furnished by C. E. Henderson, Assistant City Engineer, Port Arthur, to whom we are indebted for the photographs from which the illustrations were made.

M. H. MacLeod, General Manager and Chief Engineer, C.N.R., has furnished us

tres each way, with 12 by 12 in. caps running transversely on dock, on top of which were placed 6 by 10 in. joists covered with 3 in. surface plank. Tamarack piling and British Columbia fir superstructure, all bolted and drifted together. The rails were piled interlocked to a height of 10 ft. above dock level, the load at the centre being about 1,244 lbs. per sq. ft. There were 2,129 tons of rails on the portion that failed. The damage to them was very slight. The dock is 400 by 74 ft., and the portion which collapsed was 80 ft. in length near the shore end. The dock was overloaded considerably in excess of what it was designed for,



The Break in a Canadian Northern Railway Wharf at Port Arthur.

October 1914

The Break In a Canadian Northern Railway Wharf at Port Arthur.

lb. A.S.C.E., 33 ft. long, and had been placed in three piles, each pile being about 33 by 66 ft., with transverse spaces a few feet wide between piles. The section that failed was about 75 ft. square. Two piles of the rails were carried down with it, each pile containing about 1,050 tons. The entire length of the wharf was loaded with rails, some of the piles weighing 1,200 or more tons. The rails on the portion not wrecked were hastily loaded on cars to save from further loss and to facilitate the salvaging of lost rails.

The wharf, which was about 75 by 450 ft., was constructed in the winter of 1912-13 by the Thunder Bay Harbor Improvement Co. under the supervision of the C.N.R., according to plans and specifications furnished by the railway. The pier was built similar to the others originally used for unloading steel rails and later was covered and used for package freight as occasion demanded. It is stated that some of these older wharves had supported piles of rails weighing as much as 1,400 tons, without sign of failure.

The piles used were sound tamarack from 40 to 50 ft. long, with 12 in. butts, and were driven to hard bottom. The water varied from 12 to 20 ft. in depth. In places the bottom of the lake was covered with several feet of soft mud. No batter piles or sway bracing was used. The piles were spaced about 5 ft. each way and were cap-

debted for the photographs from which the illustrations were made.

M. H. MacLeod, General Manager and Chief Engineer, C.N.R., has furnished us with the following additional information:—"The construction of the dock was as follows:—Piles driven to rock at 5½ ft. cen-

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Notes on Roadmasters

By J. W. Powers, Supervisor, New York Central

Every practical trackman must admit that our railways are in a state of gradual development. If the older employes will look back 20 or 25 years and compared the past with the present they will observe a wonderful change for the better. Crude methods of track construction and maintenance have developed as the years roll by, until at the present time track work must be looked upon no less skilled and important than the work performed by other departments. This is as it should be. Every passing year should add to our experience and teach us lessons to be heeded in the future. The demand made upon railways in the way of speed, comfort and capacity makes it imperative that the permanent way be of the highest possible order and that such may be the case, requires the best talent, intellectually and physically, to have charge of maintenance of track.

