2.

THE NATIONAL TRANSCONTINENTAL RAILWAY

CANADIAN RAILWAY AND MARINE WORLD

C. H. RIFF

April 1910—December 1914

National Transcontinental Railway.

[illegible]nders have been received by the [Com]mission for the supply of 24,733 [illegible] tons of 80 lb. steel rails, together [with] the necessary splice bars, track [bolt]s, bolts and nuts, nutlocks and tie [plat]es. Tenders have also been received [for] the erection of a pump house at the [loc]omotive shops near Winnipeg, the [build]ing to be completed by July 1, for [the] necessary pumping plant to equip [the] same, such plant to be installed by [illegible] and also for the construction of [a] [illegible] gall. reservoir, to be com[plet]ed by Aug. 1, adjoining the locomo[tive] shops. Tenders will be received by [the] Commission to April 12 for the [illegible] of the plant for the equipment [of the] locomotive shops near east of [Winni]peg as follows:—Machines and [illegible] leather belting, shafting, hangers, [illegible] frame work, etc., miscellaneous [equip]ment, industrial track and lockers, [illegible] furnaces and forges, cranes, air [com]pressors, grey iron foundry equip[ment] and brass foundry equipment.

[GR]AND TRUNK PACIFIC RAILWAY.

[We] were officially advised Mar. 16 as [to the] present position of the work on [the G.]T.P.R., and the construction in [view fo]r the present season as follows: [The e]nd of the main line track is at [illegible] at the east bank of Wolf Creek, [illegible] [mil]es from Winnipeg. At this point [there i]s a large steel bridge to erect [over] Wolf Creek and a half a mile be[yond] another large steel structure [over] the McLeod River. The substruc[ture] of these bridges have been under [constr]uction simultaneously for several [month]s and are now reaching complet[ion], and it is expected that the erection [of the] steel superstructures will com[mence] in the early part of April, and as [soon as] it is possible to cross them, the [track will] be pushed forward as rapidly [as the] grading work will permit. The [grading] of the line is now under con[tract] from Wolf Creek to Tete Jaune [Cache], approximately 179 miles. This [work will] be pushed as rapidly as pos[sible] and it is expected to have track [laid thi]s year from the east to within 20 miles of Yellow Head Pass.

[The] grading of the main line from [Prince] Rupert easterly to Aldermere, [approxi]mately 235 miles, is well under [way]. There is under construction a [bri]dge 1½ miles east from Prince [Rupert c]rossing from Kaien Island [to the mainl]and. The work on this str[ucture] [is] being pushed forward as rapidly [as pos]sible and as soon as completed [tracklay]ing will be commenced easterly [from Pri]nce Rupert, and it is expected [to] be about 180 miles laid east [fro]m Prince Rupert by the close of [the year]. It is the intention to place [illegible] of the main line between [illegible] Tete Jaune Cache, ap[proximately] 300 miles, under constru[ction this] year.

[In] 1909 twenty-three stations [were built] between Winnipeg and Ed[monton] and an 18 stall locomotive [house and] shop at Edmonton. It is the [intention] this year to erect a 12 stall [engin]e house at Edson, the first di[visional poi]nt west of Edmonton, a 12-[stall loc]omotive house and shop at [Prince] Rupert, and stations at various [points alo]ng the line where conditions [illegible]

[GRAND T]RUNK PACIFIC BRANCH LINES.

[The follow]ing branch lines have recently [been let] under contract:

[illegible] miles south of the main line [illegible] Alta., to Calgary, approxi[mately] [illegible] miles, the J. D. McArthur [Co., Win]nipeg, general contractor.

[From] Balcarres, the end of the pres[ent con]struction of the branch line from [the ma]in line at Melville, to Regina, ap[proxim]ately 40 miles; the J. D. McArthur Co., Winnipeg, general contractor.

From Yorkton, the extension of the branch line from Melville to Yorkton, to Canora, approximately 30 miles; Rigby, Hyland & Plummer, Winnipeg, general contractors.

Contracts will be awarded in the near future for the construction of a branch line from the main line at Oban to Battleford, about 50 miles, from Regina southerly about 50 miles, and from the main line at Young to Prince Albert, about 136 miles. The grading of these branches will be pushed forward as rapidly as possible with the object of having track laid on all of them during this year.

The Melville-Regina line referred to above is one of the lines which the company is constructing under the subsidy contract with the Saskatchewan Government. The subsidy contract also covers the construction of an extension from Regina to the International boundary line near Sherwood, Mont., terminus of a branch of the Great Northern Ry. A press report states that these branch lines will be connected, and that the G.N.R. will obtain an entrance to Regina by that route and thence to other points on the G.T.P.R. Another report states that engineering parties are in the field between Regina and Moose Jaw, Sask., making surveys for a line to Calgary. The first camp was pitched at Grand Coulee. It is said the line will run almost directly to Moose Jaw, then bend north-westerly to the [illegible] South Saskatchewan R[iver] [illegible] to Calgary. Mar. [illegible]

MAY 1910

National Transcontinental Railway.

A statement of the distances, mileages and the amount of work done on the 21 contracts covering the 1804.84 miles from Moncton, N.B., to Winnipeg, Man., recently laid before the House of Commons, showed the total percentage of work done on the various contracts was 57.2%, made up as follows:—1,062.1 miles of grading completed, 725.1 miles of track laid, 439.8 miles of ballasting done, and 368 miles of telegraph lines completed, in addition to the bridge construction work.

The plans for the reconstruction of the bridge over the St. Lawrence River at Quebec have been on exhibition since Jan. and the specifications for the work are almost completed. It is expected that tenders for the superstructure will be invited in about a month.

In the evidence given by A. E. Doucet, District Engineer, April 18, before a House of Commons committee, it was stated that after the grading of the 150 miles westerly from Quebec had practically been completed, the G.T.P.R. engineers insisted that the route must be changed, because the one under construction did not give the required gradient of [illegible]. The original cost of the 150 mile section was estimated at $5,297,857, and the actual cost to date after reconstruction was $[illegible],219,828. Tenders were received to April 20 for the purchase of the five buildings at Matheson, Ont., owned by the Commission, and tenders will be received by May 2 for the erection [illegible] station building at Lake Superior Junction.

[illegible] Montreal dispatch [illegible] says [illegible] G.T.P.R. [illegible] assurance that the [illegible] the line between [illegible] with the Temiskaming and Northern Ontario Ry. and Lake Superior [illegible] be completed much earlier than was anticipated. As soon as this is [illegible] will be possible for the G.T.P.R. [illegible] run trains through from Montreal and other points on its line to Winnipeg, Edmonton, etc., via Toronto, North Bay and the T. and N.O.R. [illegible] branch.

As a result of the recent decision of the Board of Railway Commissioners there has been a change in the route of the line through St. Boniface, Man. The [illegible] leave the Springfield road near Mission Road and will proceed along [illegible] within a mile of the city hall [illegible] cross the C.P.R. Emerson [illegible] easterly to the [illegible] St. Bridge. This change will [illegible] with dangerous crossings [illegible].

Rapid progress is being made with the construction of the shops near Winnipeg. The work is expected to be completed by the end of the year. We are advised that the date for the completion of the contracts for the equipment of the locomotive shops at Winnipeg has been extended to Oct. 1.

Grand Trunk Pacific Ry.—[illegible] in London, Eng., recently [illegible] President G.T.R., said: "We are [illegible] satisfied with the progress being made with the G.T.P.R. [illegible] before the next harvest is ready to be handled we shall be ready to carry heavy traffic right through from west of Edmonton to the steamships on the great lakes at Fort William and it is safe to say that a regular service of passengers and freight trains will be running on the G.T.P. tracks to Prince Rupert in 1913."

Mail advices from Prince Rupert received in Montreal, April 12, state that the work of laying out the [illegible] is being rapidly proceeded with. Several wharves are being built and the company is planning extensions to its wharf system. A contract for laying out the terminal yards has been let to D. J. Dempsey, who has also the contract for

(Continued on page 379.)

(Continued from page 375.)

the [illegible]klaying on the first 100 miles easterly.

Grand **Trunk Pacific Branch Lines.**—The [illegible] branch lines upon which the [illegible] is concentrating its energies are [illegible] from Melville via Regina to the [illegible]tional boundary near Portal [illegible] and the other from Wainwright [illegible]gary to the International boun[dary n]ear Coutts, Alta. On the first of [illegible] track was laid in 1909 from Mel[ville to] Balcarres, and grading is [illegible] on the 60 miles between Bal[carres] and Regina. A press report states [illegible] contract has been let to the J. [illegible] who are grading this 60 [illegible] do the grading on the line from [illegible] Portal. The Government has [illegible] the company that this section of [illegible] must pass through Weyburn [illegible] will not be affixed to the [illegible]. The line which the company [illegible] to construct to Hudson Bay [illegible] from Melville. The [illegible] 25 miles was completed [illegible] contract has been let for the [illegible] a further section to [illegible]. It is reported that contracts [illegible] let to the J. D. McArthur Co. [illegible] mile line from Watrous [illegible] Sask [illegible] Battleford. Work has been [illegible] the J. D. McArthur [illegible] Calgary line upon which [illegible] laid to [illegible] 25 miles [illegible]. The surveys for the line into Ca[lgary] have been completed and plans [illegible] the route into the city were [illegible]. The line passes through [illegible] estate about three miles east [illegible] the Blackfoot trail and [illegible] south meets the C. P. R. about [illegible] of the railway bridge on the [illegible]. The route keeps [illegible] until the city boundary [illegible] whence it passes through the [illegible] subdivision and [illegible] Eighth St. [illegible]

National Transcontinental Railway.

[illegible] Minister of Railways submitted in [illegible] House of Commons April 28, a state[illegible] furnished by G. Grant, Chief [illegible]neer, as follows:—Total payments [illegible] 31, 1909, $67,390,698; Dec. esti[illegible] $1,010,014; contract reserve, $3,[illegible] amount estimated to complete [illegible]tracts, $35,949,958; total, $108[illegible] To this has to be added $16[illegible] for items not included in con[illegible] making $124,247,949. From this has to be deducted $420,2[illegible] on ac[illegible] of terminals and on ac[illegible] shops at Winnipeg, leaving the [illegible] cost of the line at $123,826,8[illegible] $9,000,000 more than the last [illegible] cost submitted by the late [illegible] in June 1908. The [illegible] are as follows:

[illegible]

section houses, water tanks, tool houses, etc.

Tenders are under consideration for the equipment of the power house at the Winnipeg shops, including water tube boilers, mechanical stokers, feed water heaters, engines, generators, air compressors, pumps, etc.

GRAND TRUNK PACIFIC RY.

The Dominion Parliament last session voted $25,000 to provide for the inspection of construction of the line, and $2,500 as remuneration for the Government director on the Board.

In an interview at St. John, N.B., May 13, the Minister of Public Works said the G.T.P.R. intended to apply to the Government under the provisions of [illegible] act for running rights over the In[illegible] Ry. to St. John, N.B., and Halifax, N.S. [illegible] terms could not be agreed [illegible] the Board of Railway Commissioners [illegible] to decide [illegible] matter [illegible] M. Hays, President [illegible] G.T.R. and [illegible] G.T.P.R. [illegible] few days ear[illegible] [illegible] was the original intention [illegible]

[illegible]

Pacific Northern and Omineca Ry.—

[illegible]

G. T. Pacific Branch Lines.—A recent [illegible] stated that the [illegible] engineers are making surveys for [illegible] Man., with the idea of [illegible] the Canadian Northern Ry. station. We are advised

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National Transcontinental Railway.

Upon his return to Ottawa June 13, after having made a visit of inspection over the G. T. Pacific Ry., and attended to some matters in connection with arbitrations between the contractors on the N.T.R., and the Commissioners, C. Schreiber, Chief Consulting Engineer, said he did not look for the completion of the line from Moncton to Prince Rupert before the end of 1913. The work was going ahead nicely, but the great difficulty in the way of an earlier completion was the heavy work in the Mountain section and the scarcity of labor. On the line west of Winnipeg 915 miles of track had been laid and of this, 820 miles were being operated. The Mountain section would be 836 miles long and there were 438 miles under construction, 249 miles from Prince Rupert easterly, and 189 miles westerly from Moose Creek. Track was being laid over the first 100 miles of the Mountain section. The maximum gradient going west is 0.4%, and with the exception of a 1% gradient for about 20 miles, it is the same coming east. Sir Wilfrid Laurier is expected to leave Ottawa July 7, for a tour to the Pacific Coast, during which he will visit a number of the construction camps, and the places reached on the line. The Minister of Railways said that when the party reached Winnipeg special attention would be given to the terminal question.

The annual report of the Commissioners covering the work of the last fiscal year to March 31, was issued June 14. It shows that 63% of the grading on the whole line from Moncton to Winnipeg was finished and 45% of the bridging. During the year 521 miles of track were laid, the total track mileage on Mar. 31 being 760, with 165 miles of sidings. The line from Winnipeg to Fort William will be opened for regular traffic in August. The total expenditure on the road up to the end of the fiscal year was $71,137,993.

Reports from Moncton, N. B., state that track laying has been completed on the Corbett and Flosch and the McManus Co's contracts, and that there is a fill-in to be made on the east side of Salmon River where the contract is met, early from Cochrane this season. A 24-stall roundhouse is being built at Superior Jct., Ont., the junction with the G.T.P. branch line to Fort William. West of Superior Jct., the finishing touches are being given to the line into Winnipeg, which will be opened for regular traffic in Aug. W. S. Calvert, one of the Commissioners having charge of construction, in a recent interview, said splendid progress was being made with construction all along the line, and especially in Northern Ontario. The commissioners were doing all they possibly could to have the terminals at Winnipeg rushed forward, so as to have everything ready to enable the G.T.P.R. to carry grain through to Fort William this season.

Atlantic Coast Terminals.—C. M. Hays, President G.T.R. and G.T.P.R., paid a visit to St. John, N.B., in June to inspect the site on Courtenay Bay, recently purchased for terminal purposes. It is reported that the G.T.P.R. will be enabled to carry freight to St. John and Halifax by using the Intercolonial Ry. from Moncton. A St. John report of June 11, says: "The G.T.P.R. will probably enter St. John by means of a branch tapping the N.T.R. main line at Chipman. Survey parties are at work locating this branch, which it is proposed shall run from Chipman via the Belleisle and Washademoak, through Kingston and across the Kennebecasis at Reid's Point to St. John."

Quebec Bridge.—The removal of the shore approaches to the bridge is being carried out by the company which put them up—the Phoenix Bridge Co. The steel is being stored by the Dominion Government, and will be utilized for bridges on the Intercolonial Ry. or for highways. The specifications for the new bridge have been completed by the engineers, and are being examined prior to tenders being called for. In a recent interview, the Minister of Railways said from the enquiries made about plans, he expected that tenders would be submitted by bridge builders from Canada, the United States, Great Britain, France, and Germany. The estimated weight of metal in the new bridge is 75,000 tons. The advertisements state that tenders will be received to Sept. 1.

Quebec Terminals.—At a recent meet-

would be given to the terminal question.

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Reports from Moncton, N. B., state that track laying has been completed on the Corbett and Floresh and the McManus Co.'s contracts, and that there is a fill-in to be made on the east side of Salmon River where the contracts meet, in order to enable the two ends of track to be joined. The bridge at Chipman is completed, and that at Salmon River is well forward. Track has been laid from Chipman to McGivney's, 40 miles, and 30 miles of ballasting has been completed. From McGivney's to Plaster Rock, 66 miles, grading has been completed, while 38 miles of track has been laid. The work between Plaster Rock and Grand Falls, 30 miles, is very heavy, but good progress has been made. The tunneling has been completed, with the exception of some of the approach work, and about 10 miles of track has been laid. There are some heavy bridges to be erected on this section, for which the Dominion Bridge Co. has the contract. There is a great scarcity of labor, but it is expected that the 256 miles of line in the province will be completed by the end of the season

Westerly from Quebec there has been completed, with the exception of about 10 miles west of La Tuque, a stretch of 160 miles, on which about 100 miles of track has been laid. Cochrane, Ont., is the next centre of construction, and from that point track had been laid for 26 miles east to Mistange River, and grading is completed for 52 miles beyond the river. A steel bridge is being erected across the river. Track has been laid westerly from Cochrane to Ground Hog River, 52 miles, where a temporary bridge is being built to carry supplies across pending the erection of a permanent bridge. It is expected to lay an additional 50 miles of track west-

Quebec Bridge.—The removal of the shore approaches to the bridge is being carried out by the company which put them up—the Phoenix Bridge Co. The steel is being stored by the Dominion Government, and will be utilized for bridges on the Intercolonial Ry. or for highways. The specifications for the new bridge have been completed by the engineers, and are being examined prior to tenders being called for. In a recent interview, the Minister of Railways said from the enquiries made about plans, he expected that tenders would be submitted by bridge builders from Canada, the United States, Great Britain, France, and Germany. The estimated weight of metal in the new bridge is 75,000 tons. The advertisements state that tenders will be received to Sept. 1.

Quebec Terminals.—At a recent meeting of the Quebec city council, S. N. Parent, Chairman N.T.R. Commission, said they were prepared to renew the previous offer of $100,000 for the Champlain market site and guarantee that the commissioners would expend $2,000,000 in the city upon a station, workshops and sheds, and they were ready to commence work immediately if the city accepted the proposition. The Federal Government was willing to spend between $8,000,000 and $10,000,000 within the next few years on the river front, building a revetment wall and wharves between Champlain market and Lampson's Cove. He understood that the city was ready to have the works commenced immediately and that was the reason he was present at the meeting to try and have matters settled. He had had an interview during the day with Sir Wilfrid Laurier and the Minister of Public Works, and as a result the latter had informed him that he would immediately see that the dredging of the River St. Charles was carried out. After some discussion, it was decided to give the question further consideration in committee. The finance committee has since recommended the acceptance of the offer.

GRAND TRUNK PACIFIC RY.

The bridge across the McLeod River, westerly from Edmonton, Alta., is expected to be completed Aug. 1 after which track laying will be resumed and carried on as far as the grading has been completed. The first divisional point west of Edmonton, will be Edson, eight

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National Transcontinental Railway.

In the course of an interview at Quebec recently, S. N. Parent, chairman of the Commissioners, said the line between Moncton and Winnipeg would be completed by the end of 1912, and that while waiting for the completion of the Quebec bridge a car ferry would be used to take trains across the river. The plans for the construction of terminals at Quebec would be prepared as soon as the contract with the city for the purchase of the Champlain market site had been signed. A Quebec dispatch says that the deeds transferring this property will be signed Sept. 1. Mr. Parent, further stated in his interview that Cap Rouge and all the houses along the river front between Champlain market and Sillery would have to disappear; the marine department shops would also have to go, and these would probably be rebuilt at Sillery. If the plan is at all possible the union station will be so built that it will connect by the roof with Chateau Terrace.

Referring to the work done on Division B, which extends from the New Brunswick boundary to 330 miles west of Quebec, a total of 507 miles, A. E. Doucet, Division Engineer, said July 6, that with the exception of a few breaks, such as the bridge over the Jacques Cartier River, and the yards at Cap Rouge, track has been laid for 188 miles from west of the Quebec bridge site to the St. Maurice River; and from eight miles east of Waymontachene as far west as the Hudson's Bay post. Grading has been completed for 78 miles west of that point, and it is expected that by the end of the season track will be laid to the crossing of the Gatineau River, about 230 miles west of Quebec. All grading has been completed south of the St. Lawrence to the New Brunswick boundary, and a considerable mileage of track has been laid. The work of bridge construction and filling is being proceeded with, and as soon as this is finished track laying will be completed. Of the total of 507 miles in the division there are only 60 miles upon which grading has not been done.

Tenders will be received by the Department of Railways to Sept. 1, for the superstructure of a bridge across the St. Lawrence River at Quebec. The tenders must be accompanied by a certified bank cheque for $100,000 as security that a contract will be entered into if the tender be accepted. The firms tendering are to accept the fair wage schedule to be barred or to be prepared by the Department of Labor, and to state when they can complete the work. The total length of the bridge will be 3,232 ft., where. The removal of the debris of the collapsed span is also going on, over 4,000 tons of steel having already been handled by the contractor.

The caisson for the main pier of the new bridge was launched at Point Pizeau, July 7. It is 180 by 55 ft., and weighs about 1,800 tons. It was subsequently towed to position and sunk.

Sir Wilfrid Laurier, on the occasion of his present trip to Western Canada travelled from Fort William, Ont., over the Lake Superior Branch of the G.T.P. Ry., and thence to Winnipeg over the completed section of the National Transcontinental Ry. The special train carrying the party is stated to have been the first passenger train over the line. A regular passenger service is to be put on early in August. The divisional point on the line between Lake Superior Jct. and Winnipeg is seven miles west of the junction, which has been named Graham, after the Minister of Railways. The town is situated on the shore of Pelican Lake, and the terminal yards cover an area of 160 acres, upon which it is proposed to lay out 17 miles of tracks. In an interview the Minister of Railways said:

"There seems to be no reason why the line cannot be used for hauling the grain crop of this season. Moreover, the line from Quebec east will practically be open for traffic, and possibly portions of it in Quebec. We find this portion of the roadway in better condition and nearer completion than anticipated. There is no difficulty in travelling 35 miles an hour. A good deal of track is absolutely completed. Parts will need another lift of ballast for the alignment of the track. Contractor McArthur will be finished in September. A permanent bridge has to be built over the Sturgeon River, but a substantial trestle bridge is doing service now. We further expect to effect arrangements by which trains will be hauled into St. John and Halifax this autumn. No one who has not travelled over this line has any idea of the difficulties which have been met and conquered. There are huge rock cuts, bridge construction and tunnelling. Ballast had to be hauled great distances. One sink hole required vast supplies of dirt at a cost of $200,000."

Referring to the arbitration as to classification on this section of the line, the preliminary report presented to the Government, June 29 shows that in section E the over classification amount is less than $25,000, and on section F to about $200,000, against which it is claimed the Government is protected by the percentage of the amount of the contracts held back.

In the course of this recent visit to Winnipeg C. A. Young, a member of the [illegible] Electric piece of line is being constructed from the river to the Canadian Northern Ry. freight shed on Water St. where the G.T. Pacific Ry. and the National Transcontinental Ry. lines meet. The method of building this piece of road bed is to go down 10 ft. and drive 45 ft. piles. The wide excavation is then filled with concrete, and high retaining walls are built to an elevation of approximately 20 ft. These walls are reinforced with steel, and are filled with gravel and concrete. The finished roadway has the appearance of a line of solid concrete 20 ft. high and 38 ft. wide. On this the G.T.P. Ry. trains will be carried from the river to the union station, which they will enter at the second floor. Over the city streets the trains will be carried on steel trusses, which will be supported by steel arches in the centre of the streets. For some distance from the river there will also be steel trestles to carry the trains.

GRAND TRUNK PACIFIC RY.

President Hays returned to Montreal, July 6, from a trip to the West, and in an interview said: "The General Manager is of opinion that the line will be completed through to Prince Rupert by the end of 1912. It is all a matter of labor. It is a matter of astonishment to see how quickly all the newcomers disappear. Trainload after trainload of immigrants are continually arriving in Winnipeg, yet within 48 hours they are all swallowed up, and what is more their coming does not appear to affect the labor market. When I was in Vancouver we wanted 100 laborers and offered 27½c an hour, but I found that 30c an hour was the lowest that would be considered."

A round house is to be built at the Mission, Port William, Ont. Peace Bros. have the contract for the piling.

A train service has been put on the branch line from Melville to Yorkton, Sask.

The bridge over the McLeod River, west of Edmonton, was expected to be completed July 15, and it is hoped that track laying will be completed to Prairie Creek, if not to the crossing of the Athabasca River, this year.

A supplement to the deed of trust of June 24, 1909, dated June 30, 1910, made by the Grand Trunk Pacific Branch Line Co. to the Royal Trust Co., as trustee, and the Saskatchewan Government, as guarantors, securing 4% first mortgage sterling bonds share 1939, issued and to be issued under chap. 5 of the provincial statutes of 1909, was deposited with the Dominion Secretary of State, July 5.

G. C. Emerson a G.T.P.R. engineer from Prince Rupert, B.C., is reported to have stated in Toronto, July 12, that the construction gangs had reached the

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...idge, track has been laid for 188 miles from west of the Quebec bridge site to the St. Maurice River; and from eight miles east of Waymontachene as far west as the Hudson's Bay post. Grading has been completed for 78 miles west of that point, and it is expected that by the end of the season track will be laid to the crossing of the Gatineau River, about 225 miles west of Quebec. All grading has been completed south of the St. Lawrence to the New Brunswick boundary, and a considerable mileage of track has been laid. The work of bridge construction and filling is being proceeded with, and as soon as this is finished track laying will be completed. Of the total of 507 miles in the division there are only 60 miles upon which grading has not been done.

Tenders will be received by the Department of Railways to Sept. 1, for the superstructure of a bridge across the St. Lawrence River at Quebec. The tenders must be accompanied by a certified bank cheque for $100,000 as security that a contract will be entered into if the tender be accepted. The firms tendering are to accept the fair wage schedule prepared or to be prepared by the Department of Labor, and to state when they can complete the work. The total length of the bridge will be 3,232 ft., with a main span of 175 ft., against a length of 3,220 ft., and a main span of 1,800 ft. in the bridge which collapsed. While the width of the floor will be 88 ft. against 63 ft. The floor will provide for two railway tracks, two electric railway tracks, a highway, and a sidewalk. The steam railway tracks will be laid in the middle of the bridge, and on either side will be a highway, single electric railway track and sidewalk. While the cantilever plan of construction is favored by the Commissioners, the firms tendering will submit a price for a suspension bridge. A Montreal dispatch of July 13 stated that M. Fitzmaurice, of London, Eng., and R. Modjeska, Chicago, Ill., had resigned from the Commission on account of friction between the members. The Deputy Minister of Railways, the same day, gave the story an emphatic denial.

The work of demolishing the approach piers of the collapsed bridge is being proceeded with, and the steelwork being taken out is being tested to determine its suitability for use in bridges elsewhere completion than anticipated. There is no difficulty in travelling 35 miles an hour. A good deal of track is absolutely completed. Parts will need another lift of ballast for the alignment of the track. Contractor McArthur will be finished in September. A permanent bridge has to be built over the Sturgeon River, but a substantial trestle bridge is doing service now. We further expect to effect arrangements by which trains will be hauled into St. John and Halifax this autumn. No one who has not travelled over this line has any idea of the difficulties which have been met and conquered. There are huge rock cuts, bridge construction and tunneling. Ballast had to be hauled great distances. One sink hole required vast supplies of dirt at a cost of $200,000."

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In the course of this recent visit to Winnipeg C. A. Young, a member of the Commission, met the Winnipeg Electric Ry. directors and discussed the diversion of their power line near Lac du Bonnet where it comes in connection with the National Transcontinental Ry. right of way.

Tenders have been received by the Commissioners for the supply of air, steam, water and oil piping system; the yard water system and pipe tunnels and wiring ducts required in connection with the shops near Winnipeg; and also for the construction of a sewer from the pump house and terminal yards there to the Seine River.

The substructure for the bridge over the Red River at Winnipeg has been completed, and the Dominion Bridge Co. is preparing to put up the superstructure, which is expected to be completed by Sept. The substructure consists of two abutments and six piers. These piers are 72 by 22 ft. at the foundation, resting on solid rock, and are 65 ft. high, the dimensions at the top being 40 by 12 ft. The shore span, over navigable water, is to consist of a lift span. A

all swallowed up, and what is more their coming does not appear to affect the labor market. When I was in Vancouver we wanted 100 laborers and offered 27½c. an hour, but I found that 30c. an hour was the lowest that would be considered."

A round house is to be built at the Mission, Fort William, Ont. Peare Bros. have the contract for the piling.

A train service has been out on the branch line from Melville to Yorkton, Sask.

The bridge over the McLeod River, west of Edmonton, was expected to be completed July 15, and it is hoped that track laying will be completed to Prairie Creek, if not to the crossing of the Athabasca River, this year.

A supplement to the deed of trust of June 24, 1909, dated June 30, 1910, made by the Grand Trunk Pacific Branch Line Co. to the Royal Trust Co., as trustee, and the Saskatchewan Government, as guarantors, securing 4% first mortgage sterling bonds share 1939, issued and to be issued under chap. 5 of the provincial statutes of 1909, was deposited with the Dominion Secretary of State, July 5.

G. C. Emerson, a G.T.P.R. engineer from Prince Rupert, B.C., is reported to have stated in Toronto, July 12, that the construction gangs had reached 100 miles east from Prince Rupert, when he left, and it was expected that a train service would be placed in operation over it this year.

President Hays, during his recent visit to Vancouver, said several sites had been offered for terminals in that city, but nothing definite had been done nor had anything definite been done in regard to the negotiations for property at North Vancouver, or the Hastings Mill site. It was reported that the company had acquired a block of property in Vancouver for office and terminal purposes, but Mr. Hays said in Montreal, July 6, that the company had not acquired any property for terminals there. All the energies of the company were being centred on the completion of the line to Prince Rupert. Wharves were, however, being built at Seattle and Victoria for the steamship traffic. It was also the company's intention to build hotels at the principal points on the line, but nothing had been done in regard to one for Vancouver.

Rapid progress is being made with

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National Transcontinental Railway.

The speech from the throne at the opening of the Dominion Parliament, Nov. 7, contained the following paragraph: "Marked progress is being made in the construction of the N. T. Ry., and a large quantity of grain is this season finding an outlet from the West to the Great Lakes over this new highway. It is hoped that ere long a satisfactory arrangement can be made for the operation of the finished portions of the line, pending the completion of the road from Moncton to Winnipeg."

The Department of Railways and Canals in its report for the year ended Mar. 31, gives considerable information as to the progress of construction the National Transcontinental Ry., from facts supplied by the Commission, the report of which has been prepared for submission to Parliament. The line to be built under the Commission's control extends from Moncton, N.B., to Winnipeg, Man., 1,804.84 miles. The entire line is under contract, and grading has been completed for 1,106 miles, 698.7 miles of track have been laid on the main line, together with 114.5 miles of siding. The work is covered by 21 contracts, and 60.1% of the whole has been done. The construction work has been divided into six districts, and the report shows progress, as follows:—

DISTRICT A.—Moncton to Quebec boundary, 256.51 miles. Grading completed 246 miles, track laid, 155.91 miles; 81.07% of the work completed. Expenditure during the year, $4,996,543.26.

DISTRICT B.—Quebec boundary to Weymontachi, 507.22 miles. Grading completed 358.25 miles, track laid 216.4 miles; 64.87% of work completed. Expenditure on construction, $5,313,240.10; on transport, $14,169.14

DISTRICT C.—Weymontachi to east of Abitibi Lake, 192.91 miles. Grading completed 13 miles; 5.31% of work done. Expenditure on construction, $360,-264.13; on transport, $26,691.28; on location, $6,948.04.

DISTRICT D.—East of Abitibi Lake to near Missinaibi River, 216.11 miles. Grading completed, 127.5 miles; track laid, 57.9 miles; 36.89% of work done. Expenditure on construction, $3,479,-414.94; on transport, $27,286.12.

DISTRICT E.—Near Missinaibi River to west of Lake Nipigon, 255.19 miles. Grading completed, 41.5 miles; 20.58% of work done. Expenditure on construction, $857,325.09; on transport, $10,249.70.

DISTRICT F.—West of Lake Nipigon to Winnipeg, 376.80 miles. Track laid as far as Lake Superior Junction, and work in progress easterly. The work on this division embraces the laying out of yards, and the building of locomotive and other shops at Springfield, about six miles east of Winnipeg. The track connecting the line with the Canadian Northern Ry's Dundee branch was laid in Oct. 1909, and 46.7% of the work of constructing the station buildings, etc., over this distance has been completed. The substructure of a double track bridge over the Red River at Winnipeg is under contract, and six of the piers have been completed. The foundations of all the terminal shop buildings are completed, and about 2,500 tons of the general steel work erected; 82.21% of the whole work has been done. Expenditure during the year on construction, $4,648,295.23; on transport, $11,982.58.

The amount expended upon the six districts during the year was $19,968,-126.86, bringing the total expenditure to Mar. 31 up to $71,918,843.88.

C. M. Hays President G.T.R., and G.T.P. Ry., accompanied by a number of officials met the Dominion Minister of Public Works at St. John, N.B., recently and went over the site selected for ter-

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minals at Courtenay Bay.. At a dinner subsequently at the Union Club, St. John, Mr. Hays said by its agreement with the Government the Company was compelled to build an all-Canadian line, and to do all its business through Canadian ports. The only Canadian ports on the east were Montreal, Quebec, St. John and Halifax. If the proper scheme of development was carried out at these ports there would be no other port necessary. The company was coming to St. John, and he hoped that it would not be more than a year hence. The plans for the development of the port had been prepared by L. Costo, of the Department of Public Works, and with the co-operation of the Dominion Government, St. John and the G.T.P. Ry., these plans would be carried through. The Minister of Public Works in a speech, stated that he had gone very fully into the question of the development of Courtenay Bay, and had made substantial progress in an agrement that would justify the Government in making large expenditures for the purpose of starting the work. It would be necessary for St. John to convey to the Government its rights on the Courtenay Bay foreshore in order to enable the work to be progressed with. The work proposed to be done was for the general good of Canada and in the fulfilment of the national idea of Canadian trade over Canadian railways and through Canadin ports.

Before returning to Montreal the party went over the section of the N.T.R., in New Brunswick, and in interviews Mr. Hays is reported to have stated it was probable that for some time the company would use the I.C.R. tracks from Moncton to St. John. The matter of securing the N. B. Central Ry from Chipman to Norton had been discussed, but it was felt that the gradients were too heavy, and that it would probably be cheaper to build a new line. The N.T.R. Commissioners completed an inspection of the line in New Brunswick, Oct. 30. The estimates for the payments required for work done on the six contracts in the province during Oct were $224,578.13.

The speech from the throne at the opening of the Dominion Parliament, Nov. 17, contained the following paragraph. "The construction of the bridge across the St. Lawrence river at Quebec, the largest work of its kind ever undertaken, has been receiving the careful attention of my Government, and the utmost care is being observed so that success may be assured. The sub-structure is now under contract. Tenders for the erection of the substructure have been received from four responsible companies, and are now being considered. It is expected that the contract will shortly be awarded and the work pushed forward to completion."

Referring to the Quebec Bridge the report of the Department of Railways for the year ended Mar 31, says "The expenditure for the preparation of plans salaries, etc., was $111,788.62, to which is added $355,279.07 paid for acquiring the Quebec Bridge and Ry Co's stock and $31,765.44 attending the commission of inquiry into the causes of the collapse of the old structure, making the total expenditure since the collapse $498,832.53. There is, however a credit of $100,000, the amount paid to the Government by the contractors for the collapsed bridge, under an agreement of Mar. 12, in settlement of all claims for damages, arising out of the collapse of the bridge, together with the value of the material in the old bridge and the manufactured material at the bridge site. The Government on its part, relinquished its lien on the plant at the bridge site, and on all steel and manufacturing material for the bridge at the contractors' work at Phoenixville, Pa.

The members of the board of engineers for the bridge visited the site Nov. 4, and inspected the damaged caisson in the dry dock at Levis. It was arranged to hold another meeting Nov. 23, when it was expected to reach a decision as to whether the caisson can be repairer or a new one will have to be built. In an interview H. E. Vantelet stated that the damage to the caisson would not retard the building of the bridge. The caissons required for the substructure work on the south shore would be built in the spring. It was expected that the putting up of the substructure would be started next fall. The work of clearing away the fallen steel had been nearly completed. The Minister of Railways stated Nov. 8, that no decision had been reached with regard to the contract for the superstructure. "It must be understood," he added, "that in a work of such magnitude it is not so much a question of price as the scientific character of the designs. These are being carefully gone over."

Respecting the terminals in Quebec, S. N. Parent, Chairman N.T.R. Commission, in an interview Nov. 12, said the Commissioners obtained possession of the Champlain market site Nov. 1, and all tenancies of stall, etc., would be terminated by Feb. 1, 1911. The buildings on the site would be demolished as speedily as possible. Meanwhile the clearing of the right of way for the line from the market to the bridge site was being gone on with, and plans for laying out the terminals were being prepared.

We are advised that freight only is being handled on the N.T.Ry. between Graham, Ont., and Winnipeg, and that no time table has been issued. The G.T. Pacific Ry started operating its passenger trains from Fort William to Graham, Oct. 21, instead of to the actual terminal of the Lake Superior branch as formerly. The commissioners have under consideration tenders for the erection of icehouses at Graham, Ont., and Redditt and Springfield, Man., to be completed Feb. 1911.

GRAND TRUNK PACIFIC RAILWAY.

The report of C. Schreiber, Chief Engineer for the Government for the building of the Western Division of the line, extending from Winnipeg, Man., to Prince Rupert, B.C., 1,751 miles, upon the work done during the year ended Mar 31, says the Prairie section, extending from Winnipeg to Wolfe Creek, 916 miles, is graded, track has been laid, and the structures built. Sidings aggregating 140.5 miles have been laid at 138 stations. Of the main line 474 miles have been fully ballasted, 350 have received a first lift of about five inches of ballast, and there remained only about 35 miles of skeleton track between Kenwistle and Wolfe Creek. There have been erected 732 miles of double fence, 792 miles of a four-wire, and 122 miles of a two-wire telegraph line. 11 interlocking plants have been installed at the crossings of other railways, and water services have been introduced at 47 points. Round houses have been built as follows.—Rivers, 18 stalls, with machine shop; Melville, 12 stalls, with machine shop; Watrous, Biggar, Wainwright, 12 stalls each; Edmonton, 18 stalls, with machine shop; two stall engine houses have been built at Portage la Prairie and South Saskatoon. The other buildings erected include four divisional station houses, 26 way station houses, 54 section houses, 66 tool houses, 79 bunk houses, five coaling plants, 80 permanent and 22 temporary loading platforms, 18 stock yards. There have also been built 115 grain elevators at stations on the line.

On the Mountain section extending from Wolfe Creek to Prince Rupert, 836 miles, location plans and profiles have been approved by the Minister of Railways and the Board of Railway Commissioners from Wolfe Creek westward for 289 miles, and from Prince Rupert eastward for 409 miles, leaving a gap of 138 miles for which location plans have not yet been approved. Of the 289 miles westerly from Wolfe Creek, only 179 miles have been put under contract, and of this the first mile involved some very heavy work, a cutting of over 130,000 cubic yards having to be taken out. The crossing of Wolfe Creek is by a bridge 622 ft. long and 130 ft. above highwater mark, and a mile distant is the crossing of McLeod River, which necessitates a bridge 1,052 ft. long and 125 ft. high. Of the 409 miles westerly from Prince Rupert, 240 are under contract. On this mileage grading, etc., had been well advanced on the first 100 miles when the inspection was made, but very little had been done on the next 140 miles, which carries the line to Aldermere. A wharf and warehouse had been built at Prince Rupert.

In a recent interview at Montreal, E. J. Chamberlain, Vice-President and General Manager, is reported to have said the company was anxious to get the business from its western lines over its eastern lines as quickly as possible. As to the entrance into Montreal he said the shortest route would be by building from the N.T.R. to about 25 miles west of Ottawa, and then reaching Montreal over the old Canada Atlantic Ry. In a subsequent interview, Nov. 2, Mr. Chamberlain said he had been somewhat misquoted. One way in which the Montreal connection would be affected was by building a line from about 200 east of Abitibi to the Canada Atlantic Ry. between Ottawa and Arnprior. The G.T.P.R. owns a charter for building such a line. Press despatches dealing with the original report says that the suggested line would leave the N.T.R. about 150 miles east of Cochrane, the junction with the Temiskaming and Northern Ontario Ry., keep to the west of Queen Victoria Lake, and come down between the Gatineau and Conlonge rivers, effecting a junction with the Canada Atlantic Ry. near Carp, Ont. The Montreal Chambre de Commerce has passed a resolution condemning this proposal and asking the Quebec Government to undertake the construction of a direct line from Montreal to the N.T.R. as a government work.

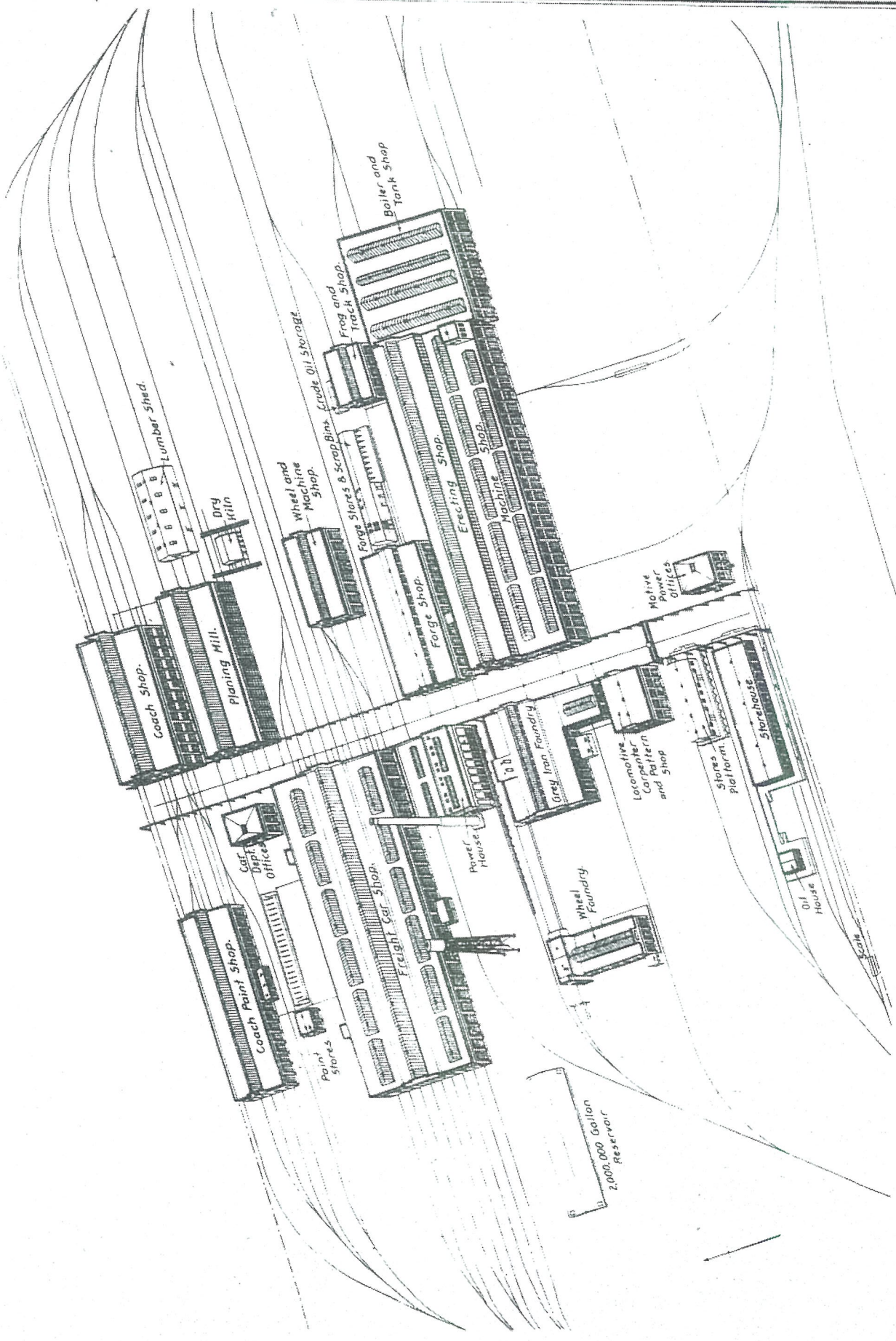
A resolution was passed by the Port Arthur, Ont., city council, Nov. 8, for the purpose of endeavoring to bring the negotiations with the G.T.P.R. for a line to the city to an immediate conclusion.

The first span of the superstructure of the bridge across the Red River at the foot of Lombard St., Winnipeg, was completed, Nov. 10.

