PORT OF

CHURCHILL

Canadian Pacific Railway.

ic signals will be installed between ell and Glen Tay, Ont., between Agin- t and Don, Ont., and between London Lobo, Ont., on the Montreal-Windsor line. During 1929 color light signals installed between St. Martin Jct., and Lanoraie; this year additional ls will be installed between Lanoraie Berthier Jct., providing continuous matic signal protection between Mon- and Berthier Jct., on the Montreal- c main line.

usual programme of bridge and g painting, repairs and replace- right of way and snow fence ls, rail and tie renewals, signal terlocking plant repairs, will be out to maintain the property y. The track tie renewals will approximately 1,7[illegible],000 creosoted inging the total placed in service ern Lines since 1918 to approxi- 12,800,000, representing 64% of in service.

oute from Winnipeg to Hudson Bay Reported on.

anadian National Rys. manage- given the Minister of Railways , Mr. Crerar, a report on recon- surveys made by C.N.R. en- the route suggested to provide railway connection from South- oba to Hudson Bay. Following cts:—The proposed Mafeking uld start from the Canadian Ry. Erwood Subdivision, at Man., and running north would urnberry Subdivision at Fresh- , an approximate distance of

provide a certain amount of tie timber and pulpwood. The grades on this route would be very favorable, on account of very little rise and fall. By the construction of this route the distance from Winnipeg to The Pas would be shortened some 48 miles less than via Hudson Bay Jct., i.e., reduced from 468 to 420 miles. An approximate estimate of cost to complete this route ready for operation would be 210 miles at $38,000 a mile, $7,980,000.

"The proposed line to be built from Gypsumville to the Hudson Bay Ry. would be an extension of the Oak Point Subdivision from the terminus at Gypsumville, Man., northerly to a connection with the Hudson Bay Railway at Wekusko, mile 82. From Gypsumville to Grand Rapids, mile 110, the line would run through a flat country, mostly muskeg, excepting the first 10 miles north from Gypsumville, on which there is some cultivation; from Grand Rapids north to Wekusko, 105 miles, there is very little land suitable for cultivation in the vicinity. There is considerable timber suitable for pulpwood. Grades on this route would be very favorable on account of very little rise and fall. By the construction of this route the distance from Winnipeg to Wekusko would be shortened some 173 miles less than via Hudson Bay Jct. and The Pas, i.e., reduced from 550 miles to 377. An approximate estimate of cost to complete this route ready for operation is 215 miles at $42,009 a mile, $9,030,000, this including the cost of bridge over the Saskatchewan River at Grand Rapids.

"The fourth suggested cutoff between Winnipeg and the Hudson Bay Ry. would be an extension northerly from Gypsumville for 77 miles, then northwest for [illegible] miles to [illegible]

Grain Elevator for Hudson Bay Railway Terminus at Churchill.

The grain elevator to be built for the Dominion Railways and Canals Department, at the Hudson Bay Railway terminus at Churchill, Man., the letting of the contract for which was announced in Canadian Railway and Marine World for June, pg. 388, will have a total storage capacity of 2,500,000 bush., of which 500,000 bush. capacity will be in the work house. Provision is made for future extensions to bring the elevator capacity ultimately to 10,000,000 bush. The elevator will be of reinforced concrete fireproof construction throughout, and will follow the most modern practice in construction and equipment for the rapid handling of grain. It has been located about 600 ft. back from the deep water dock now under construction, and will be built parallel with the dock. The location is approximately at low tide shore line, at which point action of tide water draws the frost from the ground, and enables piles to be driven to rock. The foundation of the elevator will contain 7,700 piles. These will be cut off at mean tide level and capped with the concrete mattress of the elevator structures. After piles are driven, the area of the building will be filled with gravel up to the level of the pile cutoff. Basements of all buildings will be waterproofed, with a membrane waterproofing above the level of high tide.

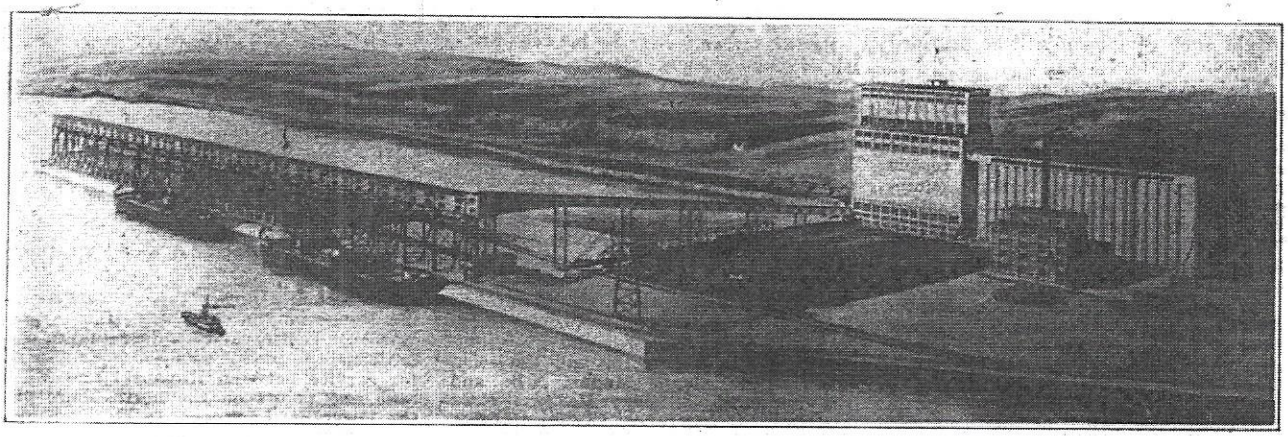
Grain will be delivered from the elevator to the deep water dock by a 4-belt conveyor system. The gallery along the dock will be about 1,500 ft. long to provide berthage for 3 grain boats under the gallery spouts. Twenty-three boat spouts will be spaced at about 65 ft. centers and will be motor operated from the dock level. It will be possible to discharge 4 streams of grain to ships at the rate of 20,000 bush. an hour for each stream. Shipping galleries will be constructed of structural steel frame, covered with corrugated iron. The unloading track shed will be served by 4 tracks of ample length, and arranged for through operation. Unloading facilities will consist of 4 Dominion-Howe automatic box car unloaders. Under conditions of maximum operation, the elevator will be able to unload grain at the rate of 400 cars a day. An efficient car haulage system will be arranged to handle cars to and from the unloaders with a minimum of delay.