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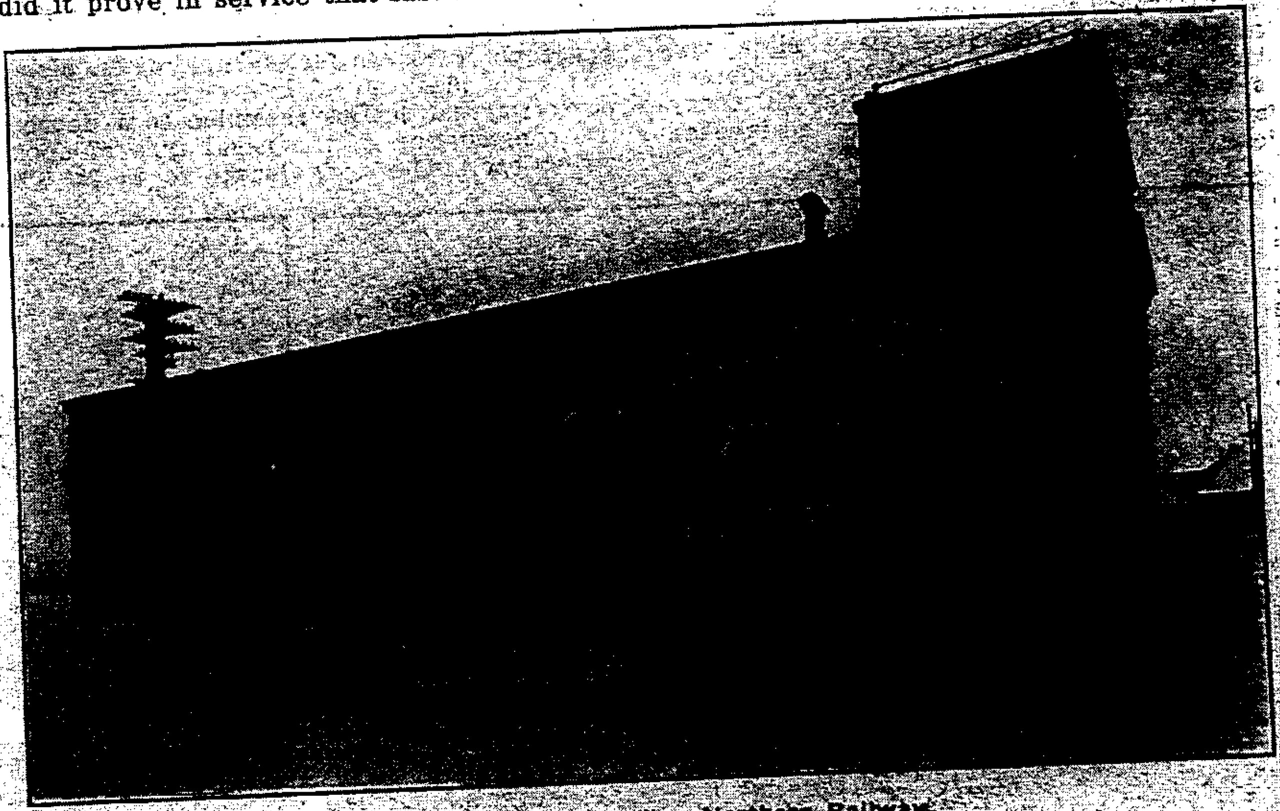
Standard Flanger Car, Canadian Northern Railway.

The accompanying illustrations show the details of construction and the completed form of a new flanger car, adopted as a standard by the C.N.R. The design was developed in Winnipeg in the winter of 1912-13 as a result of experiments and study under actual service conditions, and so successful did it prove in service that last summer 11 were built there, which, during the last winter proved to be efficient and convenient.

The requirements originally laid down for the design were as follows:—1. The car to be worked by one man. 2. Compressed air to be used for the operation of the apparatus. 3. The flanger to cut over the entire width of track out to the ends of the ties, and to any depth between the rails thought

be thrown over a shoulder of moderate height and not rolled over the top of the plough. 6. The actual cutting blades to be so designed that when they strike any solid object, such as a guard rail or crossing plank, they will bend without damaging the plough or connections. 7. All parts of the apparatus to be of simple construction and as strong as possible.


Flanger Car on Canadian Northern Railway.

The flanger apparatus is attached to the rear end of the car, just back of the rear truck. The car itself is, in design, very similar to a caboose. The flanger plough faces are of the shape indicated, mounted on a steel frame. At the rear this frame is suspended on either side by two 20 in. links. At the front it is supported from the 20 in. arm of a bell crank, the other arm of