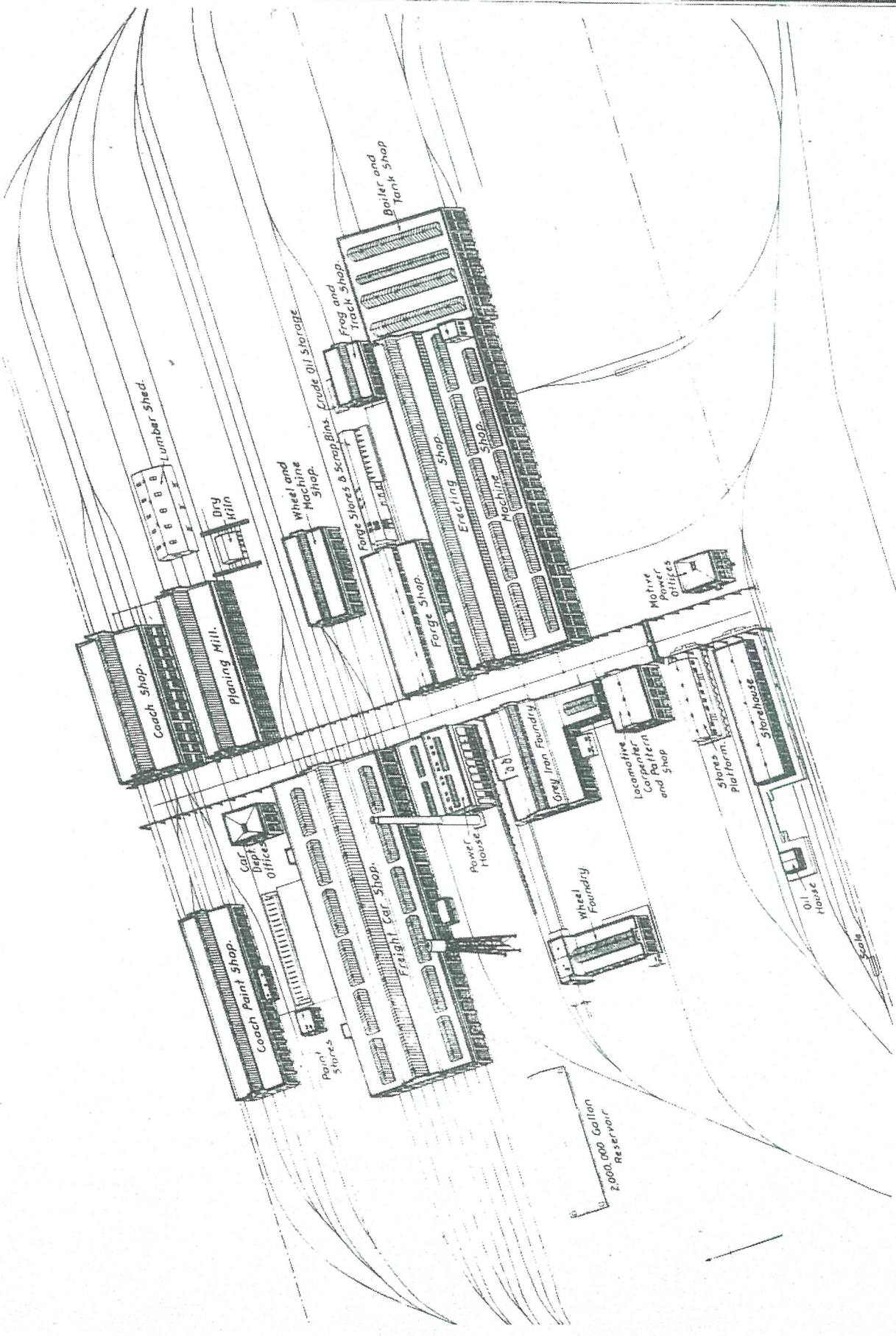
The question of the entrance of the branch line, which is to reach the International boundary, was before the Regina city council, Nov. 9, but no decision was reached. Track laying is being proceeded with on the sections of the line under construction, and the Board of Railway Commissioners has approved the amended location plans from mileage 0 to 10.47 of the extension southerly from Regina to the International boundary.

The Minister of Railways Nov. 2, approved of the plans for the entrance of one of the company's branch lines into Prince Albert, Sask.

With respect to the work west of Edmonton, it is expected to have track laid to Prairie Creek by the end of the year, on the main line, and to have made considerable progress with the branch line to the Brazeau River country. The coal fields are situated about 50 miles from Edson, and the revised location plans for the section from mileage 37 to 56.04 have just been passed by the



National Transcontinental Railway Shops Near Winnipeg. For Full Description, see August issue.



National Transcontinental Railway Shops Near Winnipeg. For Full Description, see August Issue.

National Transcontinental Railway.

An Ottawa dispatch of Aug. 12 says, according to reports received at the offices of the Commissioners, the line from Levis, Que., to Moncton, N.B., will be opened for traffic in the spring of 1911. Arrangements, it is said, have already been made in a preliminary way for a car ferry across the St. Lawrence, pending the building of the Quebec Bridge. From the south shore of the St. Lawrence, opposite Quebec, grading has been practically completed all the way to Moncton, and only about 40 miles of track has to be laid to complete the line between these two points. The contractors are busy completing the bridge work, and in ballasting. A temporary trestle is being erected across River Blue, but this will be replaced by a steel bridge next year. The work of providing stations and other buildings will be gone on with during the winter. The principal stations will be St. Hillare, Edmundston, St. Leonards, Grand Falls, Plaster Rock, Nopandogan, McGroney's Jct., Chipman; there will also be a number of way stations and section houses, the division point being at Nopandogan.

We have reason to believe that it will be impossible to open the Moncton-Quebec section in the spring of 1911. From reliable information we have received, we consider it hardly probable that the work in New Brunswick will be entirely completed before the end of 1911, and our information leads us to believe that the work from the New Brunswick boundary to the St. Lawrence River will not be completed before 1912.

The Minister of Railways has extended the time for receiving tenders for building the superstructure of the Quebec Bridge to Oct. 1.

The documents transferring the Champlain market property, Quebec, to the N.T.R. Commissioners were signed Aug. 12, and the tenants have to vacate by Oct. 1. The agreement, which calls for the payment of $100,000 for the property, and the expenditure of $2,000,000 for buildings, etc., has to be ratified by the Dominion Government.

The line is practically completed from Quebec for 195 miles westerly. The next construction centre is at Cochrane, Ont., and from there track has been laid east to Mistonga, 27 miles. Work is being proceeded with at different points between Mistonga and the end of track west of the St. Maurice River, but the difficulty of getting in supplies has rendered the progress made somewhat slow. Track has been laid from Cochrane westerly for 66 miles, and a construction train service is being operated as far as the Groundling River. The steel bridge over the Frederickhouse River is being completed. The work north of Lake Superior has been concentrated in the hands of O'Brien, Fowler and McDougall Co., who have taken over the interests of other contractors, and are now building a total of 190 miles. Supplies for the work are being taken in over the Sturgeon Lake route. The Ottawa dispatch, already quoted, states that the reports received justify the estimate that the mileage between Quebec and Lake Superior Jct., Ont., will be completed sufficiently to allow trains to be run through by the end of 1912.

An announcement was made at Montreal Aug. 17 that all arrangements had been completed for inaugurating a regular train service over the section of the line from Winnipeg to Lake Superior Jct., Sept. 1, when it was expected that that portion of the line would be handed over by the Dominion Government to the G.T. Pacific Ry. for operation.

GRAND TRUNK PACIFIC RY.

The question of the entrance of the company's lines into St. Boniface, Man., is under consideration, some opposition having developed to the proposal that the G.T.P.R. should come in over the Canadian Northern Ry. right of way. The plans were referred to the City Engineer for consideration and report.

In an interview at Winnipeg, Aug. 14, President Hays said representatives of Ross and MacFarlane, Architects, Montreal, were in the city preparing plans for an hotel which the company proposed to erect there. The building would be about 200 ft. square; it would contain about 500 rooms, and cost, when completed, about $2,000,000. It was expected that work would be started on the building as soon as the frost was out of the ground in the spring. The location secured is the corner of Broadway and Fort St., just west of the Manitoba Club.

A bi-weekly train service was inaugurated Aug. 1 to Edson, the first divisional point, 124 miles west from Edmonton, Alta. A site for terminal yards and divisional buildings was approved by Vice President Chamberlin on his visit of inspection July 28. The present plans provide for the laying of about five miles of siding, which will be about one-fifth of the mileage ultimately to be laid. Edson is situated about eight miles west of the crossing of the McLeod River. The next river crossing is at Prairie Creek, about 75 miles west of Edson, and tracklaying is now being proceeded with, and it is expected that it will be completed Oct. 1. The concrete substructure at Prairie Creek has been completed, and everything is ready for the erection of the superstructure, which will be gone on with as soon as the steel can be brought in. Beyond this the next point to be reached is the Athabasca River, at the entrance to the Yellowhead Pass, and it is expected that steel will be laid there by Dec. 1. This will give a completed line for 223 miles west of Edmonton.

From the Prince Rupert end of the line it was reported that 100 miles east would be ready by Aug. 22, so as to enable the Dominion Premier and the Minister of Railways to take a trip over it. At the end of July trains were running to the Grand Rapids, nine miles out, and the bridge over the river there was then nearly completed. From the end of the first 100 miles grading on an additional 140 miles had been nearly completed, and tracklaying is being proceeded with. The line is expected to be completed from Prince Rupert easterly to mileage 240, in the spring of 1911.

The regular through train service from Edmonton, Alta., via the G.T.P.R. to Winnipeg, the National Transcontinental Ry. from Winnipeg to Lake Superior Jct., and thence to Fort William over the G.T.P.R. Fort William branch, was announced to be started Sept. 1.

The question of the entrance of the line into Port Arthur, Ont., was discussed with President Hays Aug. 13, but all he would say was:—"The company made an agreement with Port Arthur, which seems to have ended in a muddle, and this complication has not been cleared up as yet."

The first branch line under construction west of Winnipeg is northerly and southerly from Melville, Sask. Northerly it is in operation to Yorkton, and grading has been completed to Canora, on the Canadian Northern Ry. Southerly the line has been completed and is in operation to Balcarres, on the C.P.R. Kirkella branch, and grading is well forward on the extension to Regina.

The Department of Railways has approved route maps for an extension of the Melville-Regina branch through Regina, Sask., for a distance of about five miles. It is expected to let a contract for this mileage at an early date, and from Regina to the International boundary. The company is negotiating with the city council for an agreement in regard to the location of divisional terminals in the city. A site of over 15 acres has been secured for this purpos by the company.

The next branch starts from Tofield and was completed in 1909 to Cam rose, Alta. This year work has bee carried on southerly in the direction o Calgary. The bridge across the Battl River, about seven miles south of Clare holm, has been completed. It is a trestle construction 3,100 ft. long an 115 ft. above high water mark. Trac is being laid as far south as Farmtos where the company has opened up larg gravel pits for ballasting. G. H. Wel ster, the contractor, in an interview Calgary Aug. 12, said there were ove 500 teams on the line, and constructio gangs were stretched along the line fr nearly 100 miles south of Alix, and within 50 miles of Calgary; that a b effort would be made to reach Calgar this winter, and that it was intended build a branch from this line into th C.P.R. irrigation lands, for which plan had been filed.

The third branch line under construction is from Edson, Alta., south easter into the Brazeau River coal fields. Th branch line Vice President Chamberl said in Winnipeg, Aug. 3, would be abo 70 miles, and it was expected would completed during the winter. The su contractors reported to be working the line are Phalen and Shirley, and Baker, the general contractors beli Foley, Welch and Stewart.

Two survey parties were sent out Au 1 from Kamloops, to do some furth work easterly and westerly on the l cation of the G.T. Pacific branch line Vancouver. (Aug., pg. 661.)

National Transcontinental Railway.

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National Transcontinental Railway.

In an interview Sept. 3, C. O. Foss, District Engineer for New Brunswick, is reported to have said that except for a stretch of four miles near Grand Falls, and the division yards at Edmonton, the N.T.R. in New Brunswick could be opened for traffic.

A defect was discovered Sept. 3, in the first caisson for the new main piers of the Quabec bridge, and it was condemned Sept. 6 by H. E. Vautelet, the only member of the Bridge Commission in Canada. It is said the caisson will have to be rebuilt.

An order-in-council has been passed authorizing the N.T.R. Commissioners to acquire the Champlain Market, Quebec, for terminal purposes, and they have paid the City Treasurer $100,000, the price of the property.

There is a considerable mileage of track laid in the Province of Quebec to which the completing touches are being given. This includes the 250 miles between the St. Lawrence River and Weymontachene, upon which recent press reports stated a train service would be operated this fall. We have been advised that there have, as yet, been no arrangements made for its operation by the G.T. Pacific Ry. The centre of construction of the next section of the line is at present at Cochrane, the Temiskaming and Northern Ontario Ry.'s terminus. From this point Foley, Welch and Stewart, working easterly, have 30 miles of track laid to Low Bush, where there is a big muskeg which is delaying the work somewhat. Westerly from Cochrane over 30 miles of track have been laid on the grading completed by Fauquier Bros. Tenders are under consideration for the supply of 7,543 tons of 80 lb. steel rails with the necessary fastenings, for delivery at Cochrane.

A temporary agreement has been reached between the Commissioners and the G.T. Pacific Ry., for the operation of the section of the line between Lake Superior Jct., Ont., and Winnipeg, so as to enable the G.T.P.R. to carry grain from Edmonton and intermediate points to Fort William.

Tenders were received by the Commissioners Sept. 27 for building freight sheds and storehouses at Lake Superior Jct., Ont., Redditt and Springfield, Man., the freight sheds to be completed by Dec. 31, 1910, and the storehouses by May 1, 1911.

The Western Construction Co., is reported to have practically completed the laying of the 12 inch water main from the Red River to the shops at Springfield, near Winnipeg. Tenders are under consideration for pipe tunnel and wiring ducts, and for the wiring system at the shops.

The question of the entrance of the line into Winnipeg from the east was settled, temporarily at any rate, Sept. 2, when an order was made by the Board of Railway Commissioners, granting running rights over the Canadian Northern Ry. for one year. This will enable the N.T.R. to be connected with the G.T. Pacific Ry.

GRAND TRUNK PACIFIC RAILWAY.

The G.T.P.R. has purchased a block of land on Broadway, Winnipeg, immediately east of the Manitoba club, and we are officially advised that Ross and McFarlane, architects, Montreal, are preparing plans for an hotel to be erected thereon.

The Minister of Railways completed his first inspection of the line Sept. 5; and on Sept. 13, C. M. Hays, President, accompanied by A. Smithers, Chairman of the Board, arrived in Winnipeg, having made an inspection of the completed line, and the sections under construction. Mr. Smithers stated that at all places where construction was in progress the contractors complained of the shortage of men. Notwithstanding this the company would not appeal to the Dominion or Provincial governments to permit the use of foreign labor.

Construction is being proceeded with rapidly and it is expected that track will be laid to Prairie Creek, Oct. 1, to the banks of the Athabasca by Dec. 1, and to Tete Jaune Cache by Sept., 1911. Reports from Prince Rupert, state that track has been laid to mileage 56, about three mile west of Hole-in-the-wall, where a bridge is being built. It is expected that track will be laid to Newtown, within two miles of Kitselas, by Oct. 30. Work is going on along the 140 mile section from Kitselas to Aldermere. Nothing definite has been settled as to the letting of a contract for the stretch between Aldermere and Tete Jaune Cache.

Grand Trunk Pacific Branch Lines.—An Ottawa press report Sept. 6 stated that a branch line would be built from Saskatoon through Melfort, to a connection with the Government railway to Hudson Bay at Pas Mission. We are, however, officially advised that if the G.T. Pacific Ry. line is connected at some future date with the Hudson Bay line, it will be done by extending the Yorkton-Canora branch northward. This branch line leaves the G.T.P. main line at Melville, Sask., from which point another branch is being built to Regina. An extension of this line southerly is projected and the question of the route is being discussed. On Sept. 15, the management stated that the route could not be changed so as to pass through Estevan.

A line has been located from Regina, westerly as far as Moose Jaw, and press reports Sept. 17, stated that a contract for grading of this line would soon be let. Speaking at Medicine Hat, Sept. 8, the Minister of Railways stated that the G.T.P. Ry. would build a branch line through that place, where the land for terminals has already been acquired.

While President Hays was in Wainwright, Sask., on his recent inspection trip he was reported to have stated that a branch line would be built from there into Battleford, and that engineers were at work on the surveys.

Foley, Welch and Stewart, have a contract for building a branch line from the G.T.P.R., about 16 miles west of Edson, Alta., southerly for about 70 miles. This branch connects with the Yellowhead Pass and the Pacific Pass coal companies' properties, in what is generally known as the Brazeau River coal fields.

We are advised that the company has secured a site adjacent to Parliament Square, Victoria, B.C., but nothing has as yet been determined as to the uses to which the property may be put. Newspaper reports stated it had been acquired for the erection of an hotel. (Sept., pg. 741).

National Transcontinental Railway.

Judge Cassels has decided in the Court of Exchequer that, the Crown is not liable to be sued on contracts made by the National Transcontinental Ry. Commissioners, and that actions on such contracts should be brought directly against the Commissioners.

An inspection of the line in New Brunswick was completed by C. O. Foss, District Engineer, Oct. 5, and in an interview at St. John, he is reported to have stated that section 1 would be ready for acceptance by Oct. 31; section 2 was ready for operation; section 3 could be taken over at any time, and section 4 would be completed by the end of the season. There was more delay in section 5 between the Tobique River and Grand Falls, the viaduct over the gorge of the Little Salmon River, and some other viaducts not having been completed. These would be completed in the spring, by which time section 6, which included the terminals at Edmundston, would be completed. The line in the province would be ready, and fully equipped for operation by the end of the summer of 1911.

The last day for receiving tenders for the erection of the superstructure of the bridge over the St. Lawrence River, at Quebec, was Oct. 1, when it was reported that four tenders were handed in by Canadian, British and other bridge builders. It will take some time to figure out the tenders, as they are made on the various shapes which enter into the construction of the bridge. The tenders have been turned over to the commission of engineers which prepared the plans for examination and report. With regard to the work going on at the piers, it was stated Oct. 10 that the caisson was being raised and would be examined to ascertain the extent of the damage sustained.

The plans of the union station which it is proposed to erect on the site of the Champlain market, Quebec, have been prepared by G. E. Tanguay, and have been submitted to the Commissioners.

S. R. Poulin, District Engineer, Winnipeg, completed an inspection of the work in progress in his district, extending easterly from Winnipeg, Sept. 30. He reports that work is progressing satisfactorily, considering the shortage of labor at all construction points. He expected to see the track laid from end to end of the district by Dec. 31, 1911. Track has already been laid for 25 miles easterly from Lake Superior Jct., and it is expected to add from 40 to 50 miles more by the end of the year.

The Commissioners have approved of standard plans for freight sheds, and storehouses, to be erected at different points on the line, and contracts have been let for the erection of such buildings at Lake Superior Jct., Ont. Redditt and Springfield, Man. The plans for the freight sheds show a frame structure, 28 by 60 ft., on posts, with a flat roof. One end of the building is arranged as an office, while the remainder, 50 by 28 ft., is devoted to a freight room. Two sets of sliding doors are provided on the track side, and an equal number on the opposite side, while there is a single sliding door leading into the freight room from a 9 ft. platform at the end. A room 10 by 14 ft. is built adjoining the office for perishable freight. A coal bin to hold 30 tons of coal is to be built under the office part of the building. The plans for the storehouse show a building 74½ ft. by 30 ft. 2 in. The casement is to be built of concrete, with an 8 in. concrete floor, and the rest of the building is to be of brick, with a tar and gravel roof. The basement store will be divided into two, one general store, 46 by 16 ft., containing the furnace and heating plant, and the second compartment being the oil vault, 25 by 16 ft. The main floor is divided into three sections, public office, foreman's office and store room. The basement store room is to be equipped with shelves, while the main store and foreman's office have shelves, drawers, plan cabinets, drawing tables, etc. This part of the building is heated by hot water from the boiler in the basement. The oil tanks, pumps and piping for the same, heating and lighting systems are to be installed under separate contracts.

Tenders were received to Oct. 18 for the machinery required for the equipment of a roundhouse at Lake Superior Jct., Ont., and for the centrifugal pumps and motors required for the sewage pumphouse at the Winnipeg shops. The specifications for the latter provide for the supply of one centrifugal pump, volute pattern, with a capacity of 16,000 galls. a minute, against a head of 48 ft., to be direct connected to a vertical motor of sufficient capacity; one centrifugal pump, volute pattern, with a capacity of 2,000 galls. a minute, against a head of 15 ft., to be direct connected to a vertical motor of sufficient capacity.

The arrangement for the temporary operation of the line from Winnipeg to Lake Superior Jct. was put in effect Oct. 6, when G.T. Pacific Ry. trains were run over the C.N.R. line in Winnipeg to the N.T.R., coming from the east, and so on to the G.T. Pacific branch line from Lake Superior Jct. to Fort William, Ont.

The members of the N.T.R. Commission arrived in Winnipeg, Oct. 13, from Fort William, Ont., having made their first official inspection of the newly opened line.

Grand Trunk Pacific Railway.

Speaking at Montreal, Oct. 3, Senator J. P. Casgrain advocated the building of a line from Montreal to the National Transcontinental Ry. by the Provincial Government, and leasing it to the G.T. Pacific Ry. The G.T.P. Branch Lines Co. has charter powers to build such a line.

It was expected that the G.T. Pacific Ry. would be able to enter into possession of some part of the new union station at Winnipeg towards the end of Oct.

The arrangement between the G.T.P. R. and the Canadian Northern for the building of a loop to connect with the National Transcontinental Ry. at St. Boniface, Man., was not carried out, but a temporary arrangement was made, Oct. 4, by which the G.T.P.R. trains could connect with the N.T.R. over C.N.R. tracks.

In regard to the proposed lines from Regina to Moose Jaw, Sask., we were recently advised that the company was waiting to have the location maps approved by the Government. Since this information was received the plans have been approved, an arrangement having been made between the C.N.R., the C.P.R. and the G.T.P.R., by which the difficulties have been avoided, and satisfactory routes found for the two new lines without interfering with the C.P.R.

The Board of Railway Commissioners has approved of the location of the projected branch line from sec. 31, tp. 40, range 26, west second meridian, mileage 55.148 to mileage 111.536. The branch will start at Young, mileage 422.3, on the main line, and will terminate in Prince Albert. The question of the route into that place was under consideration at a meeting of the Prince Albert Board of Works, Oct. 11.

Reports from the construction camps Oct. 9, state that the grading gangs are working within 16 miles of Calgary, on the branch line from Tofield, Alta. The route was deflected to the east of Irricana, so as not to interfere with a C.P.R. spur. Contracts have been let for the building of a bridge across the Red Deer River. The bridge will be about 1,100 ft. long and about 170 ft. above high water, and is expected to be completed in about a year. Track has been laid to the site of the bridge at Red Deer, but it is doubtful if any further tracklaying will be done until the bridge is completed.

Construction on the line west of Edmonton, towards the Yellowhead Pass, is being proceeded with rapidly. A 13-stall roundhouse, with an addition for a repair shop, is being built, and a large acreage is being laid out for yard accommodation at Edson, the first division terminal point west of Edmonton.

At the Prince Rupert end of the line, according to an interview with G. G. S. Lindsey, who returned to Toronto Oct. 13, from a trip through Northern British Columbia, "The Hazleton section of the G.T.P.R. is progressing. Steel is laid, or will be, before the end of Oct. to Kitselas, 104 miles up, and grading is fast finishing to Hazleton, 81 miles farther on, and even to Aldermere, another 55 miles still farther east, to which point the rails will be down, it is said, early next year." A train service is in operation to mileage 65 for freight purposes, and the construction trains run for some miles further.

Resulting from the recent trip of inspection over the line by President Hays and Chairman Smithers, of the G.T.R., application was made to the British Columbia Government, Oct. 11, for an order-in-Council to permit the employment of Asiatic labor on the building of the line in the province. After hearing D'Arcy Tate, the company's solicitor, fully on the question, the Government decided not to grant the application.

The surveys for the branch from near Fort George to Vancouver are being proceeded with. A party under W. I. Bassett, is working from Agassiz north via Harrison River, Harrison Lake and Lillooet River to Lillooet. The trial lines from Lillooet to Lytton run early in the season are not considered satisfactory as to gradients, and the heavy rock work involved. It is expected that a low gradient will be secured by the new survey, and if this should prove to be the case, the line will parallel the C.P.R. from Agassiz to Vancouver, unless it is decided to adopt a line into North Vancouver. (Oct., pg. 845.)

23 steel bridges on the line in New Brunswick, five of which were completed 17 in process of construction and one—the crossing of the Salmon River at Chipman,—which had not been started at the date of the report. All the bridge work in the district is now reported to be completed. In District B., which takes in 507.22 miles, east and west of the Quebec River there are 44 steel bridges, of which 25 had been completed, 11 were in progress and 8 had not been started at Mar. 31, 1910. Eight steel bridges were in progress and four were to be built on District D. The 16 bridges on District F, have all been completed since the date of the report. No contracts have been let for steel bridges in Districts C., and E.

C. O. Foss, District Engineer District A., is reported to have stated Nov. 30 that the big viaduct over the Salmon River at Chipman was about two-thirds completed and that it was expected to have the steel work completed by Dec. 30. The Commissioners recently completed an inspection of the sections of the line completed west of Quebec. Tracklaying has been completed for about 100 miles west of Cochrane Ont. the point of junction with the Temiskaming and Northern Ontario Ry. West of the end of this track there has been laid 10 miles on the O'Brien contract, which carries the line to the Metagami River. Thirty miles of grading has been completed beyond the river.

Replying to questions in the House of Commons, Dec. 1, the Minister of Railways said that during the summer of 1909, borings were made at the site of the Quebec Bridge, 10 holes being drilled on the south side, and nine on the north side, down to the solid rock. The north main pier is founded on solid rock, and the south main pier is on a solid foundation 79 ft. below ordinary water level. The Board of Engineers had not made any tests of the velocity of the wind at the site of the bridge, but the designs of the structure are based on calculations, including strains due to wind having a velocity of 100 miles an hour in any direction. Answering a further question Dec. 2 the Minister said the matter of the Quebec Bridge and terminals had been discussed in an informal way with the various railway companies interested, but further action at the present time was considered premature. The Minister had a conference with the Board of Engineers in New York Nov. 26, when matters connected with the substructure were under discussion. Nothing has been announced as to the letting of a contract for the superstructure and it is not expected that any definite announcement will be made until after Jan. 30.

January 1911

S. N. Parent, Chairman of the Commissioners in an interview Dec. 8, said the plans and specifications for the terminals and union station in Quebec were being prepared. The station would be over 300 ft. long and 100 ft. wide, and would cost about $500,000. The sheds would in all probability be located at Cap Rouge, in the vicinity of the Quebec bridge.

The Minister of Railways replying to questions in the House of Commons,

National Transcontinental Railway.

The report of the Commissioners for the construction of the line from Moncton to Winnipeg, covering the year ended Mar. 31, 1910, contains some additional particulars to those given in the report of the Department of Railways as quoted in our last issue. The total contracts for steel superstructures, bridges and viaducts awarded to Mar. 31, 1910, amounted to 38,984 tons, of which the bridges completed equalled 12,975 tons, leaving 26,009 tons of steel in bridges then under construction. There are .. steel bridges on the line in New Brunswick, five of which were completed, 17 in process of construction and one—the crossing of the Salmon River at Chipman,—which had not been started at the date of the report. All the bridge work in the district is now reported to be completed. In District B., which takes in 507.22 miles, east and west of the Quebec River there are 44 .... bridges, of which 25 had been completed, 11 were in progress and 8 had not been started at Mar. 31, 1910. Eight steel bridges were in progress and four were to be built on District D. The .. bridges on District F. have all been completed since the date of the report. No contracts have been let for steel bridges in Districts C. and E.

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S. N. Parent, Chairman of the Commissioners, in an interview Dec. 8, said the plans and specifications for the terminals and union station in Quebec were being prepared. The station would be over 200 ft. long and 100 ft. wide and would cost about $500,000. The station would in all probability be located at Cap Rouge, in the vicinity of the Quebec bridge.

The Minister of Railways replying to questions in the House of Commons, Dec. 12, said the percentage of the contracts completed, the amounts paid contractors, and the amounts reserved on Oct. 31, 1910, were as follows:

Contractor	Through mileage.	Estimated cost at date of contract.	Percent. of work done, Oct. 31, 1910.	Amount paid to Oct. 31, 1910.	Amount reserved, Oct. 31, 1910
Grand Trunk Pac. Con. Co	0.00— 50.00	$989,895.90	99.05	$1,791,480.80	$99,063.44
J. W. McManus & Co., Ltd	50.00— 58.00	289,090.62	91.49	452,702.60	44,405.83
Grand Trunk Pac. Con. Co	58.00— 96.42	767,434.95	98.50	910,404.07	51,156.01
Grand Trunk Pac. Con. Co	96.42— 163.80	1,898,124.21	96.45	2,311,891.62	106,876.85
W. Kitchen Co., Ltd.	163.80— 195.58	1,846,253.65	86.91	2,424,114.03	269,346.00
Lyons & White	195.58— 256.61	1,385,941.09	90.21	1,868,836.24	107,848.47
M. P. & J. T. Davis	256.61— 310.22	2,377,409.00	62.81	1,886,336.14	209,592.90
M. P. & J. T. Davis (East)	310.22— 460.45	5,011,346.00	75.70	5,071,612.71	263,512.52
M. P. & J. T. Davis (West)	460.45— 510.31	5,297,257.46	85.52	2,063,809.47	90,317.95
Macdonnell & O'Brien	510.31— 610.41	....	89.17	8,296,031.84	132,345.39
Grand Trunk Pac. Con. Co	610.41— 656.83	1,691,073.41	80.00	2,671,083.30	121,787.03
Macdonnell & O'Brien	656.83— 763.83	4,559,284.50	19.30	1,501,236.60	166,804.06
Macdonnell & O'Brien	763.83— 878.80	3,815,279.10	....	Nil.	Nil.
Grand Trunk Pac. Con. Co	878.80— 956.74	3,986,901.42	59.20	3,226,743.13	358,527.02
	956.74—1028.80				
E. F. & G. E. Fauquier	1028.80—1128.77	3,936,566.00	70.50	2,606,367.29	289,485.25
M. P. & J. T. Davis	1128.77—1172.85				
	1172.85—1232.85	3,308,048.25	10.18	458,093.65	50,899.29
M. P. & J. T. Davis	1232.85—1332.85	2,019,908.25	....	Nil.	Nil.
E. F. & G. E. Fauquier	1332.85—1407.85	2,101,499.88	59.70	1,464,297.38	162,699.71
O'Brien, Fowler & MacDougall Bros.	1407.85—1428.04	5,967,208.75	50.21	2,676,252.77	297,361.42
	1428.04—1534.04				
O'Brien, Fowler & MacDougall Bros.	1534.04—1557.80	1,158,258.25	84.70	1,488,876.22	165,430.69
J. D. McArthur	1557.80—1804.13	13,010,398.92	95.50	15,689,828.28	709,868.55
Hanny, Quinlan & Robertson	1804.13—1804.33	300,000.00	89.6	313,686.10	14,854.01

Tenders will be received to Jan. 24 for the supply of 61,200 gross tons of 80-lb steel rails with the fastenings for same.

Grand Trunk Pacific Railway

The construction of branch lines from the Winnipeg-Edmonton line is being pushed. The first line being built is at Melville, Sask., one section running northerly to Yorkton, and during last season it was extended to Canora, where it will terminate for the present.

We are advised in connection with recent press reports respecting the company's plans for a line to Hudson Bay, that there has been no change in its intention, as reported in our Oct. issue, that when connection is made with the projected Dominion Government line to Hudson Bay, it will be by an extension of its line from Melville, Sask.

To the south of Melville the branch has been built to Balcarres and the extension into Regina is under construction. Negotiations for the entrance into Regina have been completed and it has been agreed between E. J. Chamberlin, V.P. and G.M., and the city authorities, that the station will be located at the corner of 16th Ave. and Albert St., and the freight sheds east of the fair grounds, on lands given by the city. It was stated at a meeting of the city council Nov. 23, that a line would be built from Regina northerly and westerly to Edmonton. The laying out of the yards and the building of the station and freight sheds will be gone on with as quickly as possible. Southerly from Regina a line is being built to the International boundary on which considerable progress has been made.

The next line being built is the Battleford branch, which will have a length of 48 miles and on which approximately 45% of the grading has been completed.

The third branch starts from west of Watrous, Sask., and will extend to Prince Albert. On this line about 35% of the grading is done, and track laying has been begun.

The fourth branch starts at Tofield, Alta., and runs southerly to Calgary. Track has been laid to mileage 47, and grading has been completed to Red Deer, while clearing and other preliminary work has been done between Red Deer and Calgary.

The company is asking the Minister of Railways to approve plans for a line from Moose Jaw to the elbow of the Saskatchewan River, but as several towns want to have the route changed so that they may be served the consideration of the matter has been adjourned to see what could be done.

The company is reported to have acquired land on McDougall Ave., south of Jasper St., Edmonton, on which it is proposed to erect a large hotel.

The members of the Alberta Legislature were taken over the line west of Edmonton on a special train Dec. 4. Track has been laid for some distance beyond Edson and the grading to the Yellowhead Pass is reported to be well forward. B. B. Kelliher, Chief Engineer, is quoted as stating that if the present rate of progress is maintained a contract will be let in the spring for the section between Tete Jaune Cache and Aldermere, the only section of the line not under contract. It is expected to have track laid to the Yellowhead Pass by Jan. 31. Some of the construction gangs closed down their camps for the season, Nov. 30 but those engaged on the heavy earth work and the rock work will remain out all winter. The construction engineering department has moved its headquarters from Edmonton to Fitzhugh.

With respect to the situation at Fort George, B.C., the company has filed its plans with the Provincial Government locating the station grounds on the Indian Reservation there. This is the point from which a branch line is to run to Vancouver, and for which surveys are about completed. Three parties are in the field and will remain until the work is completed.

Track has been laid easterly from Prince Rupert to Newtown, B.C., mileage 100. Steam shovels are at work at Kitsumkalum taking out ballast for the line. In the Kitselas Canyon three tunnels are being driven through the rock, and these are expected to be completed in the spring, which will enable track to be laid as far east as Hazleton.

In Prince Rupert, work is well forward on the preparation of the site for the yards and sidings. The work has included the removal of 100,000 cubic yards of solid rock, which has been used to fill up at other points, thus making an embankment along the water front between the present wharf and Morse Creek, a distance of 0.75 mile. The total mass of rock cleared away was 1100 ft. long, 180 ft. wide, and reaching in places to a height of 68 ft. The work has been in hand for two years and a half, the contract having been sublet by Foley, Welch and Stewart, to Ross and McColl.

Application is being made to the Dominion Parliament for an act extending the time within which the Pacific Northern and Omineca Ry. company may build the lines authorized by chap. 90 of the statutes of 1902 as amended by Chap. 141 of the statutes of 1906.

National Transcontinental Railway.

In a recent interview at Montreal E. J. Chamberlin, Vice President and General Manager G. T. Pacific Ry., said the last spike of the line from Moncton to Prince Rupert would be driven early in 1913. Whether this prediction will be realized is a matter upon which more than one opinion is expressed, but the reports from all parts of the line indicate that the work is being pushed forward with the object of having the entire line in operation by the fall of 1913. It is stated that while perhaps 166 miles from Moncton westerly may be opened for traffic during the current year, it will be well into 1912 before the line is ready for traffic to Point Levis. The 166 miles referred to carries the line from Moncton to McGivney Jct., where it crosses the Intercolonial Ry. Canada Eastern section, and beyond this point, there is a very heavy piece of bridge work across the Salmon River valley, the structure being 4,000 ft. long and 200 ft. high. Considerable progress has been made on the several contracts for the rest of the distance between Salmon River and Point Levis, Que., some sections having been completed, with the exception of ballasting, and others requiring the erection of bridge superstructures, before further track laying or ballasting can be done while on some other sections there is a small percentage of grading to be done. During 1910, track was laid on an additional 130 miles, on the sections in New Brunswick, and some 30 miles of track has been laid between the New Brunswick boundary and Point Levis, while altogether in the district east and west of the Quebec Bridge track was laid on 135 miles, to about five miles west of Weymontachene. On the section north of the St. Lawrence River, a good deal of ballasting has been done, and the substructures for a number of the bridges are ready for the steel work. On the next district, east and west of Cochrane, Ont., and easterly from Graham (Lake Superior Jct.), track was laid on [illegible] miles during 1910. This makes 437 miles of track laid during 1910, which added to the 565 miles laid to Dec. 31 1909 makes a total of 1,002 miles of track laid, leaving 801 miles of line on which track has to be laid between

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...ving to questions in the House of ...ns Jan. 11, the Minister of Rail... ...aid the work of the arbitration ...nstituted to determine questions ...verbreak, overclassification, etc., ...eastern division of the N.T.R., ... completed, with the exception ...ng the award. The time occu... the first board of arbitrators— ...msden, B. B. Kelliher and C. ... C.M.G., in investigating the ...was 39 days, and the second ... which G. Grant succeeded H. ...den, spent 58 days upon the in... ... On the following day, Jan. ... Minister stated that he expected ... shortly to lay on the table ... of the arbitrators. Press re... ...m Ottawa, state that the am... ...allowed aggregate $400,000 of ...,000 is on the Lake Superior ...

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... made to the House of Com... ... 16, with respect to the Que... ... showed that the old com... ...not take any steps to notify the ...ntee company of the failure of the ...racting company to carry out its contract ...n the collapse of the bridge, and that the notice subsequently given by the ...ernment was not the "prompt notice" which the terms of the bond called for. The Government is therefore unable to collect the $100,000 mentioned in the bond.

Grand Trunk Pacific Railway.

During 1910 the company laid 335 miles of new line, exclusive of second track and sidings, distributed as follows: Branch lines in Saskatchewan;—northerly from Melville, mileage 17 to Canora; southerly from Melville, from Balcarres to mileage 48; from Young to mileage 25, on the projected branch to Prince Albert; total in Saskatchewan, 77 miles; and mileage 879 on main line to Prairie Creek, Alta., and Tofield-Calgary line, from Camrose to Red Deer River; total in Alberta, 158 miles, and from Prince Rupert to Copper River, B.C., 100 miles. The lines under construction include the remainder of the main line from Prairie Creek to Copper River, 665 miles, of which about 400 miles is not yet under contract; and the following branch lines:—Melville to Regina, from mileage 48 to Regina, 48 miles; from Regina towards the International boundary, to mileage 90; from Regina westerly to Moose Jaw, 45 miles; Young to Prince Albert, from mileage 25 to Prince Albert—87 miles; from Oban to Battleford, 48 miles; Tofield-Calgary line, from Red Deer River to Calgary, 121 miles; from Bickerdike, Alta., southwesterly, 59 miles. In addition to these lines, surveys are being made from mileage 90, southerly from Regina to the International boundary, 52 miles.

Provision is being made for the enlargement of the yards at Edmonton, Alta., an additional area of about 20 acres having been acquired. The construction on the main line is expected to make rapid progress during the year, special efforts having been made by the contractors to obtain men for the work from Europe during the winter. On the branch lines it is expected that track will be laid into Regina by about July, and that the extension westerly to Moose Jaw and southerly towards the International boundary, will have some miles opened for traffic by the end of the year. It is reported that some surveys have been made for a line from Wainwright, Alta., to Battleford, Sask. The line to Prince Albert is expected to be completed this season. In connection with the Tofield-Calgary line, no further track laying will be proceeded with until the bridge at Lignite is completed. The bridge will be over 1200 ft. long, and 125 ft. high. A good deal of the concrete work has been completed, and the steel gang is at work. It is expected that the bridge will be finished during the summer and that track will be laid into Calgary by the end of the year. The plans for the entry into Calgary have been filed and show a route crossing the Bow River, about 200 ft. north of the C.P.R. bridge, and on to the R.N.W.M.P. barracks between Sixth and Seventh sts.

A branch from Edson to the Brazeau River coal fields is under construction and recent reports state that the right of way has been cleared for 55 miles, and that the grading outfits have reached mile 36. Surveys for the line from Fort George to Vancouver, B.C., continue, but no definite statement as to construction has been made. Land for terminal purposes is reported to have been purchased in Vancouver, and a passenger and ticket office is being built at Victoria. (Jan. pg., 37.)

G.T.P. R...

National Transcontinental Railway.

Replying to a question in the House of Commons Feb. 6, the Minister of Railways said the cost of the N.T.R. from Moncton to Winnipeg, to the end of 1910, was $89,553,740, and on the following day stated that while that was the actual amount paid out to Dec. 31, the work done to that date which was being paid for brought up the total cost to $93,920,956.16. On another occasion he stated that the section of the line between Moncton and the St Lawrence, was expected to be opened by Sept. 1912. The state of completion on the several contracts on the section at Dec. 31, 1910, was as follows:

Contract	Contractors.	Percentage of work done	Percentage of work remaining to be done.
		%	%
1	Grand Trunk Pacific Ry. Co.....	99·5	0·5
2	Jno. W. McManus & Co.	98·09	1·91
3	Grand Trunk Pacific Ry. Co.....	98·64	1·36
4	Grand Trunk Pacific Ry. Co.....	99.22	0·78
5	Willard Kitchen Co.....	89.48	10·52
6	Lyons & White.....	88.70	11·30
7	M. P. & J. T. Davis	62.80	37·20
8	M. P. & J. T. Davis.....	75.70	24.30

There were then 1,450 men employed on the several contracts.

A contract has been let to J. A. Latouche, for the clearing away of the old buildings on the Champlain Market site, Quebec, in preparation for the erection of a terminal station thereon

Replying to questions in the House of Commons, Jan. 26, the Minister of Railways said neither the Government nor the National Transcontinental Railway Commission had entered into any agreement or working arrangement of any kind with the Province of Ontario or the Commission operating the Temiskaming and Northern Ontario Ry. regarding the securing of running powers over that line from Cochrane to North Bay, Ont., or to any other point; nor was it intended to discontinue the construction of the N.T.R., in whole or in part, permanently or temporarily, east of Cochrane.

The report of the arbitrators on the over-break, etc., on certain contracts has been handed to the Government and will be laid before Parliament. Press reports state that the finding of the arbitrators does not say in so many dollars how much is to be deducted but it takes each particular part of the work complained of and lays down a ruling as to what the measurements and allowances should have been. This will be compared with what was allowed and if the latter is in excess of the arbitrators' findings, deductions will have to be made accordingly. About $500,000 will, it is estimated, be taken off contractors and sub-contractors. It will come out of the drawbacks held by the Government. If dissatisfied with the award those who are affected will have the right to appeal to the Exchequer Court.

GRAND TRUNK PACIFIC RAILWAY.

There have been persistent rumors in Brandon, Man., to the effect that the G.T.P.R. was negotiating for the purchase or lease, or for running powers over the Brandon, Saskatchewan and Hudson Bay Ry., a line owned by the Great Northern Ry., U.S., and that the line would be at once extended to the G.T. Pacific Ry. Several conferences have taken place between G.T. Pacific Ry. officers and the city council, at which the mayor asked the company to give Brandon a branch line.

Press reports state that a G.T.P.R. engineering party is at work in the vicinity of Frobisher, Sask., making a survey for a line towards the International boundary.

The Board of Railway Commissioners has approved plans for the station at Balcarres, Sask., on the line from Melville to Regina; of the revised location plans for the branch from Regina to the International boundary from mileage 83.32 to 100, and location surveys from mileage 100 to 130.92.

A deputation representing the Saskatoon, Sask., city council, waited on Vice President Chamberlain, at Winnipeg, recently, with a view of discussing the entrance of one of the company's projected branch lines into the city. Four propositions have been submitted to the city council.

The Board of Railway Commissioners has authorized the company to lay tracks for its Young-Prince Albert branch across certain highways in East Saskatchewan district, and has approved of location plans for the same line from mileage 110.9 to the east boundary of First Ave., east, Prince Albert, Sask.

Calgary press reports state that that city is to be made an important centre by the G.T.P Ry. It will be the meeting point for the line from Tofield, now under construction; another from Moose Jaw, Sask.; and other lines preceding to Lethbridge, and other southerly and westerly points, while other lines will connect up with these branches from different points. The line from Tofield is expected to be completed by Sept. A conference between officers of the company and the city council representatives was held Feb. 4, with a view of completing arrangements for the entrance into Calgary.

Press reports state that the main line to Tete Jaune Cache, 47 miles west of the Rocky Mountains, will be completed by the end of the season. The contractors have been doing a good deal of rock work west of the Athabasca River during the winter, and preparations are being made for starting up other work.

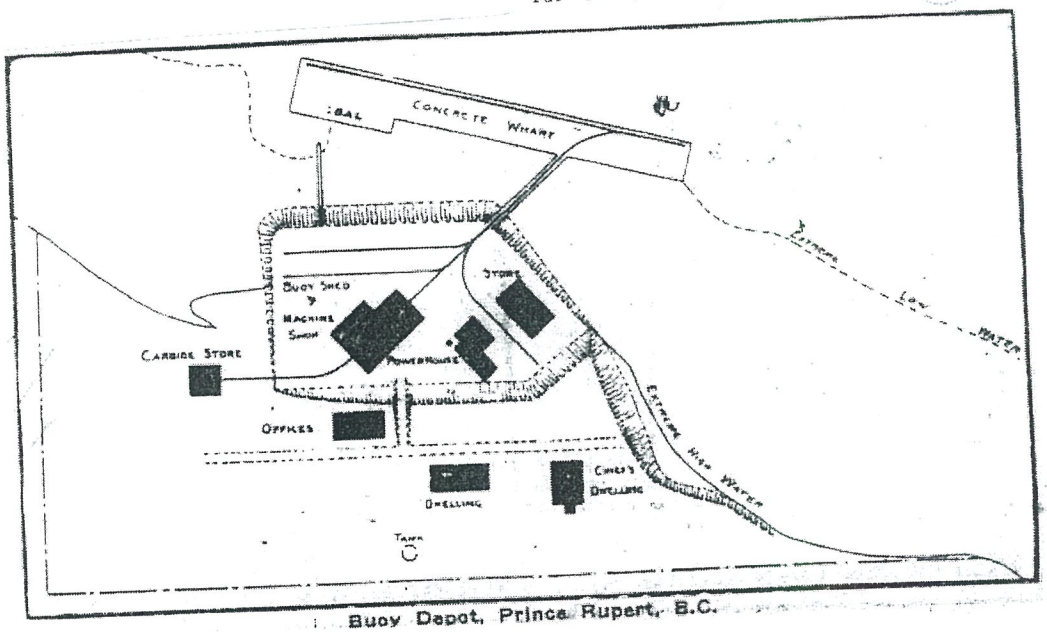
Surveys for the proposed branch line from Fort George to Vancouver are being gone on with, and two lines are being run by way of the Pemberton Valley.