The elevator work house will be 190 ft. long by 80 ft. wide, and will be 207 ft. high above the tops of piles. Work house equipment will include 4 receiving legs, with a capacity of 25,000 bush. an hour each; 4 shipping legs, with a capacity of 20,000 bush. an hour each; 11 cleaner legs and one drier leg. Provision is made for future installation of 4 legs to handle extensions of the cleaner system. Cleaning equipment will include 15 no. 11-B monitor receiving separators; eight 5-unit Emerson separators; and eight big-five Carter disc separators, all of which will be loaded on the work floor. Screenings will be cleaned in the elevator cupola, equipment for that purpose including 2 no. 11-A monitor screenings separators; 2 no. 81-D scalping shoes, one no. 5 monitor scourer, one big-five Carter disc separator, and one double Carter seed disc installation.

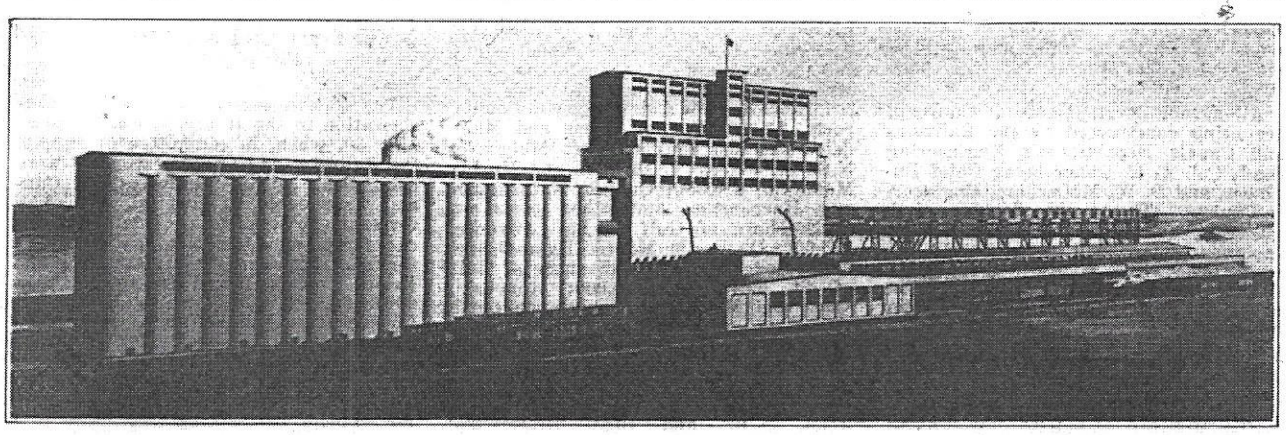
The grinder room installation for grinding screenings will be in a room constructed for the purpose over the track shed. Equipment will include a no. 4 JayBee grinder, driven by a 100 h.p. motor, with bagging machinery, and bag chute to track. Work house equipment will also include eight 2,500 bushel hopper scales; 19 cleaner garners; passenger elevator and Humphrey elevator. A complete dust collector system will be installed throughout all parts of the work house. Wall areas between columns will be filled in with steel sash and glazing, to give a maximum of light and protection against possible dust explosions.

The storage annex will be 298 ft. long by 100 ft. wide, built end on to the work house. Storage space will be made up of 44 circular bins, 24 ft. diameter; 24 outer space bins, and 76 inner space bins. All bins will have a depth of 100 ft. The annex will be served by four 42-inch conveyor belts in the cupola, and four 36-inch conveyor belts in the basement. Cupola belts will have 2 pulley self-propelling trippers built for high speed operation.

A grain dryer, with a capacity of



Grain Elevator to be built for Dominion Railways and Canals Department at Hudson Bay Railway Terminus at Churchill.



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dock will be about 1,500 ft. long to provide berthage for 3 grain boats under the gallery spouts. Twenty-three boat spouts will be spaced at about 65 ft. centers and will be motor operated from the dock level. It will be possible to discharge 4 streams of grain to ships at the rate of 20,000 bush. an hour for each stream. Shipping galleries will be constructed of structural steel frame, covered with corrugated iron. The unloading track shed will be served by 4