October 1914

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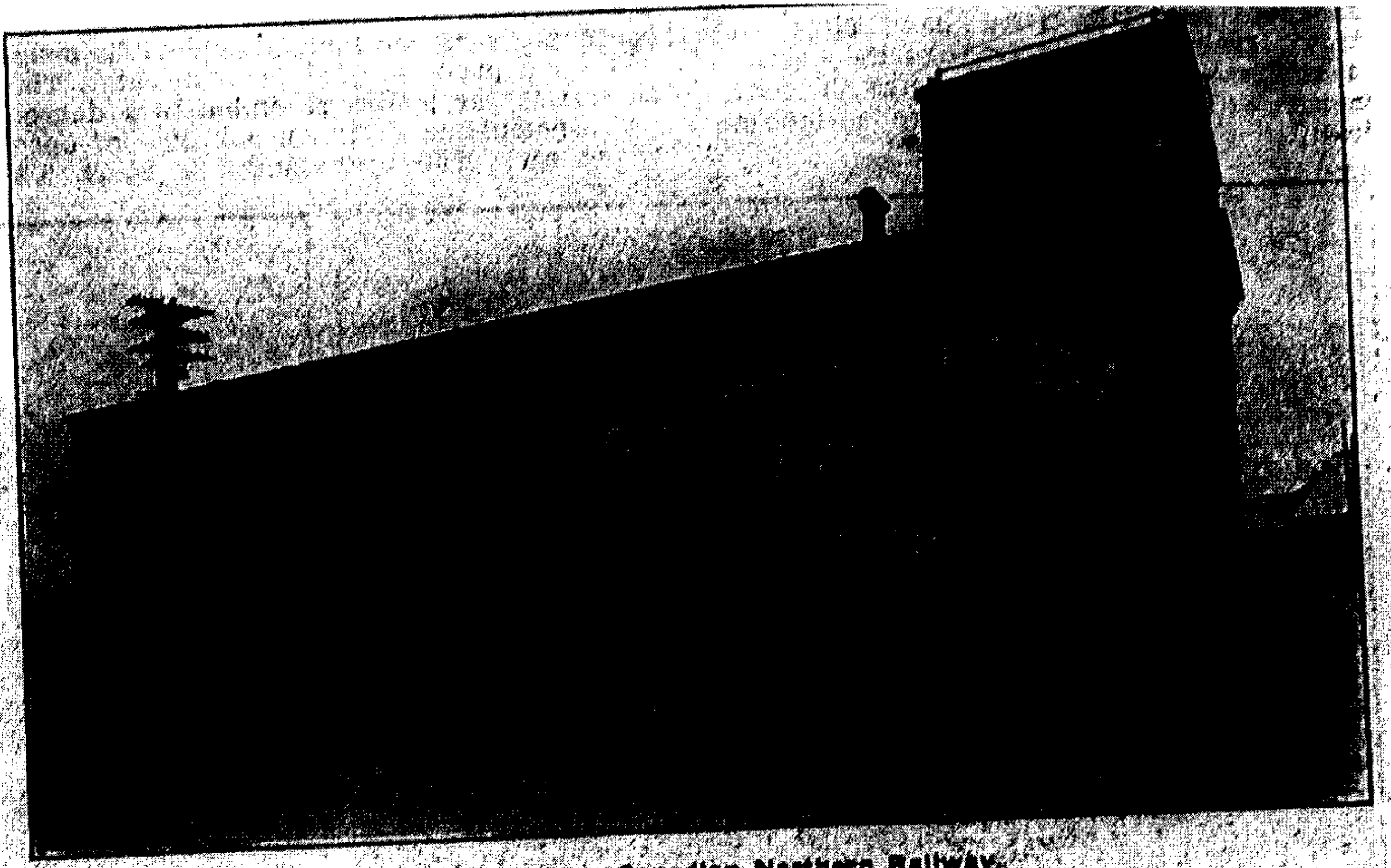

Flanger Car on Canadian Northern Railway.

were built there, which, during the last winter proved to be efficient and convenient.

The requirements originally laid down for the design were as follows:—1. The car to be worked by one man. 2. Compressed air to be used for the operation of the apparatus. 3. The flanger to cut over the entire width of track out to the ends of the ties, and to any depth between the rails thought advisable. 4. The angle of the flanger plough to be such that snow and ice will be thrown clear even when running at moderate speeds. 5. The form of the flanger plough to be such that snow and ice will tion and as strong as possible.

The flanger apparatus is attached to the rear end of the car, just back of the rear truck. The car itself is, in design, very similar to a caboose. The flanger plough faces are of the shape indicated, mounted on a steel frame. At the rear this frame is suspended on either side by two 20 in. links. At the front it is supported from the 20 in. arm of a bell crank, the other arm of which passes up through the car floor. This bell crank is pivotted in bearings fastened to wooden members attached to the under side of the centre sill ends. Movement of

October 1914

ll crank causes the plough to swing
horizontal plane from the front and
nk supports. The under side of the
has a shoe on each side directly
he rail, so that when let down it rides
ils on either side. The movement is
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pposed cylinders on the floor of the
pin through the plunger rod con-
g the two, engaging slots in the
levers of the bell crank. These op-
cylinders are supported on a steel
on the car floor.