At Prince Rupert, B.C., a great deal of work has been done in the way of laying track in the yards, laying tracks on the wharves, and providing additional wharf accommodation. (Feb., pg. 117.)

Buoy Depot at Prince Rupert B.C.

The Marine Department has let a contract to the Pacific Coast Construction Co. for the building of a buoy depot at Prince Rupert, B.C., for $159,445. The site consists of about five acres on the southern shore of Casey Cove, on the western side of Prince Rupert harbor, about 2½ miles from the existing wharves in the centre of the city. When completed the establishment will consist of a reinforced concrete pile wharf, a yard on the same level as the wharf, and the necessary offices, dwellings, workshops, etc., with the usual plant for handling and repairing buoys, lanterns, and other aids to navigation. The accompanying plan shows the disposition of the wharf and various buildings with relation to the site. The wharf will consist of reinforced concrete piles with reinforced concrete braces. The deck beams and decking will be of wood. The buildings will all be of wood, with the exception of the buoy shed, which will be of steel frame construction. A system of yard tracking will be supplied, and it is intended to use a locomotive crane in connection with this track for handling materials. It is intended to keep on hand a supply of coal, and a portion of the wharf has been widened for storage purposes. An overhead crane will be established in the buoy shed for handling heavy buoys. A system of water supply, fire protection and drainage, suitable for the requirements of the station, has been provided for and is included in the contract price. It is expected that this depot will meet all the requirements rendered necessary by the increase in aids to navigation in the northern waters of British Columbia, and the difficulty of handling these at such a distance from departmental headquarters. The plans and specifications were prepared by the Department's Chief Engineer, Col. W. P. Anderson, M. Can. Soc. C.E.

The North Vancouver ferry receipts for Jan. were $6,570.65, against $3,426 for Jan., 1910.



Buoy Depot, Prince Rupert, B.C.

April 1911

National Transcontinental Railway.

Replying to questions in the House of Commons recently, the Minister of Railways said the general standard of the railway through New Brunswick comprised a single track railway with necessary sidings of the standard gauge on a roadbed constructed and ballasted in accordance with the general specifications for the entire line, on which is laid 80-lb steel rails on first class cross ties, with steel fastenings. The bridges have concrete or stone substructures with steel superstructures, built in accordance with the general specifications of the Department of Railways, issued in 1908. The line is constructed with gradients not in general exceeding 0.4% adverse to east bound, and 0.6% adverse to west bound traffic, and with curves of a minimum radius of 955 ft. Near Tobique River, owing to the physical character of the country, a gradient of 1.1% is allowed. The present estimated cost per mile by contract divisions is as follows: No. 1, from Moncton westerly for 50 miles, $49,190 per mile; no. 2 eight miles to Chipman, $89,710 per mile; no. 3, Chipman to Intercolonial Ry., 39.7 miles, $35,333 per mile; no. 4, from Intercolonial Ry. to crossing of Tobique River, 67 miles, $46,920 per mile; no. 5, from Tobique River to mileage 2.5 west of Grand Falls, 31.5 miles, $133,518 per mile; no. 6, from last mentioned point to New Brunswick-Quebec boundary, 67 miles, $46,484 per mile. The cost per mile on no. 2 is high on account of the heavy grade; at the east end of the contract there is a cut about two miles long and 18 ft. deep at the highest point; there is also a heavy fill at the crossing of the Salmon River at mileage 57, and a viaduct of 1,200 ft. The cost per mile on no. 5 is high on account of the grading being unusually heavy and there is a steel viaduct nearly 4,000 ft. long, with a maximum height of 250 ft. across the Little Salmon River. The work provided for in the estimated cost includes clearing, excavation, culverts, substructures of bridges, tracklaying, ballasting, ties, signals, interlocking appliances, telegraph lines, fencing, water supply, track scales, temporary trestles, and extra work, also pumps and pumphouses, rails and fastenings, including frogs, switches and diamond crosses, and the steel superstructures and flooring of bridges.

The Minister of Railways in the course of a speech in the House of Commons Mar. 10, upon transportation matters, said with regard to the portion of the N.T.R. being built by the Government from Moncton, N.B., to Winnipeg, presented a statement prepared by the Commission as to the various contracts. This shows districts, mileages, etc., percentage of work done on each contract, miles of grading done, miles of track laid, miles of telegraph line completed, percentage of steel bridge superstructures completed, and total percentage of work done on all these 21 contracts up to Dec. 31, 1910. The total quantity of work done to that date was 67.62%. The statement, signed by D. MacPherson, Assistant Chief Engineer, is given below.

Mileages are given in the statement for 24 contracts the reason for this being that in three cases adjacent contracts are being carried out by the same contractor. The total mileage given is for the line to the west bank of the Red River at Winnipeg, while the percentage of contracts completed covers only to the east bank of the river.

An itemized statement of the cost of the work done to Dec. 31, 1910, and an estimate of the cost of the work required to complete the line, is as follows:

Items.	Work done.	Required to complete.
Grading, contract items	$69,176,400	$28,175,800
Right of way, expenses, etc.	1,629,900	1,910,100
Rails and fastenings, etc.	8,534,900	4,037,100
Buildings	664,300	3,644,200
Steel superstructures of bridges	3,342,160	3,242,900
Surveys and expenses	3,987,000	26,000
Engineering and expenses	4,398,560	2,712,000
Springfield shops	1,117,800	1,227,200
" car shop plant, etc.	nil	1,300,000
Terminals at Quebec, including connecting lines	19,000	4,419,000
Rentals joint terminals, Winnipeg	105,000	95,000
Headquarter expenses	1,605,100	969,000
Total	$94,580,500	$50,759,200

This statement, the Minister said, did not include the interest charged, but there was a question on that subject on the order paper, which would be answered in due course by the Finance Department. The statement now made was more complete than any that he had been able to give the House. He might mention that the section of the line from east of Winnipeg to Superior Jct., had been operated during the past few months in assisting to carry the wheat crop of the west, joining with the G.T. Pacific Ry.'s own line at Superior Jct., and the traffic being carried thence to

Contractor.	Through Mileage of Contract.	Per cent. of contract completed.	Miles of grading completed in district.	Miles of track laid in district.	Miles of telegraph completed in district.	Per cent. steel bridges completed in district.
Grand Trunk Pacific Con. Co.	0. 50	99.50				
J. W. McManus & Co., Ltd.	50. 58	98.43		*60.6		
Grand Trunk Pacific Con. Co.	58. 96.42	99.04	251.8	†249.92	206.49	81.1
" " "	96.42. 163.80	99.36				
				300.52		
W. Kitchen Co., Ltd.	163. 8. 195.58	89.87				
Lyons & White	195.58. 256.61	88.71				
M. P. and J. T. Davis	256.61. 310.22	62. 8				
" " " (East Que. Bridge	310.22. 460.45	75. 7		*28.05		
" " " (West "	460.45. 510.31	88.02	419.6	†302.21	186.6	73.9
	510.31. 610.41	94.04				
				330.26		
Macdonald & O'Brien	610.41. 656.83	92.93		*2.0		
Grand Trunk Pacific Con. Co.	656.83. 763.83	28.10		†15.8		
Macdonald & O'Brien	763.83. 878.80	Nil.	74.3		Nil.	
" "	878.80. 956.74			17.8		
Grand Trunk Pacific Con. Co.	956.74.1028.80	66.46		*23.5		
" " "	1028.80.1128.77			†174.4	92	
E. F. & G. E. Fauquier	1128.77.1172.85	73.04	197.4			71.2
M. P. & J. T. Davis	1172.85.1232.85	12.49				
" "				202.9		
" "	1232.85.1352.85		76.9	Nil.	Nil.	
E. F. & G. E. Fauquier	1352.85.1407.85	Nil.				
O'Brien, Fowler & Macdougall	1407.85.1428.04	63.45				
Bros. " "		56.54				
				*37.2		
" " "	1428.04.1534.04			†268.4		
" " "	1534.04.1557.46	84.76	346.5		306.9	54.1
J. D. McArthur	1557.80.1804.13	95. 5				
				385.6		

* Sidings. † Main.

National Transcontinental Railway.

The Dominion Parliament has voted $3,500,000 on capital account for surveys and construction work on this railway.

Speaking in Quebec recently, S. N. Parent, Chairman of the Commission having in charge the building of the line from Moncton, N.B., to Winnipeg, Man., said work at the eastern end was so far advanced that tenders would shortly be invited for the building of the stations from Moncton westerly. The site for the station in Quebec, at the Champlain market, had been cleared, and as soon as the plans for the building had been approved by the G.T. Pacific Ry., tenders would be asked for its construction. The work of completing the lines to the site of the Quebec Bridge would be gone on with during the season. Pending the building of the bridge a car ferry service is proposed and plans for the landing places for such a ferry are now under consideration.

Quebec press reports, April 18, state that as a result of the conference between the Commissioners and the directors of the G.T. Pacific Ry., it was decided to add to the dimensions of the station building to be put up. The frontage of the building, it is said, will be increased to 350 ft. and the cost increased from $750,000 to $1,500,000.

Replying to questions in the House of Commons, April 5, the Minister of Railways said the reason why only about 28% of the work had been done on contract 12 about 13% on contract 16D, and nothing on contract 13C, was because the work on adjoining sections had not been completed so as to permit of getting in supplies, materials, etc., under favorable conditions. Contract 18E had been started, and about 69% of the work had been done. It was impossible to state exactly when any one of these contracts would be completed, but it was estimated that they would all be finished in 1912.

GRAND TRUNK PACIFIC RAILWAY.

Contracts are reported to have been placed for the erection of about 500 miles of wire fencing in the prairie provinces during the current year.

The company has ordered from the Algoma Steel Co., Sault Ste. Marie, Ont., 100 tons of 60 lb. steel rails for early delivery at Fort William, Ont., for use on branch lines in Saskatchewan and Alberta.

The construction programme for the season has been arranged, and the contracts for the work were finally approved at a conference held at Montreal, April 18, between E. J. Chamberlin, Vice President and General Manager, and C. M. Hays, President G.T.R. and G.T. Pacific. The work, said Mr. Chamberlin, in an interview in Winnipeg a few days previously, for which contracts had been let, includes the construction of 645 miles of branch lines, 265 miles of main line track, 200 miles of grading on branch lines, the erection of 140 station buildings and a number of steel bridges. The details of the work are referred to below.

The modified plans for the hotel at Moncton have been completed by Ross and MacFarlane, architects, Montreal, and provide for the erection of an eight storey building, with about 350 rooms.

In connection with the reported line from Starbuck to Brandon, Man., we are advised that while people in the vicinity of Brandon have been agitating for the building of such a line, no arrangement has yet been entered into for its construction.

Further work will be done on the line northerly and southerly from Melville, Sask. The southerly branch will be completed into Regina, giving the line a length of 95 miles. Track has been laid on this branch from Melville to Balcarres, leaving about 68 miles of track to be laid to complete the line.

The line from Regina, southeasterly to the International boundary, 155 miles, will also be gone on with.

Another line will be started at Regina, with Moose Jaw as its present terminus, but with the intention of ultimately reaching Calgary. In connection with the work in Regina arrangements are being made for the laying out of large terminal yards.

On the branch from Young to Prince Albert, on which 25 miles of track were laid during 1910, further work will be done in the expectation of completing the remaining distance about 72 miles. Grading will be completed on a branch from near Biggar to Battleford, and it is expected to also have track laid this year.

With the exception of the Regina-Moose Jaw line, the contract for which has been let to Rigby and Hyland, the contracts for these lines have been let J. D. McArthur, Winnipeg. A contract for the building of 50 miles of line from Biggar towards Calgary has been let to Foley, Welch and Stewart.

In connection with these lines the following information from the latest report of the Saskatchewan Department of Railways will be of interest.

The Saskatchewan Legislature by chap. 4 of the statutes of 1908-9 voted aid by way of guarantee of bonds for $13,000 a mile in respect of three branch lines having a total length of 195 miles; and by chap. 5, of the statutes of 1909-10, aid at the same rate in respect of five other branches with a total length of 475 miles; altogether 670 miles. Of these eight lines, construction was carried on during the year ended Feb. 28, 1910, on two lines and 58.22 miles of grading, completed with 50.43 miles of track laid thereon. Following is a list of branch lines subsidized with the work done, up to the date of the report:—

	Total mileage.	Miles graded	Miles track laid.
Melville-Yorkton branch	40	26.48	26.48
Melville-Regina branch	110	31.74	23.95
Biggar-Battleford branch	45	.....	.....
Regina Southeast	155	.....	.....
Young-Prince Albert branch	110	.....	.....
Regina-Moose Jaw-Calgary branch	110	.....	.....
Biggar-Calgary branch	50	.....	.....
Cutknife branch	50	.....	.....
Total	670	58.22	50.43

Our returns of track laid in 1910, show that track was laid on an additional 70 miles, including 25 miles on the Young-Prince Albert branch on these lines during that year, and reports as to contracts let show that work is in progress on four of the lines, and that a contract is expected to be let at an early date on the Regina-Moose Jaw line. The matter of the building of the lines from Biggar and the Cutknife branch has not yet been definitely discussed by the management.

In Alberta the only branch line under construction is the one starting at Tofield, on which steel has been laid to Red Deer River, about 80 miles. A bridge, with a rail level 200 ft. above high water mark is under construction, and as soon as this is completed track laying will be resumed southerly to Calgary. The grading is well advanced, and the contractor, J. D. McArthur, expects to have it completed this year. The railway committee of the Calgary city council has had the plans for the entrance of the line into the city under consideration, and finally approved of them April 1, subject to the company's undertaking to provide for the installation of certain protective devices at the crossings. At Edmonton, it is proposed to erect a large hotel for which plans will be prepared, as soon as certain matters under discussion with the city General Passenger Agent, stated April 3, that these matters were practically decided and that the hotel would be built on McDougall Ave., opposite the Edmonton Club. A line of about 70 miles will be started at Bickerdike, and will run through the properties of the Pacific Coal Co., and the Yellow Head Pass Coal Co., with a branch to the Mountain Park Coalfields. The name of the contractor for the building of this branch has not yet been announced. The main line has been completed to Prairie Creek, about 200 miles west of Edmonton, where a large bridge has just been completed. Another large bridge is under construction over the Athabasca River, some distance westward, and good progress is being made westerly to Tete Jaune Cache, by the contractors, Foley, Welch and Stewart. On the line easterly from Prince Rupert, good progress has been made during the winter on the tunnel work in the Kitselas Canyon, and the contractors, Foley, Welch and Stewart, will push on with the work during the summer. The 400 mile section to connect up with the line coming westerly is expected to be placed under contract during the summer. We are advised that while surveys have been made, within the last year, for a line from Fort George on this section to Vancouver, B.C., it is not contemplated to make any move towards its construction until after the main line to Prince Rupert is completed.

Since the foregoing was put in type we have been officially advised that the G.T.P.R. management expects to do the following work during the current year:

GRADING MAIN LINE.

	Miles
Prairie Creek to Tete Jaune Cache	114
Copper River to Aldermere	140
	254

GRADING BRANCHES.

	Miles
Calgary branch (to complete)	117
Battleford branch (to complete)	28
Regina branch (to complete)	30
Regina-Boundary branch (to complete present contract)	40
Regina-Moose Jaw branch (to complete)	35
Prince Albert branch (to complete)	59
Alberta Coal branch (to complete)	48
New branch off same (new contract)	25
Biggar-Calgary branch (new contract)	50
	432
Total	686

TRACKLAYING, MAIN LINE.

	Miles.
Prairie Creek to Tete Jaune Cache	114
Copper River to Aldermere	140
Calgary branch	117
Battleford branch	48
Regina branch	58
Regina-Boundary branch	90
Regina-Moose Jaw branch	40
Prince Albert branch	87
Alberta Coal branch	54
Total	748

It is also the intention to erect 140 station buildings this season.

Thee G.T. Pacific Branch Lines Co., has been authorized by the Dominion Parliament to build the additional lines mentioned on pg. 1035 of our issue of Dec. 1910, and has been granted an extension of time for building the lines authorized by sec. 11, chap. 99, of the statutes of 1906.

An extension of time for the construction of the Pacific Northern and Omineca Ry., has been granted by the Dominion Parliament. The company was originally incorporated in 1902, and its powers amended by chap. 141 of the statutes of 1906. (April, pg., 331.)

National Transcontinental Railway.

Tenders will be received to June 14, for the erection of station and other buildings on the following sections:—From Plaster Rock, N.B., westward to the N.B.-Quebec boundary; from mileage 181.5 to 194 east of Quebec bridge; from mileage five to 105 east of Quebec bridge, from Quebec Bridge westward to mileage 45; from mileage 55 to 194 west of Quebec bridge; at Cochrane, Ont.; from the divisional yard at Graham, Ont., eastward for 60 miles.

The Chairman of the N. T. Commission, in an address to the Quebec Board of Trade, May 5, gave an explanation of the plans for the erection of the union station at the old Champlain market, and for the workshops which it is proposed to build on the Ste. Foye heights, near the Quebec bridge. He said the station will be a monumental structure, 250 ft. long, and three stories high, being 77 ft. from the ground to the highest point of the roof. A wharf 2,000 ft. long will be constructed alongside the station. This will later be prolonged to 6,000 ft. west. The extreme depth of these wharves will be 55 ft. at low tide, and will leave room for the location of the agency of the marine department and shipping. The workshops are to be erected at the western approach to the bridge which has been found the most practical location for them. It is at the limits of Ste. Foye, and permits the erection of big shops, which would be impossible anywhere else. The proposed shops will be second only to Winnipeg. Their site will cover 155 acres. The buildings proposed to be erected include the following:—Coach paint shop, 120 by 200 ft.; upholstering shop, 40 by 120 ft.; transfer table, 85 by 55 ft.; coach shop 120 by 200 ft.; cabinet shop 40 by 120 ft.; planing mill, 80 by 250 ft.; dry kiln, 35 by 70 ft.; lumber shed, 60 by 150 ft.; freight car shop, 80 by 400 ft.; power house, 100 by 125 ft.; store house, 70 by 150 ft.; oil house, 35 by 55 ft.; office, 60 by 60 ft.; boiler and tank shop, 150 by 150 ft.; erecting shop, 150 by 388 ft.; forge shop, 100 by 150 ft.; foundry shop, 100 by 150 ft.; pattern shop 50 by 70 ft.; roundhouse, 20 stalls, water tanks, 50,000 galls., and 100,000 galls. capacity; boiler plate and tube rack, 25 by 150 ft.; coaling trestle, 250 ft. long; sand house, 46 by 19 ft.; ashpits and cinderhoists; iron rack, 20 by 100 ft.; ice house, 59 by 29 ft.; local station, 116 by 30 ft.; store house, 74 by 20 ft.; midway crane, 1,420 ft runway; wheel foundry and machine shop, 125 by 200 ft.; wheel storage, 105, by 100 ft. As soon as details in connection with the plans are worked out, tenders will be asked for the erection of the buildings. The route which will be followed by the line would be from Sillery Cove, into the Champlain market, and shunting grounds will be provided at Wolfe's Cove.

Reports from Cochrane, Ont., state that E. F. and G. E. Fauquier have completed their 70 miles of grading west of that point, and are engaged in ballasting the track. Further west, O'Brien, McDougall and O'Gorman, have large gangs of men at work, clearing the right of way and grading. East of Cochrane, about 40 miles of track have been laid, and the ballasting completed and the contractors, Foley, Welch and Stewart, are pushing their grading gangs further east.

We are advised that there is no foundation for the report that a contract has been let or is about to be let to Haney, Quinlan and Robertson, for the erection of a coach and car shop at Transcona, near Winnipeg. At present, the commissioners are unable to say what further will be done in the way of building at the shops at Transcona.

GRAND TRUNK PACIFIC RAILWAY.

Replying to questions in the House of Commons April 24, the Minister of Railways said the estimated cost to Canada of the western division of the National Transcontinental Ry. is the interest for seven years on the bonds required to finance 75% of the cost of construction of the mountain section, and this interest is estimated at $13,293,000. In addition the direct cost to the Government for inspection, auditing, etc., in connection with the western division is estimated at $135,000. The details upon which these estimates are based are as follows:—

Estimated cost to complete, Mar. 31, 1914:—

Cost of construction	$58,520,000
Terminals, Prince Rupert	3,000,000
Interest during construction	6,000,000
Total estimated cost	$67,520,000
Amount to be financed by 3% government guaranteed bonds, 75% of $67,520,000	50,640,000
Par value of government guaranteed 3% required to finance cost of construction, estimated to be sold at net price of 80%	63,300,000
Interest on $63,300,000 at 3% for 7 years	13,293,000
Estimated direct expenditure by government for engineering, auditing, etc., in connection with western division	135,000

The above estimate is made on the assumption that the liability of the government as guarantor of the bonds, will be in accordance with the judgment rendered by the Supreme Court of Canada, as to the meaning of par. 5 of the agreement of Feb. 18, 1904, schedule to chap. 24 of the Acts of that year.

Following is the estimated cost of construction of the mountain section:—

Description of Service.	Amount.
Preliminary and legal expenses, engineering	$ 3,200,000
Right of way and real estate	250,000
Grading and tunnels	33,000,000
Bridges, trestles and culverts	10,000,000
Ties	1,300,000
Rails, fastenings, frogs and switches	5,700,000
Tracklaying, surfacing and ballasting	2,390,000
Buildings and water stations	1,500,000
Fencing, crossings and cattle guards	20,000
Snow sheds	500,000
Docks	200,000
Telegraph line	260,000
	$58,520,000
Terminals at Prince Rupert	3,000,000

The Minister added that the foregoing details of estimates are subject to revision. The fluctuating labor conditions prevailing, and the tendency to an increasing cost for labor, on the line of construction, renders this statement necessary.

A contract has been let to J. D. McArthur, Winnipeg, for the completion of the line from Regina, Sask., in a generally southerly direction to the International boundary. This contract will carry the line from the end of the section at present under contract, on which there is about 40 miles of grading to be be completed.

The contract for building the first 50 miles of the projected branch from Biggar, Sask., to Calgary, has been let to Foley Bros., Welch and Stewart.

The contract for the new branch from the Alberta coal branch has been let to Foley, Welch and Stewart. This will be known as the Mountain Park coal branch.

We were officially advised May 1, that the location of the G. T. Pacific Ry. terminals in Calgary, Alta., had not been decided, and that all reports stating that particular properties had been acquired for that purpose were incorrect.

While land has been acquired at Edmonton Alta., for the purpose of building an hotel thereon, we are advised that nothing has been definitely decided as to the size and character of the proposed building.

E. J. Chamberlin, Vice President and General Manager, is reported to have stated in an interview at Winnipeg, May 4, that it is doubtful whether a contract will be let this year for the building of the G.T.P.R. hotel at Winnipeg. The plans had not then been finally completed, and were not likely to be ready before June 1. It was impossible to say anything definite as to the accommodation, equipment, or cost of the building until all the plans had been approved.

Speaking of the proposed line into Brandon, Man., Mr. Chamberlin is reported to have said recently that the surveys would be begun almost immediately, but it was impossible to say when construction would be gone on with. This line would extend northerly from the G.T.P.R. to Neepawa.

Referring to the work on the lines which will centre in Regina, Sask., Mr. Chamberlin is reported as saying that everything was being done that could be done to have the line completed into Regina by July 31. The grading was well ahead, and the company was rushing the track laying and ballasting, with the object of having the branch in operation by the opening of the Exposition. The tracklaying gang reached Fort Qu'Appelle May 12. The question of the building of an hotel had been considered, but nothing was likely to be done this year. The Board of Railway Commissioners has approved of location of the Melville-Regina branch from the city limits at mileage 92.62 to the west side of Albert St., at mileage 97.57, Regina, Sask.

R. Hyland, of the contracting firm of Rigby, Hyland and Plummer, in a recent interview said the grading of the branch from Regina into Moose Jaw, would be completed by Aug. 1. Grading is being proceeded with west of Cottonwood Creek, four gangs being at work. A 1,500 ft. trestle bridge is nearly completed over the creek, and another bridge is being built across Wascana Creek. The course of the line is almost straight from Regina to close to Moose Jaw, where it deviates to the south, so as to secure the easiest possible entrance into the city. An agreement has been reached between the company and the city council as to the route by which the line will cross Moose Jaw. The agreement provides that the line is to be completed and in operation through the city by Jan. 1, 1912. A resolution was passed May 9, approving of some slight deviation from the original plans.

Plans were deposited with the Minister of Railways May 12, showing the route of the entry of the company's line into Calgary. The plan does not show that any provision has been made for terminal facilities in the city. E. J. Chamberlin, Vice President, stated at Winnipeg, May 5, that the company had never for a moment considered the idea of erecting an hotel in Calgary.

The plans for the proposed hotel at Edmonton, Alta., said Mr. Chamberlin, at Winnipeg, May 5, are expected to be ready about July 1, when tenders for the building would be asked.

Construction work is being gone on with rapidly on the Alberta coal branch, which runs southerly from the main line at Edson, Alta., and it is expected that it will be ready to transport coal from the mine by Nov. 30. With Edson as a centre, a survey party under W. Silcox is making a survey for the location of a line to Grande Prairie, and on towards the Peace River country.

Construction on the main line west of Edson, is being pushed, and it is expected to have the track laid to Tete Jaune Cache by the end of the season. On the section being built easterly from Prince Rupert, a certain amount of rock work was done during the winter, and it was reported May 8, that over 2,000 men had gone in to take up work this season. (May, pg. 425.)

National Transcontinental Railway.

Tenders will be received to June 14, for the erection of station and other buildings on the following sections:—From Plaster Rock, N.B., westward to the N.B.-Quebec boundary; from mileage 161.5 to 194 east of Quebec bridge; from mileage five to 105 east of Quebec bridge; from Quebec Bridge westward to mileage 45; from mileage 55 to 194 west of Quebec bridge; at Cochrane, Ont.; from the divisional yard at Graham, Ont., eastward for 60 miles.

The Chairman of the N. T. Commission, in an address to the Quebec Board of Trade, May 5, gave an explanation of the plans for the erection of the union station at the old Champlain market, and for the workshops which it is proposed to build on the Ste. Foye heights, near the Quebec bridge. He said the station will be a monumental structure, 250 ft. long, and three stories high, being 77 ft. from the ground to the highest point of the roof. A wharf 2,000 ft. long will be constructed alongside the station. This will later be prolonged to 6,000 ft. west. The extreme depth of these wharves will be 55 ft. at low tide, and will leave room for the location of the agency of the marine department and shipping. The workshops are to be erected at the western approach to the bridge which has been found the most practical location for them. It is at the limits of Ste. Foye, and permits the erection of big shops, which would be impossible anywhere else. The proposed shops will be second only to Winnipeg. Their site will cover 155 acres. The buildings proposed to be erected include the following:—Coach paint shop, 120 by 200 ft.; upholstering shop, 40 by 120 ft.; transfer table, 85 by 55 ft.; coach shop 120 by 200 ft.; cabinet shop 40 by 120 ft.; planing mill, 80 by 250 ft.; dry kiln, 35 by 70 ft.; lumber shed, 60 by 150 ft.; freight car shop, 80 by 400 ft.; power house, 100 by 125 ft.; store house, 70 by 150 ft.; oil house, 35 by 55 ft.; office, 60 by 60 ft.; boiler and tank shop, 150 by 150 ft.; erecting shop, 150 by 388 ft.; forge shop, 100 by 150 ft.; foundry shop, 100 by 150 ft.; pattern shop 50 by 70 ft.; roundhouse, 20 stalls; water tanks, 50,000 galls., and 100,000 galls. capacity; boiler plate and tube rack, 25 by 150 ft.; coaling trestle, 350 ft. long; sand house, 46 by 19 ft.; ashpits and cinderhoists; iron rack, 20 by 100 ft.; ice house, 59 by 29 ft.; local station, 116 by 30 ft.; store house, 74 by 20 ft.; midway crane, 1,420 ft runway; wheel foundry and machine shop, 125 by 100 ft.; wheel storage, 105, by 100 ft. As soon as details in connection with the plans are worked out, tenders will be asked for the erection of the buildings. The route which will be followed by the line would be from Sillery Cove, into the Champlain market, and shunting grounds will be provided at Wolfe's Cove.

D.

N.T.R. Shops at Transcona.

The National Transcontinental Railway Commissioners will receive to July 11, tenders for the construction of the following car shops:—

At Transcona, near Winnipeg.

Scrap Platform and storage bins, 200 by 35 ft.

Dry kiln 40 by 70.

Wheel and machine shop, 74¾ by 164¾ ft.

Freight car shop, 604¾ by 199¾ ft.

Planing mill, 304¾ by 104¾ ft.

Paint storehouse, 39 ft. 7 ins. by 48 ft. 7 ins.

Couch paint shop, 344¾ by 91¾ ft.

Couch shop, 204¾ by 124¾ ft.

Car Department office, 68 by 60 ft.

Motive Power Department office, 68 by 60 ft.

Contractors are requested to send in a bulk price for the work. The 10 buildings, with their equipment, are estimated to cost about $2,500,000, which will bring up the cost of the whole of the shops at this point to upwards of $6,000,000.

A plan of the entire layout of the shop plant at Transcona was given in our issue of Sept., 1910, pg. 717, and a detailed description of the whole of the buildings was given in our issue of Aug., 1910, pg. 633. The buildings to be erected under the contract now being arranged are shown in the plans in our September issue as being north of the tracks running through the centre of the yard, north of the water tank and power house. The dimensions of certain of the buildings to be erected vary from the figures given in the article referred to, but the variation is unimportant. The contractors are also called upon to furnish an indirect heating apparatus and a yard crane runway for these buildings, together with the necessary lumber sheds.

Locomotives for Government Railways.

The Minister of Railways, in answer to a question in the House of Commons recently stated that the following locomotives had been bought from 1896 to 1910. The figures in the column after the year show the number of locomotives bought. The price mentioned is per locomotive —

INTERCOLONIAL RAILWAY

1898	2	Canadian Locomotive Co.	$14,500 00
	2	Baldwin Locomotive Works	10,000 00
1899	1	Canadian Locomotive Co.	14,500 00
	2	Canadian Locomotive Works	12,000 00
	20	Baldwin Locomotive Co.	9,700 00
1900	1	Canadian Locomotive Co.	9,798 40
	1	Canadian Locomotive Co.	12,000 00
1901	10	Manchester Locomotive Co.	15,500 00
	9	Manchester Locomotive Co	13,900 00
	20	Canadian Locomotive Co.	19,000 00
	6	Dixon Locomotive Co.	16,000 00
	10	Richmond Locomotive Co.	14,317 65
1902	8	Dixon Locomotive Co.	15,000 00
	4	Canadian Locomotive Co.	17,681 88
1903	11	Canadian Locomotive Co.	20,270 00
1904	15	Canadian Locomotive Co.	20,270 00
	5	Canadian Locomotive Co.	17,500 00
1905	10	Canadian Locomotive Co.	20,300 00
	12	Canadian Locomotive Co.	23,950 00
1906	5	Canadian Locomotive Co.	18,430 00
	1	Canadian Locomotive Co.	21,950 00
	15	Locomotive and Machine Co.	21,000 00
1907	10	Canadian Locomotive Co.	21,950 00
1908	32	Canadian Locomotive Co.	18,430 00
	3	Canadian Locomotive Co.	24,000 00
	10	Locomotive and Machine Co.	19,600 00
1910	10	Canadian Locomotive Co.	22,500 00
	11	Locomotive and Machine Co.	

PRINCE EDWARD ISLAND RAILWAY

1904	2	Canadian Locomotive Co.	8,250 00
1906	2	Canadian Locomotive Co.	8,730 00
1907	2	Canadian Locomotive Co.	10,150 00
1904	4	Canadian Locomotive Co.	9,450 00
1905	1	Canadian Locomotive Co.	9,450 00
1907	4	Canadian Locomotive Co.	13,250 00

W. Fair, agent Canadian Northern Ry. at West Fort William, Ont., was arrested June 10 on a charge of embezzling about $700.

the summit of the Rocky Mountains at the Yellowhead Pass. The work is well under way to Tete Jaune Cache, B C., to which point track should be laid in the fall Tenders will be called for shortly, for the building of the 410 mile gap between Tete Jaune Cache, and Aldermere, B.C. "Possibly," added Mr. Hays, "Mr. Kelliher may be in a position to call for the tenders next week." It is expected to have the line completed by the end of 1913, and not until this work is done will the company take up, said Mr. Hays, the question of the building of a line from Fort George to Vancouver. On June 15, B. B. Kelliher, Chief Engineer, stated in Vancouver that contractors had been asked to send in tenders for this mileage, and he hoped to see work started on it this summer.

An agreement was approved by the Prince Rupert City Council June 8, under which the company is to give the city 100 feet of water front, and certain areas for park and cemetery purposes; build a dry dock to cost $2,500.000; build a station and other terminal buildings to cost $1,000,000, and a hotel to cost a similar amount, in return for a fixed payment of $15,000 a year as taxes for 10 years.

The Board of Railway Commissioners has authorized the company to open for traffic its line from Prince Rupert. B.C., easterly for 100 miles, the speed of the trains to be limited to 12 miles an hour.

The route map of a branch line of 3.27 miles from the wharf at Prince Rupert, B.C., northeasterly to Shawatlan's Passage, has been approved by the Minister of Railways.

A contract has been let to Mr. Dow, Seattle Wash., for the construction of a concrete wharf and warehouse at Vancouver B.C., for the company's steamship business; and plans are under consideration for the building of a similar wharf and warehouse at Victoria, B.C.

(June pg. 519.)

National Transcontinental Railway.

Negotiations are in progress between the G. T. Pacific Ry. and the N.T.R. Commissioners with a view of certain sections of the line being taken over and placed in operation. It is thought that the section through the St. Maurice Valley in Quebec and a section between Plaster Rock and Moncton, N.B., may be taken over this year.

According to an Ottawa press report, June 16, the Commissioners have decided not to enforce the penalty of $5,000 a month against contractors who have failed to complete the sections let to them within the time limit, on account of the difficulty experienced in getting labor since the contracts were let.

Tenders will be received to July 15 for the erection of two terminal stations, one at Redditt, Ont., and the othre at Transcona, Man.

The two mile approach of the line in St. Boniface connecting up the line from the east with the tracks of the joint terminals at Fort Garry, Winnipeg, is practically completed. The first mile of the approach is graded with sand and gravel without any trestle work; the next half mile comprises a network of trestle work, and the last half mile from Archibald St. to the river will be built on a series of concrete piers varying from 30 to 50 ft. apart. The highest point is just over Archibald St., being 30 ft above the street level. Steel bridges are erected over five streets and there is also a steel bridge over the Seine River. The J. D. McArthur Co. is carrying out the work.

GRAND TRUNK PACIFIC RAILWAY.

In a recent interview President Hays, referring to the branch lines, said it was hoped to complete some 645 miles of new lines this season. Reports from all the lines under construction show that rapid progress is being made with grading and track laying. It was stated before the Board of Railway Commissioners, July 6, that the company had 215 miles of track, ready for the operation of freight trains, but of which it was impossible to make any use, as the Commissioners had put a stop to the operation of any line for any purpose whatever until it had been inspected.

An order has been issued by the Board of Railway Commissioners approving of the location of the Melville-Regina branch from the west boundary of sec. tp. 18, range 19, west of the second meridian, at mileage 90.74 to Regina city limits, at mileage 92.62.

The revised location maps for the branch from Biggar, Sask., to the 4th meridian, 100 miles have been approved by the Minister of Railways, and the Board of Railway Commissioners has approved of location plans of the branch, from mileage 19.97 to 53.23, Sask.

The Minister of Railways has approved of the route map for three miles covering the entrance of the branch line from Tofield into Calgary, Alta. Construction on this branch was reported to have been stopped June 8, owing to an injunction having been obtained by the C.P.R. to keep the G.T.P.R. off all C.P.R. lands in the irrigation area. Construction has been stopped at Berseker, Alta., about 10 miles out of Calgary. The company's engineers are locating a line from Calgary southerly to the International boundary, just east of the Little Bow River.

The Department of Railways has approved of the route map of a line northerly from Edson, Alta., to the Pacific Northern and Omineca Ry., about 50 miles.

C. M. Hays, President, completed a trip of inspection over the line, in company with a number of other officials, June 9, when the party left Prince Rupert, B.C., on the return journey. In the course of an interview at Vancouver, Mr. Hays said better progress is being made east of the Rocky Mountains this year than in 1910. The party travelled on the company tracks for 200 miles west of Edmonton, or within 25 miles from

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National Transcontinental Railway.

The plans prepared under the direction of the Commissioners for the N.T.R. for the station building in Quebec have been approved by C. M. Hays, President, on behalf of the Grand Trunk Pacific Ry., and it is said that tenders will be asked for its construction at an early date. The building will be erected on the site of the old Champlain Market. The plans provide for a building 257 by 124 ft. It will be three stories high, surmounted by a cupola. The basement will be of concrete, and the upper part chiselled Deschambault granite. The ground floor will have a 17 ft. ceiling, and the other two stories will be 12 ft., while the rotunda under the cupola will be 63 ft. The layout of the train shed provide for the laying of six tracks at once, with the ultimate intention of laying five additional tracks. The building is expected to be completed by the end of 1912.

The Commissioners are receiving tenders to Aug. 3, for the erection of station and other buildings on the line as follows:—Seection 10, from Cochrane to Currie, Ont.; section 11, from Fraser to Grant, Ont.; section 12, from Superior to Dugald, Ont.

Tenders are also being received for the erection of a coaling station having a capacity of 1,000 tons, at Grant, Ont., mileage 232.7, District D.

GRAND TRUNK PACIFIC RAILWAY.

The Winnipeg City Council has refused to approve of a proposal of the G.T.P.R. to close 36 streets and lanes in Fort Rouge, along the right-of-way from Pembina Road to Oak Point Jct.

In connection with the proposed G.T.P. branch line into Brandon, Man., a plan has been submitted to the City Council showing an entry at the south east corner of the city boundary, passing north of the exhibition ground, and paralleling the Canadian Northern Ry. to a junction with the Brandon, Saskatchewan and Hudson Bay Ry., a Great Northern Ry. line.

The Board of Railway Commissioners has authorized the opening for traffic of the branch from Melville northerly to Canora, Sask., and of the Melville-Regina branch from Melville to Balcarres, Sask. The grading on this latter branch has been completed into Regina, and track laying is in progress. A bridge is under construction across Berry Creek, and this is expected to be completed in the fall. Work is to be started at once on the line from Regina to the International boundary, for which line the whole of the plans have been approved by the Board of Railway Commissioners. The line will terminate on the boundary in sec. 6, tp. 1, range 2, west of the second meridan. It is said that one of the Great Northern Ry. branch lines will be connected with this branch, and that G.N.R. trains will be operated over it into Regina. Grading is reported to be completed westerly from Regina, as far as Pasqua, in the direction of Moose Jaw.

The Board of Railway Commissioners has approved of location plans from mileage 20.3, at the east line of sec. 28, to mileage 40.01, at the west line of sec. 3, tp. 17, range 26, west of the second meridan, and also for a branch line from Moose Jaw, north westerly from the east line of sec. 36, tp. 16, range 27, to the west line of sec. 11, tp. 21, range 4, west of the third meridian, Sask., mileage 0 to 48.55.

The extension of the branch line from Young to Prince Albert, Sask., is expected to be completed this year. It will be 100 miles long, and 60 miles of track have been laid. Track laying is in progress on the remaining 40 miles.

From Biggar, Sask., a branch line is under construction to Battleford. Grading is reported to be practically completed and it is expected to have the track laid by Dec. 31.

The Board of Railway Commissioners has authorized the opening for traffic of the line from Biggar towards Calgary, mileage 0, to 19.97. A considerable mileage has been graded beyond this point, and tracklaying will be gone on with at an early date. It is intended that this line will effect a junction with the Tofield-Calgary branch, a few miles north of Calgary. Authority has been given by the Board of Railway Commissioners to run freight trains over this latter branch from Tofield to the crossing of the Red Deer River. This line is under construction to Calgary, but considerable difficulty is being experienced in obtaining a route, owing to the objections raised by the C.P.R. to the crossing of the irrigation ditches on its lands. The general route plan has been approved by the Board of Railway Commissioners, and the question of the crossing of the ditches was heard at a special session of the Board, July 18.

Route plans have been filed for a line from Calgary to Nanton and on to Lethbridge, Alta. Surveys are being made for an extension via Raymond to Coutts on the International boundary.

Grading on the main line west of Edmonton is reported to be well advanced as far as Tete Jaune Cache, to which point a contract has been let. Track has been laid to Athabasca River, 210 miles west of Edmonton, and less than 30 miles from Yellow Head Pass. The subcontractors are getting their plant on to the last 20 miles to be graded, and it is expected to have this completed by Dec. 31.

We are officially advised that tenders will be received to Aug. 15 for the building of the last portion of the main line, viz., the 410 miles intervening between Tete Jaune Cache to Aldermere, B.C.

A contract is reported to have been let to Foley, Welch and Stewart for a tunnel, about 0.25 mile in length, at mileage 44 from Prince Rupert, in order to avoid the construction of snowslides. The work is expected to be completed by Jan. 1, 1913.

We are advised that it is not proposed to do anything in the way of preparing plant, etc., on the company's projected dry-dock, shops and roundhouses at Prince Rupert until the agreement covering the tax assessment has been approved by the electors.

Collingwood Schreiber, Consulting Engineer to the Dominion Government, arrived in Vancouver, July 10, from Prince Rupert, B.C., having completed a trip of inspection over the coast section of the G.T.P.R. In an interview he is reported to have stated that owing to the decreasing mileage of railways under construction in the United States the contractors on the line had been enabled to secure practically all the men needed. The line was in operation for nearly 100 miles from Prince Rupert, and over 75% of the grading had been completed between Copper River and Hazleton. There had been some delay in the bridge work owing to high water in the river at Hazleton. It was expected that track would be laid to Hazleton by Dec. 31. From Hazleton to Aldermere the grading was well forward. (July, pg. 623.)

National Transcontinental Railway Station at Quebec.

Tenders were received to Aug. 31 by the N.T.R. Commissioners for the erection complete of a terminal station in Quebec, in accordance with plans and specifications prepared under the direction of the Commission, and approved of by G.T. Pacific Ry. officers.

The plans and specifications, which were prepared by Marchand and Haskell, architects, provide for a building on the site of the old Champlain Market, to be used as a passenger station for the N.T.R., which is to be operated by the G.T. Pacific Ry. The plans show a building facing on the square, the terrace side being 257 ft. wide, with a depth of 124 ft. for the main building.

The main front shows a handsome elevation, the central portion being carried considerably above the rest of the building. The feature of this part is a well designed arch, flanked by pillars, and finished with capstone and pediment. Passing through the main entrance doors, a large vestibule is reached, off which are the elevators, stairway, and booths, which will be devoted to purposes not yet defined. From the vestibule entrance is obtained to the rotunda, which is surrounded by a dome 41½ ft. in diameter. Off the rotunda are arranged ticket offices, parcel office, Canadian Express bondroom, Canadian and U.S. customs officers, a large baggage room, with public area; telegraph office, etc. Another vestibule leads from the rotunda to the concourse, which extends the whole length of the building. Off the rotunda is the general waiting room in the centre of the building, and in the main front is the lunch counter and restaurant, while on the concourse side are the waiting rooms for men and women respectively, to each of which is attached ample toilet and lavatory accommodation. A vestibule leads to a platform 53 ft. wide between the station building and the train shed. Upstairs there will be two floors over the main building, which will be used by the G.T. Pacific Ry. as offices. The baggage room, extending the full width of the building, is on the harbor side. The plans contemplate 11 tracks, of which six are to be laid at once, alongside which will be platforms 650 ft. in length. We are advised that a train shed is not contemplated at present.

The main building is to be of Deschambault white stone. The building is estimated to cost about $750,000, and it is expected to have it completed by the end of 1912.

National Transcontinental Railway Construction, Etc.

At a meeting of the Moncton, N.B., city council, Aug. 8, the Mayor said the N.T.R. Commissioners had decided that freight yards and machine shops were necessary, and that work was to be started in providing them. The immediate expenditure would be abou. $500,000. A committee was appointed to meet the engineers and arrange as to the concessions asked for.

Press reports, Aug. 11, state that J. H. Corbett, of Corbett and Floesch, has arrived in Moncton for the purpose of starting work on the yards, etc., and that the necessary construction plant is on the way to Moncton. The plans are said to include the laying of ten miles of track in the yards.

Tenders are under consideration for the building of trainmen's houses at the following points:—Napadogan and Edmundston, N.B.; Laurier, St. Foye and Fitzpatrick, Que.; Cochrane, Graham and Redditt, Ont., and Transcona, Man.

A Moncton, N.B., press report, Aug. 14, states that a contract has been let to Dr. Murray and John Leah for the erection of station and other buildings on the line between Moncton and Beaver Brook, N.B., at an estimated cost of $150,000.

A contract is reported to have been let to J. H. Gignon, Quebec, for the erection of station buildings at 35 points on the Quebec section.

Steel is reported to have been laid 150 miles easterly from Cochrane, Ont., of which 50 miles have been laid this season. The contractors, Foley, Welch and Stewart, are ballasting and finishing up their contract.