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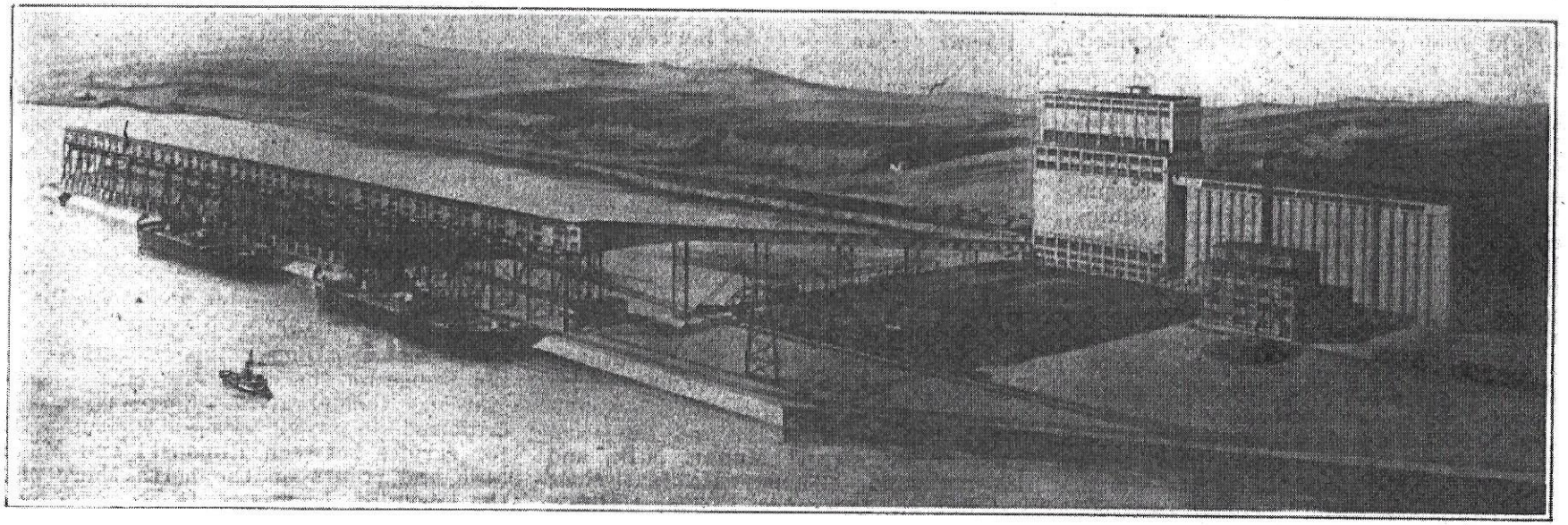

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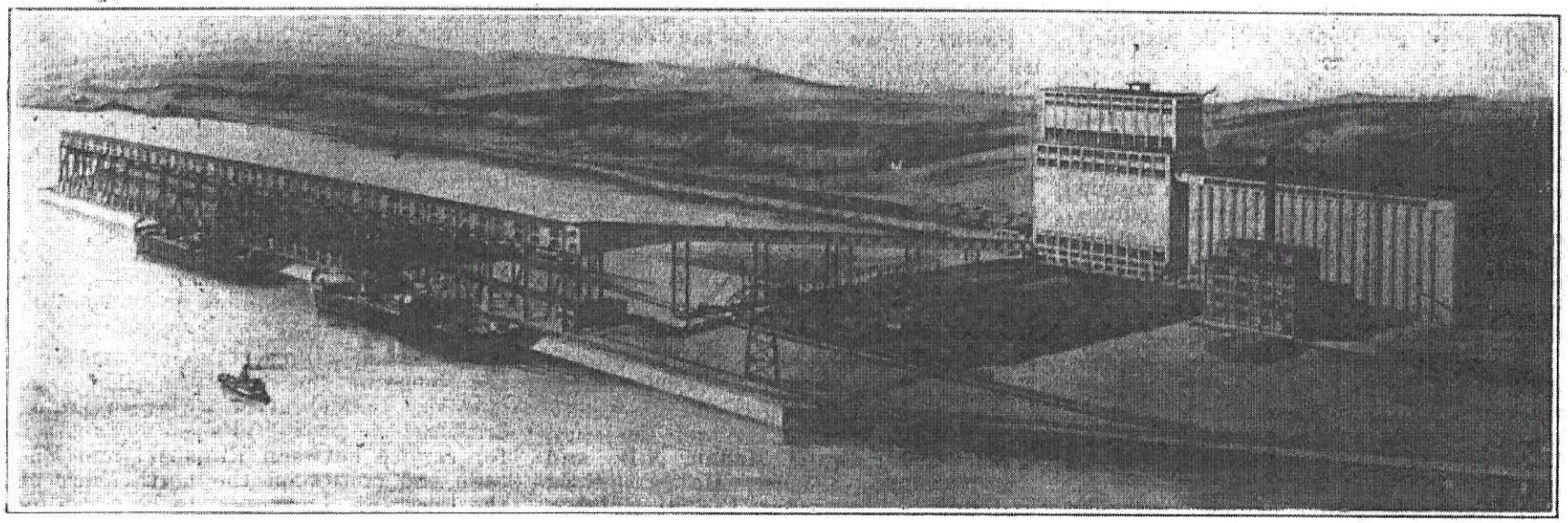

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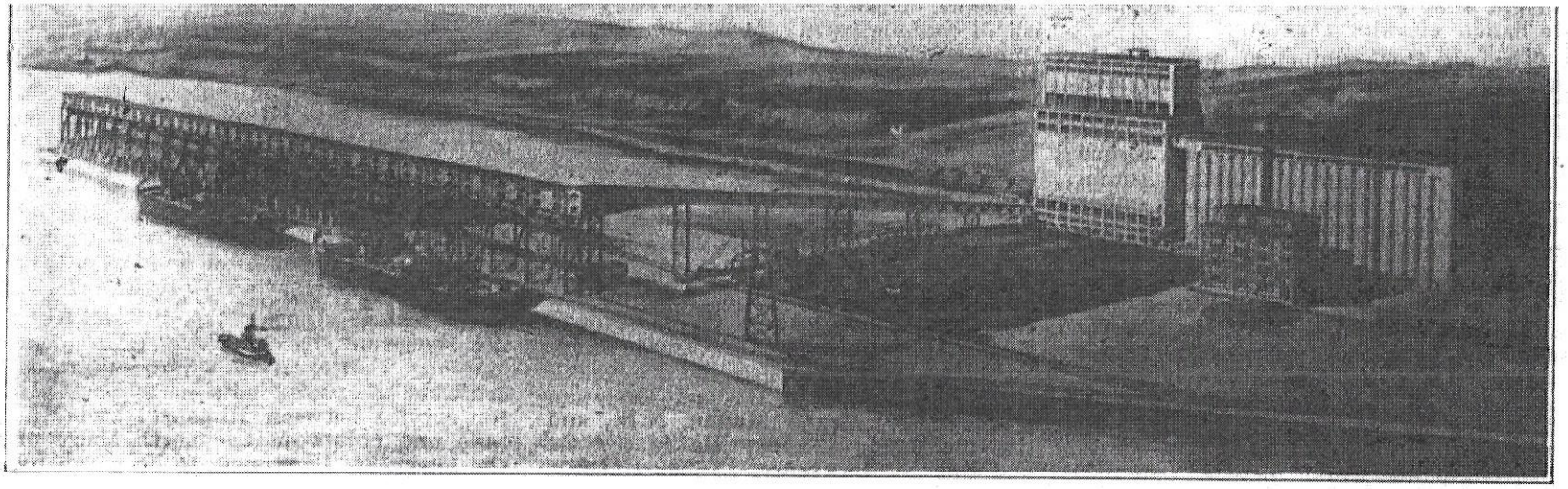