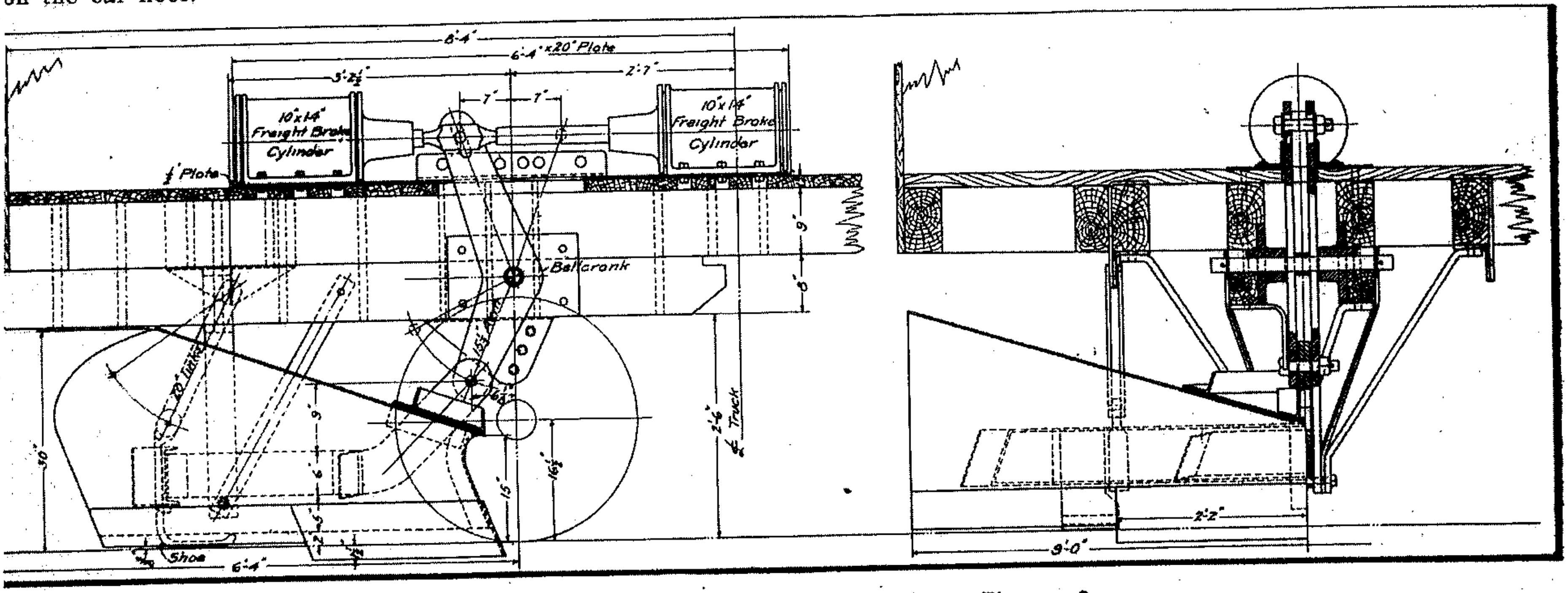
Motors on the Canadian Pacific Railway Laggan-Lake Louise Line.

Four motor cars were built in 1912 at the C.P.R. Angus shops, Montreal, for the short run from the main line at Laggan, Alta., to the company's hotel at Lake Louise, a 3½ ft. gauge line having been built for the intervening 4 miles. These cars were placed in service that summer, and after some slight remodelling, were used again last season, and have proved most satisfactory. They are illustrated herewith. Two were

built for passenger service exclusively, and

ft. 9 ins. The step arrangement on both freight and passenger cars is identical.

Each passenger car has 7 cross seats at 2¾ ft. centres, which will hold 5, giving a total seating capacity of 35, exclusive of the motorman's accommodation. The sides of the car are made of sheet steel, with brass grab handles. The seats are of rattan, of a similar type to that used in the company's standard tourist cars, except that they extend the width of the car, without the cen-



Detail of Flanger Plough on Canadian Northern Railway Flanger Car.

October 1914

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Pushing the Canadian Northern Railway Transcontinental Line to Completion.

It is gratifying to note that the war has not made any appreciable difference in regard to the construction of the C.N.R.'s main transcontinental line. The construction forces have not been reduced, except as sections have been completed, and there has been no slackening of speed in the carrying on of the work.

It will be remembered that out of the $45,000,000 of debenture stock guaranteed by the Dominion Government at its regular session in June, $15,000,000 was offered to the public in England in July. This issue had only been offered for about a day when war was declared and in that time 21% was subscribed for by the public, a pretty good indication that the whole of it would have been taken in the three days during which the subscription lists were announced to be open, had not war broken out. The whole issue had of course been underwritten, and the underwriters have not taken undue advantage of the British moratorium, but have already paid over practically the whole amount of the issue.