It is said that as a result of a conference held at Ottawa, July 31, the G.T. Pacific Ry. will take over the section of the line from Winnipeg to the junction with its branch to Fort William, Ont., at an early date. This section of the line has been operated by the contractors for some months. It is said that the question of taking over the section of the line from the south bank of the St. Lawrence River to Moncton, which is now nearly completed, was also discussed, but that no decision was reached.

The Commissioners will receive to Sept. 4, tenders for the supply of 2,000 gross tons of 80 lb. steel rails, to be delivered at Moncton, N.B.

The yards at Transcona, Man., are being surfaced and lined up by the contractors, the J. D. McArthur Co. The storage capacity at present completed is for about 1,000 cars, and this will be considerably increased when the work is completed.

We are officially advised that a contract has been let to Haney, Quinlan and Robertson for the erection of the car shops at Transcona, Man., described on pg. 741 of our Aug. issue. This firm is completing the erection of the locomotive shops at the same place. (Aug., pg. 747.)

National Transcontinental Railway Construction, Etc.

The plans for the entrance of the N.T.R. into Quebec, are divided into two sections, the first showing the double-track line between the bridge over the St. Lawrence River, and the terminal yard, and the second the general arrangement of the tracks and buildings in the terminal yard. There will be one yard with four sets of tracks, parallel with Champlain St., along the harbor front between some existing ice houses, and near Lampson's Cove; while the real terminal yards and terminal buildings will extend from near the Allan Co.'s pier, to the boundaries of the Champlain market site. The whole area between Champlain St. and the protection wall will be covered with tracks, and provision is made at the waterfront for a freight shed 500 ft. by 80 ft. Provision is also made for other buildings at convenient points in the yard. The station site is 200 by 100 ft., with a 50 ft. concourse. The platforms 608 by 15 ft. will extend from the concourse to near the existing Queen's wharf, three platforms being shown on the plan. Tenders for the erection of the station building, a description of which was given in our last issue, are under consideration.

Contracts are reported to have been let to C. A. Murphy and J. A. Lea, Moncton, N.B., for the erection of buildings on the line between Moncton and Beaver Brook, N.B., at an estimated cost of $150,000. Tenders will be received to Oct. 2, for the erection of a trainmen's house at Cochrane, Ont.

We are advised that it is not contemplated that any change will be made at present in the operation of the N.T.R. from Winnipeg to Lake Superior Jct. The G.T. Pacific Ry. began to operate its trains on the section in Oct., 1910, but under the contract with the Government, will not take over any part until the whole line is completed through between Winnipeg and Moncton.

Rapid progress is being made with the laying out of the yards at Transcona, near Winnipeg, the site of the principal western shops. About 125 carloads of gravel a day have been dumped round the buildings for filling in, and levelling and tracklaying is being proceeded with. The J. D. McArthur Co. is doing the work. The erection of the buildings by Haney, Quinlan and Robinson, is making satisfactory progress.

We were advised Sept. 20, that a contract has been let to J. King, for the construction of station and other buildings on the line between Cochrane and Superior Jct., Ont. Press reports state that portions of the work have been sublet to C. Masher, A. Haequoll and J. Lavoie.

Grand Trunk Pacific Railway

National Transcontinental Railway Construction, Etc.

A report given out at Ottawa, Nov. 1, set out that on Oct. 1, to which date the figures had all been received, track had been laid on 1,245 miles of the 1,845 miles between Moncton and Winnipeg. This track has been laid on different contracts and has not been connected. The report further states that owing to its inaccessibility, work has not been started on a section of 115 miles in the Abitibi country, for which Macdonnell and O'Brien are contractors. In connection with this report, J. T. Davis, one of the firm having the contract for the line from the Quebec Bridge location towards the New Brunswick boundary, stated recently that the work would be completed during 1912.

The shops at Transcona, Man., are expected to be opened early in January, 1912. At present only the motive power and car repair shops have been built, and work is in progress on the other shops.

R. W. Leonard, the newly appointed Chairman of the Commission, entered upon his duties Oct. 26, and after attending to office details, began on Nov. 4 the inspection of the work under construction. The first portion of the line visited was the district under the charge of A. E. Doucet. He completed the inspection of the finished line from Quebec towards Weymontachene, and on Nov. 14, left Ottawa for Winnipeg to inspect the work in progress there, the completed line to Superior Jct., and the work easterly from that point. (Nov., pg. 1059.)

Transcona
November 1911

National Transcontinental Railway Construction, Etc.

Tenders will be received by the Commissioners to Nov. 8, for the construction and erection complete of two 150 h.p. horizontal return tubular boilers and boiler room equipment in the engine houses at Napadogan, and Edmundston, N.B., and three similar boilers at Cochrane, Ont.

We are officially advised that the contract for the building of the terminal station at Quebec has been let to Jos. Gosselin, Levis, Que. The ex-Minister of Railways stated Oct. 2, that the contract had been awarded to the lowest tenderer for $745,015. A description and plans of the building were given in our Sept. issue.

The new Minister of Railways, Hon. F. Cochrane, issued an order Oct. 16, directing that contractors engaged on contracts in connection with the railway entered into since the dissolution of Parliament, are to cease work. The reason for this order is that there is no money on hand to pay progress estimates, on these works, the necessary supplies not having been voted prior to dissolution. The order does not affect work being done on contracts entered into prior to dissolution, for which supplies had been voted. As a result of a further consideration of the matter the contractors are allowed to proceed with foundations on station and other buildings. This permission does not extend to the contractor for the terminal station at Quebec.

It was recently reported in Fort William, that track had been laid easterly for about 100 miles from Superior Jct., Ont., and it was expected that the steel laying gang would reach Lake Nipigon by the end of the year. (Oct., pg. 941.)

The shops at Transcona, Man., it is reported, will be completed in about six weeks, and the repair of locomotives, etc., will be started with the new year.

F. J. McIntosh, Assistant District Engineer, St. Boniface, Man., stated Oct. 12 that there was no truth in the reports that the piers of the bridge over the Seine River were sinking because of the weakness of the foundations. The two piers and abutments were completed during the summer and the steel work is practically completed. There has, he says, been absolutely no movement of the bridge since the concrete was placed.

A later dispatch states that the foundation for the report as to the state of the bridge, lies in the fact that one of the approaches was built over a sewer at Archibald St., which caved in, and caused a crack in the west wing wall.

Grand Trunk Pacific Railway

The Railway and Marine World

February, 1912.

The National Transcontinental Railway Shops at Transcona.

Progress in the construction of the N.T.R. shops at Transcona has been noted in The Railway and Marine World as the work advanced. These descriptions in the various stages of completion were published in Aug., 1909, Aug. and Sept., 1910, and July, 1911. A number of changes, some of which involved considerable rearrangement, have from time to time been made so that the completed scheme, more particularly as it relates to the car department, is materially different from that at first outlined. In view of these changes, and the fact that the shops are now nearing completion, a complete illustrated article describing them in detail has been prepared.

These shops, located at Transcona, some six miles east of Winnipeg, on the N.T.R. main line, are intended to look after the repairs to a total of 1,860 miles of road, and have been designed with that object in view. In conjunction with the shops to be constructed at Quebec, the whole line from Winnipeg east to Moncton, will be provided for. An idea of their extent may be gained from fig. 1, an isometric scale projection of the shops. It is said that next to the C.P.R. Angus shops at Montreal, they will be the largest in Canada.

The details of the locomotive shop plant were partially developed and constructed under the supervision of F. W. Walker, M.E., Superintendent of Terminal Shops, N.T.R., who, however, resigned on July 1, 1911. W. J. Press, M.E., was, in May, 1910, appointed Mechanical Engineer, and Machinery Expert, and has since then had entire control of the completion of the locomotive shops and construction of the car shops, together with the selection and location of machinery and equipment placed in the locomotive shops, and to be placed in the car shops, and also of all mechanical equipment along the N.T.R. line. D. A. Evans, who is one of his assistants at Winnipeg, has done very good work in connection with the locomotive shop plant.

As above stated, the original purpose of the shops is to provide for repairs for the N.T.R. east of Winnipeg, which line on completion will be operated by the Grand Trunk Pacific Ry. Co. They will also be used for repairs for G.T.P.R. lines west of Winnipeg, though later on it will no doubt become necessary for the G.T.P.R. to build shops in the west, as the C.P.R. is about to do at Calgary.

The site chosen is the prairie, and in order to avoid any trouble from flooding during the spring freshets, the floor level of the shops has been raised about 4 ft. above that of the existing prairie by a heavy gravel fill over the whole area occupied by the buildings.

The various buildings have been grouped together as closely as possible to facilitate intercommunication during the severe winter, the intervening distances being made as short as possible. As will be noted from fig. 1, this feature has been carried out very successfully, considering the fact that the designers had in mind the building of a plant that would be capable of a further extension of 100% when traffic conditions should require it.

The various buildings are arranged along a midway running north and south across the property, and are served by a series of standard gauge and industrial tracks. The standard gauges branch off from the yard tracks to the south of the property. Additional communication between the buildings is obtained through the overhead travelling crane shown in fig. 1, which runs the whole length of the midway, serving all the main shops. This crane has 10 tons capacity, and is electrically operated, all exposed parts being covered by hoods in the usual manner. The operator's cage is electrically heated with a heater of the street car type. The runway is of steel construction, the steel columns supporting the girders being carried on concrete piers. Wherever possible, this runway is made a part of the adjoining building, dispensing with columns at these points.

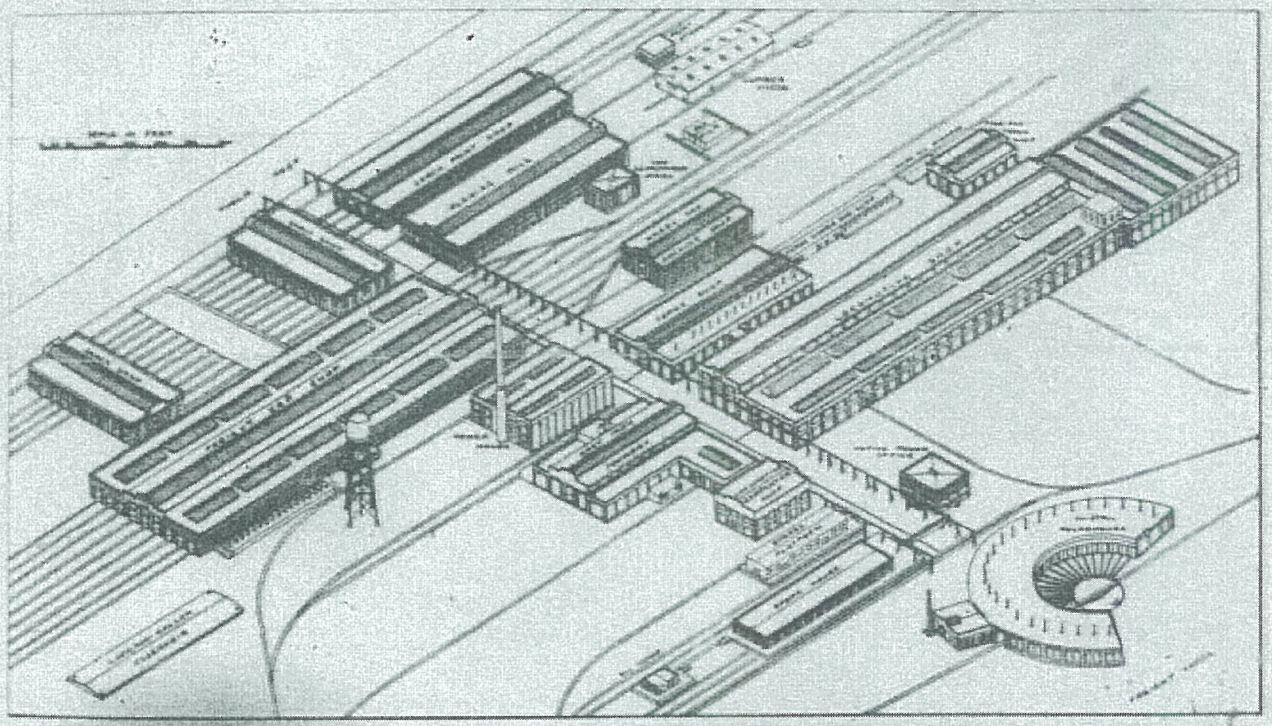


Fig. 1. Isometric Projection of Locomotive and Car Departments. (Copyright.)

As indicated in fig. 1, the car shops are to the north, and the locomotive shops to the south, the midway passing through each group of buildings. The divisional line is the through track running to the north of the power house, the latter being as centrally located as is feasible to reduce power and heat transmission losses to a minimum. The foundry and forge shops, being used by both departments are also centrally located between the groupings, the buildings that are distinctively car or loco-

motive being at the north and south ends of the midway respectively.

The buildings, with the exception of the storehouse, oil house and stores platform, are of steel construction with self-supporting steel frames, with concrete foundations and walls up to the windows. The balance of the superstructure masonry is brick, carried up into a parapet wall all around the building, and capped with a concrete coping. The roof drainage is carried down inside the buildings from receiving hoppers in the roof and through running traps to the sewers. All the large buildings are covered with a built-up roofing composed of felt and asphalt covered with gravel. All windows throughout the plant have ¼-in. thick ribbed glass, and the skylights are glazed with ¼-in. wire glass. As additional protection against heavy snow loads on the roof, the skylights are carried on steel ribs with rolled copper sheathing to carry the glass. Copper is used throughout for all flushing gutters and ventilators. The completed shops will have a total floor space of a little over 17 acres.

Mercury arc lights are being used for the principal interior shop illumination, with the lamps and reflectors hung high in the shop. This form of illumination is satisfactory, giving an easy, even light with no sharp shadows. In addition, there will be plug receptacles in all the buildings at frequent intervals for the attachment of lamps on cables for the illumination of boiler interiors and similarly hampered places. Daylight illumination is specially well provided for by ample window areas and wide skylights, giving the maximum of light. The steel-construction makes this possible. To utilize this lighting to the greatest advantage, the interiors of all the shops are painted white, so that the lighting is particularly good.

High and low pressure steam, water, compressed air and drinking water are distributed throughout the various buildings with numerous outlets. The piping distribution system is carried up and down the midway from the power house in a tunnel of sufficient size to permit a passage alongside the pipes, and branches to the various buildings are run from this tunnel in tile conduits packed with asbestos sponge. On entering the building, the piping is carried on the trusses and steel work of the shop. Fuel oil is distributed under pressure from the storage tanks to the furnaces in the boiler, locomotive and forge shops, while an accumulator gives the necessary pressure for the operation of the various hydraulic machines.

The shops are protected from fire by an extensive system of yard piping and fire hydrants, with hose houses at convenient spots. The electric travelling cranes throughout the plant are equipped with alternating-current motors, and are operated directly from the 2-phase circuits from the power house.

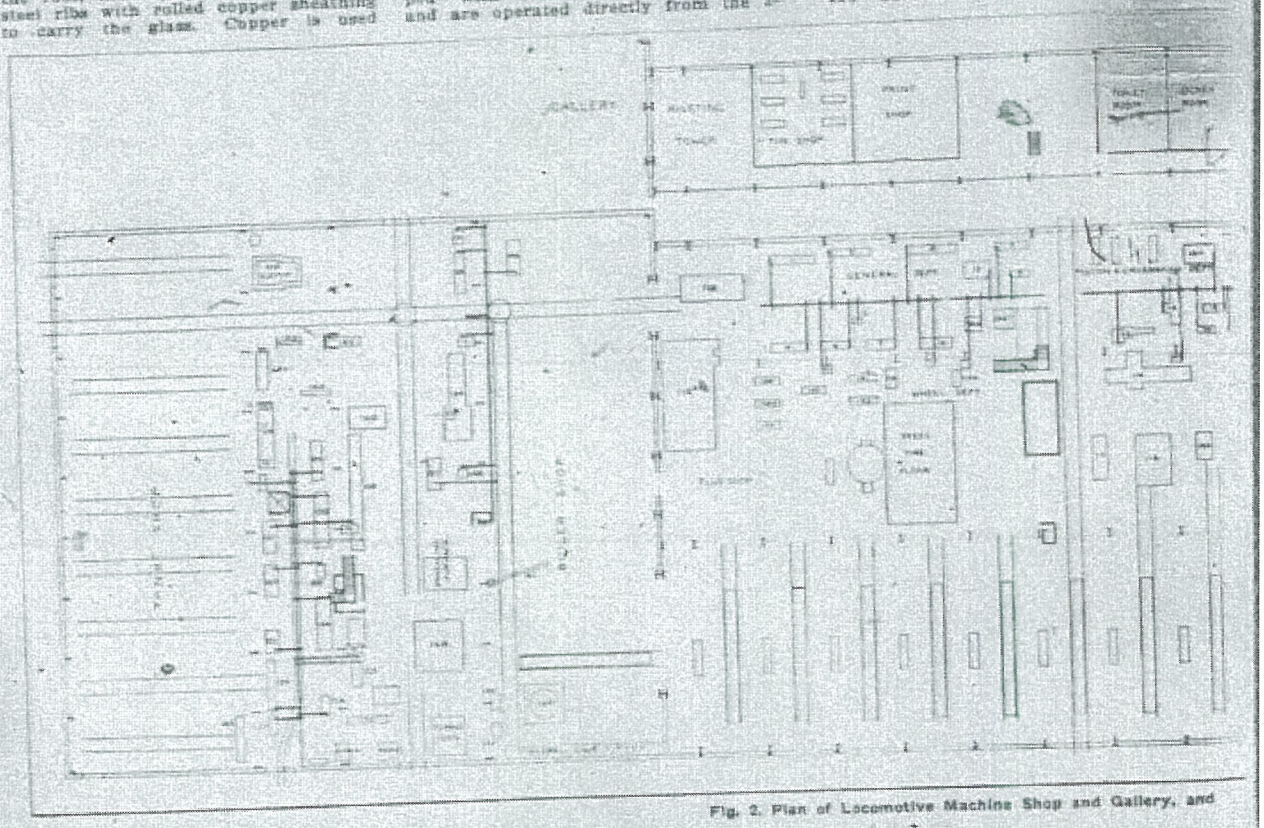


Fig. 2. Plan of Locomotive Machine Shop and Gallery, and

Locomotive Department.

THE LOCOMOTIVE, MACHINE AND ERECTING Shop, a plan view of which is given in the double-page illustration, fig. 2, is 615 ft. long, containing three bays. The main bay, which is 79 ft. wide, with a height to bottom of truss chord of 50 ft., is the section shown in the lower part of the illustration. It contains 25 locomotive pits. There are two entrances to these pits, at the sixth pit from each end. The locomotive, when entered, is picked up by a 120-ton electric crane which spans the 79-ft. bay, carrying the locomotive to the desired berth. This arrangement has certain advantages over the transfer table, and long track erecting floor layouts. A 10-ton electric crane of similar span used for general work, handles the majority of the parts.

Each pit is replete with plug connections for electric light cables for dark places, and also has valves for steam, water and air, each pit being a completely equipped unit in itself. A wall bracket crane between every alternate column is also provided. Between each pit there is the usual work bench fitted with the necessary equipment.

The next span is a 60-ft. bay containing all the heavier individual motor-driven machine tools where the bulkier and heaviest parts are handled. This is provided for by two 10-ton cranes for the handling of materials.

At the extreme left of this bay the flue shop is located adjoining the boiler shop contained in an extension to the locomotive shop, and which will be later described. The equipment of this shop is thorough, containing the following machines. (The first column refers to the index number on the illustration by which the machine can be located):

112 Chain rumbler with cleaning chain attachment.
138 Cold cutting-off machine.
138A Pipe machine.
139 Flue expander.
140 Flue welder and swedger.
141 Hot saw and expander.
142 Cut-off machine.
Staybolt nipper.
Pneumatic staybolt breaker.

The stationary machines of this lot are in a group drive, with the exception of 112, which has an individual motor. (Motor drive will hereafter be designated by "m.d.," unless otherwise noted).

The wheel department, which is next in order in this bay, is provided with all the necessary equipment, including the following machines:

113 32-in. Draw-cut shaper with crane.
113A. 12-in. Slotter.

There is also a large steel tire floor centrally located, with a lye vat of sufficient size that driving wheels, side rods, and similar parts may be completely immersed for cleaning off the grease.

Next in order comes the wheel department. In this section there are the following motor-driven tools:

114 60-in. Planer.
115 24-in. Slotter.
116 36-in. Boring mill.
117 Extension gap lathe.
118 600-ton Hydraulic wheel press.
120 90-in. Driving wheel lathe.
121 35-in. Quartering machine.
122 60-in. Wheel lathe.
124 60-in. Radial drill.

To the right of this section comes the balance of the heavy motor-driven machines, classed as a general department, with the following machine tools:

126 60-in. Planer.
128 30-in. Planer.
128 26-in. Draw cut shaper with crane.
129 30-in. Draw cut shaper with crane.
130 72-in. Vertical boring mill.
131 42-in. Vertical boring mill.
5 14-in. Bolt lathe.
6 16-in. Shaper.
7 60-in. Radial drill.
8 32-in. Engine lathe.
9 30-in. Engine lathe.
10 Horizontal boring mill.
11 50-ton Forcing press.
12 52-in. Vertical boring machine.
12A 42-in. Vertical boring machine.

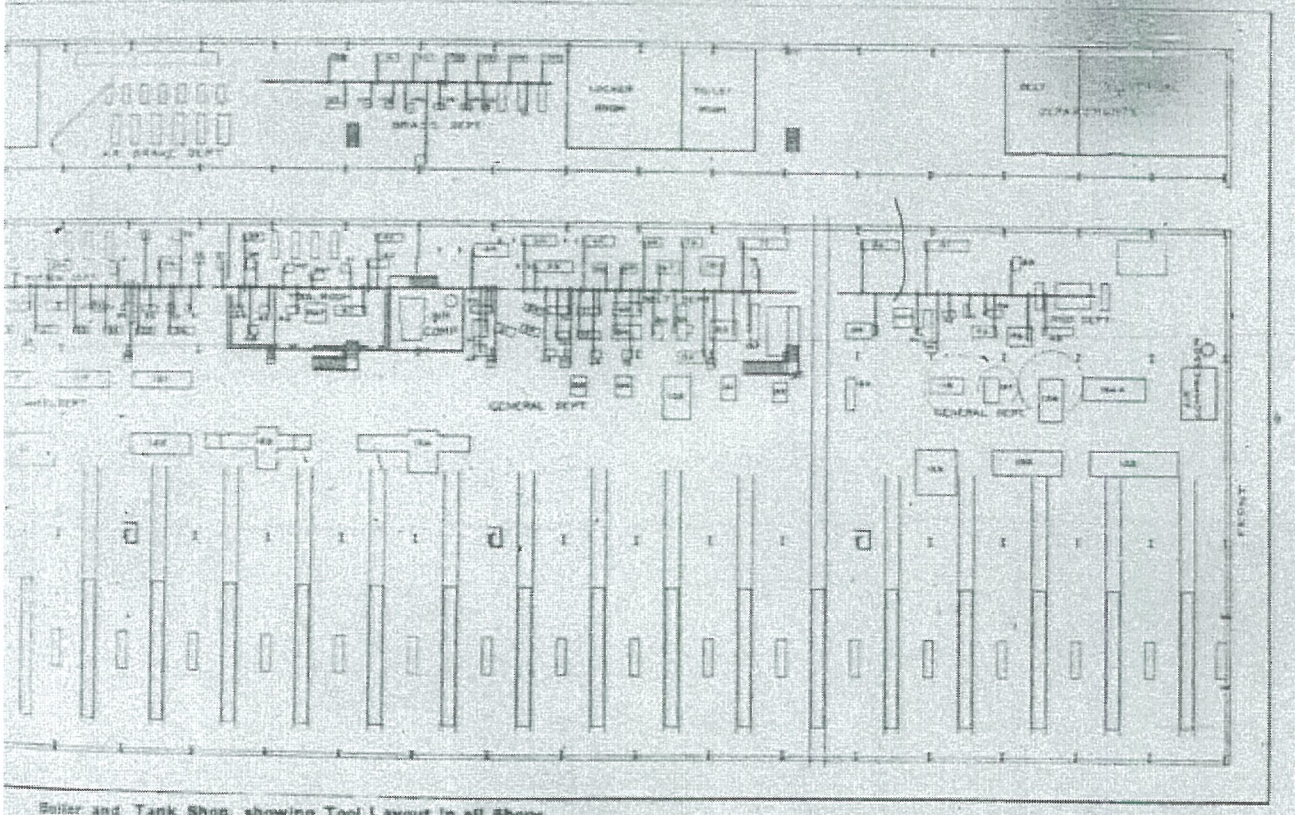
The piston, crosshead and motion department, which comes next in order, is very complete with a wide range of standard tools for this class of work. The 24 machines in this set have group drive divided into two sections with the heavier machines at the left end of the section in one drive. The complete list is as follows:

13 36-in. Planer.
13A Piston grinder.
14 Double emery wheel.
15 36-in. Radial drill.
16 16-in. Bolt lathe with taper attachment.
17 66-in. Radial drill.
18 48-in. Radial drill.
19 50-ton Forcing press.
20 16-in. Engine lathe with taper attachment.
21 Centreing machine.
22 Milling machine.
23 13-in. Emery grinder.
24 Disc grinder.
24A Link grinder.
25 16-in. Traverse shaper.
26 10-in. Slotter.
27 20-in. Engine lathe with taper attachment.
28 16-in. Engine lathe with taper attachment.
29 30-in. Planer.
30 14-in. Drill.
31 4-in. Hack saw.
32 Buffing machine.
33 Universal grinder with all attachments.
34 16-in. Engine lathe with taper attachments.
35 16-in. Engine lathe with taper attachments.
36 13-in. Engine lathe with taper attachments.

Alongside this section is the tool room in a closed partition. It has the usual tool room equipment for a shop of this size, as follows:

37 Grindstone.
38 16-in. Universal shaper.
39 14-in. Tool lathe with taper and relieving attachments.
40 6-spdle Drill.
41 2-spdle Drill.
42 13-in. Tool lathe with taper attachments.
43 14-in. Tool lathe with taper attachment and draw-in collets.
44 Twist drill grinder.
45 Reamer grinder with attachments.
46 Tool grinder.
46A 12-in. Speed lathe.
47 22-in. Engine lathe with taper attachments.
48 Milling machine.

An air compressor, electrically operated, in a compartment alongside the tool room, in conjunction with the air compressor at the right hand end of the middle bay, supplies all the air required in this shop, thus making it independent of the central plant air compressor in the powerhouse. Moreover, standing connections are provided, connected with the general air distribution for use in case of emergency.



Boiler and Tank Shop, showing Tool Layout in all Shops.

127 Combined milling machine.
132 13-in. Slotter.
119 6-ft. Radial drill.
137 26-in. Draw cut shaper with crane.
135 15-in. Vertical miller.
126A Locomotive rod boring machine.
133 60-in. Draw cut cylinder planer.
135 Special cylinder borer.
123 24 x 36-in. Milling machine.

Along the north side of the shop there is a third bay 40 ft. wide, extending the full length, with a gallery overhead. On the ground floor under the gallery the lighter group-driven machinery is placed as will be described. Commencing at the left, omitting for the present 178, a hydraulic riveter, there is first of all a general department consisting of the following smaller machine tools, belted to a jackshaft driven from two motors:

1 26-in. Engine lathe.
2 28-in. Engine lathe.
3 Double emery grinder.
4 26-in., 12-ft. Bed engine lathe.

49 3-in. x 36-in. Hollow hex. turret lathe.

operates under the large crane, and is

50 3-in. x 16-in. Hollow hex. turret lathe.
51 4-in. Hack saw.
52 4-in. Hack saw.
53 3-in. x 24-in. Hollow hex turret lathe.
54 Automatic lathe.
55 Centering machine.
56 14-in. Bolt lathe with taper attachment.

57 Automatic screw machine.
58 Automatic screw machine.
62 Emery wheel.
63 2-spdle. Drill.
64 4-spdle. Drill.
65 Hollow hexagon nut facer.
66 Nut facer with complete attachments.
67 2-in. Bolt cutter.
68 1¾-in. Screw machine.
69 2-in. 4-spdle. Nut tapper.
70 14-in. Bolt lathe with taper attachments.
71 16-in. Bolt lathe with taper attachments.
72 16-in. Bolt lathe with taper attachment.
75 6-spdle. Drill.
76 16-in. Engine lathe.
73 Centering machine.
74 1½-in. Triple head bolt cutter.
77 30-in. Engine lathe with taper attachment.
78 2-in. Triple head bolt cutter.
78A 6-spdle. Stayholt threader.
79 Grindstone.
80 16-in. Shaper.
81 27-in. Planer.
82 20-in. Engine lathe with taper attachment.
83 27-in. Planer.
84 2-in. Spindle drill.
85 36-in. Vertical boring machine.

At the front end of the shop is located the rod department with tools as follows:

86 32-64-in. Engine lathe with taper attachment.
87 28-in. Engine lathe.
88 30-ton Forcing press.
89 48-in. Radial drill.
90 Guide bar grinder.
91 Grindstone.
92 Double emery grinder.
93 26-in. Boring mill, turret attachment.
94 32-in. Drill.
95 20-in. Engine lathe with taper attachment.
96 37-in. Boring mill.

Coming next to the gallery, which extends the full length to the shop over the 40-ft. bay, it is here that the departments with lightest machinery, etc., are located. From the left the first compartment is the tin shop, which is very fully equipped with the best tin shop appliances, including formers, folders, shears, grooverz, turners, burrers, etc. Alongside this room is the paint shop for the storage of paint for the locomotive department.

Proceeding along the gallery, the next room passed is the lavatory, equipped with the latest and best shop lavatory utensils. The [illegible] adjoining contains double tiers [illegible] 12 x 42 sheet steel lockers with expanded metal doors.

Next in order is the air brake department, where all the air brake apparatus is to be tested and repaired. It is fitted out with the usual standard testing devices with the necessary tables and stands as shown.

The brass department, which comes next, contains a series of brass working tools working from an electric group drive. These machines are as follows:

97 18-in. Engine lathe.
98 18-in. Monitor geared head lathe.
99 18-in. Monitor geared head lathe.
100 18-in. Monitor geared head lathe.
101 18-in. Geared head lathe.
102 2-in. Spindle miller.
103 18-in. Monitor lathe with taper attachments.
104 24-in. Radial drill.
105 Turret drill.
106 14-in. Crank-driven shaper.
107 18-in. Engine lathe with taper attachment.
108 18-in. Monitor lathe with taper attachment.
109 Buffing machine.
110 Cock grinder.
111 Bench grinder.

Next to this brass department is a similar set of locker and toilet rooms to those just described. In the corner at the front of the building are the belt and electrical departments.

In addition to the toilet rooms provided in the gallery, there are four urinal stands located at uniform distances down the shop at the columns forming the dividing line between the erecting and electrical departments.

Indirect heating apparatus is installed in the building of sufficient capacity to keep all parts of the shop at a temperature of 60 degs. F. when the outside temperature stands at 20 below zero. Exhaust steam from the powerhouse and the exhaust of the circulating fans is supplied to the heating coils, and the air drawn through these coils is driven by fans through the underground concrete ducts and delivered into the building at floor level through outlets along both walls under the windows.

The flooring of the ground part consists of 3-in. wooden planking spiked to sleepers bedded in bituminous concrete. The gallery floor is of concrete.

THE BOILER AND TANK SHOP is located at the extreme rear end of the locomotive shop, as shown at the left of fig. 2. This shop, 180 ft. in length, has four bays, 80, 50, 30 and 65 ft. wide respectively, running at right angles to the locomotive shop bays. The height of the shop is 36 ft. from the floor to the bottom chord of the roof truss.

The 80-ft. bay, adjoining the locomotive shop, is for general boiler work for erection purposes. It is served by a 30-ton travelling crane running the length of this bay. At the north end in the end of the locomotive shop through a large opening, located in the usual tower, there is a 17-ft. 6-in. gap riveter, 178, served by a 20-ton electric crane. This tower is served from the boiler shop by a service track for the transferring of the boilers. At the lower end of the boiler shop bay there is a testing pit, and alongside a 12-in. by 15-ft. hydraulic accumulator, 169. Along the wall are the hydraulic engineers' and fitters' benches.

The second bay, 50 ft. wide, is devoted to heavy machinery and is served by a 10-ton electric crane for the handling of the material. The machine equipment of this bay is as follows:

170 12-ft. Flange clamp.
172 Tripiex 3 x 8 hydraulic pump (m.d.)
167 Wall radial drill (m.d.)
168 560-ton, 4-col. Hydraulic forging press.
147 Punch and shear.
148 Grinder.
166 14-ft. Horizontal bending rolls (m.d.)
153 25-ft. Plate planer.
154 42-in. Car wheel lathe (m.d.)
165A Car box borer (m.d.)
144 8-ft. Hand lever flanging clamp
143 6-in. Hand rolls.

This bay has a gallery extending 10 ft. over it up to which the stairs indicated lead. This gallery contains the indirect heating plant for the building and in addition the locker and toilet rooms. The balance or open section of the bay is served by a 5-ton electric travelling crane.

The rear or 65-ft. bay houses the tank shop stands, where 9 tracks are provided for tender tank repairs. A 20-ton crane spans this bay and handles the necessary materials.

This building is also heated by the direct radiation, a system of ducts and outlets similar to those in the locomotive shop being used. A 3-in. wood floor of similar construction is also used throughout. In the light-machine bay there is also a motor-driven air compressor, making this shop equally independent of the powerhouse for its compressed air supply. Standby connection is also made with the locomotive shop line.

One characteristic particularly noticeable in this shop is the convenient layout of the tools in such a manner that there is no interference from near-by machines while either one is being operated upon. This feature required special attention, considerable study being devoted to the arrangement of tools

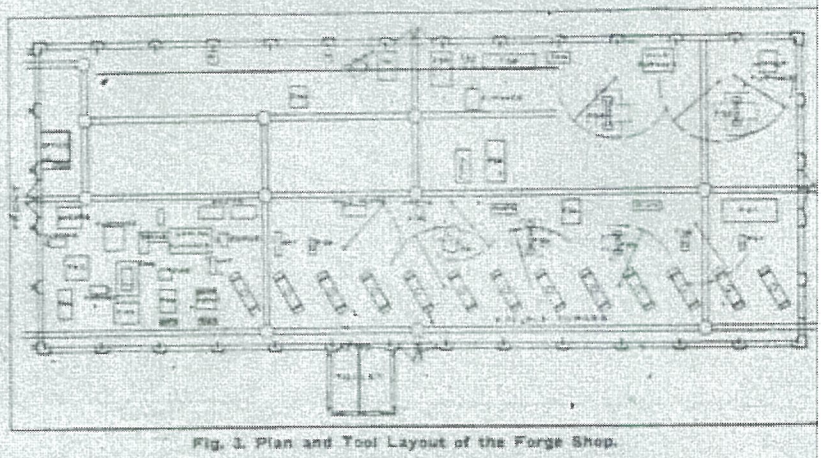


Fig. 3. Plan and Tool Layout of the Forge Shop.

170 61-in. Throat horiz. hydraulic punch.
162 Single end punch and shear (m.d.)
75 2-in. Triple head bolt cutter.
146 4-spdle. Drill.
151 4-spdle. Drill.

In addition to these, there are the forges, flange fire and annealing furnaces indicated. All power-driven machines are group drive except where otherwise noted. Like the last bay, there is a standard gauge track running its length with end turntable to transfer to the through track.

The third or 30-ft. bay contains all the lighter machinery, most of which is operated in a group drive. The machines are:

165 200-ton Hydraulic wheel press (m.d.)
157 24-in. Drill press.
154 Small punch.
155 30-in. Rod drill.
152 48-in. Rod drill.
155 12-in. Slotter.
149 Axle lathe with crane.
160 36-in. Car wheel boring machine
180 2-spdle. Drill.
161 36-in. Car wheel boring machine
150 Axle lathe.
156 Double emery grinder.
145 7-ft. Belt-driven bending rolls.

handle the standard sizes of plates and shapes used in boiler and tank practice. This studied arrangement is especially apparent around the group of machines 144, 143 and 162, where standard boiler plates may be readily flanged, rolled, punched or sheared without interference.

In addition to the equipment enumerated in the foregoing for both locomotive and boiler shops, there is considerable equipment of a miscellaneous nature. This includes such items as 6 each of 50, 40, 35 and 25-ton jacks, 90 bench vises, 18 heavy trucks, taps, dies, etc., chisels, pinch bars, sledges, box wrenches, surface blocks and oil burners.

THE FORGE SHOP is the first building north of the locomotive shop building as indicated in fig. 1. The interior arrangement of the tools and machines in this building is clearly shown in fig. 3. It is 240 by 190 ft., spanned by a single truss providing unhampered space for the location of the equipment.

The front of the building is to the left in fig. 3. On entering, the spring department is to the right in the southwest corner of the building. It is equipped to handle spring work for both locomotive and car departments, and has the following machines:

F43 Hydraulic squeezer.
F44 Hydraulic spring bender.
F45 Hydraulic punch.
F46 Hydraulic band remover.
F47 Combined nipper and trimmer.
F48 Tapering rolls.

The necessary furnaces, baths and tanks are also provided as noted, and the [illegible] conveniently arranged. Ample [illegible] is provided to the north for the storage of the raw and finished pro-

Further down the shop on the same side there is a row of 13 double forges [illegible] angle as dictated by good prac- [illegible] Adjacent to these is a row of six hammers, as follows:

F27 100-lb. Hammer.
F28 1250-lb. Hammer.
F29 1500-lb. Hammer.
F30 2000-lb. Hammer.
F31 3300-lb. Hammer.
F32 200-lb. Hammer.

It is here that the medium weight work is handled. In this section of the shop there is also a frame fire and necessary face plate, as well as these two machines:

F35 Vertical hydraulic shear.
F37 Alligator shear (m.d.)

The north side of the shop cares for the heavy work at the rear, where the following two machines:

F34 3500-lb. Hammer.
F34 5000-lb. Hammer.

with accompanying furnaces handle the heavier billets. All the steam hammers and large fires are provided with jib cranes for the handling of the work. Their locations are indicated in the illustration. F45 is a hydraulic bulldozer, with accompanying furnace, and F32 is a 3¼-in. forging machine. The balance of large equipment is:

F33 Cutting-off and centering machine.
F42 Emery grinder.
F41 1½-in. Bolt machine.
F40 Hydraulic bar shear.

The balance of the floor space is for the storage of stock, dies, etc.

A small industrial track with necessary turntables, covers the building. At the front there is a foreman's office, while in a small two-story addition from the south side are the locker and toilet rooms.

The steam to the hammers, exhaust, oil and hydraulic piping are carried in concrete ducts through the shop to the various machines. The building is heated by indirect radiation from coils along the walls under the windows.

FORGE STORES AND SCRAP BINS are housed in a frame structure 36 by 220 ft., extending to the rear of the forge shop. The east 100 ft., i.e., the section furthest to the rear, is built with a roofed platform raised 4 ft. above the grades for the convenient handling of material to and from cars. This platform is divided into bins for sorting and storage of scrap. The section not raised is completely enclosed with plank lining inside and drop siding outside, and forms storage for coke, coal and iron stock. The iron stockroom is arranged with an extensive rack system for storing the different stock sizes for use in the forge shop. The coal and coke storage bins are arranged with roof hatches in order that cars may be unloaded by a clam shell and crane from the car and the coal or coke dropped through the roof. Industrial tracks connecting with those in the forge shop provide easy access for the entrance of materials and supplies.

FROG AND TRACK SHOP.—This department is located in a building some distance to the rear of the forge stores and scrap bins. The building is 60 by 100 ft., with a 24-ft. clearance between floor and truss, and is spanned by a 10-ton electric travelling crane for the handling of the work. The shop was designed having in view the looking after of all repairs to frogs, switches, interlocking plants, and general track machine work. Fig. 4 shows the layout.

All the heavier motor-driven equipment occupies the body of the building, while the lighter, group-driven machinery is ranged along the walls. The whole is served by a continuation of the industrial trackage before referred to, with necessary turntables for spur tracks. The machinery equipment is as follows:

T1 18-in. Double head traverse shaper.
T2 12-in. Railway frog slotter.
T3 Cold cut-off saw.
T4 14-in. Double emery.
T8 Frog and switch planer (m.d.)
T12 Rail bender for rails up to 100 lbs. (m.d.)
T11 Bulldozer with crane (m.d.)
T5 200-lb. Strap hammer with crane.
T7 125-lb. Strap hammer with crane.
T9 25-in. Throat punch and shears (m.d.)
T15 24-in. Planer (m.d.)
T13 36-in. Radial drill (m.d.)
T14 36-in. Radial drill (m.d.)
T24 Cut-off saw (m.d.)
T23 3-spdle. Drill (m.d.)
T22 26-in. Planer (m.d.)
T21 Milling machine.
T16 16-in. Shaper.
T17 14-in. Bolt lathe.
T18 18-in. Engine lathe with taper attachments.
T20 6 x 36-in. Grindstone.
T19 24-in. Drill.

In addition to this equipment there is the usual miscellaneous material, including blower and motor, anvils and stands, sledges, set of blacksmith's tools, forges and furnaces.

The toilet and locker room is located in the southeast corner of the building, surrounded by an 8-ft. cement wall reinforced by expanded metal, thus allowing the crane to pass over it. The shop floor as in the other shops is formed of 3-in. wood spiked to sleepers bedded in bituminous concrete. Direct radiation from coils ranged along the walls is used to heat this building, owing to its comparatively small size.

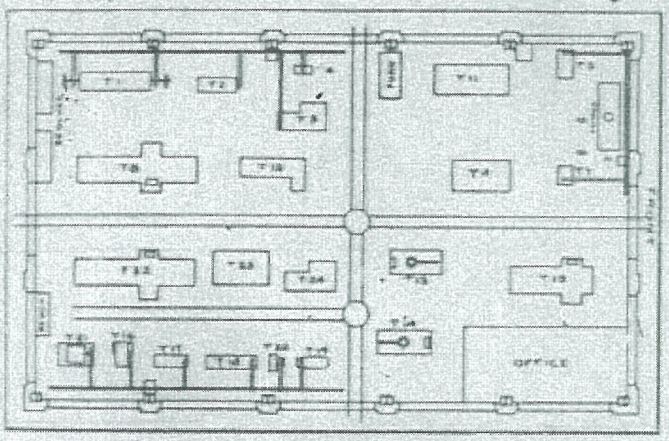


Fig. 4. Plan and Tool Layout of Frog and Track Shop.

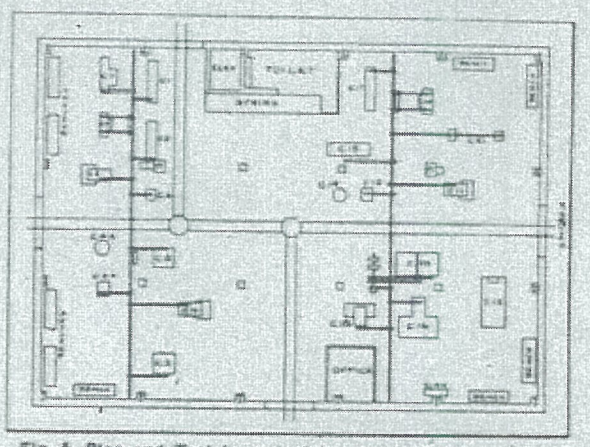


Fig. 5. Plan and Tool Layout of Locomotive Carpenter and Pattern Shop.

THE CRUDE OIL STORAGE building is a 25 by 60 ft. concrete structure close beside the frog and track shop, and owing to the nature of its contents, is built mostly underground, the floor being 8 ft. below the grade, with the side walls projecting only 2½ ft. above the ground. A concrete roof carried on steel beams closes in the building, making it thoroughly fireproof.

Inside, on concrete foundations, there are four iron storage tanks, each with a capacity of about 8,000 gals. of crude oil. Compressed air connections are made to these tanks and the oil is forced out and distributed to the various buildings requiring it.

The tanks are so arranged that the pressure can be cut off and the tanks filled by gravity from tank cars standing on sidings alongside the building. Piping connections to the outside of the building, fitted with lock-up valves, are supplied for this purpose.

THE STORE HOUSE building is located at the southern end of the midway, directly across from the locomotive erecting shop. It consists of a large reinforced concrete platform 4 ft. above grade in order to have car and platform on the

same level for the handling of supplies from the storehouse to the various buildings.

On the platform there is a brick building 40 by 260 ft. with reinforced concrete roof carried on concrete posts. The front portion of this building is fitted up for an office for the storekeeper and clerks, and has a fireproof vault. The balance of the building is equipped with an extensive system of shelving, racks, reels, etc., suitable for arranging the varied stock of materials which the storehouse contains. Side doors along each side of the building give ready access to the interior from the wide loading platforms.

The building is lighted with incandescent lamps and is heated by a system of direct radiation coils. The office portion of the building has maple flooring throughout and the balance has a cement finish on top of the reinforced concrete, the same as the platform.

THE OIL HOUSE stands about 100 ft. to the rear of the store house on a platform 56 by 70 ft., and 4 ft. above the grade the same as the storehouse platform to which it is joined by a connecting platform at the same level. This connecting platform has ramps leading up to it from grade level at both ends.