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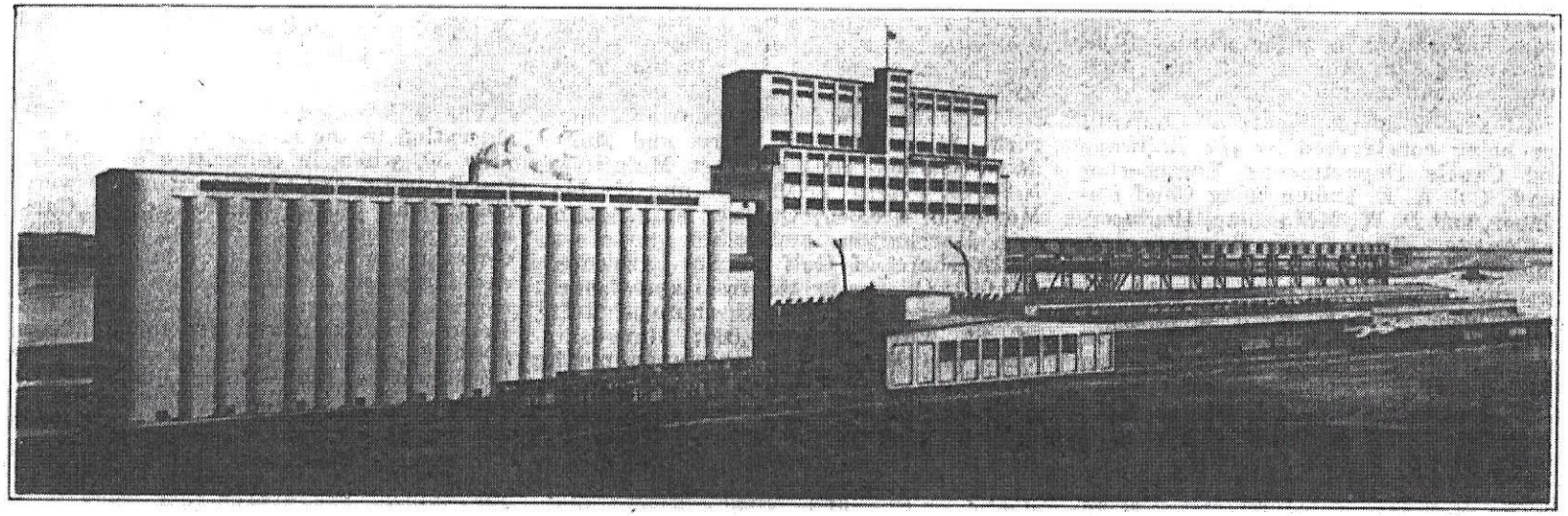

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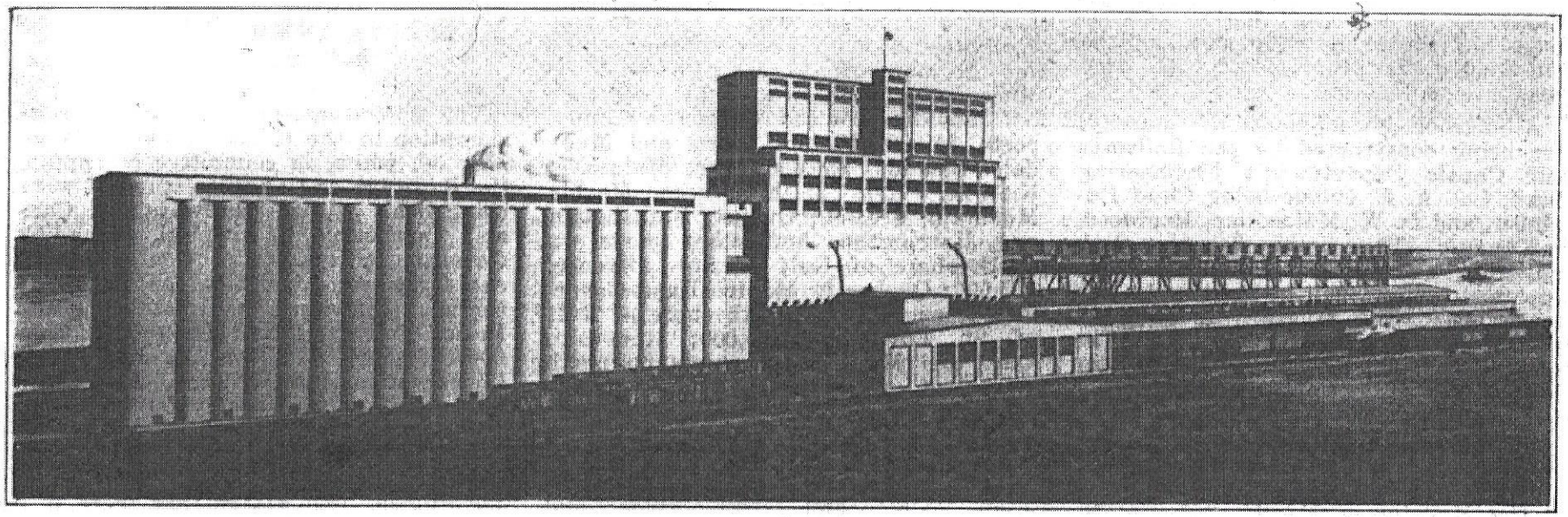

