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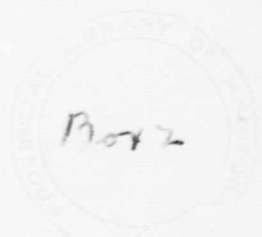
Characteristics

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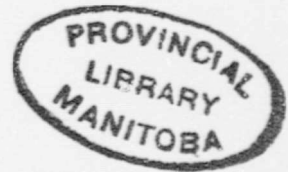
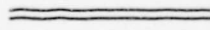


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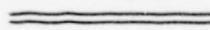
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NORTHERN MANITOBA



RESOURCES AND CHARACTERISTICS

C. M. CAMPBELL



Issued through Office of
Commissioner of Northern Manitoba
The Pas, Man.

FOREWORD.

During the late summer of 1918 Mr. C. M. Campbell was a member of a party organized by his brother (then Commissioner) Mr. J. A. Campbell, M.P., which travelled somewhat extensively through Northern Manitoba. The results of Mr. Campbell's observations subsequently appeared in issues of the "Granby News."

The position which Mr. Campbell holds in the mining profession and the acuteness of his reflections on the situations which came to his attention, have justified the collecting of these articles into the more permanent form in which they now appear.

We are under obligations to the proprietors of the "Granby News" for permission to reprint the articles, and to the Technical Press, Ltd., for the excellent technique of letterpress and illustration.

R. C. WALLACE,
Commissioner.

The Pas, June, 1919.

Resources and Characteristics of Northern Manitoba

By C. M. CAMPBELL,* in "Granby News."

NORTHERN MANITOBA is a type of country so altogether different from the territory in which the Granby Company operates that a few pictures and other details in regard to it may prove a desirable change from an almost continuous reference to things British Columbian and Alaskan.

In 1912, the Dominion Government granted to Manitoba an extension of boundaries to the north which more than trebled the old area of the province. With this addition, Manitoba is now the same area as Saskatchewan and Alberta, and but little smaller than British Columbia. For this reason this added area is sometimes referred to as "New" Manitoba. Otherwise there is nothing new about it. Geologically, it forms part of the old Laurentian Shield, that part of the continent that was above water for millions of years before the southern and western two-thirds of the continent were even outlined. From the point of

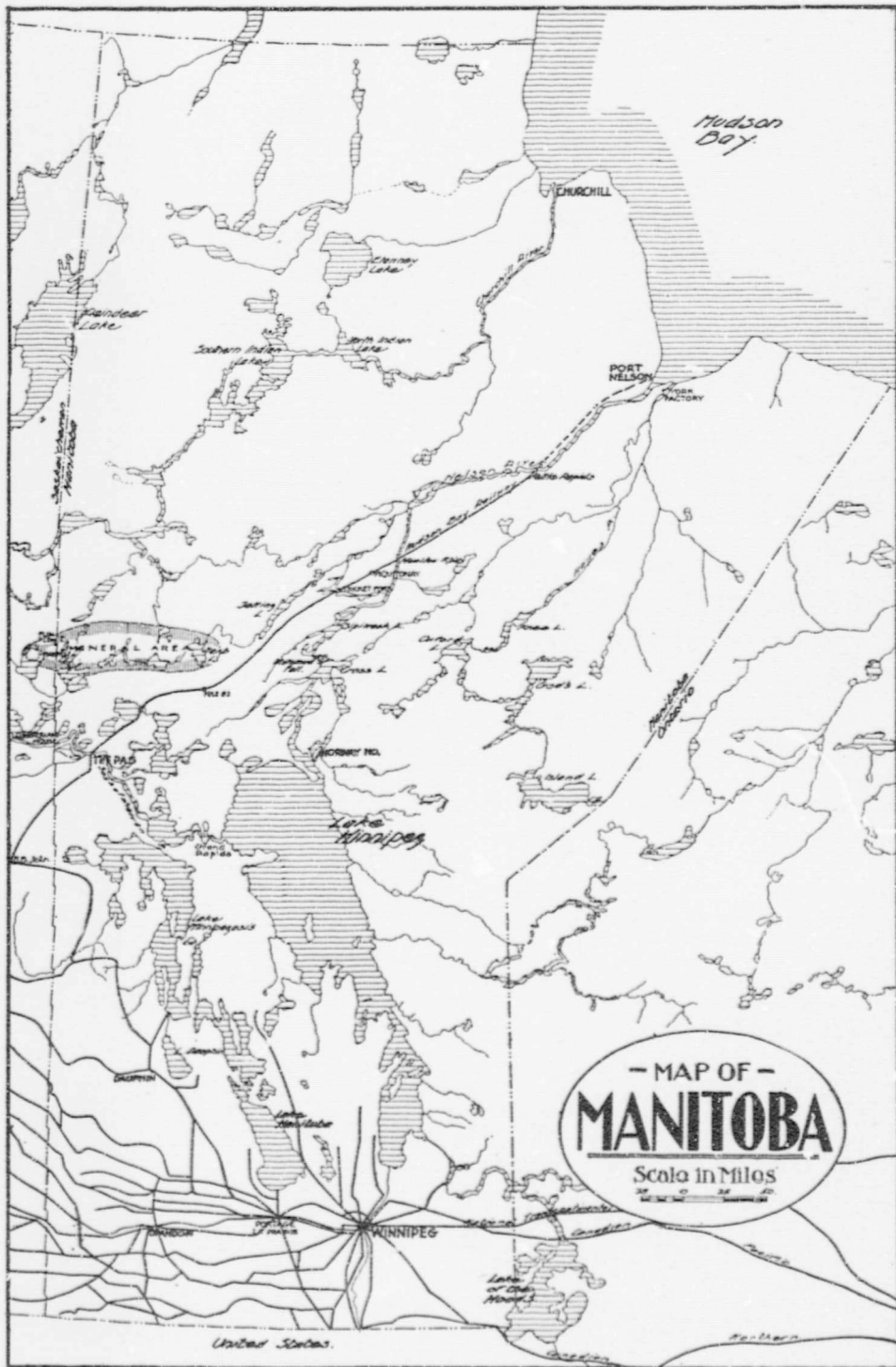
view of exploration, it is also in a class by itself. It was the same Henry Hudson who explored the Atlantic coast near New York who explored Hudson Bay, and he died there. The Hudson's Bay Company was granted its charter in 1670, and soon afterwards had trading posts along the coast of the Bay. This was in the time of the Stuarts. During the reign of George II., Fort Prince of Wales, a veritable fortress in those days, was built at the entrance to Churchill Harbor and was the headquarters of the Hudson's Bay Company for many years. Port Nelson would naturally be supposed to have been named after Horazio, Lord Nelson. Such is not the case. It was named after the mate of Admiral Sir Thomas Button, whose party explored the Bay two hundred years before the battle of Trafalgar.

Though it is not without fertile areas,

*Superintendent Granby Consolidated Mining, Smelting and Power Co., Ltd., Phoenix, B.C.