At the time of writing there is every prospect that very nearly the whole of the track will be laid on the entire main line from Montreal to New Westminster by the end of this year and that what little tracklaying may then remain uncompleted will be finished very soon thereafter.

October 1914

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Canadian Northern Railway Construction, Betterments

Sir William Mackenzie is reported as having stated, Sept. 5, that the British underwriters of the C.N.R. bonds guaranteed by the Dominion Government, had been able, notwithstanding the war conditions, to arrange for the provision of a considerable portion of the funds required to complete the company's transcontinental line and other works on hand. Sir Donald Mann returned east from a trip over the company's lines under construction as far as Victoria, B.C., and was reported to have said in Montreal, Sept. 18, that construction was proceeeding satisfactorily at all points.

Transcontinental Line. There is now continuous track between Pembroke, Ont., and about 40 miles west of the Yellowhead Pass, in British Columbia, and good progress is being made with the balance of the line. Between Montreal and Hawkesbury, Ont., grading is completed and about 34 miles of track laid. The Back River and Isle de Mille bridges are under construction and are to be completed this year, and the whole of the grading, track laying and ballasting is expected to be done this year. From Hawkesbury the line is completed to Fitzroy Harbor, about 40 miles west of Ottawa. Work has been started on the superstructure of the 1,700 ft. bridge over the Ottawa River, which is expected to be completed in February next. From Fitzroy Harbor to Portage du Fort, about 22 miles of grading have been completed, and track laying and ballasting is to be finished this year. At Portage du Fort, where there is another crossing of the Ottawa River, the bridge is practically completed. From Portage du Fort to the bridge crossing of the C.P.R., about 7 miles east of Pembroke, 18 miles, track has been laid and ballasted, so that the line has been completed from Ottawa to near Pembroke, about 87 miles, except the bridges at Fitzroy Harbor and the crossing of the C.P.R. near Pembroke. The substructures of the bridges at the

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Canadian Northern Ontario
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October 1914

except the bridges at Fitzroy Harbor and the crossing of the C.P.R. near Pembroke. The substructures of the bridges at the crossings of the Montreal River and of the G.T.R. at Pembroke are completed. From Pembroke track has been laid to Capreol, the junction with the line from Toronto, and from Capreol west there is continuous track to 40 miles beyond the Yellowhead Pass in British Columbia.

Rapid progress is being made on the Canadian Northern Pacific Ry. in British Columbia. From the present coast terminus at New Westminster track has been laid to east of Cisco bridge, about 141 miles. Between Cisco and Kamloops, about 100 miles, there are 10 large bridges over the Fraser and Thomson Rivers, all but two of which are in place and these are being proceeded with. From Kamloops track has been laid both ways, viz., about 15 miles west and about 130 miles east. From Yellowhead Pass track has been laid for about 40 miles west, leaving a gap of about 170 miles between that point and the end of steel being laid east from Kamloops. The grading of the whole line in B.C. is practically completed, except one small tunnel and two cuttings, and it is expected that the whole of the track from New Westminster to Yellowhead Pass will be laid by Feb., 1915, or possibly earlier.

Montreal Tunnel and Terminal Co.—The plans for the temporary station to be erected on Lagauchetiere St., Montreal, which have been prepared by Warren and Wetmore, New York, provide for a three story building—one story being below the street level—of steel and concrete, having a frontage of 150 ft. and a depth along St. Monique St. of 100 ft. The front will be set back 12 ft. from the sidewalk. Seven swing doors will lead into a

October 1914

October 1914

CANADIAN RAILWAY AND MARINE WORLD

Railway Construction, Betterments, Etc.

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Canadian Northern Ontario Ry.—A contract has been let for the erection of a cooling plant at Trenton on the Toronto-Ottawa line.

The city of Hamilton is reported to have abandoned its objection to the route asked for through the north end of the city, and to be anxious to have construction work started. The route to be followed from Hamilton will connect with the Toronto-Niagara Power line, following it to Falls View, thence circling Niagara Falls city to a point below the whirlpool, where it is proposed to build a bridge across the river to the United States side.

It is expected that a freight service will be started on the main transcontinental line north of Lake Superior from Capreol, Ont., the junction with the line from Toronto, through to Port Arthur, before the end of this year.