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1,100 bush. an hour, will be housed in a separate building between the work house and the storage. The dryer will be of the steam dust collecting type, and will be provided with large garners above and below the dryer, so that operation may proceed continuously without interference with receiving and shipping.

The office building, at one end of the work house, will contain the elevator offices, millwright shop, dining and rest rooms for the staff, and quarters for the inspection department. A complete millwright shop equipment will be provided to handle elevator repairs.

The elevator equipment will include about 5 miles of conveyor belting, and 165 motors, varying in size from 5 h.p. to 150 h.p. A feature of the motor equipment will be the use of high torque motors, with magnetic starting equipment. Anti-friction bearings, of either ball or roller bearing construction, will be used throughout the plant, to reduce power requirements and also repairs and maintenance.

Electric power for the grain elevator dock facilities, and for supplying power to Churchill, will be generated by a modern power plant to be built in connection with the grain elevator. The power house structure will be 120 x 100 ft. Its equipment will include two 600 b.h.p. boilers, one 300 b.h.p. boiler, with induced and forced draft, two 1,500 k.w. steam turbo-generator sets, and one 600 k.w. turbo-generator set. Steam will be generated at 650° temperature and 230 lb. per sq. inch gauge pressure at outlet. The power plant will include switchboard for controlling electrical apparatus in the power plant, and for distributing circuits to the elevator and dock. A pump house, located on the dock, will pump salt water to the con-

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All harbor developments at Churchill e being constructed by the Railways d Canals Department's Engineering aff, Col. A. E. Dubuc being Chief En- neer, and D. W. McLachlan, Engineer-Charge. The grain elevator, dock lleries, and power plant have been signed by, and will be built under the pervision of C. D. Howe & Co., con- ting engineers, Port Arthur, Ont. The neral contract for the grain elevator s been given to Carter-Halls-Aldinger , Ltd., Winnipeg.

from or near Fond du Lac, on the north shore of Lake Athabaska, easterly to a crossing of the Shipman River north of Black Lake, thence slightly south and east to a crossing of the Porcupine River, thence southeasterly to or near the elbow of the Cochrane River at or near the boundary line between Saskatchewan and Manitoba, thence southerly through Manitoba to the southern end of Lake Kasanjerri, thence easterly crossing the Seal River and the Etawney River to Churchill.

An Ottawa press dispatch stated that British capitalists controlling large mineral deposits north of Lake Athabaska were behind the application. Another dispatch, sent shortly after the petition for legislation was presented, stated that it was very unlikely that the powers sought would be conferred, and that the Canadian National Rys. would probably be given the first chance to build railway lines in the Hudson Bay region.

Kenora to English River Ry.—We are advised officially that surveys being made by J. P. Rose, in connection with the projected railway from Kenora, Ont., to the English River district, are of a preliminary nature so that when the time comes for building a line complete information will be available. The Backus Brooks Co. of Minneapolis, Minn., has a lease of large timber limits from the Ontario Government for the development of which it is required to build a railway northerly from Kenora.

Kettle Valley Ry.—Appropriations for betterments and improvements for this year include amounts for relaying of

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By Harold A. Innes, M.A., McM., Ph.D., Chic., Associate Professor of Political Economy, Toronto University.

The driving of the last spike at Churchill, Man., on April 3, 1929, and the completion of the first lift of gravel on Sept. 13, by which the Muskeg Limited was able to proceed as the first train to Churchill marked the end of a long struggle on the part of the engineer. It was a vindication of the skill of the Canadian engineer, and, if it marked the beginning of a long series of new problems, it gave promise of the success with which these problems will be solved. The Canadian north is a challenge to the Canadian people, but it is particularly a challenge to the Canadian engineer.

The history of the line dates back to the abandonment of the Hudson Bay route and the opening up of railway communication from the south and from Montreal. In the 'eighties a short stretch of line was built north of Winnipeg and is now a part of the road which terminates at Gypsumville. The Canadian Northern Ry. continued the line as part of its main line to Hudson Bay Jct., and in 1908 a branch was completed to The Pas, 467 miles from Winnipeg. On Aug. 10, 1908, survey parties left Winnipeg to locate the route to Hudson Bay.