The Bridge to the Island, Port Nelson, Manitoba



Northern Manitoba has no claim to belong to the great fertile belt and for this reason settlement has been limited to the fur-trading officials and the trappers connected with them. The population of the southern part has therefore forged ahead, and, though the beautiful and fertile prairies only comprise a small percentage of the area of the province, they are producing nearly all the wealth at the present time. In the southern part, the price of wheat has been of first importance. With the development of the north, the price of fish and the price of copper and zinc may soon be of more importance than the price of furs, and it would appear that the total values of the northern produce will before long bear a more favorable comparison with the output from the wheat fields.

This vast territory is a network of rivers and lakes. There are no mountains, and the difference in elevation between the highest point on the surface and the nearest water is seldom more than one hundred feet. Travel is by canoe in summer and by dog train in winter and many spots are isolated for months at a time. When we left Churchill at the end of August, the Hudson's Bay officials there did not expect another mail until February. They have not yet heard that the war is over. In this land there are no horses, automobiles are non-existent and there are no dusty roads. Dust is a curiosity in Northern Manitoba.

A large part of the country is covered with a dense forest growth, though the trees are comparatively small. The big conifers, so common all over British Columbia, are absent, as are also the eastern hardwoods. Spruce grows to a fair size and is used for lumber. There are many beautiful groups of poplar, white tamarac, birch and jack pine are common.

There is an ample fuel and tie supply and the probability of a limited pulp wood industry. The big lumber mill at The Pas has capacity for 100,000 feet in ten hours, and considerable lumber of the grade mentioned is exported. Really first class lumber has, however, to be imported. The small size of the trees is due largely to lack of drainage, and in some areas they are particularly stunted. These are the areas where sphagnum moss grows to perfection. This is also known as peat moss, but whether it can be considered an asset on account of the deposits of peat it has formed is doubtful. In the late war it had a certain value as a surgical dressing on account of the shortage of cotton. It may be a valuable asset some day. A more probable asset of a minor nature is the willow, which in many areas grows to the perfection required for the willow furniture and basket industry.

Northern Manitoba has lately come into notice as a mining country. The mineral area is shown on the map directly north of The Pas. There are other mineral areas in the province, but so far this is the one that has given the most encouraging results. The Mandy mine, near the western extremity, ships twenty per cent. copper ore about 200 miles by barge and team to the railroad and then 1,500 miles to the Trail smelter. Nearby is the Flin Flon low grade deposit, which has been extensively diamond drilled and is reported to have close to twenty million tons of ore on which a profit can be made when railroad transportation can be obtained. The government have announced their intention of building the necessary road. Free gold quartz mines are in operation at the eastern end of this area and promise encouraging results with further development. In other parts there are large areas of clay suitable



Crest of West Fall, Whitmud Rapids

for brick and of limestone suitable for lime or building stone. Some attractive looking granites are also reported.

The region is well stocked with the larger wild animals of the deer family. Caribou in herds of many thousand come as far south as Reindeer lake. Moose are plentiful along the swampy areas of the Saskatchewan. The fur-bearing animals include black and polar bear, otter, wolf, lynx, mink, weasel, beaver, marten, fox and muskrat, and of these the greatest is perhaps the last mentioned. The total yearly fur catch is estimated at about two million dollars and of this one-third can be credited to the muskrat. During certain seasons large numbers of geese and ducks are taken by the Indians. Several varieties of grouse are found. Other different kinds of birds breed in the district, notably pelicans and cormorants. With the necessary restrictions and encouragement, the wild animal life will be a permanent resource of no mean order.

The fish catch amounts to over a million dollars a year. A third of this represents whitefish, a splendid fish which is extensively exported. Sturgeon is also caught in considerable quantity. The Hudson Bay, one of the best prospecting areas on the globe for the fisherman, has a class of fish all its own. This includes the arctic salmon, whose motto is "Second to None." Whales, porpoises and seals are also found in the Bay. At present, there is a large market for fish in the adjoining parts of Canada and the United States, and in course of time this market will be unlimited.

Considering the high grade nature of the Manitoba supply, which may even be improved with the introduction of other varieties, it would appear that, with the installation of fish hatcheries and packing plants and with the transportation lines now being built, the future for this industry is very bright.

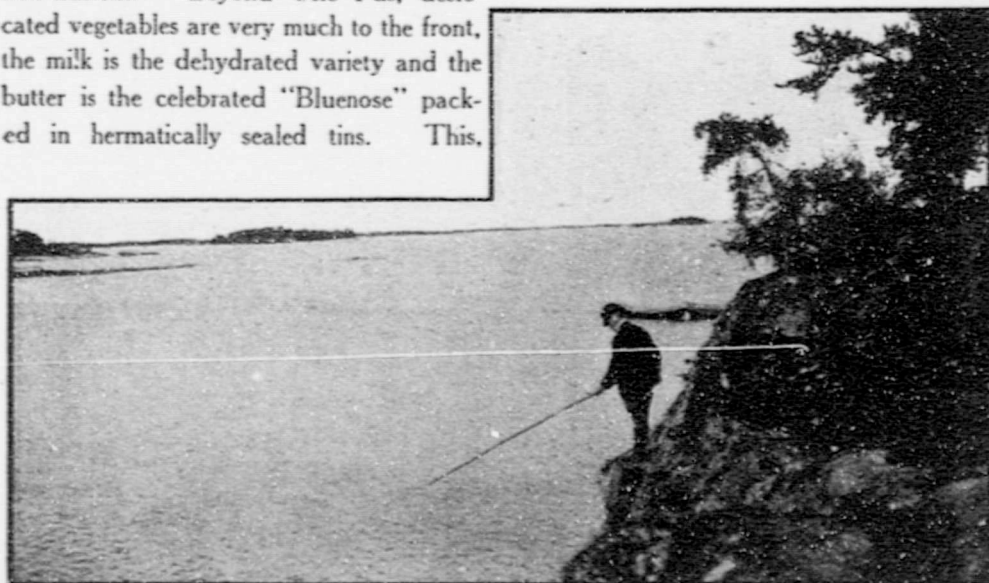
All the waters of Manitoba and also the waters of a considerable area outside Man-

itoba drain into Hudson Bay within the limits of that province. The distance from the foot of Lake Winnipeg and the western boundary of the province to the Bay is about 400 miles and the drop is from 700 to 1,000 feet. This drop causes rapids and falls at many places so that water-powers are almost innumerable. Water-power experts have figured out millions and millions of horse-power. These statistics are misleading. Due to the small heights of the individual falls, the width of the streams and the low nature of the banks in many places, these powers can be harnessed economically in but few instances. It is satisfactory to know though that these instances are sufficient in number to assure cheap and ample power for a larger population than the territory is ever likely to possess. Heavy consumers of electric power in the future may include mining and wood products plants, the railroad if it justifies electrification, and nitrate plants.

The agricultural industry is at present non-existent. Beyond The Pas, desiccated vegetables are very much to the front, the milk is the dehydrated variety and the butter is the celebrated "Bluenose" packed in hermetically sealed tins. This,

however, does not mean that there are no prospects. As far as vegetation is concerned, the nature of the winter is of little moment. It is the warmth and daylight of the summer that counts. Mr. McInnis, of the Geological Survey, who has explored the area about the central part of the Hudson Bay railway, states that this country averages four or five degrees higher in temperature than the same latitude farther west, and that the isothermal line continued eastward comes down as far south as the north shore of Lake Superior. In this district, the growing season has eighteen hours daylight out of the twenty-four, which makes a total of one hundred and eighty hours more in the season than in Central Ontario. This means ten days' extra sunshine and helps to explain the success that has attended small gardens at the different posts, some of them in high latitudes.