The oil house has a basement below the platform with a 10-ft. headroom. In this basement on concrete foundations are 2 storage tanks for holding the various kinds of oil in stock. An additional tank for holding gasoline is buried outside the building with a pump connection into the building. The tanks are filled either by gravity through fill pipes from tank cars standing alongside the building, or else from barrels poured into fill boxes set in the platform floor and connected to the tank fill pipes. A system of drainage pipes is arranged for cleaning out the tanks.

On the top of the platform there is a small brick building 30 ft. long with concrete roof and divided into two rooms by a concrete wall. The oil in the tanks below is handled by Bowser measuring pumps located in one of these rooms. The other room is used for storing oil cans, waste, etc.

Connecting basement and outside platform level there is a hydraulic elevator for the handling of barrels and similar material from the basement storage. There is also a stairway to the basement from inside the building, and also a pump running down from the outside.

The building and basement are heated by direct radiation coils and the floor is the same as the balance of the platform. The building is made as fireproof as possible, and the windows are glazed with ¼-in. wire glass.

THE STORES PLATFORM is situated on the midway, alongside the storehouse, and separated from it by two intervening tracks. It consists of a large 60 by 180 ft. reinforced concrete platform similar to those just described. It is carried on concrete posts, and is open below, the deck being at a 4-ft. level. The platform projects 15 ft. into the midway, enabling the midway crane to handle material to and from the other buildings.

On the platform, a light steel frame-

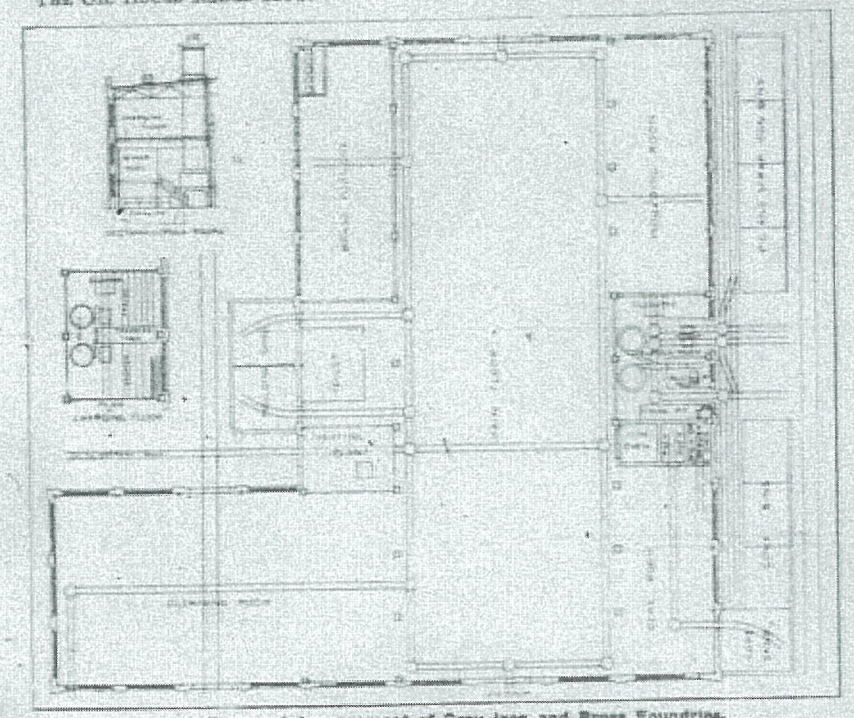


Fig. 6. Plan and Arrangement of Grey Iron and Brass Foundries.

work, enclosed on the sides and ends with corrugated iron and furnished with a roof covered with prepared roofing, furnishes a light protection. A 5-ton hand-operated crane spans the building and has a runway the whole length of the building out on to the front platform through wide crane doors to exchange loads with the midway crane. Access to the building is provided by four doors on the sides and one on each end, opening out to the platform. The building is lighted with incandescent lamps in groups with reflectors.

The stores platform is intended for use as a storage for large, heavy material such as castings and pipe, and thus act as a relief to the general storehouse for this class of material, which will be protected from the weather by the light structure and will be conveniently handled by the small crane.

THE LOCOMOTIVE, CARPENTER AND PATTERN SHOP is a two-storied structure, 70 by 100 ft., facing on to the midway directly north of the stores platform from which it is separated by a track to the latter. It has a self-supporting steel frame on concrete foundation. The upper floor is of reinforced concrete carried on concrete columns. The sides and roof are likewise of reinforced concrete, making a practically fireproof room, as all communications with it are protected by fire doors. It is used as a pattern storage and is equipped with shelving and racks for the purpose.

The ground floor has the usual 3-in. wooden floor and is used as the carpenter and pattern shop, being equipped with the following wood-working machines driven from line shafting:

C1 Pattern-maker's lathe.
C2 Pattern-maker's lathe.
C2A Face lathe.
C3 Band saw.
C4 Band saw.
C4A Wood trimmer.
C5 Small 24-in. planer.
C6 Combined grindstone and revolving oil stone.
C6A Glue pot.
C7 Knife grinder.
C8 Universal saw bench.
C9 2-spdle. Shaper.

The foregoing constitutes the machinery in the pattern section at the left or west end of the shop. The balance below comprises the carpenter section equipment:

C10 Planer, moulder and matcher.
C11 Band saw.
C12 Cut-off saw (m.d.)
C13 Combined grindstone and revolving oil stone.
C14 2-spdle. Shaper.
C15 24-in. Hand planer.
C16 3-spdle. Boring machine.
C17 Wood lathe.
C18 Tenoning machine.
C19 Wood trimmer.
C20 Glue pot.
C21 Swing cut-off saw.

The carpenter section equipment also includes two woodworking air drills with bits, chucks and 50 ft. of air hose.

The pattern shop is intended to look after the manufacture, alteration and repair of patterns and the carpenter shop to attend to the necessary woodwork incidental to locomotive repairs.

The lavatory and locker room is located about the centre of the north side of the room. Alongside are the elevator and stairs for communication with the upstair pattern storage. The stairway is enclosed, as is also the elevator shaft, the latter being of concrete.

THE GREY IRON FOUNDRY is a large building 110 by 200 ft., with a cleaning room annex 60 by 80 ft. It is directly north of the locomotive carpenter and pattern shop, and faces on the midway. The main plan and a couple of the detail views are shown in fig. 6.

The main foundry has a central bay 70 ft. wide and two side bays each 30 ft. wide. The central bay is used for the general moulding floor, and is spanned by a 5-ton electric travelling crane equipped with a 5-ton auxiliary hoist for light lifting. There are also small jib cranes attached to the columns for handling flasks, etc. The 30-ft. bay on the north side has a moulding floor for small castings at the west end, and core room and ovens at the east end, each served by a 1-ton hand-operated travelling crane.

There are three core ovens, two 7 ft. wide, 12 ft. long and 9 ft. high, with shelves and rack cars for general cores, with racks on one side and end, and one 13 ft. wide, 12 ft. long and 9 ft. wide, with racks on both sides and end. The doors of these ovens are of the counterweighted lifting type. The larger oven has a platform car for cylinder cores and other large work, and is served by a 5-ton jib crane. There is also a portable core oven.

Between the two departments on the north side of the building, the cupola room, 30 by 40 ft., is located. In it are two cupolas, 72 and 84 ins. in diameter respectively, and 50 ft. in height. Each cupola has 12 tuyeres.

The scale room for weighing the charges, and the blower room on an

elevated steel platform, are also in the cupola room. The core ovens are fired from this room also, keeping all the ash, etc., in one place. The loaded cars after weighing are raised by a 2-ton pneumatic elevator to the charging floor and are here handled by a couple of pneumatic charging machines, one for each cupola. The charging floor has a steel plate floor, and is laid out with a transfer truck and storage tracks for keeping loaded cars on hand ready for charging while the cupolas are running.

The 20-ft. bay on the south side of the building has a small brass foundry at its west end, enclosed by expanded metal screens 10 ft. high. There are 4 brass furnaces 24 ins. diameter, and one 32 ins. diameter, located in the corner of the building. This small foundry is equipped with regular brass foundry equipment, including tongs, shank, core-maker's bench, chipper's bench, band saw, spine cutter, 2 tumblers, 20 by 32 ins. and 24 by 36 ins. respectively, emery grinder and moulding machine. It is served with a one-ton crane.

The iron foundry has the following additional equipment: 20 charging trucks, 6 coke boxes, 10 steel frame yard trucks, 36 x 60 in., cinder mill, 4 tumbling barrels, 36 x 48 in., 2 emery grinders, exhaust system from tumblers and grinders, core wire straightener, 2 chipper's benches, 4 core-maker's benches, hammer core machine, 2 sand sifters, 6-18 by 18 by 36-in. water tanks, 20,000, 10,000 and 4,000-lb. geared ladles, 3 1,500-lb. truck ladles, 20 250-lb. 10 150-lb., and 20 60-lb. ladle bowls, brake shoe moulding machine, 3 moulding tubs, 30 moulding flasks in 4 sizes, 18 sets of moulding tools and a gravity moulding machine.

The cleaning room is at right angles to the main building, and is spanned by a 5-ton electric travelling crane. In this annex are located the tumblers, grinders, etc., and a service track runs through the room for the loading of cleaned castings right on to the cars for shipment.

The moulding sand is stored in bins on the south side, filled from cars on the service track and distributed by industrial tracks inside the building. Along the north side of the building, between the service track and the foundry, as shown in fig. 6, there is a long galvanized iron shed, roofed in and divided into separate compartments. Here are stored direct from the cars, the coke, pig and scrap iron under cover, and these are brought into the foundry on cars running on industrial tracks, also under cover between the bins and the building. Having both material and handling [illegible] cover is a valuable feature [illegible] weather.

The Locomotive Power Office is south of the locomotive erecting shop and opposite the storehouse. It is a brick structure with steel interior frame, 60 by [illegible] ft., consisting of two stories and a basement.

The basement is devoted to a large testing laboratory, lavatories and storage. The ground floor has offices for the department's officials and clerks, and on the first floor are the draughting room, file room, and blueprinting room. A vault is carried up from the basement to roof with vaults on each floor.

The floors are of maple on spruce joists carried on the walls and steel work. The interior is plastered throughout and the halls and stairs have a wood wainscotting. The building is heated by direct radiation coils and has incandescent electric lighting fixtures.

The Canadian Northern Ry. reports a total wheat haul for 1911, of 28,750,000 bush., an increase of about 14,000,000 over the previous year. About 3,000,000 bushels are still in elevators along the line.

National Transcontinental Railway Construction, Etc.

The Minister of Railways stated in the House of Commons, Jan. 12, that the three members of the Commission for the building of the transcontinental railway, appointed by the late Government, C. A. Young, C. F. McIsaac and W. S. Calvert, had been asked to resign, and that the positions would not be filled. The Government proposed to have the act appointing the commission amended to suit its new policy, and to place the whole work in charge of the present Chairman, R. W. Leonard, M. Can. Soc. C.E.

Grand Trunk Pacific Railway Construction, Etc.

C. M. Hays, President, and W. Wainwright, Second Vice President, interviewed members of the Government at Ottawa Jan. 8, when, it is said, that the whole situation connected with the financing of the balance of the construction of the line between Winnipeg and Prince Rupert was considered, and the question of the operation of the Moncton-Winnipeg section discussed. It is said that a further loan, probably amounting to $15,000,000, was asked for.

E. J. Chamberlin, Vice President and General Manager, returned to Winnipeg Jan. 13, from Montreal, and in an interview, gave details of construction projected for the current year, stating that the work would involve an expenditure of about $20,000,000. He has been advised by the Chief Engineer that the boring of the tunnels in the Kitselas district has been completed, which will enable track to be laid during the year to 185 miles easterly from Prince Rupert. It is expected also that 150 miles of

February 1912

Marine Department

The Grand Trunk Pacific Ry. Marine Terminal, Prince Rupert.

By F. C. Kirby and W. T. Donnelly, Members of the Society of Naval Architects and Marine Engineers.

When, in 1910, the authors of this paper were retained to visit the Pacific Coast for the purpose of studying the shipping and marine repair facilities and to visit Prince Rupert, the western terminus of the Grand Trunk Pacific Ry., there was a question how to proceed, for not only was Prince Rupert

Drydock, Ship Repair and Shipbuilding Plant, as they will appear when completed.

beyond their geographical knowledge, but it also failed to appear upon any available map or charter. However with an abiding faith in the G.T.P.R. they undertook the commission. Proceeding to the Pacific coast over the Northern Pacific Ry., they visited Portland, Seattle, Tacoma and Bremerton in the U.S. and Victoria, Vancouver and New Westminster, B.C., finally proceeding from Vancouver on a C.P.R. steamship northward through the inland passage, and after three days steaming through the narrow waterways which were literally the submerged valleys of the Coast Range, they arrived on the evening of the third day in Prince Rupert harbor and were, for the first time, fully convinced that such a location actually existed.

Those who are especially interested and desire to extend their geographical knowledge, are referred to the most recently published charts of the Northern Pacific and Alaskan coasts, on which Dixon's Entrance, north of Graham Island between 54 and 55 degrees north latitude, can be readily located. To the east of Dixon's Entrance, Brown Pass leads to Chatham Sound and across this to the east, between Digby and Kaien Islands, is found Prince Rupert harbor, so hidden away and unprepossessing is the entrance that until 1906 it was supposed to be unnavigable. Actual surveys show it to be one of the most easily entered and satisfactory harbors on the Pacific coast. The entrance, which is from the south, is about three-eighths of a mile wide. It is entirely unobstructed with a depth of water nowhere less than 20 fathoms. The entrance may be said to extend northward for three miles, when the harbor is reached, extending northeast for four miles, with an unobstructed width of from one and a half to three-quarters of a mile.

The city of Prince Rupert is located on Kaien Island, which forms the right of the entrance, and the southeast of Prince Rupert harbor. The city proper is laid out over an area, three and a half miles long by one mile in breadth, on the shores of the island, with a background rising to an elevation of from 1,800 to 2,000 ft., the general characteristics reminding one very forcibly of the city of Montreal with Mount Royal behind it. The G.T.P.R. will reach the coast by the Skeena River valley, about 15 miles to the south, and crossing to Kaien Island at its southern end, will closely follow the shore to and along the water front of Prince Rupert.

The general character of the shore of Prince Rupert is bold and rocky, falling off very rapidly to a depth of approximately 20 fathoms. A careful examination of the entire length of the harbor front of Kaien Island determined Hays Cove as the only practical place for such a development as was contemplated; that is, a floating dry-dock of 20,000 tons lifting capacity, so designed as to be capable of operating in sections as

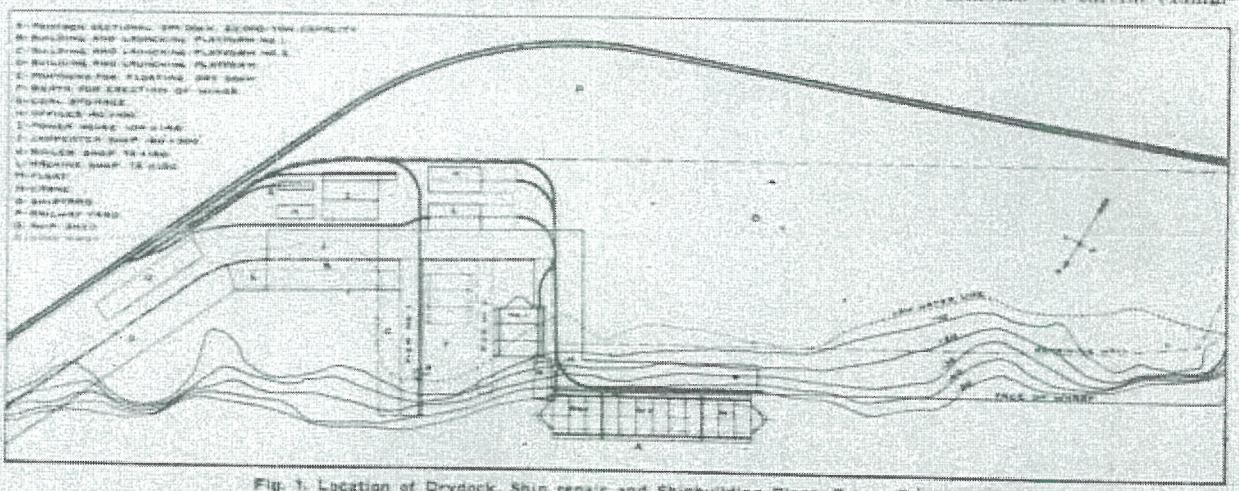


Fig. 1. Location of Drydock, Ship repair and Shipbuilding Plant, Prince Rupert.

a number of smaller docks, an adequate shore plant comprising electric power generating plant with air compressors, machine shop, boiler and blacksmith shop and covered construction shed under which the pontoons of the floating dry-dock could be built.

The dock is to be of such a design and construction as to be almost entirely built upon the site. To accomplish this, the general plan provides for the practical completion and equipment of the shore plant before the dry-dock is commenced.

One of the controlling features in the general plan of this development was the fact that Prince Rupert will be 400 miles from the nearest base of supply or point where any considerable assistance, mechanical or otherwise, can be obtained. It was therefore determined at the outset that the mechanical equipment, large tools, etc., must be of the very best and most complete. Also, that on account of the high price of labor on the Pacific coast, ample provision for the use of power in every way possible should be made. This has resulted in the design of an electric power generating station with ample capacity for all present needs and with a large possibility of extension.

As the plans were laid out in such a manner as to make the development progressive, constructing those parts first which could, when completed, be used in the construction of the remainder, this outline will be followed in the description.

Fig. 1 gives a general plan of the plant, showing location of dry-dock, piers and buildings.

PIER AND PLATFORM WORK.—The first work to be undertaken will be the pier, marked "Pier no. 1" on the general plan. This will be 420 by 60 ft., the piling being on 10 by 5 ft. centres. The pier will require about 600 piles.

At the same time, there will be built the platform at the shore end of this pier 80 by 920 ft., having an area of 74,400 sq. ft., and will require about 1,800 piles on 5 by 10 ft. centres.

At the western end of this platform there will be an extension off shore 150 by about 100 ft., and at right angles to this, an extension 560 by 80 ft. for the attachment of the floating dry-dock. A double line of diagonal bracing is used in the pile work. This is on account of the excessive rise and fall of tide, which for spring tide is 25 ft. The tops of the piles are thoroughly secured by double 6 by 12 clamps and connected by 12 by 12 caps. The decking is to be of 4 by 12 planking. Piles are to be creosoted. The total area of the platform and pier work will be 181,400 sq. ft. The completion of this work, it is expected, will provide ample space for the landing and handling of materials for the rest of the plant.

LAUNCHING PLATFORM.—In front of the main platform, east of the pier, there will be built a launching platform for side launching. This will be 80 by 440 ft., and will be carried on 16-in. piles on 5 by 10 ft. centres, braced and reinforced by heavy piling along the edge over which the launching will take place. The general arrangement and bracing of this piling can be seen by referring to fig. 2, showing the platform in connection with the building shed. It will be noticed that the outer half of the building platform has a slope of 1¾ ins. to the ft., which is approximately the launching grade for side launching.

POWER HOUSE.—The general location of the power-house will be seen by referring to fig. 1. Electric power is to be furnished for operating the pumping machinery of the floating dry-dock, for compressing air and to operate machinery in the various shops; also, for furnishing electric lighting for the plant. The building is to contain both boilers and power plant under one roof with fireproof dividing walls, and is to be 104 by 148 ft., having a covered area of 15,392 sq. ft. It will be of modern steel-frame construction, the walls and roof to be of reinforced concrete.

There will be installed 2-400 h.p. water tube boilers, supplied with automatic stokers, chain-grate type, such as are known to give good satisfaction with Pacific coast coals. Provision is made for adding two extra boilers. There is also a provision for the installation of an economizer, in case it is found that the load factor warrants the expense. Draught will be obtained by a steel or concrete chimney 175 ft. high and 11 ft. in diameter. An overhead trolley is provided for handling coal from storage to hoppers above the stokers and also for handling ashes.

COAL HANDLING AND STORAGE.—Provision is made for receiving coal both by water and rail. Coal by water will be received at the outer end of the pier, for the unloading of which there is provided a standard grab-bucket installation, so arranged as to load cars beneath the hoppers, the cars to be handled by small yard locomotives to the coal pocket of 1,000 tons capacity, located adjacent to the boiler house. Coal received by rail will be delivered direct from the G.T.P.R. cars, which pass at the rear of the property, to the coal pocket approached by an incline.

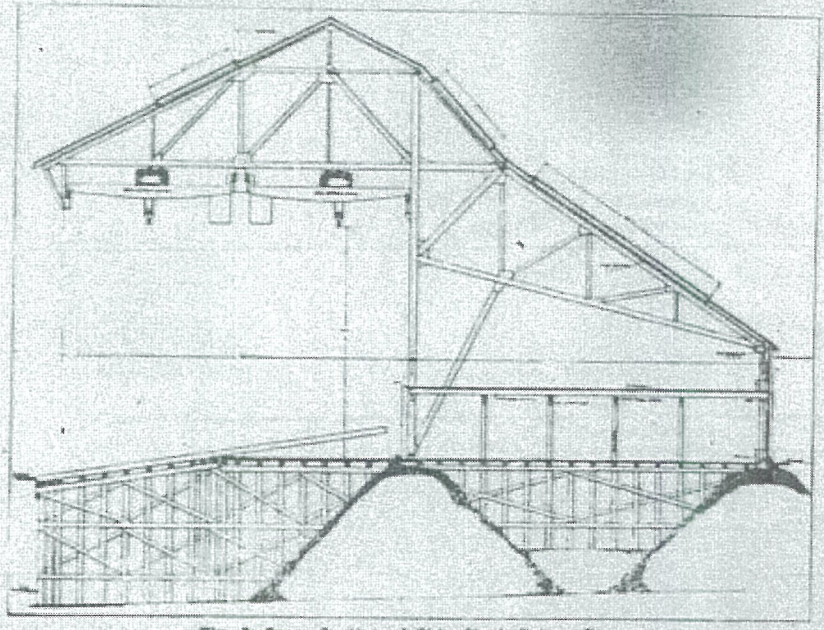


Fig. 2. Cross Section of Ship Shed, Prince Rupert.

MAIN ENGINES.—There will be two main engines of 900 h.p. each, and while vertical reciprocating compound engines are specified, using steam at 175 lbs. pressure and 258 r.p.m., turbine engines will be considered as an alternative.

CONDENSERS.—Jet condensers are planned, but alternate figures will be taken for service condensers. The type to be used will depend upon local conditions as to the cost of water at the time of installation. Condensing water will be obtained through the rock cutting and shaft sunk within the power-house, the circulating water being handled by a vertical centrifugal pump operated by an electric motor.

GENERATORS.—Electric generators are to have a capacity of 600 k.w., 3-phase, 25-cycle, 550-volt alternating current. For these generators there will be provided two steam-driven exciters, one of 50 k.w. and one of 25 k.w. capacity. These machines are to be direct current, 220 volts. There is also to be a motor-driven exciter of 25 k.w. capacity, the motor for this machine to be a 35 h.p., 3-phase, 25-cycle, 550-volt alternating current squirrel-cage-type motor.

CRANES.—There will be provided for the erection of this machinery in the power plant, a 15-ton overhead travelling crane. This will be operated by electricity and the current supplied will be from one of the steam-driven exciter sets.

AIR COMPRESSOR.—For furnishing compressed air to the shops of the plant, there will be provided a compound Corliss air compressor having a displacement of 1,580 cu. ft. of free air per minute when operating at 150 revs. This compressor is to be designed for a steam pressure of 175 lbs. per sq. in. and for an air pressure of 100 lbs. The distribution of the air will be by means of underground piping through the yard.

SWITCHBOARD AND DISTRIBUTION SYSTEM.—The entire system of light and power throughout the plant is to be controlled from the switchboard located on the main floor of the power-house. The switchboard is to consist of 15 panels. These machines are to be direct current, 220 volts. There is also to be a motor-driven exciter of 25 k.w. capacity, the motor for this machine to be a 35 h.p., 3-phase, 25-cycle, 550-volt alternating current squirrel-cage-type motor.

The construction throughout is to be most substantial and thorough, fully meeting the best standards of central station distribution.

CUT AND FILL AND FOUNDATIONS.—By referring to fig. 1, showing the natural conditions of the site, it will be seen that the ground is very difficult, all the property either having to be cut down or raised to grade by fill. The location of the power-house was determined by the condition of the ground, which, at this location, is of rock which will have to be reduced to the grade required. The cut and fill work is intended to go forward at the same time as the pier work, and the power plant will be commenced as soon as the site can be levelled. The rock cut for the power-house and yard grading will amount to 18,000 cu. yds., the rock fill for retaining walls, 57,000 cu. yds., and the earth fill for grading, 73,000 cu. yds. The dredging between the pier and dry-dock bulkhead will amount to 100,000 cu. yds. to obtain a depth of water of 20 ft. at low tide.

BOILER AND BLACKSMITH SHOP.—The combined boiler and blacksmith shop is to be 76 by 150 ft., the central part to be 33 ft. wide, provided with a 15-

ton travelling crane. The design is of the usual steel-frame shop construction with side bay and will, in this instance, be covered with wood. The flooring will be of concrete with heavy foundations for the large tools. The tool equipment will be very complete, comprising heavy punch and shears, rolls, plate planer, flanging clamps, etc., heavy steam-hammer and a full equipment of blacksmiths' tools.

THE MACHINE SHOP will be constructed from the same set of plans as the boiler and blacksmith shop. The flooring will be of concrete with special foundations for large tools. Ample provision is made for thorough lighting and the building will be steam-heated throughout. A very complete equipment of machine tools will be provided, comprising all machinery necessary to handle the heaviest crank and other shafting of large steamers; also, boring, drilling and turning machinery for repairing all the secondary machine equipment of steamships. Large tools will be driven by individual motors, the smaller tools being arranged for group driving. A 15-ton overhead travelling crane will be provided for both boiler and machine shops. The building will be supplied with compressed air and a special room will be fitted up for the repair and care of air tools.

By referring to fig. 1, it will be seen that the location of the machine shop is such that ready access may be obtained from the dry-dock and water front, and it will be noticed that provision is made for entering the boiler and machine shops with railway cars. Provision is also made for the extension of these shops as the business develops.

BUILDING SHED AND WOODWORKING SHOP.—On account of the excessive rainfall in Prince Rupert, it will be necessary to do the work of building the pontoons for the floating dry-dock under cover.

In laying out the general plan for the property and in view of its future development, the possibility of shipbuilding was carefully considered, and while there is no immediate prospect for the building of steel vessels so far from the base of material, it was thought advisable, in preparing for the building of the pontoons under cover, to make the construction of a permanent nature, suitable for shipbuilding, to be used in the immediate future for wooden shipbuilding and later on for steel shipbuilding. To accomplish this, the building shown in fig. 2, has been developed. This building is located over the launching platform and over part of the general platform extending eastward from pier 1, with foundations carried down to rock.

It will be seen from the general plan, fig. 1, that the property is laid out for side launching, this being the only practical development that was possible under existing natural conditions. The building about to be described is the result of these conditions. While side launching is unusual in Europe and general in America, it is practically universal on the Great Lakes, and the general design of this structure is the result of experience there.

The shipbuilding portion of the structure is designed to have a covered width of 86 by 300 ft., with a clear height under cranes of 50 ft. and under girders of 58 ft. The shop section of this building is to be 80 by 300 ft. The ground floor will be used for machinery and the upper floor will be used as a laying-out floor. The equipment of woodworking machinery will be most complete, comprising large re-saw band saw, timber sizer, rip and crosscut saws and other woodworking and finishing machinery.

ADMINISTRATION BUILDING.—There will be an office and administration building 40 by 100 ft., constructed of wood two and a half stories high. This will be fitted up with draughting room, accounting and bookkeeping department and private offices. The exact location of this building has not been determined as this will depend largely upon the opening and grading of streets approaching the property.

TWENTY THOUSAND TON PONTOON Floating Dry-dock.—Referring to fig. 1 there will be seen the general design drawing of a 20,000-ton pontoon floating dry-dock, description of which has been reserved until the last from the fact that, as previously stated, it is to be almost entirely constructed at and by the plant of which it is to be the principal feature.

This dock is to have an over-all length on keel blocks of 804 ft. 4 ins., a clear width of 100 ft., and a width over-all of 130 ft. The lifting power is the aggregate of 12 pontoons of timber construction, each 130 ft. long corresponding to the width of the dock, 44 ft. wide in a direction corresponding to the length of the dock and 15 ft. deep. These pontoons are to be united by steel side walls or wings 38 ft. high, 15 ft. wide at the bottom, and 19 ft. wide at the top, the walls being divided so that the whole structure may be used under ordinary conditions as three separate docks, one of six pontoons, with an over-all length of 269 ft. and two of three pontoons each, with an over-all length of 194 ft. each. The largest commercial ship upon the Pacific Coast at the present time is the Minnesota, the

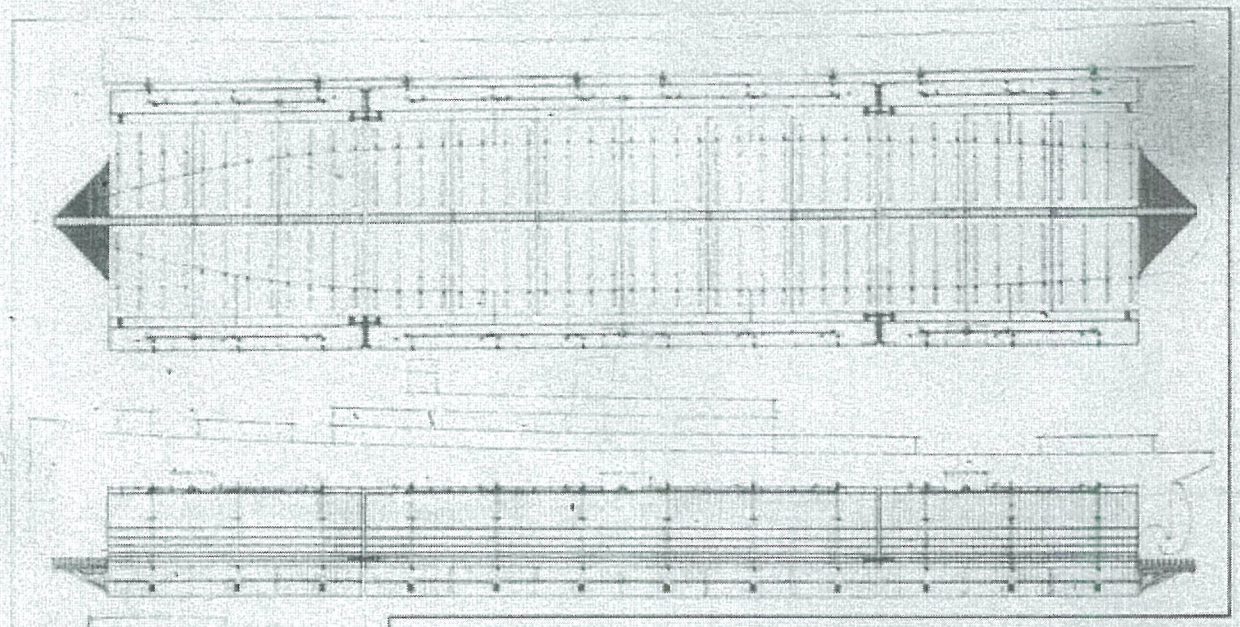
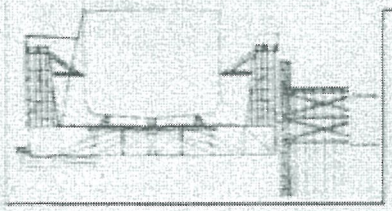


Fig. 3. Twenty Thousand Tons Pontoon Floating Drydock, Section Type.



outline of which is shown on the dock. This vessel would have a dead weight in ordinary unloaded condition of approximately 13,000 tons.

The machinery for pumping the dock will consist of centrifugal pumps operated by electric motors, the capacity of the equipment being sufficient to pump the entire lifting power of the dock in less than two hours. A detailed description of the pumping machinery will be given later.

The structure as a whole is secured to the shore by the engagement of clamps on the dock with a vertical truss secured to the pile platform or pier in such a way that it is free to rise and fall with the tide, and when being raised or lowered with a ship. The location of these attachments is such that when it is desired to use the dock in three separate sections, the bow section may be detached and moved around the corner of the pier work located as shown on the general plan alongside the platform, and secured in the same manner as provided for in its original position. To make the other two sections available as separate docks, it is only necessary to detach the middle section, comprising six pontoons, from the pier work and advance it the length of the detached section, when the sliding clamps upon the wings will coincide

with those used for the previous section when the dock was operated as a whole. This will allow ample space between the centre and stern sections for the overhang without interference of vessels which may be docked on them.

As the feature of a sectional dock to be used as a whole or separately is somewhat new, it is desired to call attention to the fact that the three largest commercial docks in the United States, namely, the 10,000-ton floating dry-dock of the Merjen and Lang Dry-Dock Co., built in 1906; the 12,000-ton dock of the Morse Dry-Dock Co., built in 1902 (both in New York harbor), and the 10,000-ton dock of the port of Portland, Oregon, are sectional docks in five sections each. All of these docks are of timber construction, and are giving excellent service.

Pontoons.—As previously stated, the pontoons for this dock are to be 12 in number, constructed entirely of timber. They are to be 132 ft. by 44 ft. by 15 ft. deep, with a crown of 3 ins. at the centre, and will have 15 trusses spaced at 9-ft. centres. There will be a centre water-tight bulkhead 12 ins. thick, and about this bulkhead the centre will be reinforced for carrying keel blocks. There will be three partial bulkheads on each side to stiffen the pontoons. All diagonal braces are heavily reinforced with anchor stocks. The arch brace is made up of planking through-bolted with screw bolts, and is intended to take the reverse stresses when the dock is floating light. This is a considerable amount when it is considered that the wings are superimposed weights carried at the extreme ends of the trusses, supported by an evenly distributed pressure over the entire bottom. Six by 12-in. deck beams are worked across the upper and lower truss members, carrying the 3-in. deck and bottom planking parallel to and reinforcing the truss members for the maximum stress. This construction also makes it possible to get in double vertical tie rods alongside of bulkheads in such a manner that they may be replaced at any time. The whole structure is made water-tight by caulking with white pine wedges.

To protect the exterior from teredo and other marine worms, it is first thoroughly graved with tar poisoned with arsenic, then sheathed with two layers of hair felt, each thoroughly saturated with tar and arsenic, and then with dressed lumber, also treated with arsenic and thoroughly secured with galvanized nails. This treatment, together with the facility for inspection afforded by the possibility of detaching and docking any pontoon, has been found to give satisfactory protection.

Each pontoon will require approximately 320,000 board ft. of lumber or a total, including outrigger or prow on the end pontoons, of 4,000,000 board ft. The entire bill of lumber will be of selected grade of Oregon pine or Douglas fir.

As previously stated, it is the intention to have these pontoons built upon the launching platform under the building shed, using the tools and equipment provided for the plant. Sufficient room has been allowed to build three pontoons at the same time. As soon as they are launched they will be moved into the basin between the pier and dry-dock platform and temporarily united together in correct relative position by timber clamps, when they will be ready for the erection of the steel wings.

The Steel Wings consist of channel and angle frames on 3-ft. centres corresponding to the trusses of the pontoons, and a covering of plating varying in thickness from ¼ to 5-16 in. The construction is greatly facilitated by reinforcing the plating against water pressure on the outside by horizontal angles. This does away entirely with troublesome intercostal connections and gives the material used very much greater value in the construction as a whole.

There will be required about 2,200 tons of steel. Where the wing meets the deck of the pontoon there is a steel shoe secured to the frame of each pontoon and a corresponding shoe riveted to each frame of the wing. These are connected together by a steel link about 15 ins. long and pins, the upper one of which is tapered ¼ in. to the foot. The driving of this pin wedges the pontoon and wing together. At the point of contact, the bottom of the wing is reinforced by a 12 x ⅝ in. plate and made water-tight by canvas packing saturated with red lead. On the outer side of the wing the method of securing is similar, except that the shoe on the pontoon is replaced by a cast-steel strap through-bolted to the pontoon.

Provision is made for multiple punching on uniform centres of 3 ins. and 4 ins. throughout, and the intention is to have the material fabricated in Europe or the eastern part of the United States, all frames assembled and shipped by water to Prince Rupert. The erection of the first section is to be commenced as soon as the first three pontoons are launched, the compressed air machinery of the plant being used for pneumatic riveting.

Pumping Machinery.—The dock will be pumped by 24 12-in. centrifugal pumps, one in each end of each pontoon. The pump suction will take water from the bottom of the pontoon, the suction being protected by a liberal area of screen. Delivery will be directly through the flood-gate used in lowering the dock.

The pumps will operate at approximately 275 r.p.m., being driven by a vertical shaft. All the pumps on each side of each section will be driven through gearing and horizontal shafting by one electric motor, as shown in fig. 1. A jaw coupling is provided in the wing at about the level of the top of the pontoon for disconnecting the vertical shaft when the pontoon is removed for self-docking.

There is also an indicator for determining the level of water in the wings. This consists of a counterweighted float in vertical guides and a vertical rod extending through the deck of the wing. As the water enters the wing, the float rises and the height of the rod above the deck will indicate the depth of the water in the wings.

A similar device is provided to show the depth of the water in the pontoon. The flood-gates are operated to control the lowering of the dock and also to control the pumping collectively and individually of the different pumps, it being understood that with the pumps running, no water will be delivered if the flood-gates are entirely closed, and that, by a regulation of the gates without altering the speed of the pumps, any degree of control or any distribution of control can be accomplished. In case one side is rising too rapidly, the partial closing of the gate on that side, without disturbing the operation of the machinery, will effect the control, or the gates may be left at the same opening and the machinery stopped.

By this method, a much quicker and more powerful control may be obtained, as not only will the discharge of water from the dock stop, but will immediately commence to enter, thus doubling the power of control which would be obtained by closing the gates.

Electrical Equipment.—As previously explained, the group of pumps on each side of each section of the dock will be operated through horizontal and vertical shafting by one electric motor. Thus, for the two smaller sections of three pontoons each there will be required four 100 h.p. motors, and for the larger section of six pontoons there will be required two 200 h.p. motors. The motors are to be alternating current, 3-phase, 25-cycle, 550 volt, and will operate at approximately 500 r.p.m. They are to have wound rotors and slip rings for variable speed control. The armature shaft is to be extended both ends and will operate the distribution shafts through reduction gearing at a speed of approximately 200 r.p.m.

There will be two motors on each section, one on each wing. The power circuit on the pier is connected to the power circuits on the sections by flexible cables. The power circuits of each section are independent from the main circuit, so that each section receives its power independently, but the control system is to be so arranged that the two motors on any section may be operated from one master panel or the combination of any two sections may be operated from the master panel on either of the two sections, and lastly, when all three sections are used together, all six motors are to be controlled from the master panel on the middle or larger section.

The Master Panel is to consist of a panel or drum having suitable contacts or switches for independently starting or stopping any of the motors. The starting or stopping of any one motor or a number of motors will not affect other motors at rest or in operation. The provision is also to be made for operating any or all motors at one-half, three-quarters and full speed.

Compressed Air Equipment.—While steam-driven air compressors are provided in the power plant to furnish compressed air for the shops, it was deemed advisable on account of difficulty due to the extreme rise and fall of tide, to make flexible air connections to the floating dry-dock and to provide an electrically driven air compressor upon each section.

On one side of each section there will be provided an electrically driven air compressor having a capacity of 500 cu. ft. per min. The air will be delivered to a receiver in the wing below, and from this to air piping carried along the bottom to each side of the wing, with multiple outlets for the connection of air hose to the pneumatic tools. Provision will also be made for connection between the sections of the dock when they are operating together.

Electric current for operating the air compressors will be taken from the circuits supplying the motors for pumping the dock, and as air will be used only after the dock is pumped up, the capacity of these circuits will be more than ample.

Operating Equipment, Bilge Blocks, Keel Blocks, etc.—The keel blocks are to be of oak 12 x 18 ins. x 4 ft. long, and are to have a height of 4 ft. The bilge blocks are to be on about 12-ft. centres, and operated according to the usual American practice by means of a galvanized chain on the floor of the dock and a leading rope through 6-in. sheaves secured to the wing near the deck, leading up and returning over the pipe railing around the tops of the wings. The return rope leads to the tail dog and is used in tripping the dog and pulling the block out when the ship is leaving the dock. The bilge blocks are provided with an elevating screw which has been found to be of great service for removing blocks one at a time for painting.

In the American practice of handling floating dry-docks, side shoring is not used. There is a general practice, however, of using centring rams for locating and steadying the vessel in position until firmly at rest upon the keel and bilge blocks. The arrangement of these rams can be seen in fig. 2, showing the general design of the dock.

Illustrative Display Drawing.—There is submitted herewith an illustrative

struction have been witnessed, and also the final checking up of material, full detail reports are made out showing what material has been constructed during the week, also what other material is under course of construction, and what material has been shipped, also commenting on any errors that may have been discovered and how the same have been remedied, with a report in addition as to what future progress would be expected.

Inasmuch as this material was purchased on a pound price, the inspection company had special representatives at each of the bridge plants, estimating the weights of all material entering into the various bridge members, so as to check up against the actual weights furnished by the bridge company. If the actual weights are in excess of 2%, as allowed by the Dominion Government specifications, such weight is cut down to the estimated weight, made up by the inspection company, based on an allowance of 2%.

Inspection of Erection.—As soon as the bridge companies have made shipment of their first carload of material, and the erection gang of the bridge company has arrived at the bridge site, on the order of the bridge engineer, an inspector is immediately dispatched by the inspection company to such site. He supervises the erection of the entire structure from start to finish, seeing that the same is carried out in strict accordance with the requirements of the specifications. As the work progresses, the inspector takes at least three photographs each week, showing the progress that has been made, and also keeps an account of the labor expended in connection with the erection of the particular bridge on which he is engaged. To show that the photographs are taken weekly, a special sign is furnished by the inspection company, on which the name of the structure appears, together with the date on which the photograph was taken. This is embodied in the photograph. Weekly reports are furnished by the inspector, and the bridge engineer is kept advised as to all movement of delays that might occur at the erection site in connection with such structure. On completion of the bridge, the inspection company then reports that the work has been carried on to the satisfaction of its inspector, and such report is forwarded to the bridge engineer, who himself, or his representative, then makes final inspection of such bridge structure, after which payments for the completed work are made. In all the various departments of inspection at the mills, at the bridge shops, and on erection, only men who have had long experience and training in that particular class of work are engaged.

Throughout all the various courses of construction a private stamp is used, bearing the trade mark of the inspection company, together with a number representing the inspector who has used this particular stamp. This serves as a means of identification, so that the inspector at the shop, and also at the field may see that the material has been inspected and accepted. By this means if any faulty or defective workmanship should show itself, the inspector who passed this particular piece of work can be easily located by the number which he carried affixed to his stamp.

Cost and Estimates.—In the final estimates the actual amounts and cost under the several items are:

Substructure—				
1,727 cu. yds. 1:2:4 Concrete	at	$15.00		
4,524 cu. yds. 1:3:5 Concrete	at	11.00		
4,597 cu. yds. Excavation	at	1.00		
10,534 cu. yds. Excavation	at	2.50		
Superstructure—				
Steel 12,291,318 lbs.	at 4.55 cts.		=	$654,392.31
Timber 218,641 ft. B.M.	at 4.60 cts.		=	23,229.50
				$678,622.28

Progress estimates were paid monthly on the superstructure according to the following basis:

	Unit.	Rate.
Steel	100 lbs.	$ 4.98
Timber in floor	M.B.M.	46.00
Schedule for Monthly Estimates.		
Steel provided	100 lbs.	$2.00
Steel manufactured	100 lbs.	1.00
Steel delivered at site	100 lbs.	.48
Steel assembled	100 lbs.	.98
Steel riveted	100 lbs.	.15
Steel painted and fully completed	100 lbs.	.15
		$ 4.88
Timber delivered	M.B.M.	$40.00
Timber framed and placed	M.B.M.	6.00
		$46.00

This basis of payment was considered a fair and equitable distribution of cost throughout the different stages of manufacture. It is the result of experience on many bridges previously built by this and other bridge companies on the described method of working and specifications, and the writer believes may fairly be used in other similar cases, as proportionate cost data.

The work was carried out under the general direction of the writer from the Bridge Engineer's office in Ottawa, W. A. Duff, A.M. Can. Soc. C.E., Assistant Bridge Engineer, having charge of the general design and details. The Dominion Bridge Co., Ltd., Montreal, were the contractors for the steel, which was efficiently carried out, F. P. Shearwood, M. Can. Soc. C.E., having charge of the design for the bridge company.

The design and layout for the erection and the traveller were made under the direction of Jas. Finley, superintendent of erection, who was responsible for the successful carrying out of the erection, also E. W. Nichols, foreman on erection.

The substructure was completed by Powers and Brewer, subcontractors under Willard Kitchen Co. The construction and laying out of this part of the work was performed under the direction of C. O. Foss, M. Can. Soc. C.E., District Engineer. Although the work was prosecuted in all seasons of the year there has been no accident or casualty of any kind.

Progress of Erection Little Salmon River Viaduct.