The report of the engineer advocated the adoption of Nelson as a terminus, and on Sept. 28, 1910, the first sod was turned at The Pas. In 1913 the bridge across the Saskatchewan was completed and at the end of the season 80 miles of track had been laid. By 1917 rails had been laid to mile 332 and the grade completed to Nelson. After a lapse of ten years activities were renewed in 1927, with the reconditioning of the line and the installation of new divisional facilities at miles 137 and 327. Meanwhile the difficulties involved in establishing a port at Nelson, because of the shallow character of the mouth of the river, led to a reconsideration of the terminus. Frederick Palmer was asked to report on the relative merits of Churchill and Nelson from the standpoint of providing loading berths for three ships at one time and acommodation for six ships at one time, the ships having a draft of not less than 26ft. Machinery was sent in by airplane, and borings were taken of the bottom of Churchill harbor in the winter of 1926-1927. It was found that it would be possible to dredge the harbor to the required depth and with a favorable report from an engineering party on the possibilities of ing the putting down of 51 miles in 56 days. On this unballasted roadbed, supplies were rushed in, and after navigation opened ballast trains were used to dump gravel on the roadbed. The track was lifted up and gravel put underneath. The experience gained with construction on this section was elaborated on the Hudson Bay Ry. In part the problem was solved by the use of the tractor, but the basic consideration as in the Flinflon line, involved putting down the track over frozen ground, and rushing supplies, ballast trains and equipment to the various ballast pits along the line, especially at miles 396, 467 and 507, before the open season. On Oct. 16, steel had reached mile 428, and by April 3 the last spike was driven at mile 510. The ballast trains operated both ways from the pits and gradually filled up the unballasted portions of the line.

Tracklifting gangs were engaged in raising the track by jacks and pounding the gravel underneath the ties. During the open season the whole was kept under close supervision by a completed telephone system and the use of small gas cars operated over the unballasted track. The station men, employed formerly to build the grade, were transferred under this system to the task of digging extensive ditches to drain off water from the small lakes and pot-holes across which the road had been built in winter. The technique of construction involved the solution of various problems, including the thawing of gravel in the ballast pits and the thawing of ground with steam points for piles. Moreover the problem involved in securing an adequate water supply for winter operations at various water tanks and also at the terminal at Churchill and of laying out buildings and elevators on frozen ground may be satisfactorily solved only after a long period of experiment. Comparatively little scientific investigation has been carried out on frozen ground and it is limited chiefly to work in Russia and to practical experience in the Yukon and on the Hudson Bay Ry. Canada should be in a position to make distinct contributions on the subject. The construction of the railroad has been achieved successfully as the result of the skill and courage of Canadian engineers in advancing boldly to the working out of new technique.

The completed line has a maximum grade of 0.4 northbound. The elevation signed ships, are all within the range of the engineer's problems.

But assuming that facilities have been established by which wheat can be shipped throughout a period of 12 weeks, which is generally conceded, assuming that connections have been built to The Pas by which a railway system built to converge on Winnipeg is realigned to converge on Churchill, and that sufficient time has elapsed to put the road in condition for handling heavy train loads of wheat and the port in condition for the rapid loading of ships at Churchill, the line is subject to numerous handicaps. In the first place the cost, including the abandoned works at Nelson and the port at Churchill, as well as all other equipment, with the interest charges on capital invested during construction, will not fall far short of and will probably exceed $50,000,000. It has been argued that the port will be able to handle 100,000,000 bush. in a favorable season, but it is necessary to keep in mind that freight charges, insurance and general expenses must be adjusted in line with other ports, Vancouver, Montreal and New York. The Canadian National Rys. and the Canadian Pacific Ry. to the east and to the west are strongly entrenched competitors. Allowing for a possible lengthening of the season through improvements introduced as a result of engineering skill, for a return cargo which will cut down the costs of a back haul of empty cars for at least 510 miles, and for elaborate storage facilities at Churchill cutting down the peak load haul during the open season, there is still the necessity of earning interest on the investment for eight and possibly nine months of the year.

The ultimate success of the line will depend therefore on the development of local traffic along the railway and in Hudson Bay. The task of the engineer and of Canadians is that of opening up the Canadian north made accessible by the railway. It is becoming increasingly apparent that mining and water power are the basic factors in future development. Lumbering and fishing may be developed, as subsidiary industries to mining and power, but the evidence so far available is not encouraging as to their development on a large scale. Narrowed down to minerals and power, the problem may be discussed more clearly. In the first place, in the search for minerals substantial progress has been made in working out a new technique

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The construction of railways after the Great War in the frozen ground area of the district north of The Pas has involved a revolution in engineering. It will be impossible for an economist to discuss the details of this revolution, but a general description may be ventured. The branch to Flinflon was the experimental section in which the technique was devoloped. The experiment involved using a narrow right of way to put down ties and track on the frozen [illegible] and pushing construction rapidly ballast trains operated both ways from the pits and gradually filled up the unballasted portions of the line.

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The completed line has a maximum grade of 0.4 northbound. The elevation at The Pas is 1,190 ft. and at mile 10 it increases to the highest point, 1.290 ft. There are few curves of more than 3° and the total curvature is 12.6% of the mileage. Construction includes 51 miles in cuts, 12 miles solid rock work and the remainder embankments.

The port engineers have had a wealth of experience at Nelson and at Churchill. Dredging operations, as carried on at great distances from a base, brought their own problems, but the completion of the railway will contribute to the solution of those problems. The success of a through route for wheat by Hudson Bay must depend on thorough investigation of ice conditions in the straits, in the Bay, and in the harbor, and on the energetic tackling of the problems raised. Such questions as weather forecast-

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Discussed Between Governments.