Numerous areas suitable for agriculture



Little Playgreen Lake, Norway House



Travelling in Northern Manitoba—Over the Long Portage

have been noted. Some of these are favorably located and can be opened up with little trouble. Others have to be cleared and drained. In most cases a stratum of perpetual frost is found a few feet below the surface. Cultivation, by opening up the ground will cause this to disappear. This has been the experience elsewhere. Hay and wild grasses grow luxuriantly. There is not much doubt, therefore, but that the hardier grains and vegetables can be grown and that stock can be raised to a considerable extent. With increased population, it is believed that the people can be supplied from local sources with most of the farm produce required, and it is hoped that later there will be considerable tonnage for export.

Climatic conditions in Northern Manitoba are much the same as in the southern part of the province and in North Dak-

ota, only somewhat more severe. The Pas, which is the distributing point for the whole north country, has a climate similar to Prince Albert and Edmonton. The coldest month is January. In 1916 the temperature for this month averaged sixteen degrees below zero. Last year the average was five degrees above zero. It then gradually warms up until in July the average is plus sixty-nine degrees. One thing to be noted about the winter in its favor is the dry and clear atmosphere prevailing. During the four months, December to March, the total precipitation is only slightly over one inch. The total precipitation for the year is eighteen inches. In this connection, the evidence of Mr. J. B. Tyrrell, who is probably the best posted individual in regard to conditions in Northern Canada, is very much to the point. He says "The conditions that make life hard for the people are not nearly as bad in the very coldest parts of Canada as in many parts of Siberia. One city in Siberia has a mean January temperature of 56 degrees below zero. There is no such mean monthly temperature known in North America at all. If a mining industry were to start in our far north country there would be no particular difficulty in establishing a standard of comfort equal to that enjoyed in many parts of the great plains."^{*}

As far as living conditions are concerned, probably the only serious drawback to comfort is the prevalence of mosquitoes during part of the summer season. In this respect Manitoba cannot claim to be unique, as there are many parts of the world, not excepting parts of British Columbia, where this insect is a pest. To a person from Southern British Columbia however, where mosquitoes are interest-

^{*}Journal Canadian Mining Institute for 1908, p. 364.

ing from an entomological standpoint only, a trip into Northern Manitoba in the summer means considerable rough handling until some training is obtained in the workings of the mosquito head net, the mosquito bar and the various brands of mosquito dope. There is a great reward for the scientist who will devise a method to eliminate the mosquito. Later in the season, when the early frosts kill off these pests, comes the Indian summer, a period

of a few weeks when the climate can be described only with superlatives.

The above information gives in a general way an idea of the nature of the country and what can be expected from it; there are a few features which warrant further details. These will be considered in the following order: First, the Nelson River; second, the Hudson Bay Railway; third, Churchill and Fort Prince of Wales; and fourth, the Pas Mineral District.

The Nelson River.

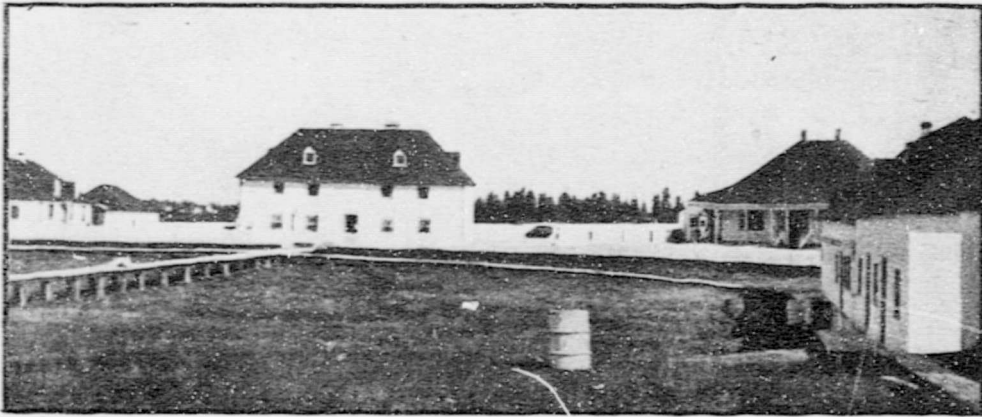
The Nelson River is one of the main drainage systems of the North American continent, including as it does not only the river under that name, but also Lake Winnipeg and the numerous rivers flowing into it, of which the chief are the Red and the Saskatchewan. The water flowing out of Lake Winnipeg is therefore very considerable, and thanks to the equalizing action of this lake and the numerous surrounding lakes, the flow is fairly regular throughout the year. For over half the distance to the Bay, the river has different channels and numerous lake expansions studded with islands. The shores are rocky and covered with trees; there are waterfalls and rapids and from a scenic point of view this stretch of waterway will stand well up in any list. Throughout the lower part of its course, the river flows in one channel, in many places nearly a mile wide between well-defined banks often fifty or seventy-five feet high.

Notwithstanding the volume of water carried, it is not navigable for anything but canoes, and even with this craft navigation is not as easy as on the neighboring Hayes

River, and for this reason the latter has always been the route of travel for Hudson's Bay Company's boats between Lake Winnipeg and the Bay. The government have gone into the matter of locks at the different rapids as an aid to navigation, but the cost and maintenance is too great to make the idea practicable. The Nelson is the great water-power river of Manitoba, and the aggregate power of these rapids and falls has been estimated as high as 6,859,000 h.p.

The chief settlements along the Nelson River are Norway House and Port Nelson. The latter has been practically abandoned since the war stopped operations on the railway project. At one time, however, there were over one thousand men working at Port Nelson.

Norway House is one of the chief stations of the Hudson's Bay Company in the country. The Post is prettily located on the east branch of the river, where it enters little Playgreen Lake. In addition to the Post there is a large industrial school, under the management of the Methodist church, while a Roman Catholic