Canadian Northern Ry.—The relaying of the Winnipeg-Emerson line with 90 lb. steel is reported completed, and the ballasting almost finished. The track in Saskatch-

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Canadian Northern Ry.—The relaying of the Winnipeg-Emerson line with 90 lb. steel is reported completed, and the ballasting almost finished. The track in Saskatchewan is also being relaid with 90 lb. steel. The section on which work is now in progress is between Roblin and Kamsack. It is expected that about 300 miles of track will be relaid with the heavy steel this season. The released 60 lb. steel is being laid on new branch lines.

Grading is reported started by W. J. Cowan, and a number of subcontractors, south of Kindersley, Sask., on the Delisle extension, which it is ultimately intended will connect at Camrose, Alberta. The line will follow the South Saskatchewan River, on the north bank, to the Alberta boundary, where it will turn north. Seven contracting outfits are reported to be at work on the extension.

The Provincial Secretary of Alberta is reported to have said recently that a contract had been let to the Northern Construction Co. for the building of the line southerly from Macleod, and that the McArthur Construction Co. had been given a contract for building about 25 miles to St. Paul de Metis, on the Oliver branch.

October
1914

Vancouver Terminals.—We are officially advised that there is no foundation for the reports that plans had been filed for a tunnel from Burrard Inlet to the yards now being laid out at False Creek, Vancouver. At present there is no definite information available as to what work is to be done at that point. One of the works to be done is the building of a retaining wall, for which negotiations are in progress with the city council, but we are advised that the details of the agreement have not been worked out, and that the plans have not been prepared, as stated in recent press reports.

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October 1914

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Bridge to near the Nitinat River, has been completed and, with the exception of the bridges, is ready for tracklaying. The steel bridges are to be put in as the track is laid at mileages 54, 68, 73, and 75. The grading from mileage 100 to the Alberni Canal, mileage 136.5, is expected to be finished by the end of the year.

The line from Parson's Bridge to Patricia Bay has been graded and is ready for tracklaying, with the exception of the putting in of the steel superstructures of the bridges. Tracklaying is expected to be started on this and the Alberni line in October.

The plans for the wharf at Patricia Bay provide for a dock 441 by 61 ft., with an approach pier, 1,700 ft. long. From Patricia Bay a ferry will be operated to connect with the company's transcontinental line on the mainland. (Aug., pg. 374.)

October 1914

General Superintendent, Easter
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Boswell is survived by his wido
daughter, Mrs. W. H. Burr, Toronto, and one son, Arthur Boswell, Route Agent, Dominion Ex. Co., Hamilton, Ont.

November
1914

Hospital Cars on the Canadian Northern Railway.

The Canadian Northern Ry. has equipped two of its cars for service as a hospital unit in conjunction with the Canadian military concentration camp at Valcartier. One is a standard colonist car, used as the ward, and the other is a baggage car, used as the hospital commissary. Both cars are now in service at Valcartier, Que., where they are located on a camp siding.

The interior of both cars has been painted white, having been given three coats of a hard drying highest grade enamel. The floor is of a sanitary material, fitted with hospital corners to allow for flushing with hose and water, and is covered with carpet. The finish throughout is flush and easily cleaned.

The colonist car is 72½ ft. long over body, of the standard C.N.R. type, and contains 18 sections, providing accommodation for 36 patients in the upper and lower berths. There is a small kitchen at one end of the car, which is to be used as the hospital

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The Imperial Government, under the provisions of the Regulation of the Forces Act, 1871, passed an order in Council, Aug. 4, declaring that it was expedient that the Government should have control over all the railways within Great Britain and Ireland. Following is a copy of a typical circular notifying the public of this movement. It was issued by the General Manager, Great Western Ry., and reads as follows:—"The Government have, for the time being, taken over the control of the railway in connection with the mobilization of the troops and general movements in relation to naval and military requirements. The management of the railway and the existing conditions of employment of the staff will remain unaltered, and all instructions will be issued through the same channels as heretofore."

The actual working of the various lines under the new conditions is vested in a committee of general managers, representing the following great trunk lines:—Caledonian, Great Central, Great Northern, Great Western, London and Northwestern, Lancashire and Yorkshire, London and Southwestern, Midland, North Eastern, South Eastern and Chatham, London,

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by the Great Eastern Ry. It consists of eight 50 ft. bogie class cars, and one 48¼ ft. car. One car contains compartments for nurses, doctors, attendants, stores and pantry; another contains a treatment room and pharmacy, and a third contains the guard's compartment, stores, etc. The remaining space contains beds for 120 patients.