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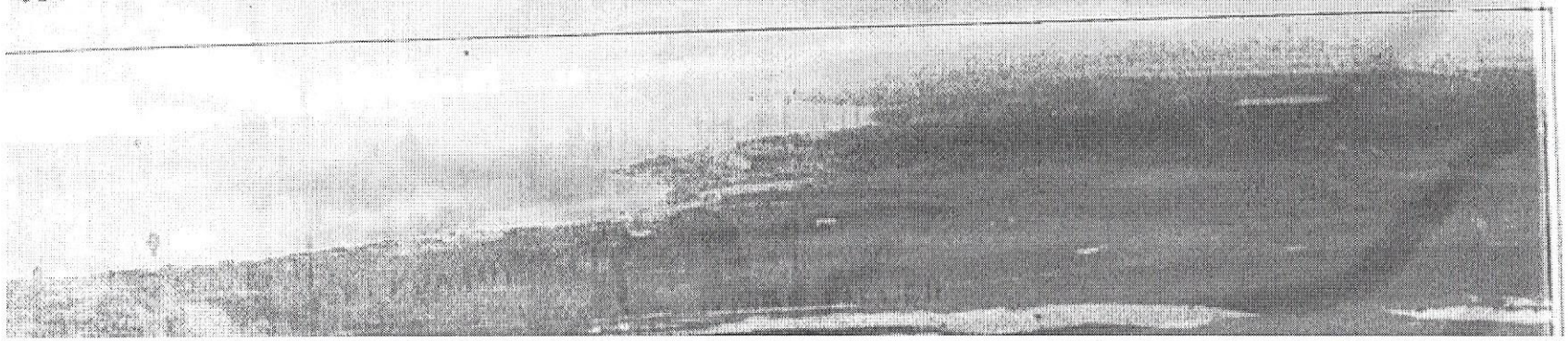
he Dominion Minister's Reply.

Dominion Minister of Railways 'anals, Dr. R. J. Manion, replied 24, as follows: "I have received letter enclosing the resolutions port facilities to be conducted along sound engineering lines and with due regard to economic considerations. Nevertheless, in deference to western sentiment, it was agreed that, if at all possible, a test of the port facilities should be arranged for the fall of 1931, in order that any deficiencies might be corrected, and that attention might be attracted to the possibilities of the new route in advance of formal inauguration the following season. Since taking over the portfolio, I have given close personal attention to the progress of this work, having lost no time in visiting the Hudson Bay Ry. and port of Churchill, and satisfying myself as to conditions there,



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Marine Department

Hudson Bay Route Operation Discussed Between Saskatchewan and Dominion Governments.

The Saskatchewan Minister of Railways, Labor and Industries, Mr. Merkley, wrote the Dominion Minister of Railways and Canals, Feb. 17, as follows:—"I send you herewith copy of three unanimous resolutions which were passed at the meeting of Saskatchewan Traffic Council, in Regina, on Feb. 5, in respect to export freight traffic via the Hudson Bay route. The Saskatchewan Government heartily concurs in, and supports, the resolutions. In regard to resolution no. 1 the view of this government is that arrangements should be made during the inaugural period this fall, so that ocean rates from Churchill shall not exceed the ocean rates in effect from

"Resolution no. 3 deals with the necessity of the establishment of adequate stockyard facilities at Churchill for the prompt transfer of livestock from the Hudson Bay Ry. to ocean ships. The Saskatchewan Government also recommends this resolution for your favorable consideration, as the organized livestock bodies of Saskatchewan advise me they purpose using the bay route for their export cattle movement to British markets."

The Dominion Minister's Reply.

The Dominion Minister of Railways and Canals, Dr. R. J. Manion, replied Feb. 24, as follows: "I have received your letter enclosing the resolutions

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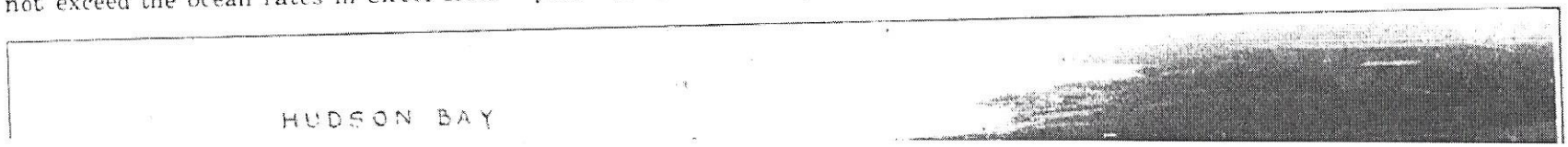

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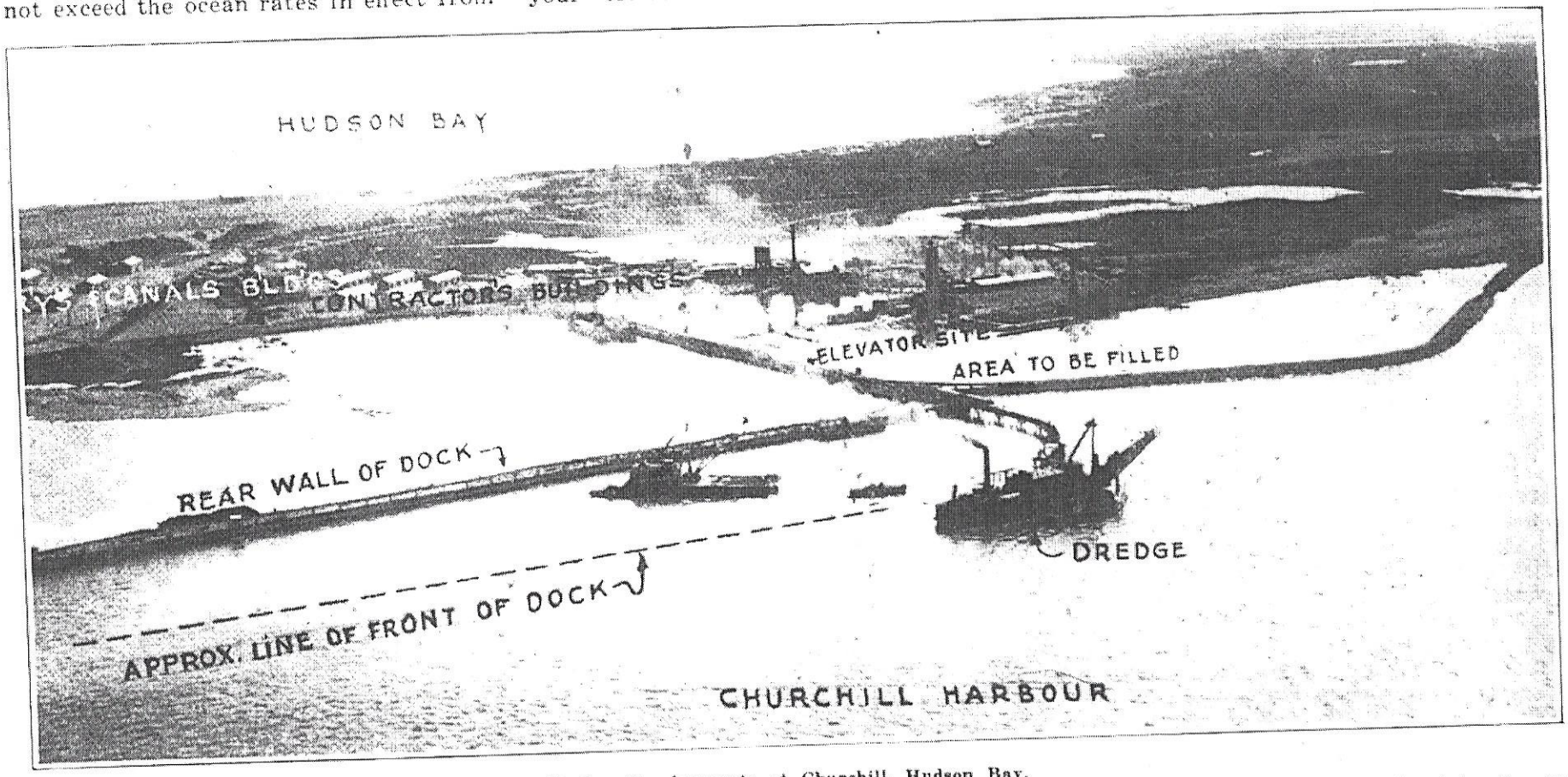