Inside the Enclosure, Norway House

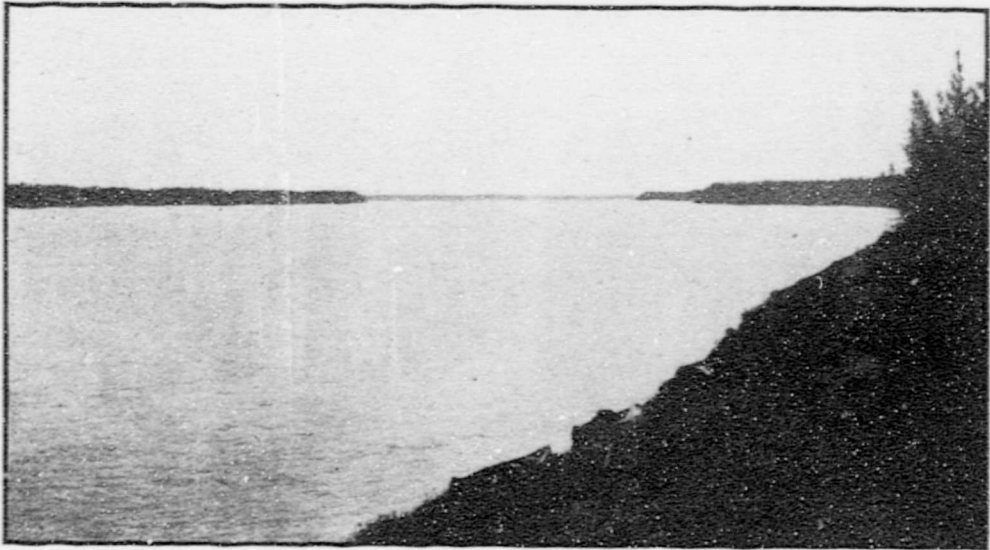
school is located farther down the river at Cross Lake. The Anglicans have a church here. A few independent traders and government officials make up the rest of the white population, which numbers about forty. The Indian population is about one thousand, and is part of the Cree tribe. This is, therefore, a trilingual settlement and notices are posted in English, French and Cree. Norway House is not confined within town limits as they are usually un-

derstood. There is no main street, but the settlement is spread out over different parts of the shore and islands. At the time of our visit, an enterprising moving picture man had picked out a centrally located, but entirely uninhabited island and was erecting his plant.

Norway House now enjoys some tourist traffic in the summer, as it is the northern terminus of a line of boats running from Selkirk, a town on the Red River near



Chain of Rocks Rapids, Nelson River



The Lower Nelson River

Winnipeg. Further north, however, travel is entirely by canoe. The procedure in this district is for three Indians to go with each canoe; two of them paddle while the other rows. In other parts of the province two Indians with paddles are considered sufficient. It is important to note that the canoes used in the north are not the ones with the unstable equilibrium usually found around summer resorts. The craft that took us into Port Nelson was nineteen feet long, had a beam of over four feet and carried, in addition to the two Indian canoemen, four passengers and over half a ton of freight.

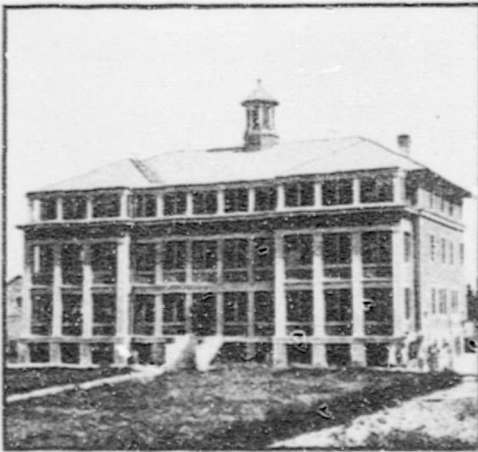
Indians will shoot a rapid whenever possible. Often the passengers, in order to lighten the boat so that it will go through the shallow water in parts of the rapids, walk over the portage. Sometimes, in addition, the freight is packed over and the canoe goes down light.

Usually, however, canoes and contents all go over the portage. The amount of burden that an Indian can carry with the aid of a tump line is often prodigious. A sail is usually carried and put up at the least excuse. If a regular sail is not on deck, an Indian will soon improvise one with a blanket and a few saplings. About forty miles per day is considered good travelling. Sometimes an Evinrude can be of great assistance, but there should be no doubt of it being in working order, as not only the motor but also the gasoline has to be packed over the portages. Travelers these days do not carry blankets. The proper thing is an eiderdown. This is on the same plan as the bed covering of that name, but is heavier and covered on the outside with duck and on the inside with a woolen fabric. They are wonderfully light and warm.

The Hudson Bay Railway.

The "Forty Years Ago" column of the Winnipeg Free Press recently contained the following item: "The grand jury of the assizes congratulated the province at the near approach of rail communication with the United States, but trusts that a railway to Port Nelson will not long be delayed." Ever since that time there has been continuous agitation for this road and different governments have promised to build it. Work was finally started in 1910 and the project would doubtless have been completed by this time but for the intervention of the war. The course of the line, which is shown on the map, is between The Pas and Port Nelson. At the present time the grade has been completed and rails laid for over 300 miles, so that there is only about 100 miles more rail to be put down. The harbor improvements are well under way and can doubtless be put in shape to handle considerable traffic by the time the railway is completed.

The main object of the Hudson Bay

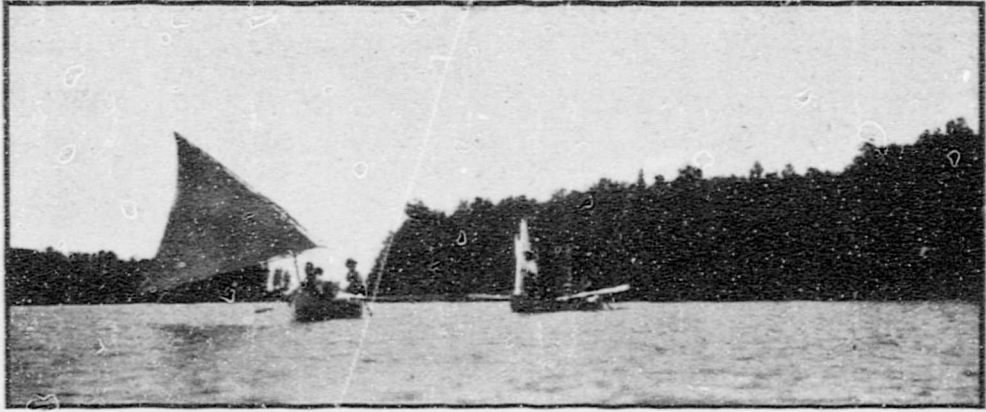


Indian Industrial School, Norway House

Railway is to provide an alternative or optional route for the products of the prairies to the Old Country. At the present time the bulk of the shipments go via Montreal. Port Nelson and Montreal are about equidistant from Liverpool. Winnipeg is 600 miles nearer to Port Nelson than to Montreal, whereas for all points to the north and west of Winnipeg, and this includes almost the entire fertile belt, the distance in favor of Port Nelson is greater. It is estimated that the Hudson Bay route will mean an average shortening of a thousand miles between the wheat fields and Liverpool. In other words, wheat can be landed at Nelson as cheaply as at Fort William.

According to the government report signed by M. J. Butler, deputy minister of railways, other sources of traffic are the exportation of cattle, the usual package freight to and from Europe and the possibility of developing a reasonably large import coal trade. He also states that the road will be capable of running sixteen daily trains into Port Nelson, which would mean a delivery of 64,000,000 bushels of wheat per month. He assumes that ships can be secured wherever there is sufficient business offered and that the saving possible would be five cents per bushel, providing the insurance and freight rates are equal at Montreal and Port Nelson.