1910.	No. of Days.	Erected to Bent No.	Tons.	Aver. per day Tons.
To July 30	[illegible]	42	112¾	....
July 30 to Aug. 6	[illegible]	47	57¾	13½
Aug. 6 to Aug. 12	[illegible]	44	3[illegible]	71
Aug. 12 to Aug. 18	[illegible]	43	80½	12.1
Aug. 18 to Aug. 19	[illegible]	42	129¾	128¾
Aug. 19 to Aug. [illegible]	[illegible]	41	101¾	32
Aug. 23 to Aug. 24	1	40	129¾	129¾
Aug. 24 to Aug. 26	[illegible]	39	102¾	51.1
Aug. 26 to Aug. 29	[illegible]	38	132¾	66.1
Aug. 29 to Sept. 16	[illegible]	35	128	*57.2
Sept. 16 to Sept. 24	[illegible]	33	208¾	42.6
Sept. 24 to Oct. 4	8	30	441¾	55.2
Oct. 4 to Oct. 11	6	28	351¾	58.5
Oct. 11 to Oct. 17	[illegible]	27	177¾	34.5
Oct. 17 to Oct. 2[illegible]	[illegible]	25	228	65.6
Oct. 2[illegible] to Oct. 28	[illegible]	23	324½	64.9
Oct. 28 to Nov. 2	4	22	162	40.5
Nov. 2 to Nov. [illegible]	[illegible]	21	152¾	51
Nov. [illegible] to Nov. 1[illegible]	[illegible]	19	320¾	46.3
Nov. 1[illegible] to Nov. 16	[illegible]	18	205¾	102
Nov. 16 to Nov. 18	1	17	152	152
Nov. 18 to Nov. 20	2	16	159	79.2
Nov. 20 to Nov. 23	3	15	152	50.3
Nov. 23 to Nov. 28	4	14	156¾	39.2
Nov. 28 to Dec. 2	4	13	150	37.5
Dec. 2 to Dec. 7	[illegible]	12	152	29
Dec. 7 to Dec. 12	4	11	118	37
Dec. 12 to Dec. 16	4	9	211½	28
Dec. 16 to Dec. 21	4	7	131	135.5
Jan. 3, 1911, to Jan. 11	4	6	147	36½
Jan. 11 to Jan. 18	4	5	163	36¾
Jan. 18 to Jan. 22	5	4	148	29.2
Jan. 22 to Jan. 25	3	3	146	48.8
Jan. 25 to Jan. 28	3	2	118¾	39.5
Jan. 28 to Feb. 2	4	1	132¾	33
Feb. 2 to Feb. 7	5	End	98	20
Feb. 7 to Feb. 9	1		93¾	93¾
	141		7,042.5	48.9

*Held up 11 days by broken gear in traveller.
†Shut down for holidays.

The foregoing paper was read before the Canadian Society of Civil Engineers recently.

JUNE 1912

National Transcontinental Railway Construction.

The Dominion Parliament has passed three acts affecting the National Transcontinental Railway. The first extends the time limit for the building of the Western Division, which is being built by the G.T. Pacific Ry. Co. under agreement. The second provides for the payment of such sums as may be necessary to meet the difference between par and the amount at which the guaranteed bonds sold, under the Imperial Privy Council's decision on an interpretation of the meaning of the word "implement" in the supplemental agreement of 1904. The third provides for the placing of the control of construction of the Eastern Division under one commissioner instead of four, with the title of "The Commissioners of the Transcontinental Railway."

Replying to questions in the House of Commons, Mar. 4, the Minister of Railways stated that F. P. Gutelius, M. Can. Soc. C.E., and G. L. Staunton, K.C., are to receive $45 a day and reasonable expenses while engaged in investigating the National Transcontinental Railway affairs. Mr. Gutelius will be in no way connected with the C.P.R. during the period he is employed by the Government.

On Mar. 13 the Minister stated that car repair shops were being built at Winnipeg and a site was being prepared at Quebec for the National Transcontinental Ry. repair shops. To the question, "Are such repair shops intended to be for the use and benefit of the G.T. Pacific and the G.T. Ry?" he answered "Yes."

The Minister of Public Works, the Minister of Railways, the Postmaster General and representatives of the marine interests have arranged a conference to be held at an early date with reference to the terminal facilities for the railway in Quebec. It is desired that the waterfront property at present held by the Richelieu and Ontario Navigation Co. be acquired by the Government, but up to the present the company will not entertain the proposition.

Grand Trunk Pacific Railway Construction

Main Line.—Press reports state that it is proposed to add immediately at least five miles of sidings and spur tracks at Wainwright, Alta., and that sites are being acquired for the erection of warehouses.

The company has acquired lands between Namayo and Kinistino Streets, Edmonton, Alta., for yard purposes. The yard will have 10 pairs of tracks, with three wagon roadways. Plans have been submitted to the city authorities for a freight shed 52 by 400 ft. fronting on Elizabeth St. It will be of frame covered with zinc sheeting, with a felt and gravel roof, on concrete pedestals.

E. J. Chamberlin, V.P. and G.M., is reported as stating that owing to the fact that there has been no snow in some parts of the foothills and the Yellowhead Pass, and too much in others, the work of getting in supplies for the building of the line to the Fraser River in B.C. has been hindered. There is considerable rock cutting to be done on the lines between the present rail head and the river, but it is expected to have the track laid to that point by June 1.

It is reported that the first steel bridge in British Columbia on the line from the east crossing the Fraser at mileage 29 has been completed. It is 500 ft. long and the rail level is 75 ft. above high water.

A good deal of grading has been done from Tete Jaune Cache towards Fort George, B.C. It is reported that subcontracts have been let for grading both easterly and westerly from Fort George, near which point it is expected that the last spike will be driven.

The section of the line under construction easterly from Prince Rupert, B.C., to Aldermere is well advanced to completion. Track has been laid to 13 miles from the crossing of the Skeena River below Hazleton, and it is expected that it will be laid to the river early in April. This will take the rails to 170 miles from Prince Rupert. The piers for the bridge have been completed and it is expected that the bridge will be completed early in June. Grading has been practically completed to Aldermere, and it is expected to have track laid to that point by the fall. Owing to the advanced state of construction to this point, the headquarters of C.E. Van Arsdel, Division Engineer, are to be moved further east and a camp is being prepared for the construction offices near Bulkeley Summit. Sub-contracts are reported to have been let for grading from Aldermere to Burns Lake as follows:—Aldermere easterly eight miles, Jno. Bostrom; next 10 miles, Freeburg and Stone; next four miles, D. McLeod; next 17 miles, Sheedy and Smith; next 10 miles, L. Albi; ten miles west of Bulkeley Summit, D. Ross; five miles east of Bulkeley Summit, J. McLeod; next 10 miles, A. L. McHugh; next 10 miles, D. Stewart; 14 miles along Burns Lake and eastward, D. A. Rankin and Co.

Terminal Work at Prince Rupert.—Contracts are reported to have been let for the excavation work on the site of the dry dock, terminals and hotel in Prince Rupert, B.C. The station is to be built on the site of the present town hall. The present hotel—the Prince Rupert Inn—is being removed to Centre St. and this site will be used for yard purposes.

G.T.P. Branch Lines.—We are officially advised that the company is not considering the building of a branch line from Napadoggan to Fredericton, N.B., 45 miles, as stated in press reports.

The construction for the current year includes the completion of the branch from Harte to Brandon, Man., 24 miles.

In connection with the guarantee of bonds of lines of the G.T.P. Branch Lines Co. in Saskatchewan the Provincial Legislature has extended the time within which such lines are to be completed to Dec. 31, 1912. Another act has been passed providing for the issue of guaranteed bonds or other securities for $12,000 a mile, under the provisions of Sec. 9, chap. 4, of the statutes of 1908-09. The securities to be guaranteed under this act are in respect to additional lines to be built under order-in-council, which are to be completed by Dec. 31, 1914. Under this legislation contracts were let in 1911 for the building of several lines, certain of which it is expected to have completed by the end of the current year. These are:—

Regina boundary branch, from Regina southeasterly, 155 miles, J. D. McArthur, contractor. Winnipeg. In connection with this line the Board of Railway Commissioners has approved revised location plans from mileage 17.02 to 91.13.

Regina to Moose Jaw, 40 miles, Rigby, Hyland and Plummer, contractors.

Moose Jaw northwesterly, 40 miles, J. D. McArthur, contractor.

Prince Albert branch, to complete from 67 miles out of Young to Prince Albert, 54.5 miles. J. D. McArthur, contractor.

Battleford branch from Oban to Battleford, 48 miles. J. D. McArthur, contractor.

Cutknife branch, from Battleford, westerly, 50 miles. J. D. McArthur, contractor.

Biggar-Calgary branch, from Biggar, Sask., southwesterly to Calgary, Alta., 104 miles. Foley Bros., Welch and Stewart, contractors. The schedule of the act passed by the Saskatchewan Legislature this year provides for the guaranteeing of bonds to be issued for this line for 50 miles, in addition to the 50 miles already built, and also provides for a guarantee of bonds for this or any other of the lines already guaranteed for further extensions not exceeding 40 miles in any case. For the section of this line in Alberta, an extension of time for construction has been granted by the Alberta Legislature.

The Grand Trunk Pacific Saskatchewan Ry. Co. has been incorporated by the Saskatchewan Legislature, with E. J. Chamberlin, G. W. Caye, W. Le B. Ross, D'Arcy Tate and H. H. Hansard, Winnipeg, as provisional directors. It is authorized to build the following railways: From tp. 9 or 10, range 13, west of the second meridian through Weyburn, thence southwesterly and westerly to the western boundary of the province in tps. 2 to 5; from tp. 18, range 19, southwesterly to a junction with the first mentioned line; from Saskatoon westerly and northwesterly to Battleford; from near Watrous southwesterly to Swift Current and thence to the International boundary between ranges 23 and 30 west of the third meridian; from Melville northerly, northwesterly and westerly to Watrous; from Saskatoon southeasterly and southerly to Regina; from tp. 16, range 8, west of the third meridian, southwesterly and westerly to a junction with the G.T.P. Branch Lines Co.'s Biggar-Calgary branch; and such other lines within the province as may be authorized from time to time by order-in-council. Another act has been passed authorizing the Government to guarantee the company's bonds up to $12,000 a mile in respect of these lines. The proceeds of the sale of the guaranteed bonds shall be paid into a special account and paid out as the work proceeds upon the certificate of the provincial Minister of Railways. Part of the mileage has to be built during the current year and all the lines have to be completed by Dec. 31, 1914. The lines referred to will total 205 miles, and the act provides that the guarantee may be added to bonds to be issued in respect of the extension of any one of them for a further distance of 40 miles.

The Alberta Legislature has extended the time for the construction of lines authorized under previous legislation, for which contracts have been entered into either with the G.T.P. Branch Lines Co. or other subsidiary companies. The lines, for which contracts were let last year, or which are included in the construction programme for the current year, are as follows:—

Tofield-Calgary branch, completion of the branch involving 95 miles of construction. J. D. McArthur, contractor.

Calgary to Lethbridge, 111 miles. Tenders are reported to be under consideration.

Alberta Coal branch, completion of branch involving 25 miles of construction. Foley Bros., Welch and Stewart, contractors.

The act passed at the Alberta Legislature's recent session also provides for the guarantee of bonds for the building of a line from an unnamed point on the G.T.P. Ry. southerly for 58 miles to open up additional coal fields.

The G.T.P. steamship dock at Vancouver, B.C., which was opened for traffic Feb. 27, is fully described in a separate article in the Marine Department on another page of this issue.

Telegraph Lines.—Particulars of construction to date and the programme for this year are given on another page.

A New York press report states that the Howe Sound and Northern Ry. has been acquired in the interests of this company, the purchase price being $375,000. The line runs from Newport northward through the Squamish River Valley for about seven miles.

National Transcontinental Railway Construction

F. P. Gutelius, M. Can. Soc. C.E., and [illegible], K.C., the commissioners appointed to investigate the construction of the N.T.R., will leave Ottawa shortly to begin their investigations on the line. They have been looking over the plans and specifications and examining the contracts and reports upon which payments for work were made, in order to familiarize themselves with the position of the work. The principal object of the investigation is to determine the causes of the discrepancies between the original estimates and the actual cost of the work. It is expected that the investigation along the line from Moncton to Winnipeg will last about three months.

The section of the line from Moncton, N.B., to the southern end of the Quebec bridge is reported to be ready to be taken over from the contractors, as also is the section of the line from just outside Quebec westerly for about 350 miles. The sections of the line, the construction on which is being proceeded with east and west from Cochrane, Ont., are well advanced. Steel is reported to have been laid easterly from Cochrane to Peter Brown Creek, 150 miles. Track was laid to mileage 1197.45 from Moncton, on Division C, that is to about 37 miles east of the west end of Division C, which lies west of Cochrane. Work on the various sections of the line on which grading has not been completed was carried on where possible during the winter, and the construction camps are now filling up with men preparatory to starting up the regular season's operations.

The first locomotive to be taken into the shops at Transcona, Man., was run in Mar. 25, although the shops are not yet fully equipped for work. Good progress is being made by Harvey, Quinlan and Robinson with the erection of the car shops, and the J. D. McArthur Co. has a large force of men on laying out the yard tracks. The coal chute erected by the J. McDiarmid Co., has been completed. Tenders are under consideration for a diversion of the sewer on Verandrye and Archibald streets, necessitated by the layout of the yards, etc.

The following have been given as the levels of the line in western Quebec by K. Weatherbone, assistant engineer of District C:—Lake Abitibi, high water level, 870 ft.; Whitefish River, water level, 870 ft.; Lois River, 915 ft.; Kakmoonan River, water level, 984 ft.; Robertson Lake, water level, 1,004 ft.; branch of Nawapitechin River, water level, 978 ft.; Molesworth Lake, water level, 1,003 ft.; Spirit Lake, water level, 1,036 ft.; Harricanaw River, water level, 971 ft.; Peter Brown creek, water level, 1,003 ft.; Natagagan River, water level, 1,000 ft.; Coffee River, water level, 1,007 ft.; Bell River, water level, 994 ft.; Migiskan River, west crossing, water level, 1,071 ft.; Sunday Brook, water level, 1,092 ft.; Crooked Creek, water level, 1,123 ft.; Migiskan River, east crossing, water level, 1,158 ft.; Canon Creek, water level, 1,139 ft.; Atik River at outlet from Atik Lake, water level, 1,277 ft.; Durant Lake, water level, 1,327 ft.; Steele Lake, water level, 1,353 ft.; Kekek River, water level, 1,364 ft.; Hamilton Lake, water level, 1,427 ft.; Susis River, 1,394 ft. (April, pg. 180.)

National Transcontinental Railway Construction

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Grand Trunk Pacific Railway Construction.

Main Line.—The plans for the proposed yards between Namayo St. and Kinistus Ave., Edmonton, involve the crossing of the latter. The company desires to cross at the level, but the city council, April 16, passed a resolution calling upon the company to put in a subway.

It has been decided that the new union station at Edmonton with the Canadian Northern Ry. will be located between First and Second Streets.

C. Schleicher, Consulting Engineer Dominion Government, returned to Ottawa, April 17, after having made a trip of inspection over the line as far as Tete Jaune Cache, B.C. He reports having found track laid to 30 miles beyond the Yellowhead Pass, and grading well advanced to Tete Jaune Cache. The contractors were putting forth every effort in order to get the line through to the Fraser River, in order that a steamship service might be opened up as far as Fort George. On the section easterly from Prince Rupert, track had been laid for 138 miles, and grading was being carried on as far as the 245th mile.

It was reported, Mar. 30, that the following subcontractors were at work east and west of Tete Jaune Cache:—H. E. Carlton and Co., A. E. Griffin and Co., Burns, Jordan and Co., Sims, Carey and Co. P. Welch, representing the contractors, Foley, Welch and Stewart, is in charge of the whole of the work in British Columbia, and is making his headquarters alternately at Fitzhugh, Alta., and at Bulkeley Summit, B.C.

Harte-Brandon Branch.—The contractors for the branch under construction from Harte to Brandon, Man., are Rigby, Hyland and Plummer, Winnipeg. It will be 24 miles long, and is to be completed during the current year.

The Dominion Parliament has voted a subsidy of 25 per cent. of the cost of a bridge across the Assiniboine River at Brandon.

The company is being invited to build a line from near Miniota, Man., to Brandon, to effect a junction with the Harte-Brandon branch.

Melville-Canora Branch.—The branch line northerly from Melville, Sask., which now terminates at Canora, will, it is said, be extended to Le Pas, Man. Recent press reports state that the surveys have been completed over a route from Canora to Le Pas.

Regina Station and Hotel.—Plans for the station at Regina have been completed, and have been communicated to the municipal authorities. The building, which will be erected at the corner of Sixteenth Ave. and Albert St., will be two stories, with a frontage of 250 ft. and a depth of about 500 ft., including the train sheds. The ground floor will contain all the public offices, while upstairs will be located the divisional staff. The estimated cost is $200,000.

Plans for the proposed hotel in Regina will, it is expected, be submitted to the municipal authorities at an early date.

Regina-Boundary Branch.—Track laying was started April 11 on the branch line from Regina to the international boundary, 155 miles. The grading is being done by J. D. McArthur, Winnipeg. It is expected to have the branch completed this year.

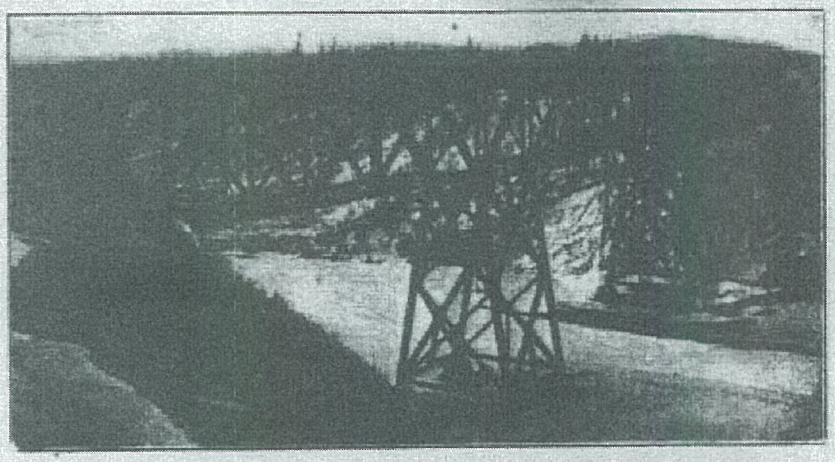
Regina-Moose Jaw Branch.—It is expected that the 60 mile branch connecting Regina and Moose Jaw, Sask., will be completed this year. The contractors are Rigby, Hyland and Plummer, Winnipeg.

Moose Jaw Northwesterly.—The construction of the branch line from Moose Jaw for 40 miles northwesterly was expected to have been started April 30. The contractors are Rigby, Hyland and Plummer, Winnipeg.

Battleford Branch.—Construction on the branch from Oban to Battleford, Sask., 48 miles, has been started up for the season by the contractor, J. Daudelin, Battleford. It is expected to have it completed this season.

The Prince Albert Branch, which starts at Yonge, Sask., has been completed for 47 miles. The extension of the line to Prince Albert, 54.5 miles is being built by J. D. McArthur, Winnipeg.

Calknife Branch.—The Board of Railway Commissioners has approved the correction of errors in the revised location plans of the branch. The contract for the building of 50 miles, from Battleford, Sask., is being carried out by Lamoreaux and Peterson, Omaha, Neb.



The Grand Trunk Pacific Railway Wolfe Creek Bridge.

Biggar to Calgary Branch.—Work is reported to have been started on this branch by Foley, Welch and Stewart. The branch starts from Biggar, and will enter Calgary over the company's Tofield-Calgary branch tracks. Its total length will be 194 miles.

Tofield-Calgary Branch.—Track laying was resumed April 8, and it is expected that the work will be completed into Calgary, Alta., early in July. The contractor is J. D. McArthur, Winnipeg. Considerable difficulty was met with in fixing the route of this line, as, in common with the Canadian Northern Ry. branch into Calgary, it passed through the C.P.R. irrigated lands.

Calgary Terminals.—It is reported that the company has purchased the N.W.M.P. barracks site in Calgary, for terminal purposes, for $1,000,000. E. J. Chamberlin, V.P. and G.M., stated Mar. 30, that a site had been acquired, and that an announcement would be made as to plans at an early date. The station would be built as soon as possible.

Calgary-Lethbridge Branch.—No contract has yet been let for the grading

G.T.R. Running Rights Over Temiskaming and Northern Ontario Ry.

The Dominion Parliament has confirmed two agreements made between the Temiskaming and Northern Ontario Ry. Commission and the Grand Trunk Ry. Co., under which the G.T.R. acquires running rights over the Ontario Government railway.

The first agreement, dated May 1, 1911, provides for the building by the T. and N.O. Ry. of a line southerly from North Bay to a junction with the G.T.R. at Nipissing Jct., and to lease the same to the G.T.R. at a rental of 4½% upon the cost, for 50 years, determinable after 20 years on five years notice. Other companies may be given the right to operate over the line, in which case a joint arrangement shall be made as to terms. The G.T.R. will pay in addition to the rental, all taxes, and keep the extension in repair, and the Commission has right of re-entry in case of default. All differences are to be arbitrated.

The second agreement, dated Dec. 1 1911, provides for the use by the G.T.R. of the T. and N.O. Ry. line from the terminal yards at North Bay to the junction with the National Transcontinental Ry. at Cochrane, Ont., about 253 miles, with all sidings, side tracks, buildings, etc., but exclusive of the repair shops and store buildings at North Bay and Englehart. The G.T.R. is given the right of joint use of the line as described with the T. and N.O.R. for $200,000 a year and interest at the rate of 4½% on all sums expended upon the betterment of the line since July 1, 1911. The Commission agrees to maintain the line and all the appurtenances up to a standard equal to the portion of the G.T.R. line between Nipissing Jct. and Toronto. The schedule of trains shall be arranged between the officials of the two railways, the Commission's superintendents to be in charge. The Commission's employees to render service to both parties equally; [illegible] to be manned by G.T.R. [illegible] In cases of doubt T. and N.O. officials are to be given the right of [illegible]. Switching connections shall be provided and operated by the Commission, [illegible] half of the cost of operating the same, it to be paid by the G.T.R. The division of the cost of maintenance between the two lines is also provided for. The books of each railway recording the operations over the line may be mutually inspected. The agreement also provides for the terms upon which traffic is to be interchanged with the C.P.R., etc., the carriage of express matter, and the use of telegraph lines, etc. The agreement is to run for 21 years, but within three years the G.T.R. may secure legislation extending it to 25 years, with the option of a renewal for a further period of 25 years. Matters unprovided for are to be arranged by agreement, and all differences arising between the parties are to be settled by arbitration.

MAY 1912

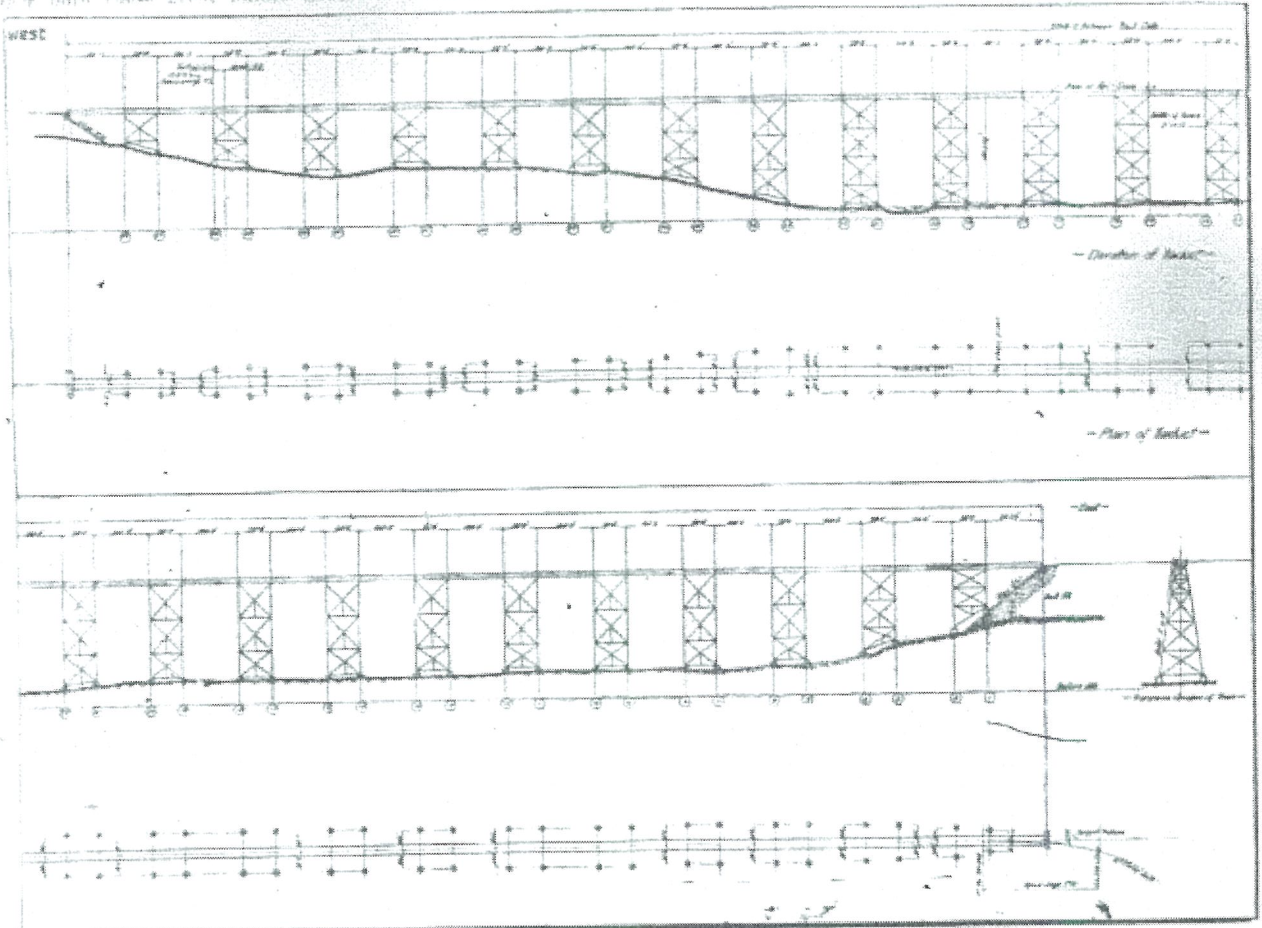
The Little Salmon River Viaduct, National Transcontinental Railway.

By R. F. Uniacke, M. Can. Soc. C.E., Bridge Engineer, N.T.R. Commission.

The act of Parliament authorizing the construction by commission, of the Eastern Division of the National Transcontinental Ry., provides for a location from its eastern terminus, Moncton, through the central part of the Province of New Brunswick, and through the Province of Quebec by the shortest available route to the city of Quebec. At the time of the inception of the Intercolonial Ry. New Brunswick had been thoroughly explored before the final location was adopted, and the controversy of the routes has been fought out over both these great public undertakings. Three routes were located for the Intercolonial known at that time as the frontier, the central, and the Baie des Chaleurs routes, and of these on the recommendation of the Chief Engineer, and owing to Imperial considerations, since a subsidy aid had been granted by the Home Government, the Baie des Chaleurs route was adopted.

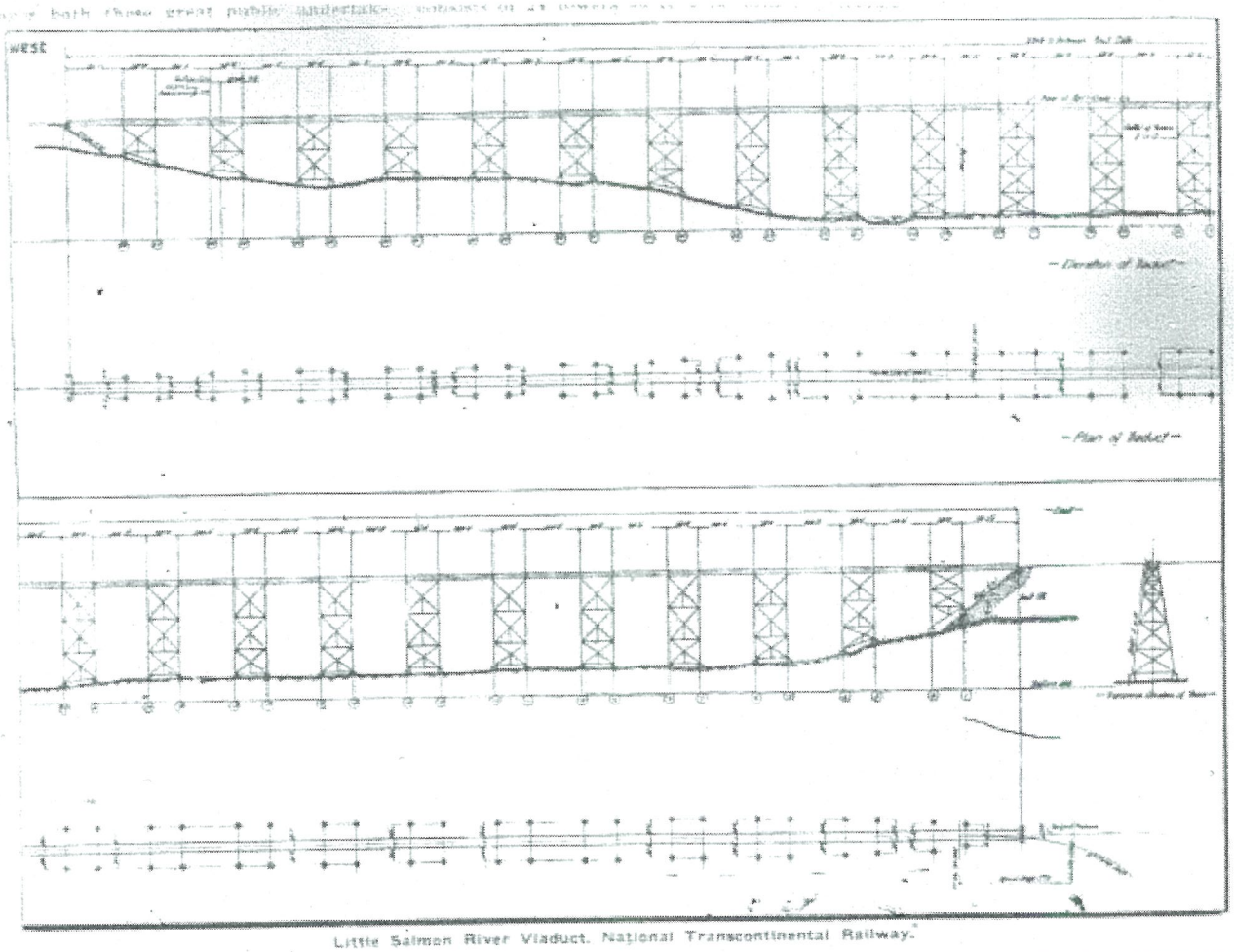
The engineers of the Transcontinental had located two lines, one known as the river route, following the St. John River, north from Fredericton, and the other the central route; the latter was adopted as fulfilling more closely the provisions of the act. That a railway has now been constructed along this route having a ruling 0.4 compensated grade, with a maximum curvature of 6°, is owing in a large measure to the advance in modern bridge and high viaduct construction. The valley of the Little Salmon River, 185 miles from Moncton, presented one of the obstacles to be overcome, as the grade development showed a crossing over 4,000 ft. long, with a height of 200 ft. above the water line. The description of the design and construction of this viaduct the writer has undertaken to present in this paper.

The line approaches the west end of the structure with a 6° curve through a rock cutting and crosses on a tangent bearing N. 10°—27 ft. W., the grade rising 0.40 ft. per hundred. The layout consists of 24 towers 58 ft. 9 in. centres and 25 intermediate spans 100 ft. 3 ins. c. to c., the end spans being 100 ft. 10½ ins. centre of bent to outer end of steel; all the tower spans are alike and also the intermediate spans, except that the masonry ends are extended to give the required bearing. The towers and bracing are made alike as much as possible, necessitating one set of templates only for the spans and parts of towers which duplicate each other. A through girder system of construction was adopted, the girders being spaced 17½ ft. c. to c., while the floor beams with gussets were spaced 14 ft. c. to c., along the plate girders. The east end span is on a spiral to a 6° curve and in consequence the girders are deflected at this abutment 1 ft. 3 ins. off the tangent to the structure produced. There were several reasons which led to the adoption of a through girder system. In high trestle construction, where the use of false work is out of the question, the most economical layout is that of an intermediate span as long as can be handled with a well designed traveller working from grade, so as to reduce the number of high towers, their pedestals and foundations. Spans of 60 ft. with 40 ft. towers are generally employed where deck girders are used, spaced 9 ft. c. to c., and bridge ties resting on the top flanges. Owing to the through girder system having a spacing of girders 17½ ft. c. to c., spans of 100 ft. are handled, since the bearings of the traveller rest on the flanges, thus giving that much more base to brace the traveller in handling loads. The stability of the erection outfit is amply provided for so that in this case girders weighing 30 tons were placed in position. It certainly gives a feeling of safety to see from the car window the flanges of a heavy steel girder, and that this is not altogether sentiment is shown by the fact that instances of derailment are recorded, in which the car held to the roadway by the lateral resisting power of these girders.



Little Salmon River Viaduct, National Transcontinental Railway.

SUBSTRUCTURE.—The approach at the east end being through a rock cutting, in order to avoid building the steel work on a curve, and also to utilize the material in the cutting without waste, an abutment of reinforced concrete placed on top of the rock fill was decided on. A buried pier built from the original surface at this point would have been over 100 ft. high, difficult to design and build, and very costly. This was avoided by the use of a bank abutment. The concrete was reinforced to prevent danger of cracks from settlement in the



Little Salmon River Viaduct, National Transcontinental Railway.

JUNE
1912

work, and in order to give time for the work to settle the ends of the girders were temporarily supported by a crib work of square timber, before building the permanent abutment.

In the design of the pedestals and west abutment, borings and test pits were first made to determine the character of the soil. This proved to be of compact sand, gravel and hard pan, so that no piling was required, the footings being designed to distribute the load at a pressure of from 2.5 to 4 tons per square foot. The four pedestals near the water line at the banks of the river were built with curved cutwaters, the axis of piers being parallel to the direction of the current, forming suitable breakers. The anchor bolts for pedestals consisted of two rods, 2 ins. in diameter, the lengths varying according to the uplift to be resisted. These rods were anchored at the bottom by nuts of 10 in. channels and washers, the concrete being built around them. In order to give room for a little variation in their position, conical forms were set around each bolt, a lip being left at the top extending beyond the base plate of column through which these rods were filled with grout after the steel was erected. The west abutment or buried pier was about 40 ft. in height above the footing course, and in order to reduce the pressure on the soil and allow the embankment to run through and surround it, an arched void was left in a longitudinal direction. No difficulty was experienced in building to this design.

In laying out the work no triangulation was required and an ordinary steel tape was used, the writer's experience being that, as provision is made in the orders for expansion, a slight variation in the position of the anchor bolts is permissible, providing the expansion bars are made longer than the theoretical length requires. The chief difficulty consists in maintaining the anchors in a vertical position and protecting them from rough usage from swinging buckets of concrete and other causes.

CONCRETE.—The materials used in the concrete were Portland cement, sand and gravel, the two latter being obtained on the bank of the river near the bridge site. In this locality good sand is very difficult to obtain and, after a test of sand from several pits, the local material was selected, the sieve test showing after the gravel was screened out:

Retained on 20 mesh sieve	6%
Retained on 30 mesh sieve	17%
Retained on 50 mesh sieve	15%
Retained on 74 mesh sieve	2%
Retained on 100 mesh sieve	2%
	100%

After treating the finer residue with a 2% solution of sulphuric acid, it was found to contain 6% of soluble matter, which was eliminated by through washing, and a mixture of one part cement, two parts sand, and four parts gravel, varying from the size of a pea to 2 ins., was obtained. As the sand was not of the best quality, the use of 1-2-4 mixture was ordered in shafts of pedestals, since they have to sustain a high concentrated load on a comparatively small volume of concrete. The concrete used in the buried pier and foundations was a 1-2-5 mixture. In obtaining a proper facing mixture the coarser material was kept away from the forms by the use of perforated spades, pushed down and drawn back while the mixture was still plastic. This method was found more satisfactory than that of attempting to bond a facing mixture into the body as required in some specifications.

Fig. 1—General View.

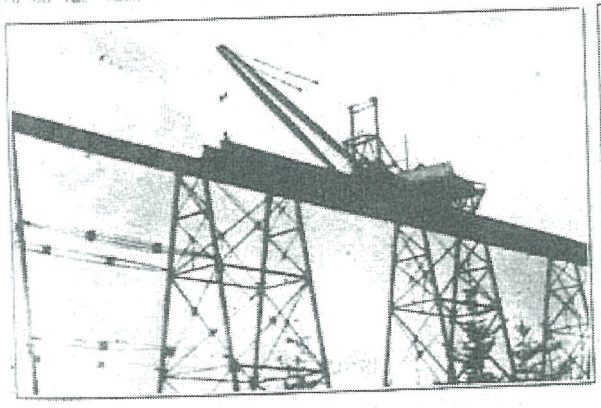


Fig. 2—100 ft. Girder Raised.

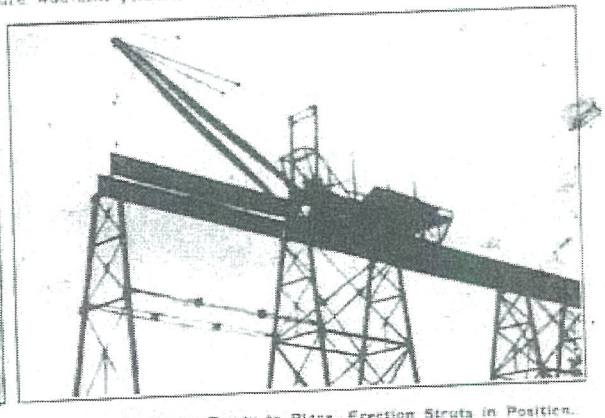


Fig. 3—100 ft. Girder Ready to Place. Erection Struts in Position.

CEMENT.—The following description of the method adopted for sampling and testing the cement used on all structures under construction on the N.T.R. may be of interest. The cement specifications are standard, and the governing tests are for fineness, specific gravity, soundness, time of setting, and tensile strength. The cement shall not acquire its initial set in less than 45 minutes and must have acquired its final set within 10 hours, the briquettes being kept in a damp closet for 24 hours and afterwards immersed in water until time of breaking.

It is the writer's practice on receiving notice that a consignment of cement is to be shipped to a contractor to send an inspector to the mills to draw samples from the bags as they are being loaded into the cars; one bag in 40 is sampled, both doors of the car sealed with the N.T.R. lead seal and the sample cases forwarded to the cement testing laboratory in Ottawa, in charge of a chief cement inspector attached to the Bridge Engineer's office. The seal being intact on arriving at the bridge site is a notice to the field inspector that the car has been sampled by the Bridge Department. The preliminary tests for soundness are made at once, the mills are notified to hold the cars if these results appear doubtful, and the final record covering the full 28 days tests is generally completed and the contractor advised of the acceptance soon after the cars are on the work. In mills where the records have been continuously good, the contractor has been permitted to use the cement on completion of the

seven days test. In some cases where work would be held up for want of cars, but always at the contractor's risk and subject to the 28 days tests; in no case where this has been allowed has the result proved a mistake in judgment. A cement sampling record slip is enclosed in the sealed sample case giving all information as to shipment. Copies of the final test record are furnished to the district engineer as well as to the mills for comparison with the manufacturer's tests, and the records are compiled in loose leaf books for future reference.

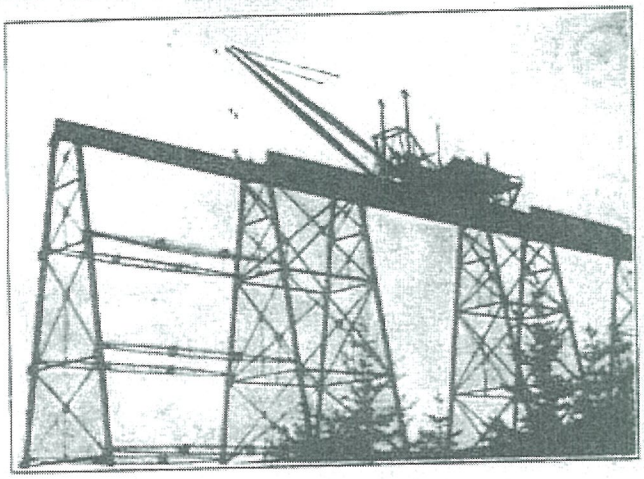


Fig. 4—100 ft. Girder in Place.

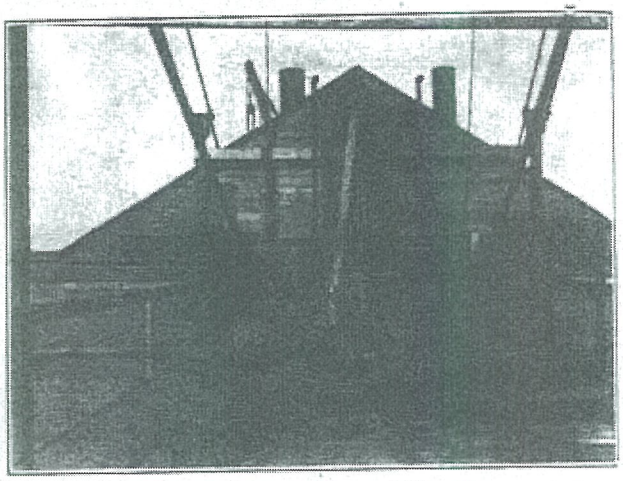


Fig. 5—Working Platform of Traveller.

By means of these records and a system of reports from the field inspectors of the arrival of cars, it is an easy matter to trace any car and identify its contents after being piled in the cement storage house at the bridge site.

DESIGN.—The Dominion Government specifications were strictly adhered to in the proportioning of the members. The compression members were figured for the pin ended formula of these specifications. In the tension members of the towers a limiting length of 200 l/r was used to avoid sagging of members, to make them capable of resisting compression and to give initial stiffness. The use of bulb angles in the sway bracing of towers makes a very stiff and economical section and avoids breakages in shipment, the great fault in box laced section of light angles. Traction and wind were figures as called for in the specifications.

The posts viewed from the stress sheets do not appear to be economical, because of their relatively small radius of gyration when compared with a built up channel section; but the saving in weight of details, and simplicity in shop work fully compensates for the extra main material. In the light of column tests it is reasonable to expect that the reduction in unit stresses for the increase of radii length would not be justified by practical tests. The metal is used mostly in directly resisting the primary stresses, as very little is required for secondary purposes (viz., lattice the plates, etc.), and in this way a stronger column is obtained. The section used has also the advantage of continuous webs in each direction, which are greatly superior to the easily bent lattice bars, and moreover the interior of the column is much more accessible to the paint brush for shop and field coats. The section is symmetrical on both axes, having therefore its centre of gravity in the centre of the section, and no eccentric loading is induced from the girders. The small amount of redundant metal means uniformity of stress in the columns, and simplicity in the make up will decrease the cost of maintenance.

TENDERS.—In calling for tenders for the steel work our usual practice was followed of furnishing bridge companies with a general design and details of girders and towers, together with a printed form of tender in which was filled in the estimated weights of steel, and number of feet b.m. of timber in the floor. With this system all bridge companies bid on the same basis, and are not required to make a single drawing to submit with tenders, but merely to fill in the unit prices for steel and timber erected in place, and to carry out the amounts on the estimated quantities furnished, viz., steel 14,000,000 lbs., timber 520,300 ft. b.m. After the tender is awarded the bridge company submits stress sheets and details for approval before ordering the material from the mills.

FLOOR.—The rails were directly supported by 8 in. x 12 in. x 14 ft. bridge ties resting on the steel stringers, every fourth tie being 16 ft. long to support the plank footway placed outside the guard timber for the convenience and safety of the section men. An outside guard timber 8 in. x 9 in. dapped 4 in. over the ties, which were spaced four inches apart in the clear, the ties were secured to the stringers by ¾ in. hook bolts, and the guard timbers bolted through the tie with one ¾ in. bolt in every fourth tie. A steel guard rail 60 lbs. to the yard will be placed inside the gauge line, and 8 ins. therefrom in the clear, these guard rails coming together

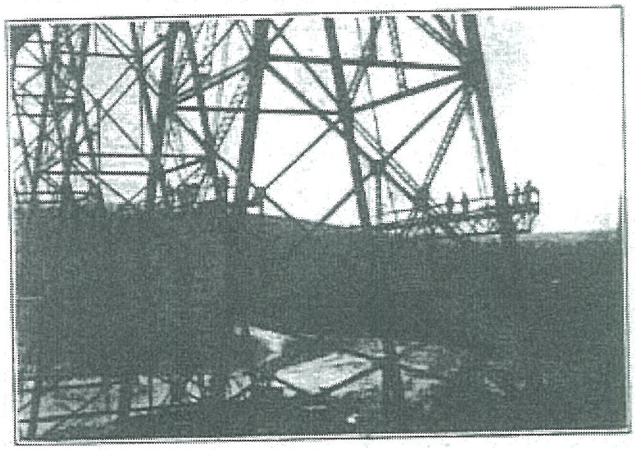


Fig. 6—Rivetting Galleries.