Passenger Rate Advances in the United States.

Eastern railways in the United States have filed with the Interstate Commerce and the respective State Commissions notices that beginning Oct. 1, the charge for open and interchangeable mileage books will be at the rate of 2¼c. per mile instead of 2c., as heretofore. This increase is made to carry out the suggestion of the I.C. Commission that additional revenue "demanded," as the Commission says, "in the interest of both the general public and the railways," should be obtained by carriers in trunk line territory by other than increases in freight rates.

In its decision in the 5% advance freight rate case the Commission found that there had been a very general and substantial increase in railway expenses, the Commission

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November 1914

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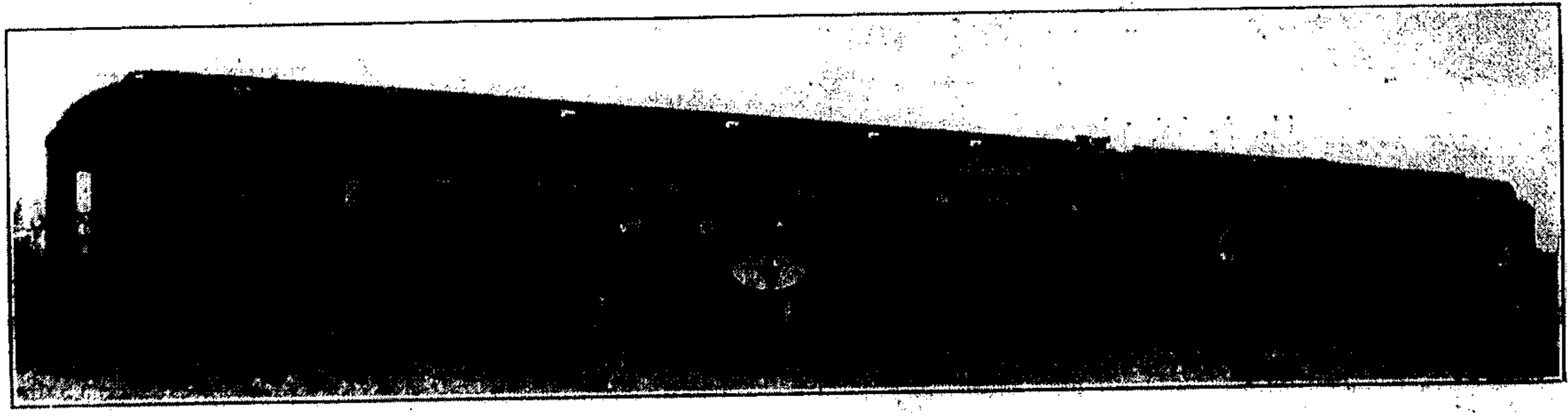

Hospital Ward Car and Commissary Car, Canadian Northern Railway.

[illegible] across the aisle from this Brighton and South Coast, the official chair-

November
1914

kitchen, and across the aisle from this kitchen section is a small baggage storing space. This end of the car in the ordinary colonist car also contains the women's toilet and lavatory, and at the other end the men's lavatory and heater room. This provides a double lavatory accommodation for the hospital. The car is equipped with suitable bedding, including mattresses, sheets, pillows, pillow cases, pillow slips, blankets, headboard curtains, berth curtains, etc. Electric light, with dynamo and storage battery auxiliary, have been applied, using 10 c.p. lamps. Each window is fitted with an air intake ventilator, such as is standard for all C.N.R. cars, and in addition 12 automatic exhaust ventilators have been applied in the deck. Water is supplied by an air pressure gravity system, such as is in use on C.N.R. equipment. Combination hot water heating is used, so arranged as to operate independently as a unit, or receive steam from an outside source. The changes in the car were made at the Crossen Car Co.'s works, Cobourg, Ont.

The hospital commissary car is a standard 60 ft. baggage car, provided with electric light, steam heat, etc., as in the other car. It is used as a local hospital commissary and office car for the medical attendants. It is also possible that it may be used as an operating car, as the military authorities are making internal changes in its arrangement.

While it would be possible to use the hospital car as a transport for taking serious cases into the base hospital, in Quebec, up

November 1914