The development of other sources of traffic, such as package freight and coal, is of prime importance. Ships can hardly be expected to go empty to Nelson, even if they are sure of a return grain cargo. Take the case of Montreal. The country tributary to that port is only able to absorb



Under Full Sail, Northern Manitoba

about half as much tonnage as is shipped from there. A large amount of Canadian wheat is therefore shipped through United States ports for the reason that the southern ports are better able to assure cargoes going both ways. There is a big demand for coal in the prairies and English coal in the shape of incoming cargoes can be delivered cheaper over a considerable area than Alberta or Pennsylvania coal. A large amount of package freight can also be absorbed. Until more incoming freight can be handled it is hardly likely that the export of wheat will reach anything like the figure given above.

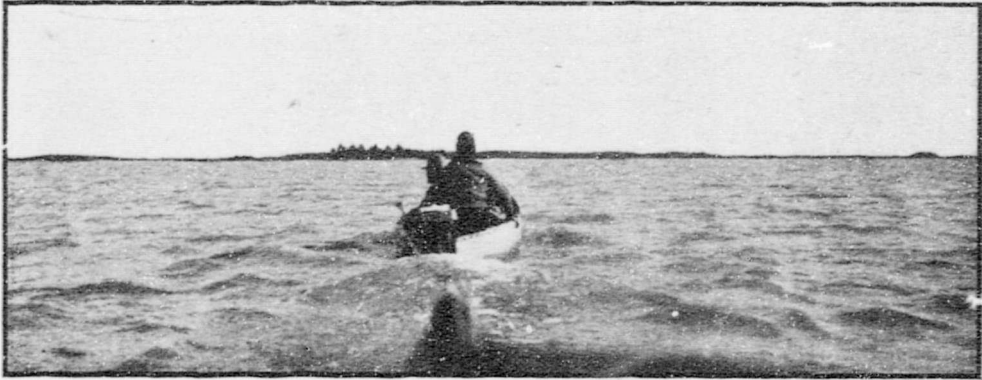
The saving of five cents per bushel would seem to be an error. Theoretically at least, the saving should be the rate on wheat from Fort William to Montreal, which is given by other authorities as fifteen cents per bushel.

There is also the development of the northern part of the province to be considered. This reason, that the railway is necessary to assist in the prospecting and further exploration of the country, does not seem to have been sufficiently emphasized by the authorities. Here is a prospect which shows evidence of valuable natural

resources. Thorough prospecting which may prove it to be a bonanza can only be done with the assistance of a railway. It is quite possible that before long the local traffic itself will justify the construction of this road.

The chief point against this route as a short route to Europe is the fact that ocean transportation is limited to the period during which Hudson Straits, on account of ice conditions, can be safely navigated. Different expeditions have investigated this and they nearly all agree that the straits are perfectly safe for three and a half months between the first week in July and the last week in October. This time can usually be extended a week or two at each end, and possibly longer. While the short season is to be regretted, it is not considered a bar to the successful operation of this route.

As for the road itself, there are evidences that the traffic cost per ton mile will be close to the minimum. An air line from The Pas to Port Nelson is 402 miles, while the railway line is 424 miles. There in one tangent thirty miles long and tangents ten miles long are common. The Pas has an elevation of 830 feet. There is



Sometimes an Evinrude Can be of Great Assistance

a very slight rise for the first sixty miles and then a gradual drop to the Boy. The maximum grade is four-tenths of one per cent. The road is laid with 80-lb. rails. Though the road is through a swampy country in places, good bottom is obtained at a few feet depth, and as sufficient sand and gravel pits have been located and are being used, a well ballasted road is assured. The road will be operated by the government, which now owns the Can-

adian Northern, so that it will be quite feasible to speed up this portion of the line during the heavy shipping season by transferring men and equipment from other divisions.

Three large bridges have been found necessary, one over the Saskatchewan and two over the Nelson. Of these the most important and most interesting from an engineering standpoint is the Kettle Rapids bridge over the Nelson, which is illus-



Travelling by Gas Car on the Hudson Bay Railway

trated. This will be seen to be a three-span continuous truss bridge instead of three individual trusses as is usually the case. The location required a structure 1,000 feet long with spans 300, 400 and 300 feet. The side spans could be and were erected on false work, but on account of the rapid current and deep channel, the centre of the river was open all winter and the centre span had to be cantilevered. Thanks to the fact that the rock foundations of the piers and abutments assured no settlement to the structure, the continuous truss was feasible, and, as it offered other advantages over the regular cantilever type, it was adopted. The cost of the bridge was \$300,000.

Hudson Bay is unfortunate, due to lack of harbors. What is known as Port Nelson is merely the estuary of the Nelson River, and is so shallow that a large boat can run aground and still be out of sight

of land. Work to date has consisted in building an island in the estuary which is connected with the mainland by a long bridge. Dredging will be done beyond the island and docks built there. A channel to deep water is known to exist and is being surveyed and will be further dredged. It will eventually be necessary to spend further large sums at Nelson as the terminals there will have to be particularly efficient to handle the traffic in the short season.

The project is not without its defects, but very few commercial routes are. Considering, however, the present heavy export trade which is increasing rapidly and the probability of a very considerable import trade and the development of a local trade, it would appear that the route will meet with a success which will amply justify the prolonged agitation.

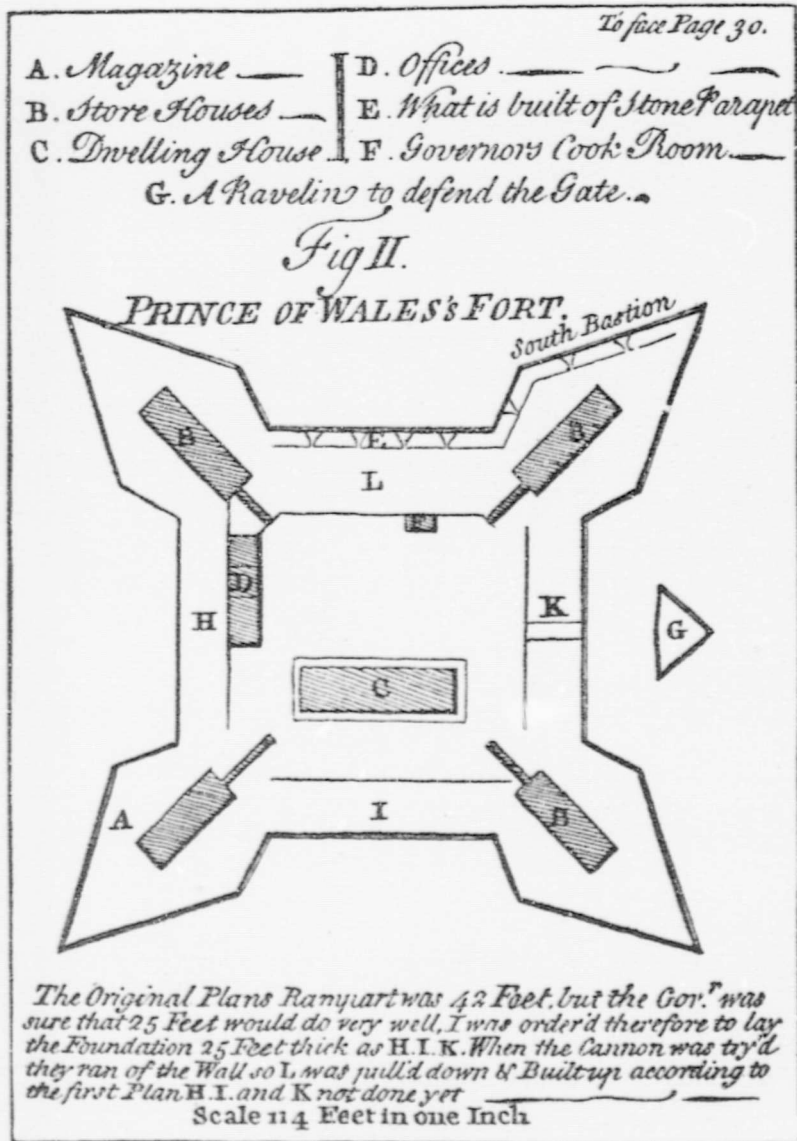
Churchill---Fort Prince of Wales.