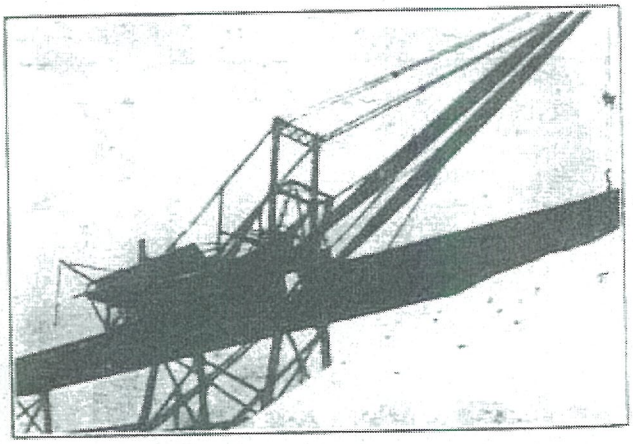


Fig. 10—Placing Last Girder Span.

at the centre of the track one rail length beyond the end of the bridge and being protected by a cast steel point fitting the rail section and spiked to the road bed ties.

ERECTION.—Actual erection began July 27, 1910; the steel was all assembled and last span swung Feb. 8, 1911, and all riveting and painting fully completed by Aug. 19, 1911. Material was unloaded at a siding at the west end and handled by a two boom derrick car in the storing yard. A light standard gauge locomotive with lorry cars handled the material from the storage yard to end of steel. The main feature of the

erection outfit was the 40 ton two boom erection derrick, travelling on the top flanges of the girders, the trucks of the traveller running on 115 lb. crane rail, the base of which rested on timber temporarily secured to the girder flanges. This derrick was self-propelling by means of a chain and sprocket connecting the trucks with the erecting engine, which consisted of two 10 x 12 in. cylinders—2 drum—4 spool hoist. The 115 ft. booms were box section composed of 4 36 in. x ⅝ in. web plates at centre section and tapering at the end, connected with four 3½ x 3½ x ⅝ angles. This section was found to weigh actually less than a latticed section and the combined unit stresses from compression and bending were very much reduced. The writer was told that the men working on the traveller, and assembling, were very enthusiastic over the ease with which the big machine handled its work. The wind at the deck of the trestle was very strong, and was generally blowing at right angles to the bridge, but the work was practically never held up on account of too much wind. The use of the erection struts is shown in fig. 2; after a tower and its girders were assembled the erection struts were removed and used again to stiffen the first bent of the next tower until it too was connected and self sustaining. The hook bolts temporarily connecting the ends of these struts with the columns proved very efficient.

Another important feature was the use of riveting bridges for convenience and safety of the men in assembling, reaming, and painting. By reference to figs. 6, 7 and 8, the method of handling them will be plainly seen. They were carried along the top of the trestle by the two boom yard derrick car, and after being secured to the top flanges of girders by hooks, the cages were

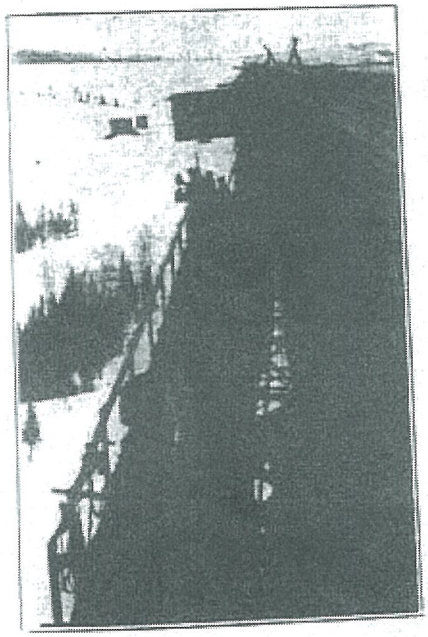


Fig. 5—Riveting Gallery in Position at Top Tower.

lowered or raised by hand, as required, the free end of the tackles being on the platform, so that the riveters could block away themselves.

The erection staff varied from 60 to 80 men, of which but 6 were employed on the big traveller, 1 subforeman and 14 men were used to assemble the steel work, and the rest formed from 2 to 6 gangs of riveters, also crew for derrick car used for unloading material in yard, and delivering same to traveller, and driver for light locomotive. The riveting gangs averaged 302 rivets a day of 10 hours per gang, a rate which would probably have been reduced by 50% if ordinary staging had been used, instead of the riveting cages.

The accompanying table showing progress of erection indicates rather remarkable time, considering the force employed. A pair of 160 ft. girders

Fig. 7—Method of Raising and Moving Riveting Galleries.

were swung and bolted in their final position in 37 minutes, and floor beams and stringers assembled in half a day.

PAINTING.—One coat of black metalastic paint was used in the shop, with a coat on each contact surface before assembling. Two field coats were applied, the first metalastic brown, and the final coat acheson graphite. Rivet heads and shop marks were touched up before applying the field coats. The use of a different shade for the first field coat was a great help to the inspector, to enable him to see that the several coverings were properly applied.

THE INSPECTION of this work covers mill, shop, and erection inspection, all in accordance with the Dominion Government specifications of 1908. The bridge company, on being advised of the name of the inspection company, which is to do the inspection, is required to furnish it in triplicate with copies of all mill orders; one copy is furnished the bridge engineer, and one copy is sent to the inspection company's representative at the mills where the material is to be rolled.

The inspector then makes arrangements to be present at the rolling of the material which is being furnished on these orders, making complete surface inspection of every piece, measuring it for width and for length, and gauging the thickness. Specimens are then selected from the material so inspected by the representative of the inspection company; taken from each heat of steel which has been rolled into the material furnished on his particular order. These test pieces so selected are then forwarded to the machine shop to be properly prepared, that is to say, machined on both edges and straightened true. The test pieces so prepared are then sent to the testing laboratory at the mills, where the same are measured and broken in the testing machine, in the presence of the inspector. The results of this test piece have to conform with the requirements of the specifications, that is to say, the tensile strength has to be within the limits, also the elongation and reduction of area of the steel. The inspection company, in addition to witnessing the pulling of these test pieces previously selected by their representative, also secures from the rolling mills a certificate of the chemical analysis which may be found in the steel so tested. Frequently the inspector requires drillings to be taken from the test pieces at the mills, so as to check up the accuracy of the reports presented to him by the rolling mill company. Test pieces and material which they represent are identified by melt numbers.

As soon as the surface inspection of the material has been made, and the tests have proved satisfactory, the inspector then undertakes to see that the material is properly loaded in the cars ready for shipment to the bridge works. Full descriptive reports are then made out by the inspection company, showing the number of pieces and the size and length of each piece so shipped from the steel works, together with the results of tests. These reports are then sent forward to the bridge engineer.

SHOP INSPECTION.—As soon as the material has been received at the bridge works, the same is then unloaded, and when work is ready to commence, the various pieces of material which go to make up a full sized member are brought into the shop. The representative of the inspection company is present to see the laying off of the material, the first step in the preparation for punching. The punching is then witnessed by the inspector to see that punches and dies of the correct size are used, as required by the Dominion Government specifications. The inspector then further sees that the material, as soon as it is punched, is properly assembled, and that a sufficient number of bolts are used, so as to insure perfect fit and matching of all holes, prior to the same being riveted. The process of riveting is also supervised; and, lastly, the finished member is checked over to see that the measurements and clearances are correct, and that construction is in full accordance with the shop drawings submitted by the bridge company and approved by the bridge engineer.

Fig. 9—Method of Erection.

The painting, which is also a very important part of the work, is then closely supervised, to see that the temperature in which the material is painted is suitable for such painting, also that the material so painted is stored under cover until such paint has become thoroughly dry.

After all these several stages of con-

National Transcontinental Railway Construction.

The commissioners received tenders to May 31 for the construction of 200 ton mechanical coaling plants, with sandhouses and track approaches at Moncton, N.B., Napadogan, N.B., Edmundston, N.B., Grant, Ont., Calvert, Ont., and Armstrong, Ont. Tenders were also received to May 31 for the construction of a 1,000 ton coaling station with inclined trestle approach at Cochrane, Ont.

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The question of the provision of terminal facilities for the N.T.R. at Quebec, which was taken under consideration by the present Government after its accession to office in Sept., 1911, and by R. W. Leonard, who now constitutes the commission, is apparently being settled on a new basis. The following statement was given out, May 3, at Quebec by the Minister of Railways and Mr. Leonard:— "At the last Cabinet Council meeting, before the Hon. Mr. Pelletier left Ottawa, the question of the terminals at Quebec was fully considered, and it was then officially declared that a decision would be taken here today. The visit which we have made has confirmed us in the opinion that the ideal place to enter the city, especially for passenger traffic, is to pierce a tunnel from Wolf's Cove to St. Malo, and to have a union passenger station at the Palais. The Champlain market site will be utilized for local freight. There is no room on the Champlain market site for big elevators, and the place is too narrow. The railways here must soon handle a great part of the through grain traffic, and an elevator of some 10,000,000 bush. capacity is necessary. It should be built in such a way that other units may be added, so as to handle from 20,000,000 to 30,000,000 bush. In order to do this, there must be space to move about. The Government has bought, in St. Malo, 200 acres of fine property, which will be used for a car yard. As to the work shops, the site already chosen at St. Foye, near the bridge, is a very good one, and has been finally decided upon. We will have car ferries, which will take care of the traffic, pending the completion of the Quebec bridge. The work will be begun as soon as the plans are completed, and will be brought to a satisfactory completion without delay."

The locomotive shops at Transcona,

JUNE 1912

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The locomotive shops at Transcona, Man., have been completed, inspected by the Government engineers and taken over from the contractors, Messrs. Haney, Quinlan and Robertson.

R. W. Leonard returned to Montreal, May 16, after having completed an official inspection of the sections of the line under construction east and west of Quebec. There is a gap of 32 miles to be completed between Quebec and the New Brunswick boundary. West of Quebec the line is completed for 100 west of La Tuque. There are about 200 miles to be completed between the end of track and Cochrane, Ont., which it is expected to have done by the end of 1913. The line from Cochrane to the junction with the Lake Superior branch, G.T. Pacific Ry., is expected to be completed this year. Arrangements are reported to have been made by which the C.P.R. will connect with the line at Grand Falls, N.B., for hauling lumber and the operation of a mixed service between Quebec and La Tuque.

Grand Trunk Pacific Railway Construction.

At the Fort William terminals of the G.T.P. branch line from the National Transcontinental Ry., a large force is working on the 2,500,000 bush. addition to the elevator, which it is expected to have completed by the fall. All the piles have been driven, and the concrete is being placed. It is expected to make a start on the new coal docks, and to carry out other improvements during this year.

Work is being proceeded with on the Harte-Brandon branch in Manitoba. We are officially advised that nothing definite has been decided with reference to the extension of the line from Canora, Sask., in the direction of Hudson Bay.

In regard to work in Saskatchewan the Provincial Premier is reported to have stated, May 1, that he had been advised that the company will lay nearly 400 miles of steel in the province this year. The branches from Regina to the International boundary, from Regina to Moose Jaw; to Prince Albert, and from Biggar towards Calgary, will be completed, the latter probably beyond the boundary into Alberta. Reports from Regina state that one track laying outfit started work there, and by May 8 had laid 20 miles on the line towards the International boundary.

In Alberta a second track laying outfit started work at mileage 102 on the line from Tofield towards Calgary, and was reported to have laid 25 miles of track to May 8.

In connection with the plans for station and terminal facilities in Calgary, an agreement has been reached, and is awaiting final ratification between the company, the city and the Dominion Government. It provides for the sale of the N.W.P. barracks by the Government to the company for $150,000. The company is to transfer a portion of the land so acquired for street purposes, pay for the moving of the barracks, and provide some buildings for other purposes, pave an avenue, and contribute $25,000 towards the erection of an additional span on the traffic bridge over the Elbow River, connecting East Calgary with the city. On the site of the present barracks the company contracts to build a station facing Eighth Ave., at a cost of between $275,000 and $300,000; and suitable freight sheds on the south side facing Muth Ave. The plan of the lay out of the property shows that the line will cross the Elbow River at its confluence with the Bow River, and that tracks will extend to Sixth St. The station building will be 150 by 100 ft., and the freight shed will be 700 by 50 ft. There will be three passenger platforms, the central one 40 ft. wide, and one at each side 25 ft. wide.

Plans are before the Minister of Railways for a line from Calgary to Coutts, but owing to some objections a new survey is being made, and in connection with this an effort is being made in Great Falls, Mont., to have an arrangement made by which the line will be extended into that place.

It is expected that building operations will be started shortly on the hotel in Edmonton, Alta., for which plans have been prepared by Ross and McFarlane, Montreal.

A tracklaying outfit has started operations from the present end of track near the Alberta-British Columbia boundary, and it is expected that track will be laid to Tete Jaune Cache by July 1. Another tracklaying outfit has started working easterly from the present rail head 164 miles out of Prince Rupert. P. Welch is quoted as stating on his return from a trip east from Prince Rupert, that a train service would shortly be extended to the Skeena River crossing, and that grading was well advanced right along to Fraser Lake.

We are officially advised that a con-

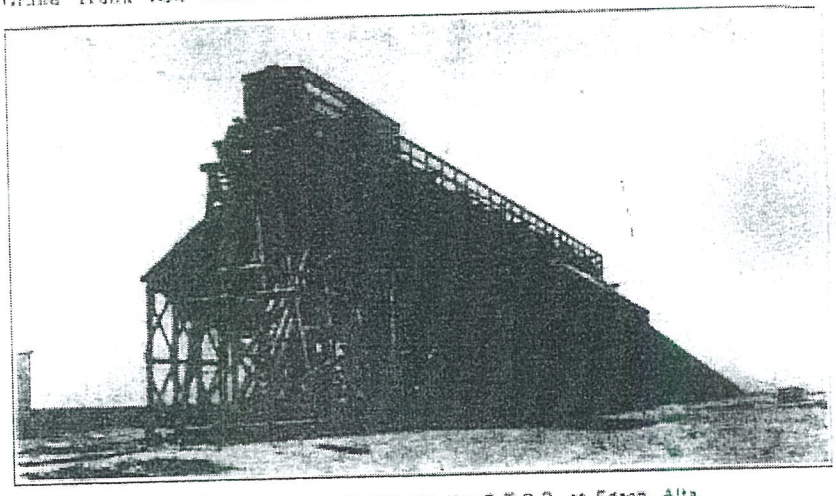
June 1912

1,000 Ton Coaling Station on the Grand Trunk Pacific Railway.

By J. C. Le Grand, Bridge Engineer, G.T.P.R.

It may be of interest to have a description of one of our 1,000 ton coaling stations, which has been adopted as standard for all our principal division points, the one particularly referred to having been built at Edson, Alta., the first division point west of Edmonton.

When I was first called upon to design a coal chute I was furnished with drawings of the one in use on the Grand Trunk Ry., which is called the



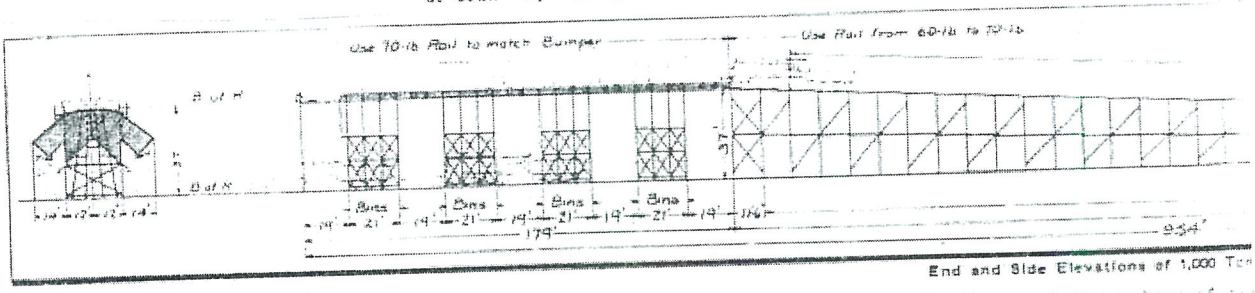
1,000 Ton Coaling Station for the G.T.P.R. at Edson, Alta.

ramp type. This type, in common with those in use on railways in the United States, is composed of pockets separated by bents 12 ft. centres, with sliding gates and aprons on each side, the whole covered by a frame roof resting on two sides composed of scantling covered with plank. Upon going over these plans the first thing that struck me was the enormous quantity of timber used to accommodate a comparatively small quantity of coal. By adding to a similar cross-section a bent on the outside of the coaling track, this bent supporting upper bins with a revolving gate discharging on the centre of the coaling track, I practically doubled the capacity of the section.

Now, what governed me in the design of the length was the number of cars required to be unloaded at one time, this number being stated to be four cars. These four cars and their length gave me the length required for the horizontal part of the trestle placed over the bins. I then designed the bins in four groups each one composed of three sections made by four bents 7 ft. centres, well braced together, the space between each group being 19 ft. centre to centre of bents, spanned by means of steel beams carrying the rail on their top flange, each bin being provided on each side with a revolving gate and an apron which can be lowered for discharging into tender. They are also provided, as before mentioned, with two undercut revolving gates, which discharge directly into tender.

The side bins over the coaling tracks are completely covered with a roof having an inclination slightly greater than the natural slope of the coal, thus allowing the complete filling of each section to the roof line. The centre portion is covered with hinged gates which are opened when coal is to be unloaded from box cars. The centre portion between rails is covered by movable traps, which are removed when hopper cars are used. When there are no cars standing on top of bins, the traps and hinged doors are closed, these forming a kind of archway roof, upon which the snow will hardly remain.

The trestle approach, as constructed, gives a rise of 8 ins. in 12 ft., which corresponds to about 5.55% grade. The total length from the point where the vertical curve commences to the last bent is 954 ft., of which the vertical curve takes up a distance of 200 ft., the trestle 575 ft., and the horizontal part including the four groups of bins, 179



End and Side Elevations of 1,000 Ton

ft. The distance between base of rail of the coaling tracks and the base of rail of the coal track is 27 ft., and the distance between the two coaling tracks is 33 ft., these two coaling tracks being called inbound tracks in the mechanical department yard.

Comparing this with the G.T.P. design, the portion required for the bins is 179 ft., with a capacity of 1,000 tons against 228 ft. for a capacity of 500 tons. The estimated cost of the G.T.P. design is about $13,000 for 500 tons, or about $26 a ton; the G.T. Pacific design costs $25,000 for a capacity of 1,000 tons, which means $25 a ton.

Outside of this, a great feature is the arrangement of groups well separated in case of fire. With the revolving gates in case of fire in any one group of bins it can be emptied practically instantaneously and the fire extinguished very readily, thus saving practically the

[illegible] structure. In the other design several fires have occurred in which not only the bins but the entire trestle has been destroyed.

The question of capacity is also a very important one, especially in this western country, where coal movement is so often seriously delayed owing to our rigorous winter season, strikes, etc.

The foregoing was read before the Western Canada Railway Club recently. As this design is to represent standard practice, it has been most carefully worked out in every detail, and it contains a number of interesting points that the foregoing description does not mention. The timber sizes are as follows:

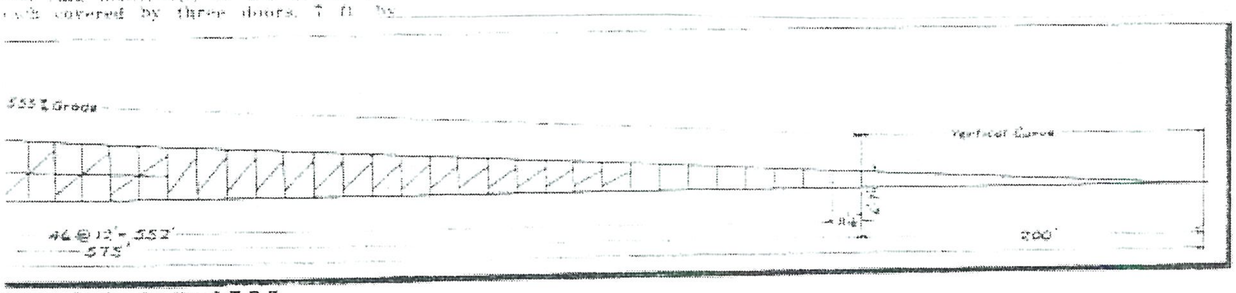
[illegible] ...8 x 8 ins. by 10 ft. long
[illegible] ...8 x 8 ins. by 12 ft. 8 ins. long
[illegible] ...8 x 16 ins. by 21 ft. long
[illegible] ...4 x 10 ins. by 1 ft. long
[illegible] ...10 x 14 ins. by 12 ft. long
[illegible] ...10 x 10 ins. and variable length
[illegible]
[illegible] x 10 ins. by 3 ft. 1 in. and 2 ft. 5 ins. long
[illegible] ...10 x 10 ins. and variable length
[illegible] bracing ...2 x 10 ins. and variable length
[illegible] bracing ...4 x 5 ins. and variable length

Two different designs of foundations are called for under different conditions of the ground on which the coaling station is to be constructed. Where piles can be driven, they are in all cases to be used, driven 2½ ft. apart under each post in the line of the station length, two per post under the bin section, and one per post under the ramp, with the heads of the piles in all cases projecting above the ground 1 ft. on which the framed bents rest. Where it is impossible or impracticable to drive piles, the framed bent is to rest on concrete foundations under the bins, and on mud sills under the ramp portion. The concrete for the bin piles is to be a 1-3-5 mixture, the centre one containing 1[illegible] cu. yds., and the outer ones 1.1 cu. yds. each.

The vertical curve portion of the approach is filled with a stone fill for drainage purposes to a level of 5 ft. 7 ins., where it strikes the framed structure ramp.

All contact surfaces in the framed structure are to be given a coating of creosote residuum to preserve the timber from decay.

The central openings for hopper bottom cars mentioned in the article are each covered by three doors, 7 ft. by 1½ ft. The outer doors in the top are six in number on each side and measure 5 ft. 9 ins. by 2½ ft. The tender filling doors in the sides and bottom of the bins have swinging doors that cut the coal in the direction of flow down the chutes.



Coaling Station for the G.T.P.R.

J. B. Fuller, operator, Canadian Northern Ry., Woodworth, Man., was, on June 3, sentenced to two years' imprisonment for being intoxicated while on duty.

The Fort William Coal Dock Co. has decided to make extensions to its plant in order to handle the increased business. A contract has been placed with the Brown Hoisting Machinery Co., Cleveland, Ohio, for a six ton bridge and equipment, and another with the Canadian Westinghouse Co., Hamilton, for three generators.

joint section suitable for the increased traffic, the C.N. Ry. will relay the line with 80 lb. steel, upon the completion of which work the M. Ry. shall pay $30,000 in half yearly payments of $[illegible] each.

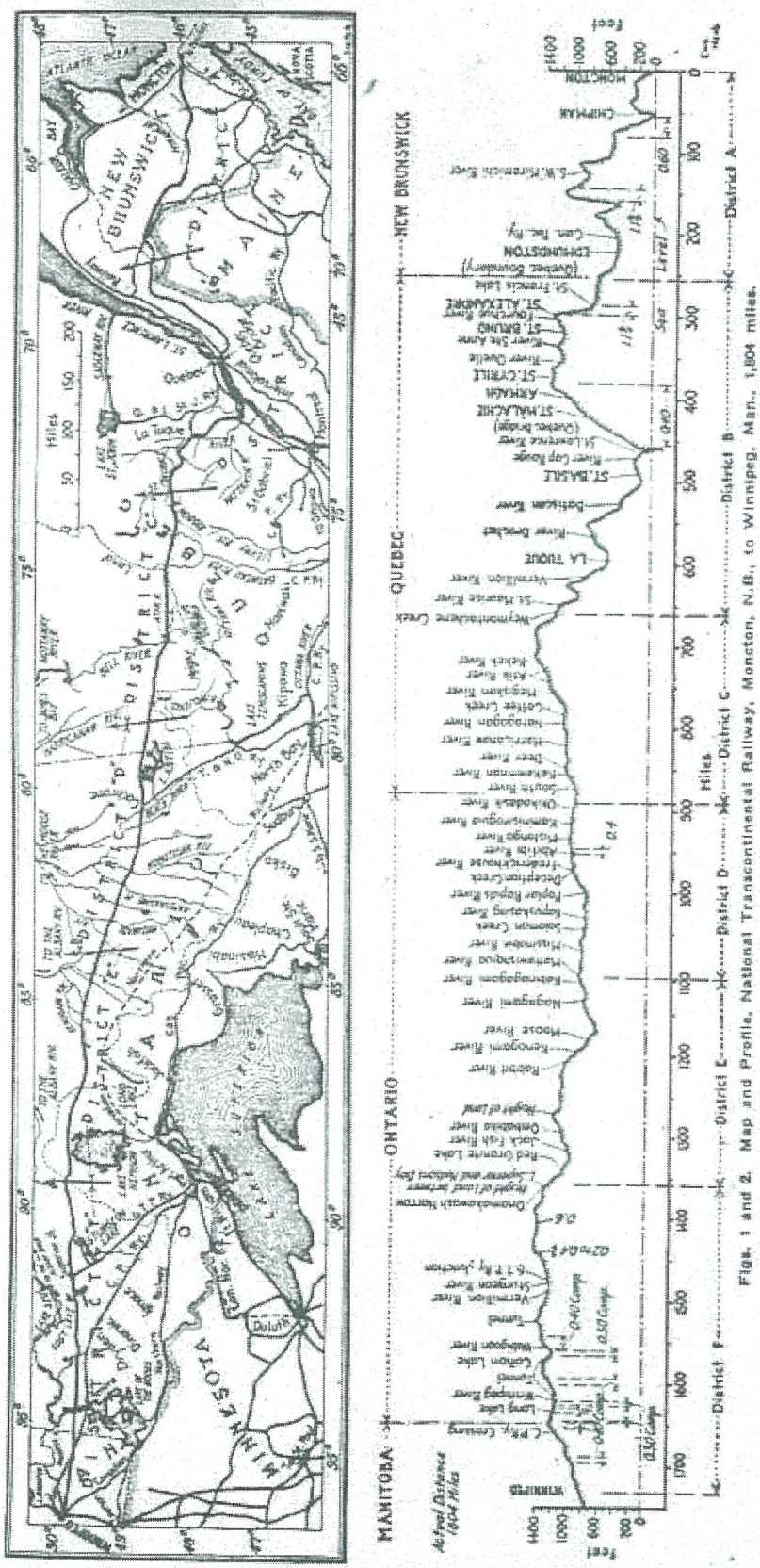
For the use of the joint section the M. Ry. shall pay $35,000 a year for the Emerson-Portage Jct. section, and $1,225 a year for the line westerly from Portage Jct., and such proportion of [illegible] on the capital expenditure other than relaying rails, as the car miles of the M. Ry. bear to the total car miles of all companies using the section, and a pro rata proportion of expenses chargeable to maintenance.

The agreement contains all the necessary provisions defining the powers of each company, safeguarding the interest of each in cases of accident, etc., reserving to the M. Ry. the right to build its own connection with the C.P.R. at

in connection with large joint stock corporations — amalgamations, rearrangements, and new incorporations—necessitate a great deal of work in the compilation of such a book of reference as this. The edition for 1912 is brought well up to date, and adequately represents the organization, finances and position of the leading railway and transportation companies of Canada and the U.S., as well as of allied companies, and the industrial concerns of the two countries from which the transportation companies draw such a large portion of their revenues. The present volume has been increased to 1,100 pages; the matter is well arranged, and the index copious and clear. It is published by the Manual of Statistics Co., 20 Ves[illegible] St., New York. Price $5.

The Canadian Northern Ex. Co. has opened a waybill office at Gypsumvi[illegible] Man.

The Construction of the National Transcontinental Railway.



Figs. 1 and 2. Map and Profile, National Transcontinental Railway, Moncton, N.B., to Winnipeg, Man., 1,804 miles.

In 1902 a company was formed in Quebec to build a railway from Atlantic tidewater, on the Saguenay River, to Port Simpson, on the northwest coast of British Columbia. The line was to be known as the Trans Canada Ry. In the following winter, three parties were placed in the field, one at either end, and the third party north of Lake Winnipeg. Several hundred miles were surveyed and some knowledge of the character of the country was obtained. Early in 1903, the newly formed Grand Trunk Pacific Ry. Co. took over the scheme and the parties were recalled. A new and more southerly route was then projected, extending from Winnipeg westerly to Edmonton, and thence to some undetermined point on the Pacific Coast, and easterly from Winnipeg to a junction with the Grand Trunk Ry. at North Bay, on Lake Nipissing.

This easterly division swung north along the waters of Lac Seul and the Ogoki River as far as the 88th meridian before turning southeast. It penetrated a country little known, and uninhabited except by a few scattered families of half-starved Ojibways. A reconnaissance was made over the whole route as projected, which included a branch from Lac Seul to Fort William, on Lake Superior. Ignorance of the country, shortness of supplies, lack of transport facilities, and outbreaks of scurvy were among the difficulties with which the parties had to contend. A few caches had been established at isolated points, but, for the most part, supplies were brought in with the parties and replenished from the nearest fur-trader's outpost or Hudson's Bay Co. post.

In 1904 the Dominion government appointed the National Transcontinental Railway Commission to take over and build the line from Moncton, N.B., to Winnipeg, Man. The Grand Trunk Pacific Ry. is building west from Winnipeg to the Pacific Coast and will operate the entire line from Moncton, N.B. Under this commission the route of the eastern division was again changed and a year was spent on new surveys and the study of those already made. It was then laid out to skirt the north shores of Lakes Nipigon and Abitibi, continuing in the same general direction to the headwaters of the St. Maurice River, crossing the latter near Quebec, and proceeding thence in as direct a line as possible, without leaving Canadian territory, to Moncton, at the southeastern corner of New Brunswick. There it connects with the Intercolonial Ry., which is owned and operated by the Dominion Government and which extends to the Atlantic ports of St. John, N.B. and Halifax, N.S.

While contracts were let and construction was commenced at Winnipeg and Quebec as early as 1906, final location through the remote districts of northern Quebec and Ontario was not completed until late in 1908, and revisions have since been made from time to time. Before the most economical location was staked out, before even a satisfactory line could be projected, an enormous belt of country had to be explored and mapped. From Lake Nipigon eastward to the St. Lawrence valley, two main routes were selected for exploration. The one eventually adopted has been described above. The other followed a more or less direct line, passing close to the south shore of Lake Abitibi, touching the north end of Grand Lake Victoria, an expansion of the Ottawa River, and proceeding thence across the Gatineau and Lievre Rivers to the Mattawan and St. Maurice. An alternative route in New Brunswick, by the St. John River valley, was also surveyed.

The total distance from Moncton to

August 1912

Winnipeg was estimated to be about 1900 miles, on what was assumed to be the most direct feasible route. The problem of definitely locating this route was not an easy one, as for more than half the distance the line of general directness ran through an unsurveyed, unsettled and practically unknown region cut up in all directions with a network of lakes and rivers, many of them not shown on any existing maps, and when so indicated, often found to be entirely misplaced. The engineers, had, therefore, in many cases to make their own maps, as the surveys proceeded, and had in all cases to correct and complete existing maps.

SURVEY WORK AND LOCATION.

During the autumn of 1904 and the following spring, some 34 survey parties were equipped and sent out, and before the end of 1905 there were 45 parties in the field, consisting of about 15 men each, not counting a large number of men engaged in transporting supplies by canoe and packing in summer and by dog train in winter. Each survey party had an engineer in charge, transitman, leveller, topographer, draughtsman, rodman, pickman, two chainmen, cook and eight or nine axemen and packers. Each party was given certain governing points to connect, and was instructed to thoroughly exhaust the possibilities for the most favorable and reasonably direct line between these points. Barometric explorations and compass lines were followed by preliminary lines run with transit, and plans were plotted with 10 ft. contours on a scale of 400 ft. per in.

With those plans, and with profiles on the same scale, projected locations were made on the most favorable lines and afterward actually run on the ground and called a "first location." These plans and profiles were plotted in the field, and tracings (with reports) were sent to headquarters monthly. These reports were carefully gone over by the Chief Engineer and Assistant Chief Engineer, necessary changes suggested, and instructions issued accordingly. Whenever the head of a party completed what he considered the best possible "first location," the engineer in charge was changed and another man given a chance to improve the line by making his best attempt at a revised location. The original head of the party, or a third man, was given a chance to still further revise for a final location. In this way it was found that a healthy rivalry was established and good results obtained. Revision of location is, however, never considered as finished until construction is well under way, as it is often found, after the line is located, that slight changes will effect very considerable saving.

An equation table giving definite values of savings in distance, curvature, rise and fall, etc., was furnished all parties in the field, so that, having the estimated cost of construction of any two or more lines, the better one to adopt from all points of view could be at once determined. This table is given further on.

The earlier explorations and reconnaissances were made by compass and barometer, followed by transit with stadia, or chain and level. Steel-band chains were used for distances in final location. The parties consisted usually of 18 men in settled districts to 24 men in unsettled districts, six of the latter number being packers. In general, they were sent into the field in pairs, at intervals of about 80 to 150 miles, with instructions to run, respectively, east and west from some more or less well defined point. In the more remote localities, it was found impossible to fix these points at all accurately, owing to the non-existence of reliable maps; nor could the course of the indicated route be followed closely owing to the presence of some unsuspected large body of water or other topographical obstruction. Consequently, much difficulty was encountered in joining up the surveys of two approaching parties. At the head of the St. Maurice, the Tete de Boule Indians were found to possess an unusual aptitude for cartography, and by following their rude maps, a junction was effected with the party running east from the Gatineau.

Working in a country so cut up with lake and river expansions as to be more than 50% water, absolutely unmapped and unknown, and some 250 miles from the nearest railway, two parties overlapped several miles, one being 10 miles north of the other, before communication was established between them and a connection made. A rough stadia traverse, 80 miles long, following the old Indian canoe route from Lake Abitibi to the Kenojevis River, and occupying 11 days, furnished course and distance between surveys, which had started nearly 200 miles apart. In the Kenogami District, one of the earliest G.T.P. Ry. parties exhausted their provisions, and searched three days without finding a line, which had been blazed north from a supply cache, to which they tied in their reconnaissance. They left behind them as a record of their experience a string of lakes bearing the suggestive names: "Storm," "Ice," "Poverty," "Stampede" and "Relief." By discharging ship's rockets simultaneously on a pre-arranged night, quick connections were in several instances effected across unsurveyed gaps.

Observations for latitude were made, of course, but as there were at the outset no means of intercommunication between the parties in remote localities, other than through the district head quarters, on the C.P.R., months elapsed before these could be interchanged.

VALUES FOR EQUATING DISTANCE, ETC., IN LOCATION.

It has been noted above that field parties were furnished with equation tables showing definite values for savings in distance, curvature, etc. The values given below were used in the final determination of location. Tables 1 and 2 give the values for distance and rise and fall. For calculating the justifiable expenditure per mile, 10 daily trains each way (equal to 20 daily trains) were assumed for the line between Moncton and Quebec, and also between Winnipeg and the junction with the branch to North Bay; between other points 12 daily trains were assumed. Justifiable expenditure per mile takes into consideration maintenance of rails, ties, ballast, etc.

TABLE 1.—VALUE FOR EQUATING DISTANCE.

Class.	Value per Train mile	Value per ft. per daily train per annum	Capitalized value per daily train per ft.	Capitalized value per daily train per annum per mile*	Saving per daily train per annum per mile of shortening	Justifiable expenditure per mile of saving in distance per annum for 12 daily trains	Justifiable expenditure per mile of saving in distance per annum for 20 daily trains
A	0.30	2.0c.	$0.50	$2600	$104	$31,200	$52,000
B	0.50	3.4c.	0.85	4500	180	54,000	90,000
C	0.60	4.0c.	1.00	5300	212	63,600	106,000
D	1.00	7.0c.	1.75	9200	368	110,400	184,000

*Capitalized values per mile to nearest $100 and interest 4%. One daily train each way equals two daily trains.

A. Distances so short as not to affect track or train wages, aggregating less than two miles.

B. Distances affecting train wages, but not so great as to affect the number of stations or sidings. From two to five miles.

C. Distances so great as to affect number of stations and sidings required. From 5 to 75 miles.

D. Distances so great as to affect number of engine districts. Over 75 miles.

Values for Equating Curvature (All Trains)—The elimination of 1° of curvature will save 16c per daily train per annum (including passenger and freight trains); equal to a capitalized value of $4 per degree. Justifiable expenditure per degree of saving in curvature; $48 for 12 and $80 for 20 daily trains. If a curve is in a particularly dangerous place, which necessitates a watchman or other additional expense, the value of its elimination must be considered separately. One degree of curvature means one degree of central angle, regardless of radius of curve. It is assumed that expense due to curvature is in proportion to the total central angle.

Assumed Costs per Freight Train Mile, Engine Mile, Etc.—Train mile, $1. Engine mile, 35c., both assisting and running light; 40c. if assisting both ways, with no light running. Minimum cost for assistant engine when not at division point or used for yard work, $18 per day or $6,600 per annum. Light running 25c. per engine mile. Switching 30c. per engine mile. Doubling grades, 90c. per engine mile straight distance, or 45c. per additional engine mile.

TABLE 2.—VALUE FOR EQUATING RISE AND FALL (ALL TRAINS).

(Freight train velocity limits: max., 30 m.p.h.; min., 10 m.p.h.)

Class	Value per ft. rise and fall per daily train per annum: Value	Capitalized value	Justifiable expenditure per ft. of saving in rise and fall for 12 daily trains per ann.	20 daily trains per ann.
A. Minor grades ..	$0.12	$3	$36	$60
B. Minor grades ..	0.48	12	144	240
B. Ruling grades..	0.88	22	264	440
C. Minor grades ..	1.00	25	300	500
C. Ruling grades..	1.40	35	420	700

A. All rise and fall up to 20 ft.

B. Where grades require shutting off steam, but not application of brakes in descending. This class includes all rise and fall of over 20 ft. on grades less than 0.8%, and between 30 and 100 ft. on 0.8% grades and steeper grades of small drop not covered under Class C.

C. Where grades require the application of brakes and shutting off steam in descending. This class includes all rise and fall of over 100 ft. on grades of 0.8% and a proportionate fall on steeper grades.

Values for Railway Grade Crossings—Justifiable expenditure to save one normal grade crossing of another railway, $40,000.

TRANSPORTATION AND SUPPLY.

Much of the early organization had to do with transport and supply problems. Through New Brunswick, Manitoba and the settled portions of Quebec existing railways, roads and steamship lines gave easy access to all parts of the line. LaTuque (at the head of navigation on the St. Maurice River), St. Gabriel, Maniwaki and Kipawa (terminals of the C.P.R. branch lines), and North Timiskaming, at the extreme end of the lake of that name, were the points of departure from which radiated canoe routes to the vast wilderness of northern Quebec. Between Lakes Nipigon and Abitibi, the Moose and Albany Rivers spread their finger-like branches southward to within short distances of the C.P.R. main line, furnishing water routes which were reached by canoe and portage from Bisco, Woman River, Chapleau, Missinabi, Grassett, Montizambert and Heron Bay. Lake Nipigon affords comparatively easy access to a hundred mile stretch across its northern drainage area; while to the west, Ignace, Dinorwic, Dryden and Kenora were used as shipping points to Sturgeon and Minnitaki Lakes, and the Wabigoon and Winnipeg Rivers.

In the autumn of 1904 and winter of 1905, from 40 to 50 completely equipped parties were placed in the field between

Moncton and Winnipeg. Some of these hardly reached their destination before being overtaken by the freeze-up, and were forced to return and cut trails in order to bring up sufficient supplies to carry them over the winter. A transport department was organized, and as soon as the condition of the roads and lakes permitted, large quantities of provisions and outfit were pushed north to the furthest limit of lumbering operations over existing bush roads, and stored in main transport depots, or in warehouses of the Hudson's Bay Co. From these, part of the supplies were forwarded by dog sleigh and packer, and the balance distributed by canoe after the ice had gone out in the following June.

Caches were established from time to time at intervals of from 20 to 40 miles; log shacks were erected and a couple of men placed in charge of each. These were generally located on some canoe route, and being maintained permanently, as long as the surveys lasted, constituted an important aid in their prosecution. Regular systems of mail service were provided later, following the supply routes, but during the long freeze-up, lasting from about the middle of October to the middle of December, and to a less extent throughout the break-up, extending over the greater part of April and May, insecurity of ice on river and lake practically put a st p to communication with the outside world. Throughout most of Quebec and western Ontario, innumerable waterways, many of them rendered navigable for canoes by beavers, provided an easy method of moving camp. But across the interminable muskegs and spruce-covered swamps of the clay belt, parties had in summer to depend solely on the tump line to pack their supplies and outfit.

Medical officers were stationed at wide intervals, but there was little sickness that could not be cured by a blue pill. The most serious discomforts endured were black flies in summer, and a few intensely cold days in midwinter when the mercury sometimes touched 60° below zero. Accidents due to upsetting canoes and breaking through ice were unfortunately, too common. In the first three years of the survey, 27 lives were claimed by the frigid waters of river and lake, at that time the only highways. Narrow escapes were of almost daily occurrence. On several occasions, parties were caught by the freeze-up on their way out, canoes being abandoned, and treacherous river crossings negotiated on hands and knees. Two men tried to run a 30-ft. chute on the Gatineau. One jumped on to a rock, and the other was rescued with difficulty from the pool below after the canoe had been dashed to pieces. Another canoe broke in half while descending the Woodchuck rapids on Bell River, and the occupants paddled five miles into camp seated one in either piece.

GRADES AND ALIGNMENT.

At the outset it was decided that the railway should conform to a high standard. Grades were not to exceed 0.4% opposed to eastbound traffic (which is the heavier), nor 0.6% against westbound traffic. The curvature was limited to 6°, and all curves of 1° and over were connected to their tangents with easy spirals. The 6° limit for curves was used only where topographical conditions prevented easier curves being used at reasonable cost. Grades were compensated for curvature at the rate of 0.4% per degree, so that on 6° curves the maximum grade (eastbound) was 0.16%. Vertical curves were introduced at summits and sags, the rate of change in grade being 0.1% and 0.05%, respectively.

Pusher grades were adopted at two points only and are quite short. The whole line between Moncton and Winnipeg (with the slight exception of short approaches to the Quebec Bridge on 1% grades) was definitely located with the above mentioned very easy maximum grades. But 146 miles from Moncton, it was found that by the insertion of about 12½ miles of 1.1% grade adverse to eastbound traffic, a saving could be made of 17.2 miles in distance, nearly $2,000,000 in construction and $1,250,000 in capitalized operating value. At another point (in Quebec) 286 miles from Moncton, a similar grade 10 miles long, adverse to eastbound traffic, was found to effect a saving of 18.8 miles in distance, about $500,000 in construction, and over $750,000 in capitalized operating value. These possibly temporary grades were adopted with the corresponding saving in distance and cost. If the future traffic of the road justifies the expense, these two short links of standard grade can be built at any time.

In comparing rival routes, values based on assumed capitalized cost of maintenance and operation were given to savings in distance, curvature, and rise and fall as noted above. Owing to the locality traversed, artificial values for these, due to competition, seldom had to be considered. Distance was evaluated at $6 to $35 per ft., depending on amount saved and expected traffic; curvature at $48 to $80 (or more) per degree; and rise and fall at $36 to $700 per ft. on long maximum grades requiring the application of brakes in descending.

Throughout the 1800 miles between Moncton and Winnipeg the geographical characteristics, and consequently the engineering problems, varied greatly. The short rout across the broken topography of New Brunswick necessitated long stretches of maximum grade and development for distance, culminating on the slopes of the divide between the Miramichi and St. John Rivers. Even with a short pusher grade of 1.1% eventually adopted here, cost of construction was very heavy. This included a tunnel and 3914 ft. of viaduct, 193 ft. high, over the Little Salmon River. A pusher grade was also required to negotiate the summit between the St. Lawrence and Bay of Fundy waters, near the extreme northern corner of Maine. In southern Quebec, the line parallels the St. Lawrence River, 20 miles inland, before swinging north to where the substructure for the new Quebec Bridge is rapidly nearing completion. Just beyond, another great viaduct, 3000 ft. long and over 150 ft. high, was required to span the gulch of Cap Rouge. Three of the piers for this was sunk by pneumatic caisson, one to a depth of 55 ft. below high water.

LOCATION AND ROUTE NORTH OF THE ST. LAWRENCE.

Perhaps the most difficult problem confronting the locating engineers, on the whole eastern division, was to find a path through the forbidding range of hills loosely called the Laurentian Mountains, which forms the northern watershed of the St. Lawrence River. Some 80 miles west of Quebec city this range is abruptly cleft, enabling the St. Maurice River to carry south the accumulated drainage of 15,000 sq. miles. Three alternatives were proposed: 1, to develop a line up one of the more easterly streams until sufficient altitude should be attained to cross over into the St. Maurice valley and follow this to its upper waters; 2, to enter this valley at its lower end, cross it, and attempt to reach the hinterland by way of the Mattawin or Riviere aux Rats, two of its main tributaries from the west, or 3, to proceed further up the St. Lawrence, and pierce the Laurentian at some more westerly point, avoiding the precipitous cliffs of the St. Maurice.

All of these routes were explored. The third, apart from other objections, proved too long. The second and most direct was reported against on account of the excessive slope in the lower waters of the valleys explored, the difficulty of developing distance within their narrow confines, and the great cost of bridging the lower St. Maurice. The approved route followed up the rivers Batiscan and Brochet, until a pass was reached over-looking the hamlet of La Tuque, at the head of navigation on the St. Maurice, where the latter turns from southeast to south. The descent was effected by fitting a two-mile horseshoe curve into a recession of the hillside.