Harbor Developments at Churchill, Hudson Bay.

The basis of this illustration is a photograph taken by the Air Force in August, 1930. The lines and lettering were added by the Dominion Bureau of Statistics, on information supplied by the Railways and Canals Department.

Montreal during that period. The Sas- ... Government after mature adopted by the Saskatchewan Traffic Council relative to the Hudson Bay ... and as to the possibility of realizing western expectations in the matter of early completion. Only those who have

of 5,000,000 bush. of grain, [illegible] such movement would, the presence at Churchill of from 20 to 25 ships at a time when a clear harbor and no interference whatever would best serve the true interests of the undertaking as a whole.

"We look for a large cattle movement via Churchill once the port is open, and are providing trackage alongside the berths, reserving one berth and 400 ft. clear of sheds, so that there may be a space for cattle pens and accommodation for loading. It is suggested that the most suitable place for feeding cattle destined for export via Churchill would be at The Pas, where hay is available in quantity. That, however, is a matter concerning which I do not presume to speak with authority.

"I have read with interest the resolution respecting freight and insurance rates. Of course neither ocean rates nor ocean insurance is within the control of the government. What brings ships to the ports of Canada, or elsewhere, is the business offering, and competition is the deciding factor in the matter of rates. The government is, however, concerned with providing the facilities which will make Churchill a safe and attractive port during the navigation season, and that responsibility has not been evaded, nor will be. Including the work abandoned at Nelson, and the expenditures of the Marine Department in aids to navigation in Hudson Strait and Bay, this work involves a capital expenditure of $56,000,000. It will be the aim of the present government to protect that outlay and to endeavour to see that it affords commensurate return to the producers of Western Canada. I have no reason to expect that western shippers will be disappointed in the rates that will obtain from Churchill; nor that the underwriters, in view of the modern aids to navigation now available, will consider it necessary to demand unreasonable marine insurance. A proper estimate of the cost of Hudson Bay insurance can, of course, only be arrived at as a result of experience in the use of the new route, over a period of years, but should there be any disposition to discriminate against the Hudson Bay route, either as to rates or insurance, you may be certain that the government will take whatever action may be available to redress the situation. On

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Grain Elevator for Churchill.

Tenders were invited by the Dominion Railways and Canals Department for the construction of shipping galleries at Churchill, Man., to be submitted by March 24, plans and specifications having been prepared by C. D. Howe and Co., Port Arthur, Ont., consulting engineers in connection with the grain elevator being built at Churchill, which was described and illustrated in Canadian Railway and Marine World for July, 1930, pg. 475, details of the grain shipping facilities having also been given. Carter-Halls-Aldinger Co., Ltd., is the general contractor for the elevator's construction. As stated in our July, 1930, issue, the elevator's capacity will be 2,500,000 bush., of which 500,000 bush. will be in the work house. A recent Winnipeg press dispatch said:—"Groundwork on the elevator is completed to the first floor. It is expected that construction of the power house alongside the elevator, will commence late in March and that concrete pouring will begin in May on the elevator and the work house, from the ground floor up. Work on the shipping galleries must be hurried too, to have them ready for the restricted shipping proposed for the autumn. Across the harbor from the historic Fort Prince of Wales, the elevator will reach out 550 ft. along the shore line and tower 200 ft. against the sky."

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The dispatch said that the elevator will have the second largest work house in the world, and added:—"Storage will mean but little to the sprawling bins ranged along the south shore of the harbor, but ability to handle grain, dump cars, clean, weigh and separate the grain, and run it out to waiting ships will be a paramount necessity for the elevator at the port with a winter-shortened season. Only the great pool elevator no. 7, at Port Arthur, will be able to handle grain more rapidly than the one at Churchill."

Winnipeg and St. Boniface Harbor Commission has asked the Dominion Government for an immediate grant of

with the Commission's plans for harbor extension.

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