From a historical point of view Churchill is one of the interesting points in the new world. It was here that the Hudson's Bay Company built their greatest stronghold, Fort Prince of Wales, which ranks with the great fortresses of an earlier age on the Western Hemisphere. Churchill was also the residence for many years of Samuel Hcarne, governor of the Hudson's Bay Company, but known more especially as one of the great explorers of the west.

Its claim for attention under present conditions rests on the fact that it is the sea outlet not only for the Churchill River basin, which comprises an area of 114,000

square miles, but also for a large amount of adjacent territory which may have valuable natural resources and on the fact that it possesses a deep water harbor of considerable merit, a most desirable natural advantage of rare occurrence in Hudson Bay waters. For many years it was considered the logical salt water terminus for the Hudson Bay railway, but as this honor has now gone to Port Nelson, Churchill, if it is to rank as a place of much importance, will have to depend on the discovery and successful exploitation of resources in its own hinterland.

It appears that the Hudson's Bay Company, according to their charter, was re-



Copy of drawing from one of Miss Laut's books.

quired to fortify the country, hence the construction of Fort Prince of Wales, far and away the most ambitious structure of that class which this company ever built. Construction lasted for fourteen years, between 1733 and 1747, and was in charge of Joseph Robson. A copy of his drawing as it appears in one of Miss Laut's books, is shown. There are no camera restrictions around Fort Prince of Wales, and as illustrations of the fort are exceedingly rare, this article includes rather more than would otherwise be the case. An examination of these pictures and the map will give a good idea of this stronghold.

The fort was 312 feet square with walls built of stone, which on three sides was dressed and laid in courses. The walls were 25 feet thick and surrounded on the top with a parapet having forty-two openings for large guns. Three of the bastions contained stores and fresh water while the fourth contained the magazine. In the courtyard were the governor's residence, barracks, warehouses and offices.

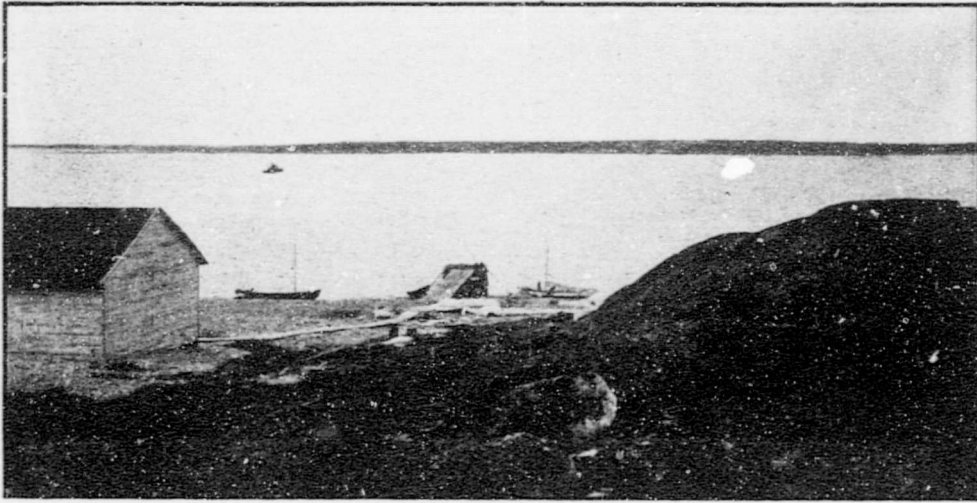
At the time the fort was built and for twenty-five years later, the operations of

the company were confined to posts on the shores of the bay. During this period the explorers and traders from Eastern Canada were busy mapping the interior and extending their lines of trading posts farther and farther, so that their operations finally began to conflict with those of the company. The success of the interior posts finally stirred the Hudson's Bay Company to action and commands were sent to Moses Norton, governor at Churchill, to send explorers into the west and north.

At that time as told in "The Pathfinders of the West," by Miss Laut, "the garrison consisted of thirty-nine common soldiers and a few officers. In addition, there hung about the fort the usual habitues of a northern fur post—young clerks from England, who had come out for a year's experience in the wilds; underpaid artisans, striving to mend their fortunes by illicit trade; hunters and coureurs and voyageurs, living like Indians, but with a strain of white blood that forever distinguished them from their comrades; stately Indian sachems, stalking about the fort with whiffs of contempt from their long



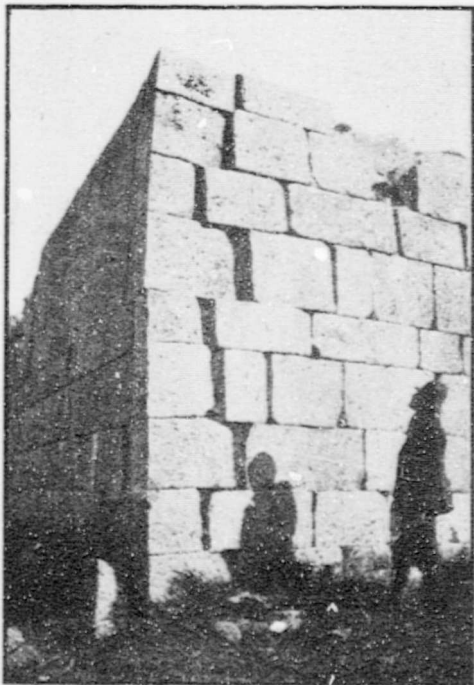
Gateway, Fort Prince of Wales



Looking Across Churchill Harbor, Whaling Station to the Left

calumets for all this white-man luxury; and a ragamuffin brigade, squaws, youngsters, and beggars, who subsisted by picking up food from the waste heap of the fort.

The commission to despatch explorers to



Salient angle north bastion, Fort Prince of Wales

the inland country proved the sensation of a century at the fort. Round the long mess-room table gathered officers and traders, intent on the birch-bark maps drawn by old Indian chiefs of an unknown interior, where a 'Far-off-Metal-River' flowed down to the Northwest Passage. Huge log fires blazed on the stone hearths at each end of the mess room. Smoky lanterns and pine fagots, dipped in tallow and stuck in iron clamps, shed a fitful light from rafters that girded ceiling and walls. On the floor of flagstones lay enormous skins of the chase—polar bear, Arctic wolf, and grizzly. Heads of musk-ox, caribou, and deer decorated the great timber girders. Draped across the walls were company flags, an English ensign with the letters 'H. B. C.' painted in white on a red background, or in red on a white background."