Beyond La Tuque, the waters of the St. Maurice come down 30 miles from the old Hudson's Bay post at Weymontachene, dropping 700 ft. in a series of cataracts and turbulent rapids. Its course is fairly direct, except for a long detour to the north around the 18 miles of air line between the mouth of the Vermillion and CooCoo Caches. Four miles above La Tuque, the main river is bridged by six 140-ft. trusses, on concrete piers and the precipitous side hill is followed to Vermillion. Here, after repeated efforts, a circuitous route through the long granite ridge was located in CooCoo Cache, and the St. Maurice again followed to Weymontachene.

From Weymontachene to the Gatineau River, the obvious route appeared to be via the Ribbon River, but a 10-mile saving in distance was effected across from its mouth to its upper basin. However, this involved two semi-loops, a 100,000 yd. summit cut and several others of slightly less magnitude. The first preliminary west of the Ribbon struck far to the north, via Haircutting Lake, avoiding the Gatineau valley altogether. Later the east branch of this was crossed and the sinuous line between interlacing waters of the St. Maurice and Gatineau roughly followed to where it intersects the height of land, 50 miles beyond.

Innumerable lakes and creek expansions, separated by irregular ridges of sand and boulders, covered with jackpine, here constitute the outstanding features of the topography. So intricately interwoven are these, that the country had to be criss-crossed with lines for a width of 20 miles before a satisfactory alignment could be obtained, with a profile showing only moderately heavy work. Similar conditions prevailed for a further distance of 25 miles to the Atik River, which was followed to its junction with the Megiskan, a branch of the great Nottaway. This region was the most inaccessible and least known on the whole line, and will be the last to be completed.

While the St. Maurice valley was being explored from the Quebec end, engineers sent north from Ottawa, North Bay and western points, had made the unexpected discovery that the country beyond the height of land presented far fewer difficulties than that draining into the St. Lawrence. Accordingly, late in 1905 the route south of Lake Abitibi was abandoned.

The actual height of land is crossed three times in northern Quebec, and twice in northern Ontario, with elevations above mean tidewater of 1500, 1070, 1075, 1120 and 1280, respectively. At all of these points except the most westerly, the work is light. From the Megiskan River to Lake Nipigon, occurs a vast spruce-covered plain, of which the soil is a deep agricultural clay, interspersed with a few sand ridges and isolated outcrops of rock, and covered in many places by from 1 to 10 ft. of muskeg. That part east of Lake Abitibi (a shallow and muddy expansion of the Abitibi River, 400 sq. miles in extent) is intersected by the sluggish waters at the sources of the Nottaway and Harricanaw Rivers. The western portion, on the other hand, is drained by swift flowing branches of the Moose and Albany Rivers, so numerous as to require a bridge on an average every sixth mile, not counting arch culverts up to 30 ft. span. These show on the profile as deep gulches, separated (except for an occasional long shallow cut) by mile after

mile of surface line within a few feet of subgrade.

The alignment throughout this section is exceptionally direct. For 250 miles westerly from Lake Abitibi, the length of preliminary location exceeded the air line by less than 4%; it contained only six curves of 3° and none over 3°. The first G.T.P.R. reconnaissance, run in 1903, between the Kenogami and Missinabi Rivers, was a straight line 115 miles long. On final location some of the very long tangents were broken up to obtain more favorable river crossings, but several stretches of 16 to 18 miles were retained.

North of Lake Nipigon, granite ridges alternate with flat stretches of muskeg and clay. These latter occur with decreasing frequency as the line crosses the height of land for the last time to enter the rock-ribbed and unproductive wilderness which forms the barrier separating the farm lands of eastern Canada from the prairies. With the exception of a short tract of indifferent agricultural soil, between Lost Lake and the Wabigoon River, the country is barren and desolate, much of it having been denuded even of its original growth of stunted spruce.

An enormous number of irregular bodies of water lie scattered over its surface, many of them with shores deeply indented, and buttressed by rugged cliffs. In the vicinity of Onamakawash Lake, along Canyon Lake, and on both sides of the Winnipeg River, the rock cuts were exceptionally heavy. Embankments of even larger size had also to be made of rock borrow and train-hauled material. Corresponding conditions prevail along the line of the C.P.R., and repeated surveys showed that no improvement could be effected by adopting a still more northerly route. The last 50 miles into Winnipeg is, for the most part, through settled prairie country. By crossing and keeping south of the C.P.R., the worst portion of the deep Julius muskeg, which required years to fill, was avoided.

CONSTRUCTION WORK.

Actual construction began in the spring of 1906, contracts having been signed for the building of 150 miles from Quebec west, and 245 miles from Winnipeg east. The latter portion was to a connection with the branch to Fort William (then under construction by the G.T.P.R.); thus giving a line from the wheat district to Lake Superior. From time to time additional sections were let, until by October, 1908, the whole line was under contract. Supplies for constructing the most easterly 850 miles were distributed from various points on the Intercolonial, Canadian Northern C.P.R. and other railways. The extreme western end was also easily accessible by steamer and short winter road from various points on the C.P.R. as far east as Dinorwic. The central portion was opened up east and west from La Tuque, the Timiskaming and Northern Ontario Ry., Lake Nipigon, and the Thunder Bay branch of the G.T. Pacific Ry.

Steel on the Quebec and Lake St. John branch was laid into La Tuque early in 1907. About the same time the T. & N. O. Ry. ran its first train into McDougall's Chutes at the head of navigation on the Black River, a tributary of the Abitibi. From here, two main transport routes were established. One extended upstream into Abitibi Lake. The other followed down the Black and Abitibi Rivers, to where the new line crossed the latter, beyond which a monorail tramway was constructed 8 miles across country to the Frederickhouse River. The tramway was operated by a platform truck having shafts attached to a pole at right angles to the rail. The horse thus walked alongside the car and rail, the car being guided on the rail by double-flanged wheels. A service of steamers and gasoline boats was established on each route, short stretches of light-rail tramway being built around the worst rapids. Push roads were also cut to provide winter communication. Later, when the T. & N. O. Ry. had extended its line 40 miles to a junction with the National Transcontinental Ry. (where the town of Cochrane now stands), the steel was laid east and west over the new grade, these routes were abandoned.

Meanwhile the G.T. Pacific Ry. had finished its branch from Fort William to Sioux Lookout, with a spur into Sturgeon Lake. This extended the field of operations, and gave impetus to that part required to connect Winnipeg with the Great Lakes. In the summer of 1908, a narrow gauge railway, 18 miles long, was constructed around the rapids of the Nipigon River, and before navigation closed that year, a considerable quantity of supplies had been distributed along the north shore of Lake Nipigon by steamers built for the purpose. In the following year an attempt was made to establish a similar transport route from Jackfish over the height of land, into Long Lake, and thence down the Kenogami River. This failed, owing to the inability to secure reasonable grades up the steep ascent from Lake Superior, except at prohibitive cost.

It was accordingly decided that the 350 miles between Cochrane and Lake Nipigon should be covered from either end. By Dec. 1910, 40 miles at the west end of this was graded and track laid for over 100 miles at the Cochrane end. Two months later a winter tote road was completed across the remaining distance, and sufficient supplies and outfit to grade all but a few cuts were distributed in log warehouses erected at intervals of about 20 miles.

GRADING.

As most of the work was of the lightest description, chiefly side casting, the construction plant consisted almost entirely of shovels and wheelbarrows, with a few tons of light rails, some car wheels and a load or two of explosives for loosening frozen clay, and breaking up boulders. This light work was practically finished by Oct., 1911, and up to the end of Feb., 1912, 30% of the balance of the excavation had been completed.

In the heavy rock districts work, of course, proceeded much more slowly. The usual methods of blasting were employed: 1, block holing, loading with dynamite and firing with time fuse, in the smaller cuts; 2, heavy springing, loading partly with black powder and discharging with battery in the larger cuts, or where it was desired to break up and waste several thousand cubic yards at once; 3, tunnel blasting, or "coyoting." For this latter work, the station man was usual paid per lineal foot for shafts and tunnels. In loading these, the high explosives were sometimes left in the case, but the blast was usually more effective if the cartridges were removed from the boxes. Frequently 6000 cu. yd. or more of rock were broken up by one of these blasts. Where the expense of bringing in cars and track was excessive, the shattered rock or muck was removed by stone boat on pole track, the poles being well iced in winter, or lubricated with black oil in summer.

Deep clay cuts in the Abitibi region were excavated with less expense in winter, as in summer horses could only travel in the greasy blue gumbo after the cuts (and often the fills as well) had been corduroyed. But in the winter, so long as the work progressed steadily, even in the coldest weather, the cut did not get time to freeze deeply in a single night, and the frozen top could be undermined or broken down with a few sticks of dynamite. A slight additional expense was incurred in winter by shovelling snow away from the base of the dump.

Much of the grading in New Brunswick and Quebec was performed with steam shovels having dippers of ½ yd. to 2½ yd. capacity. These were hauled into the work in winter with their necessary complement of dinky engines, cars and track. Some of the smaller machines were similarly used in northern Ontario. Scrapers, both wheel and slush, were employed on the prairie section, and elsewhere generally for light sandy work, a few being sent in across Lake Nipigon. An elevating grader was tried in the Abitibi country, but was soon discarded, as the horses mired in the sticky clay.

SLIDES.

Slides were numerous throughout the clay belt. These occurred, to some extent, in the sides of cuts, which frequently required a slope of 1 on 2 or even flatter. Much more serious, however, were those which took place under deep fills and behind concrete abutments. At Brule Creek and the Okikodasik and South Rivers, heavy concrete structures on poles were moved bodily out of place, but the shifting from original position was not sufficient to prevent the erection of the steel superstructure after movement had stopped. In some instances it appeared probable that pressure behind the concrete had deflected the piles laterally through the yielding clay; in others, that the slip had occurred on an inclined plane below the level of the foundations.

At the little Mistongo, a long 6-ft concrete arch was built on pile foundation, and the deep gully bridged by a light trestle, from which material excavated in an adjoining cut was dumped. Some of this, in wet weather, simply flowed away in a river of mud. After several slides had occurred, which broke up and buried the culvert, sweeping three or four trestles in succession down the slope, the fill was completed in winter, a large square box culvert of heavy timber being built to replace the arch culvert. With the freshet, the embankment again settled, and a small lake formed on the upstream side, from the middle of which protruded one end of the timber culvert, standing upright. Continuous filling at length brought the embankment up to grade, the water being at first pumped and siphoned over the top, and later carried of through a reinforced concrete pipe built permanently through the bank and having a long extension at the downstream end.

BRIDGES AND CULVERTS.

On completion of the main surveys, small parties were sent over the line with instructions to take soundings where any openings were to be left. A light boring machine was used, by which casing pipe screwed together in sections was forced down through the river bed, and the core broken up with the drill, and removed by means of a rope attached to a short tube with ball valve. At the Manuan River, this machine was set on the ice, and the casing driven by an improvised pile driver, consisting of a section of green birch for hammer, working between leads and operated by transport dogs. When the ice went out the machine was transferred to a raft, and the dogs harnessed to the spokes of a windlass. By this contrivance, pipes were driven through 50 ft. of hard compacted sand.

The treacherous soil of the clay belt was the cause of a great deal of trouble in securing stable foundations, especially when attempting to excavate in midstream. A coffer-dam for the main pier of the Abitibi bridge, consisting of 4 ft. of puddle, between an outer row of 12-in. ordinary sheet piling, and an inner row of Wakefield sheet piling, 18 in. wide, failed to prove watertight. Eventually a continuous lining of steel sheet piles was driven around the inside and left in the work. The cofferdam was then partly unwatered, and material squeezed up by the foundation piles excavated with an orange-peel bucket to slightly below the river bed. Concrete for this pier was laid in mid-winter, much of it under

water, being prevented from freezing by the injection of steam. Fig. 4 and 5 show work at this pier. A cofferdam of sand bags at the Mattagami was used, with indifferent success.

When possible, long spans were used to avoid foundations in midstream where clay was encountered in the river bed. For shore foundation pits, round logs were generally used to prevent caving in, as sawn lumber was expensive or unprocurable where such pits were dug ahead of the steel. Trestles of unsquared timber were erected at most of the openings where a bridge or culvert was required. They were constructed of the largest timber in the vicinity, irrespective of variety, even cottonwood being used. For the longer stringers, however, British Columbia fir was imported. These trestles were of the most temporary character, and in a few cases failed to withstand the impact of outgoing ice during the spring freshets. They served, however, to push the track ahead, so that steel and cement could be brought in for the permanent structures.

Concrete was almost universally employed for substructures. This was partly owing to the absence of a good quarrying stone, but more largely to the scarcity of skilled stone cutters and masons.

There will be about 240 steel bridges and viaducts, or a total length of 11 miles, and aggregating 61,000 tons. Of this amount, 52,000 tons have been erected or are under construction, leaving about 9,000 tons to be let. The greater part of this will be erected in 1912 and the balance in 1913. The maximum single span is 300 ft., and the Winnipeg River bridge, is an example of these 300 ft. truss spans. Steel viaducts are built with 40 ft. towers and 60 ft. intermediate spans. The viaduct over the Mistongo River (Abitibi region), is typical of these structures. All bridges are designed according to Dominion government specifications: engine loading, class "heavy," weight 180 tons, 49,400 lb. on each pair of drivers. Plate girder spans, both through and deck, are used up to a length of 100 ft. Bridge lettings are generally given early in the year and cover the required erection for the same year, depending on the concrete being completed and track reaching the bridge site. Upon these conditions the time of completion depends. For transportation, construction rates are given bridge companies over lines under construction, on a ton-mile basis. Bridge companies are furnished with drawings and weights of steel, so all can bid under the same conditions. All steel cont[illegible] for a pound price erected, and [illegible] price for timber in floor.

TRACK AND TRACKLAYING.

The track is laid with 80 lb. rails of Am. Soc. C.E. section, 33 ft. long, with four bolt angle-bar joints. There are 3,000 ties per mile, 18 ties per rail on tangents and 20 on curves. By far the greater part of the ties cut for the line are of jack-pine; tamarack, hemlock, cedar and spruce are used in lesser quantities. Both single and double boom "pioneer cars" were used in tracklaying work. Tracklaying was sometimes carried on throughout the winter, the snow being in some cases shovelled or ploughed off the grade, or simply tramped down sufficiently not to impede the "tie-buckers." Finally snow packed about the ties was found to make a much firmer and more even skeleton track than that laid in the summer, but when this melted, a lot of repairing and shimming was required to render the line safe for material and surfacing trains.

Throughout Jan., 1912, tracklaying was continued west of the Nagagami River at the rate of one-third mile per day, with the thermometer often 40° below zero, and seldom above 5° below. Under favorable conditions, two miles of track a day was often laid for short periods, but temporary interruptions usually brought the average down below one mile a day.

TELEGRAPH.

The telegraph line is being built at the same time as the railway. It provides for an ultimate capacity of 12 wires, although only two wires are now being erected.

PROGRESS AND DELAYS.

It was hoped the entire railway would be completed in six years. Progress, however, on that portion to which access could be had only from either end, was continually interrupted by delay in getting out some large cut, failure of a temporary structure, development of sink holes, or other unforeseen cause. Throughout part of northern Ontario and Quebec, no supplies could be moved except in winter, by reason of the extensive prevalence of clay and muskegs, over which horses could not travel. In other localities, such as those served by Lakes Nipigon, Sturgeon and, to a less extent, Abitibi, contractors were dependent for transport on the season of open navigation. Frequently it was essential to have supplies conveyed part way by steamer and part by winter road.

Failure to foresee and make provision for what should be required months, or even a year ahead, meant serious loss. Uncertainty regarding the duration of the seasons had to be allowed for also. In 1907 there was a 2 ft. depth of snow in the Kenogami district on June 1, and the ice in Lake Nipigon did not break up until June 16; whereas on another occasion snow had disappeared from long stretches of the tote roads (running east from Cochrane and Matheson) before the end of March. Navigation could not generally be relied on after about Oct. 20 on many of the waterways traversed. Toward the close of one of the busiest seasons on Lake Nipigon, both steamboats operating on this route went aground within a fortnight of each other, in consequence of which large quantities of essential supplies were not delivered until late in the winter. During the excessively dry summers of 1909 and 1910, disastrous forest fires swept over the country. These did enormous damage along the line north of the height of land, burning up contractors' camps, warehouses and plant, and putting a stop to the work in many localities.

Scarcity of labor, and time lost in replacing men who quit, was an ever present cause of delay. By far the greater part of the grading was sublet to "station men," who frequently "jumped" if they found themselves going behind with their work. Prices, however, were high, and in most cases, covered the extra cost of pushing the work in the face of unfavorable conditions.

The undertaking has now progressed to such a point that it is reasonably certain trains will be running across the whole eastern division sometime in 1914. The track is already laid 355 miles eastward from Winnipeg and 750 miles westward from Moncton, except for a short distance in southern Quebec, and the yet unbridged St. Lawrence.

Another stretch of track extends east and west of Cochrane, covering 330 miles of the clay belt. This leaves a gap of 150 miles in northern Quebec and another of 240 miles in northern Ontario. Across the former, contractors were putting in supplies last winter, but except for the most easterly 10 miles, which is partly constructed, no grading has yet been done. Throughout the latter, however, only a small amount of excavation and some temporary trestles remain to be completed, on which work is being rushed, so as not to delay the "pioneers" of the tracklaying gangs working from either end. These are expected to meet not later than the end of the present year, giving through connection by way of the T. & N. O. Ry. between the cities of eastern Canada and the wheat fields of the West.

Across New Brunswick, east and west of Quebec city, for about 100 miles out of Cochrane, and between Winnipeg and Superior Junction, train filling, surfacing and ballasting are finished steel bridges are in place; water tanks, stations and section houses built, or under construction; telegraph line strung, and the line practically ready for operation. Division yards are located at an average of 120 miles apart, and the grading and the work on engine houses and other necessary structures for these are well advanced, at all except three of the yards. Sidings are provided about seven miles apart, with a water tank at every third siding.

While the whole country west of the settled part of Quebec was a wilderness six years ago, thriving towns have since grown up at La Tuque, Cochrane, Hearst and Graham. All of these are actual or prospective junction points with other railways and all in the midst of vast pulp-producing forests. La Tuque has the enormous undeveloped water powers of the St. Maurice River behind it, and Cochrane and Hearst are destined to be the market towns for the future farms of the clay belt.

PROGRESS REPORTS ON CONSTRUCTION.

In order to keep check on the rate of progress of the work D. MacPherson, the Assistant to the Chairman introduced percentage forms of reports, being modifications and extensions of somewhat similar forms in use on the C.P.R. The form shown in fig. 3 is returned monthly to the Assistant to the Chairman by the division engineers, through the district engineers, and it is then graphically plotted on a diagram, a portion of which is shown in fig. 4. This shows not only the percentage done during the month on grading, ballasting, and all other items of construction, but also shows the percentage done to date under each of these headings and the percentage done of the whole work in each main contract. This form of report has been found invaluable as an aid in answering requests for information from the government and for compiling the annual reports.

The form of progress report on construction is a sheet 14 in. wide and 17 in. high, divided into seven vertical columns with headings as follows: 1, class of work; 2, percentage done in month; 3, percentage done to date; 4, cost of work done during month; 5, cost of work done to date; 6, approximate estimate of total

THE COMMISSIONERS OF THE TRANSCONTINENTAL RAILWAY.

Contract No............. District............ Contractor..................................

Percentage Report of Work Done, Month Ending .... 191....

Division No...... from Mile.......... to Mile..........

Class of work.	Percentage done in month.	Percentage done to date.	Cost of work done during month	Cost of work done to date.	Approximate estimate of total cost of work.	Brief description of work done.
Grading						
Tracklaying						

Fig. 3. Headings of Monthly Progress Report.

National Transcontinental Railway Terminal Facilities at Moncton, N.B.

The National Transcontinental Ry. has under construction the facilities for its eastern terminal at Moncton, N.B., where it connects with the Intercolonial Ry. for St. John N.B., and Halifax, N.S. The trackage at present contemplated amounts to 10.6 miles, with room for the laying of an almost equal number when the demand arises.

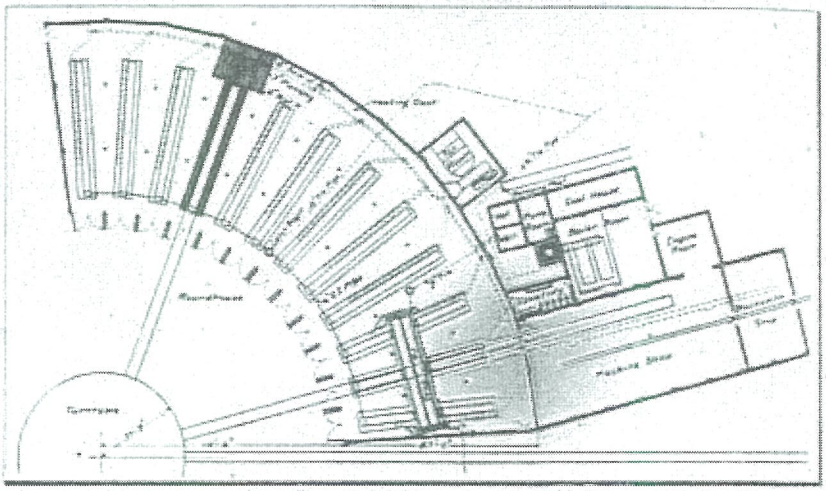
The extent of the terminal, with its various auxiliary buildings, may be judged from the accompanying plan of the yard layout. The yards, with approaches, are over a mile long, and are located one mile from the point where the line joins the I.R.C., or about 1¾ miles from Moncton station. It is but a short distance from the I.R.C. new shops. The yards are located on a slight grade of 0.2088 ft. per hundred, rising from east to west. The eastern, or Moncton, end is 79.10 ft. above mean high water mark, and the western end, 87.45 ft., meaning a total rise in the length of the yard of 8.35 ft.

The yards are all to be north of the through main line, as it is expected that the trackage that can be placed there will prove ample for some time. To the south, it will be noticed, there is a strip the length of the yard which it is intended at some future date to convert into storage tracks, with a possible diversion of the main line to the south of this larger yard. The present storage capacity amounts to 600 cars, and the newer yard addition will add room for 600 more.

The main line along the south side of the property is located 18 ft. centres from a parallel track, the western end of which is used for caboose storage. Parallel with this, there is another through running track connecting with the caboose track through cross overs at the eastern end of the caboose storage space. To the north of this, at a 14 ft. spacing, there are nine through storage tracks leading from a 1 in 6 ladder track from the second track at the west end, and into a similar ladder at the eastern end, except for the lower three, which converge before leading on to the ladder, made necessary by the curve of the main line at that end of the yard. The first track north of these storage tracks is an open running track, connecting with the main line at both ends through a separate track parallel to the end ladder tracks. At both ends, there is a short parallel track, the one at the eastern end being used for caboose storage for traffic made up to travel in the opposite direction to that for which the west end caboose track is placed.

The upper ten tracks, at a 20 ft. spacing, entered by a separate 1 in 6 ladder track from the west, are for repair and bad order cars, conveniently located to the shops. Parallel with the ladder, near the west end, there is a short track for the wrecking outfit, which is handy to the main line on to which it can be run without any intermediate interference from blocked tracks.

The roundhouse and machine shop, located at the end of the car repair tracks, is of standard type, being erected along both the N.T. Ry. and the Grand Trunk Pacific Ry., and is shown more in detail in the plan of the standard layout. The same roundhouse and shop are used at this point, the layout being reversed, which is the only difference. The one to be built here will have 12 stalls, but it will be noticed in the yard plan that space has been left for a future addition, for which the design of the shop layout is planned to accommodate. A 75½ ft. turntable serves the roundhouse, the inner posts of which are at a 116½ ft. radius. The roundhouse is 87 ft. deep. The upper nine of the stalls have no special fittings, but are constructed of concrete, the floor edge and the forward end planked. The three lower stalls have a drop pit connecting the three, with the centre track leading through into the machine shop to the rear. The machine shop in turn communicates with the blacksmith shop, which has an intervening wall, an optional construction being the elimination of this wall. An industrial railway connects the shops, leading out into the yard to the rear, where the bad order tracks are located. The engine room, boiler room, coal house, pump room and hot well adjoin this building. One of the bad order car tracks leads in alongside of the coal house for the coal supply. The fan room, along the outer wall of the roundhouse, supplies hot air through a concrete duct buried along the outer wall, smaller ducts leading therefrom along the walls of the pits, with entries at short intervals. The shops also have a buried system of conduits for heating.



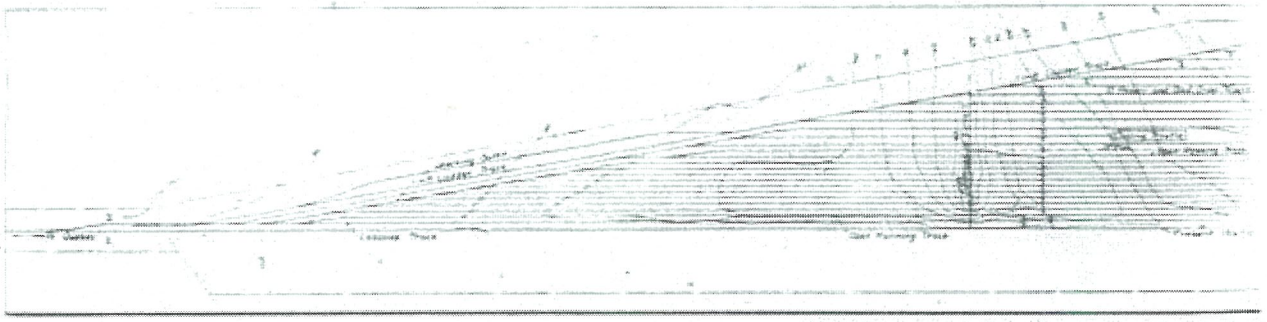
Standard Divisional Roundhouse and Shops for National Transcontinental Ry.

Between the bad order tracks and the upper through running track, there are three leading from the west from the same ladder as the upper running tracks at a 19 ft. spacing. The middle one of these from the west leads on to the coaling trestle, from which the chutes are supplied. The two outer tracks are for coaling the tender. Further east on the same tracks are the ashpits, both tracks converging from that point on to the turntable. From the turntable east, there is only a single track leading parallel to the ladders to the main line.

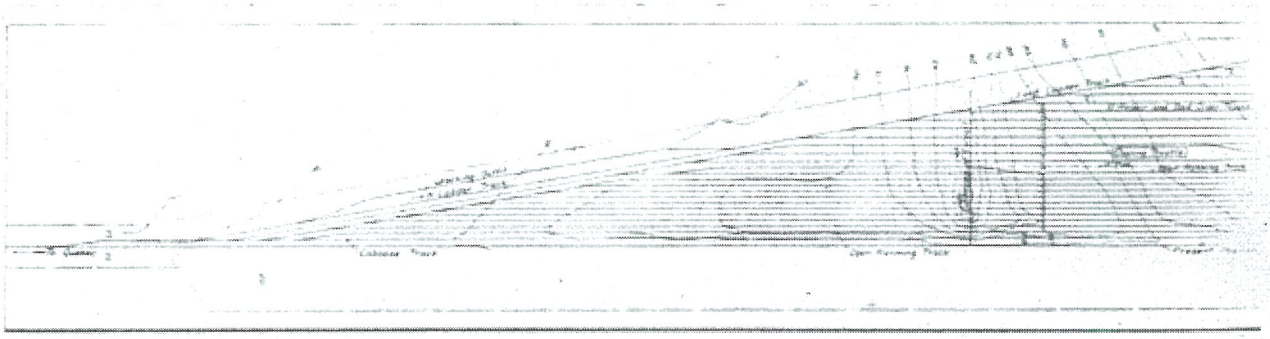
The engineering difficulties in the way of locating the yard were considerable, and careful planning was required. The yards could not be located in Moncton from a lack of suitable space. Likewise it was impossible to place the yards very close to the city, from the fact that the track rises out of Moncton on a 0.6% grade, which is rather too great for an extensive yard. The nearest place where a nearly level yard could be built, was the present site, 1¾ miles from town.

The contour lines of the original ground formation are shown on the yard layout plan. Between the level at the location of the culvert under the tracks and that of the ground where the roundhouse is to stand, is a full 45 ft. At the east end, the final elevation is to 79.10 ft., necessitating the reduction of the 100 ft. level of the shop site and the filling in of the ravine, carrying the filling-in operation nearly to the western end of the yards, where the final level is to be 87.45 ft. The tracks on the western portion of the yard are all on made ground, but the shops are all on the higher levels that were reduced. Any settling of the fill will not affect the buildings. A very convenient arrangement of tracks and buildings has been obtained, considering the restrictions laid upon the engineers in the laying out of these yards.

All the work of filling has been com-



Yard Layout and Shop Arrangement for National



Yard Layout and Shop Arrangement for National

track north of these storage tracks is an open running track, connecting with the main line at both ends through a separ-

machine shop to the rear. The machine shop in turn communicates with the blacksmith shop, which has an inter-

layout plan. Between the level at the location of the culvert under the tracks and that of the ground where the round-

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NTR Branches

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Standard Divisional Roundhouse and Shops for National Transcontinental Ry.

which the design of the shop layout is yards could not be located in Manch

cost of work; 7, brief description of work done. The itemized classes of work in the first columns are as follows: 1, grading; 2, tracklaying; 3, ballasting; 4, culverts and small waterways; 5, permanent bridge substructures; 6, tunnels; 7, fencing; 8, water service; 9, telegraph line; 10, sundry; 11, important individual pieces of work included in the above items, but for which detail percentages are desirable; 12, engine houses, 13, buildings, (stations, section houses, boat houses, trainmen's houses, freight sheds, store houses, ice houses, coaling plants, cinder hoists); 14, advances and deductions; 15, extra work orders.

The percentages are of the total amount of work done on the division (including individual works shown in detail if any), and they represent the percentage of money value of work done. For tracklaying, ballasting, fencing and telegraph line, the percentage columns must be filled in on this basis, and also the total number of miles completed must be given in the last column (brief description).

The engineering organization consists of a Chief Engineer, G. Grant; assistant Chief Engineer; Bridge Engineer, R. F. Uhlarke; district engineers (each in charge of a district 250 to 400 miles long); division engineers (in charge of 40 to 50 miles), resident engineers (in charge of 10 to 15 miles). The Chairman of the National Transcontinental Railway Commission is R. W. Leonard.

FREIGHT TRANSPORTATION FACILITIES AND ADVANTAGES.

The originally estimated distance of 1,909 miles between Moncton and Winnipeg has been reduced gradually by re-located revisions of location at various points to a distance of 1,804.3 miles. This distance is 261 miles less than the shortest distance over any other combined railways between Moncton and Winnipeg. The distance between Winnipeg and Quebec will be 1,351 miles, which is 223 miles shorter than the C.P.R., and the grades are so much more favorable that engines of equal capacity should haul nearly twice the load on the new line that they can on the latter.

Mr. MacPherson points out that transportation of grain by water has always been much cheaper than by rail, but the latter has been slowly and surely cheapening until the present time, when the easy gradients and tremendously powerful locomotives of modern lines will make a combination on land difficult to excel (or peradventure to equal) on water. The distance from Winnipeg to Quebec via C.P.R. to Fort William, and lake, canal and St. Lawrence River to Quebec is 1,771 miles, involving five transhipments of wheat. The distance on the National Transcontinental Ry. will be 1,351 miles, and, as the maximum eastbound grade is 0.04%, compensated for curvature, a Mallet articulated compound is capable of hauling, on this grade, a gross load behind the tender of 4,290 tons. Assuming the tare 33⅓% of gross load, the net paying load would be 2,860 tons, equal to 95,333 bush. of wheat, in one train. Assuming the earnings of such trains to be $4.40 a train mile, or exactly double the earnings of the C.P.R. freight train miles for 1908, the cost per bushel over the 1,351 miles between Winnipeg and Quebec is bound to be 4.25c. The lowest rate that has been in force from Fort William to Montreal, via the lake, canal and St. Lawrence River, a distance of 1,216 miles, is believed to have been 4c. per bush. in 1908. This rate for 1,216 miles would be equivalent to 4.44c. for 1,351 miles, so that, at $4.40 per train mile, the engines above referred to could haul grain on the National Transcontinental Ry. eastbound from Winnipeg to Quebec for 0.19c. per bush. cheaper than the cheapest existing water route could haul it the same distance, and 10.66c. per bush cheaper than the present combined rail and water rates between the two points in question; in brief, at about 25% of the present rail and water rate. It would appear, therefore, that the days of the absolute supremacy of water transportation are in danger of at least a partial eclipse.

The foregoing, reproduced from Engineering News, was compiled mainly from information furnished by D. MacPherson, M. Can. Soc. C.E., Assistant to the Chairman N.T.R. Commission, which included a detailed statement, prepared at Mr. MacPherson's instance, by Karl Wuetherbee, one of the assistant district engineers.

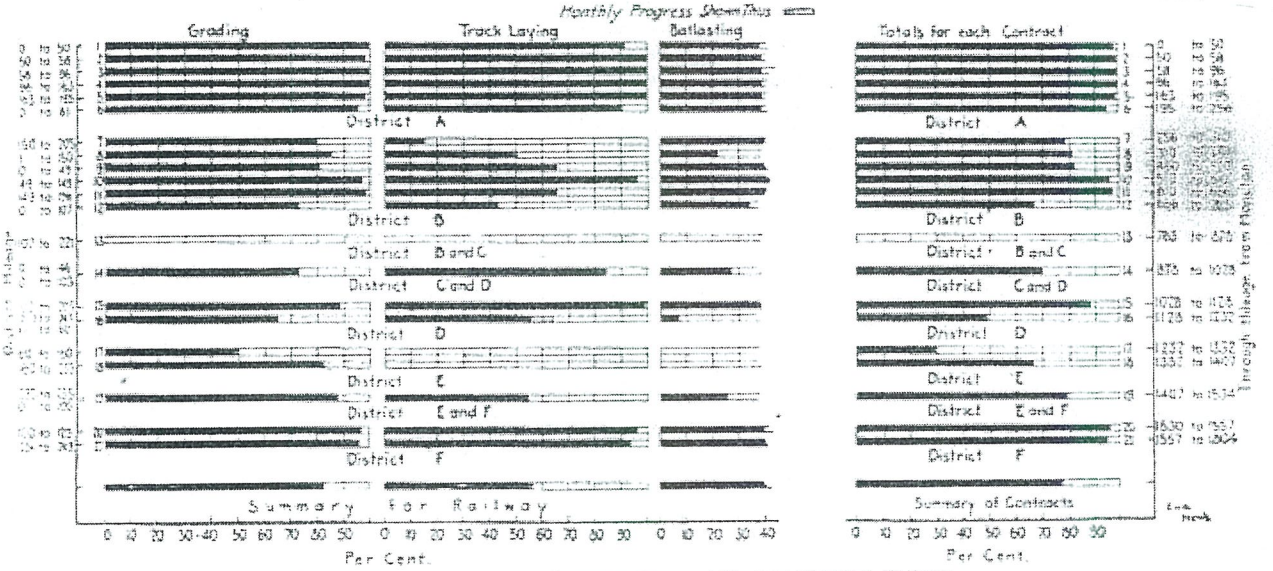
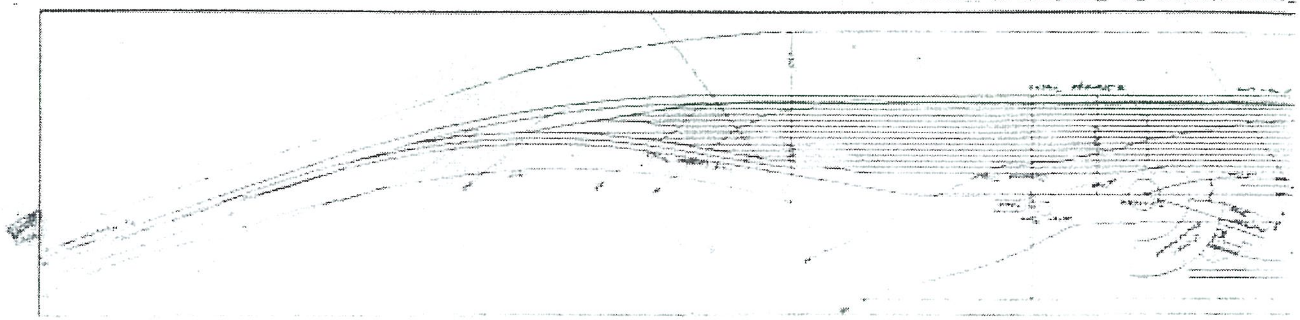


Fig. 4. Portion of Progress Diagram, National Transcontinental Railway.

(The cut shows only the first three and the last of the several classes of wo

pleted, and track laying is i- progress. The contract for the roundhouse has been let, and work is to commence in the near future. Tenders have been invited for the coaling trestle and the other buildings of the shop plan. The yard layout was designed at Ottawa, and the work carried out under the direction of the C. O. Foss, District Engineer, N.T.R., St. John, N.B.



Transcontinental Ry. Terminals at Moncton.

proposing to build about [illegible] to connect its mines with the G.T.P. Ry. lines in the district. (Aug., pg. 413.).

National Transcontinental Railway Construction.

Recent press reports from Fredericton, N.B., state that three gangs of section men have been placed on the line between Moncton and Grand Falls, N.B., and are at work under the direction of T. C. Burpee, Engineer of Maintenance of Way, Intercolonial Ry. It is added that the local understanding is that the Intercolonial Ry. will shortly establish a train service on the line, pending its being taken over by the G.T. Pacific Ry.

In an interview at Quebec, Aug. 11, R. W. Leonard, Commissioner, is reported as stating that he had been studying the question of the terminal in Quebec. He had a conference with W. Wainwright, Vice President, and a representative of the engineering staff of the G.T.P. Ry. on the matter. It is proposed to make some changes in the plans, which will be submitted to E. J. Chamberlin, President, upon his return from the west early in September.

M. J. O'Brien is reported as stating that grading is completed on the section of the line he is building to 150 miles east of Cochrane, Ont., with the exception of about 35 miles, which he expects will be finished this year. Track has been laid over the greater portion of this mileage, and will be completed early next year. Track is laid from Cochrane easterly practically to a junction with the O'Brien contract. It is expected, adds Mr. O'Brien, that the whole line from Quebec to Coch-

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Grand Trunk Pacific Railway Construction.

Collingwood Schreiber, Dominion Government Consulting Engineer, returned to Vancouver, B.C., Aug. 8, after having completed a trip of inspection over the line and the sections under construction in British Columbia. He stated that he was satisfied with the progress made and the character of the work done. The work, however, had been held up to some extent by strikes, but these had not been so extensive as had been reported. There [illegible] some shortage of labor. He was

missioners for approval, and the right of way is being acquired. Track is reported to have been laid for about 10 miles on the branch north-westerly from Moose Jaw, and it is further reported that considerable grading has been done on the branch running out of Moose Jaw westerly.

Ballasting is reported to have been completed between Young and Wakow on the branch line from Young to Prince Albert, Sask, but no further tracklaying has been done. The construction of the branch involves the erection of a bridge across the South Saskatchewan River,

rane will be ready for traffic, except for the finishing up process, by June 30, 1913.

Track is laid for over 250 miles west of Cochrane, and on the section under construction between track end and Superior Jct. temporary trestle bridges are being erected, in the expectation of connecting up the steel, so that it may be possible to run grain trains over the line and out to eastern points via the Timiskaming and Northern Ontario Ry. and the G.T.R. during the winter.

Traffic Orders by the Board of Railway

National Transcontinental Railway Construction.

The intention, it appears, is to have the steel laid complete from Cochrane, Ont., to Winnipeg this season. R. W. Leonard, Commissioner, is reported as stating that there is an 80 mile gap between these two points. While it is expected to have the steel laid by the end of the season, it is considered doubtful whether one line can be got into such a condition that it will be possible to operate grain carrying trains over it.

The yards at Transcona, Man., have a capacity of 5,000 cars, and this can be increased as occasion requires. The finishing touches are being put to the yards by the J. D. McArthur Co., which has the contract.

Tenders are under consideration for piping systems, pipe tunnels, pipe coverings and wiring ducts required for the car shop plant at the Transcona shops. (Sept., pg. 465.)

Grand Trunk Pacific Railway Construction.

farther west, the survey crosses the river twice within a few miles, recrossing it at the canyon. There is also a bridge at Resplendant, making five spans over the Fraser river. A long bridge will cross the Shuswap river and one must be built over the Ghost river before trains are run into Fort George. Reports from Fort George state that a contract has been let for the clearing of 50 acres on the Nechaco river, Fort George, for yard purposes, and that work was started thereon, Sept. 5.

W. C. C. Mehan, General Superintendent at Prince Rupert, reports that all station buildings on the main line east of that city are completed as far as Van Arsdol. These are at Kaien, Phelan, Sock Eye, Tyee, Mann, Kwinitsa, Salvus, Exarew, Shames, Amsbury, and Terrace, respectively. A 50,000 gallon permanent water tank has been located at Kwinitsa, at mileage 46, and one at Van Arsdol. New stations are in course of construction at Usk, Pitman, Hallwood and new water tanks at Nichol and Kitwanger. Stations are going up at all permanent sidings and water tanks wherever necessary. Station facilities will be complete to Hazelton shortly after the steel

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National Transcontinental Railway Construction.

The Minister of Railways stated in the House of Commons Dec. 4 that the total expenditure by the Government on construction to that date was $125,053,267.53, of which $15,545,118.29 had been paid to the G.T. Pacific Ry. in respect of the construction contracts which that company held.

We are officially advised that during the construction season of 1912, there were laid 361.15 miles of track distributed as follows: Mileage 109 to 153 east of Quebec Bridge, 54 miles; mileage 1 to 75 west of Quebec Bridge, 7.50 miles; mileage 288 and 419 west of Quebec Bridge at different points a total of 84.75 miles; mileage 168 west of Cochrane and mileage 102 east of Lake Superior Jct., Ont., at different points a total of 235.90 miles.

A train service was put in operation on the section of the line from Moncton to the New Brunswick-Quebec boundary, Nov. 20, the timetable providing for west-bound service to Edmundston, N.B., on Mondays, Wednesdays, and Fridays, and an east-bound service to Moncton, Tuesdays, Thursdays and Saturdays. The passenger cars used have been hired from the Intercolonial Ry., and the locomotives and freight cars from the contractors, and the Intercolonial Ry. The operation of the line is under the charge of W. B. Cronk, General Superintendent, for the Commissioners at Ottawa, with E. P. Cronk as Superintendent at Edmundston.

The Minister of Railways stated in the House of Commons, Dec. 4, it was expected that the section of the line from the New Brunswick-Quebec boundary to Quebec city would be completed and ready for operation in Sept., 1913. It is reported that there are only about 12 miles of track remaining to be laid on this section of the line, and that the principal work to be done is the bridging, ballasting and levelling.

The whole question of the site of the terminals at Quebec, the Minister of Railways stated in the House of Commons, Dec. 4, is still under the consideration of the Commission. The matters being considered include the question of the construction of a tunnel under Cape Diamond, with the object of locating the terminals elsewhere than on the Champlain market site.

West of Quebec to 150 miles east of Cochrane, Ont., there remains only about 50 miles of steel to be laid. Track now extends from the last point named to a considerable distance west of Cochrane, and the Minister of Railways stated in the House of Commons, Dec. 2, that he expected to receive a report by Dec. 31, that all the steel had been laid to Graham or Lake Superior Jct. At the last report there were only 48 miles unrailed. R. W. Leonard, the Commisisoner, is quoted as recently stating that the Cochrane-Lake Superior Jct. section of the line would not be in a condition for the operation of trains until September. The section of the line from Lake Superior Jct. to Transcona, four miles east of Winnipeg, is completed, and a train service is being given by the G.T. Pacific Ry. under an agreement. Negotiations for a lease of this section are in progress. The Commission will give the G.T.P. Ry. the opportunity of leasing the various sections of the line as they are taken over from the contractors, but the company is not compelled," added Mr. Leonard, "to declare its policy until the entire line between Moncton and Winnipeg is completed." (Nov., 1912, pp. 562.)

Tenders will be received by the Commissioners, to Feb. 13, for the furnishing and delivery of machines, tools, appliances, motors, furnaces, cranes, etc., required for the equipment of the car department of the shops at Transcona, Man. Specifications and other information may be obtained from W. J. Press, Mechanical Engineer, Ottawa.

National Transcontinental Railway Construction.

We were officially advised, Nov. 17, that the Intercolonial Ry. expected to begin operating the entire section of the National Transcontinental Ry. between Moncton, N. B., and St. Jean Chrysostome, Que., the point of junction with the Intercolonial near Levis, Nov. 23. The distance is 457.7 miles.

The service previously given extended from Moncton to St. Eleuthere, Que., 290.8 miles. No definite arrangements have been made for the operation of any other part of the line, except as at present. It is expected, however, that arrangements for the permanent operation of the whole line will be concluded at an early date.

Tenders are under consideration for the supply of boilers and stokers, feed water heater, steam engines and stokers, generators, switchboard and wiring, at the Leonard shops, St. Malo, Que.

Tenders will be received to Dec. 8 for the supply of 150,000 ties, to be delivered at Belair and La Tuque, Que. (Nov., pg. 501.)

Railway Lands Patented.—Letters patent were issued during September in respect of

December 1914