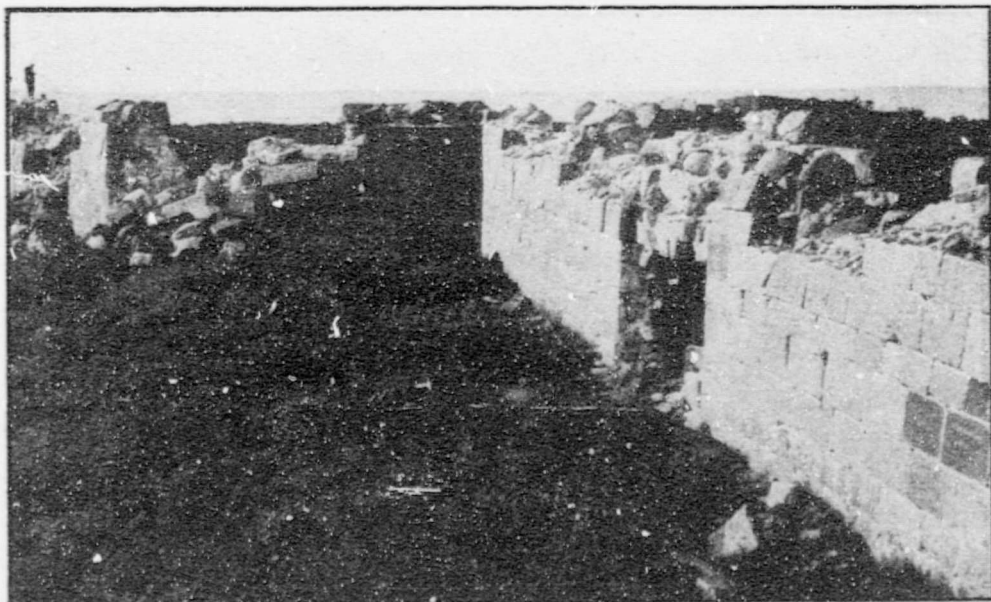
In those days Samuel Hearne, formerly with the royal navy under Lord Hood, was on the company staff at the fort, and he was assigned to explore the route and report on the "Far Off Metal River," now known as the Coppermine. He

started on November 6th, 1769, but when 200 miles out his Indian guides stole his supplies and deserted him, and he was compelled to make his way back with his two white companions as best he could. He started out again on February 23rd with five Indian guides, but again his supplies and instruments were stolen or broken and he was compelled to turn back. "Terrible storms impeded the return march. His dog was frozen in the traces. Tent poles were used as firewood, and the northern lights served as the only compass. On midday of November 25th, 1770, after eight months' absence, in which he had not found the 'Far-off-Metal-River' Hearne reached shelter inside the fort walls."

On his return trip he met with Matonabbee, chief of the Chipewyans, who offered to conduct him to the "Far-off-Metal-River." At Churchill, he laid his plans before the Governor and in less than two weeks was on the march again. Ac-

companied by Matonabbee and some Indians, he reached the Coppermine and the Arctic ocean after many privations, the following July. Returning by the way of Athabasca Lake, he reached Fort Prince of Wales June 30th, 1772, after over eighteen months' absence. His trip was a notable achievement, and, on the death of Governor Norton, a year later, Samuel Hearne became governor. In this position he worked to increase the prestige of his company in the interior, establishing Cumberland House in 1774.

This brings the history of Churchill to the time of the American revolution. After France had been allied with the United States for some time, the French government formed the design of destroying the English settlements on Hudson Bay, and Admiral La Perouse arrived before Churchill in August, 1782. According to Miss Laut's investigations, the French force consisted of 400 troops in three ships carrying 70 to 100 guns apiece, and she



Fort Prince of Wales—The Front Wall and West Bastion



Overlooking Hudson Bay, Fort Prince of Wales

states that Hearne, considering he was not justified in resisting this force, surrendered without a blow. From the recital of Hearne's experiences in the north, he can not be accused of lack of personal courage. Whether he used good judgment in surrendering is not discussed by any writer on the subject. Forty efficient men with the retainers and Indians available could have made a gallant and probably successful defence. There seems, however, to be a great deal of doubt as to the force he had on hand when the French arrived. The Hudson's Bay officials claim that the garrison was out duck hunting, and this explanation is set forth by L. J. Burpee in his well-known book, "Scouts of Empire."

He says: "Some years ago Dr. Robert Bell met an aged pensioner of the company on the bay, who had been present when La Perouse appeared with his French fleet. 'When the French appeared outside the walls,' said he, 'there were not sufficient men inside to have manned one gun. The majority were all away in the marshes duck shooting.' He described graphically how La Perouse appeared before the gate demanding the surrender of the fort, how Hearne, realizing the uselessness of

resistance, hastily doffed the rough working clothes in which he had been working about the fort, and put on the full uniform of his office as governor; how he marched out through the gate, his sword drumming against the stones as he went, and presented the keys of the fort to La Perouse on a silver salver; and how the latter, having stripped the fort of everything of value, tried to pull down the massive walls, failing which he blew them up with gunpowder, leaving them pretty much as they appear to-day."

It is to be regretted that this chapter in the life of Fort Prince of Wales cannot be used as an inspiration. The moral, however, is obvious. Hearne was taken to France a prisoner, but for reason of his exploration and interesting accounts thereof he seems to have been treated as a notability.

Reference to the pictures show that the fort was not very badly wrecked. One of the Dominion government officials suggests that the material in it could be used for other building purposes. In the hope that he has experienced a change of heart, the name of this vandal is not disclosed. This fort is the most impressive monument

in Western Canada of a former romantic period, and it is hoped that it will be treasured as such.

Hearne does not seem to have been greatly impressed with the copper possibilities of the Coppermine. Doubtless he had exaggerated ideas of what he was going to see. No thorough prospecting of this district has been made, and what is known of it is summed up in the Canada year book for 1916-17 as follows:

"The late Dr. G. M. Dawson, while assistant director of the Canadian Geological Survey, stated before a committee of the Dominion Senate in 1888, that there was every reason to believe that the rocks along the Coppermine River were as rich in copper as those in the Lake Superior district of Michigan. Mr. J. B. Tyrrell, reporting on the copper possibilities of the far north, said: "The copper bearing rocks would seem to extend along the Arctic coast both east and west of Coppermine river for about five hundred miles

in all, and probably many of the smaller islands off the coast are also of the same rocks, and the total area of these rocks undoubtedly amounts to many thousands of square miles. Comparing the early accounts of the occurrence of native copper on Lake Superior with the accounts which we now possess of the copper on Coppermine river, and considering the enormous extent of the northern deposits, we have reasonable grounds for hope that before many years the Coppermine area will produce as much copper as is now mined in northern Michigan.

"The Eskimos of the far north all have spear and arrow heads, needles, etc., beaten out of pure copper. The Eskimos who come to Fort Churchill to trade have snow knives, ice chisels, and fish hooks made out of native copper. They use copper tops over their pipes while smoking, and any break in their guns is usually mended with copper. From the stories they tell it would appear that there are great quanti-



East Wall of Samuel Hearne's Residence, Churchill, as it now appears

ties of native copper along the Arctic coast and on the islands of the Arctic near the coast."

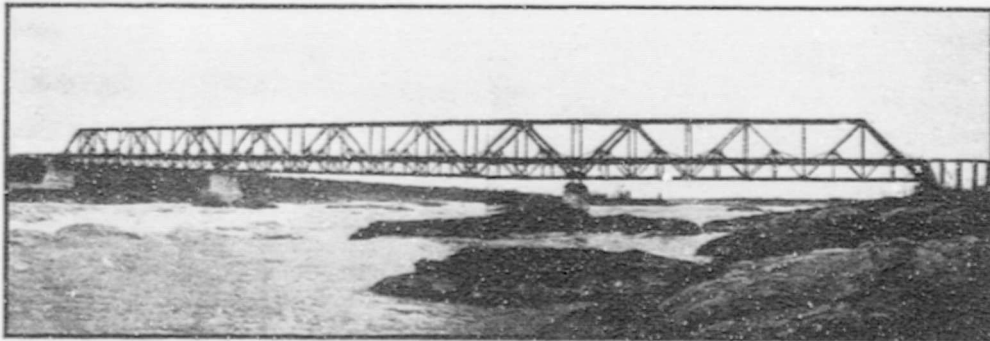
This country may be rich enough to pay off the national debt, and on the other hand further exploration may be disappointing. Now that the war is over and enthusiastic and capable Canadian aviators are returning home, the Geological Survey will doubtless add an aviation corps to its forces, and do some exploratory work in this northland. It is now exactly a century and a half since Hearne made his first attempt to reach this famous copper field, so that this district would by this time seem to be entitled to an authoritative and modern report.

The other territory farther south comprising the basin of the Churchill river also offers, to use the words of a government pamphlet, "a magnificent field for investigation." It is doubtful if much of this territory will be explored from Churchill. On the completion of the projected railway from The Pas to Flin Flon, the latter will be the frontier railway point and exploratory expeditions will doubtless start north from there.

Any article on Churchill would be incomplete without some reference to its harbor. Whatever defects it may have, there is its outstanding merit, that any

storm-tossed mariner will find quiet water behind the gray quartzite hills that form its boundaries. These ridges jut out into the bay for miles and surround a basin seven miles long and at one place four miles wide, with an entrance 2,000 feet wide and 50 feet deep at low water. This basin has gradually, however, filled with detritus until it is now for the most part a tidal lagoon. There is still a deep water area of about half a square mile near the entrance which has not yet been silted up, and connecting with this is a further area along the eastern shore over a mile long which averages about 700 feet wide and 20 feet deep.

The importance of Churchill has pretty much vanished. No attempt has been made to restore the fort, and the Hudson's Bay Company's present post, four miles in and under the shelter of a protecting ridge, is not fortified. It is visited by Chipewyans and Eskimos who come to trade. The introduction of mineral oils has taken most of the profit out of the whaling industry, and the whaling station of the company has not been used for years. The R. N. W. M. P. barracks have been abandoned, so that this whole vast territory is now populated by only two white men, the manager for the company and his clerk.



Kettle Rapids Bridge, over the Nelson River

The Pas Mineral District.

Manitoba's ambition to become a mineral producer of note depends at present mainly on that Huronian area north of The Pas indicated on the map. The great Laurentian shield, which forms such a large area of Canada and which is part of the pre-Cambrian system of rocks, contains numerous areas, both larger and smaller than the one in question, of Huronian and allied later members of that system.

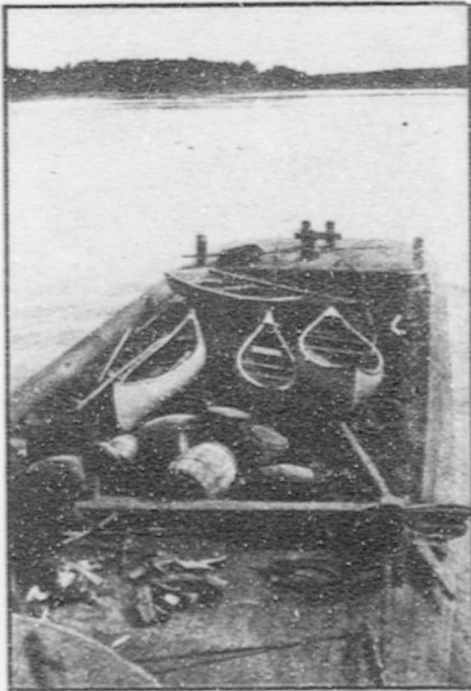
These Huronian and allied rocks are entitled to every respect. They have produced the iron of Minnesota, the copper of Michigan, the nickel and copper of Sudbury, the cobalt and silver of the Cobalt camp and the gold of Porcupine. Though every area is not in the forefront as a producer—the Rat Portage and Rainy Lake areas cannot so far be said to have been a success—yet the epoch-making results obtained in the areas mentioned justify the

intensive prospecting of every area of this type.

Between Lake Superior and the Churchill river there are over a dozen of these areas and there are numerous others from there to the Arctic ocean. Due to the small amount of geological work done many of these areas are bounded on the map mainly by dotted lines. There is, therefore, the probability that further areas will be discovered with more detailed exploratory work. Mineral discoveries have been made in other parts of Manitoba, but the area in question is pre-eminent.

The eastern end includes the free gold veins around Herb lake. Several of these have been worked to some extent even though war conditions did not encourage gold mining. The Rex, with a vein 1,700 feet long and from two to eight feet wide, has erected a mill and has produced considerable gold. The Moosehorn nearby has made one shipment of \$80 ore to Trail. There are numerous other properties in the prospect stage. This district has no railroad connection and is reached by a twelve mile wagon road from Mile 82 on the Hudson Bay railway.

The extreme west also shows some free gold veins on which little work has been done, while along the boundary line are the Mandy and Flin Flon sulphide deposits. The western section is reached from The Pas by river steamer via Cumberland House to Sturgeon Landing, and thence by canoe by way of Goose river, Lake Athapuskow and Schist lake. This is a picturesque piece of country and if the weather is good the trip makes a delightful outing. Diamond drilling is in progress at the Chica claim on the Pineroot river, numerous prospects have been staked on the



Mandy Ore on the Sackatchewan River



Travelling through the Manitoba Area.

north shore of Lake Athapapuskow and there is good prospecting ground beyond. From the east arm of this lake, at Cranberry portage, a good canoe route exists all the way to Herb lake. Along this route some good free gold and sulphide deposits have been staked and they will be further explored this season.

It is, however the Mandy and Flin Flon deposits which have given the area its best advertising to date. The Mandy has shipped ore valued at over a million dollars.* The ore body at this mine is nearly vertical, lies in schist and is 225 feet long, forty feet wide and has been mined to a depth of 200 feet.* It is made up of pyrite zinc blende and chalcopyrite, and contains a remarkable concentration of the copper mineral. Mining has been restricted to the copper and the richness of this segregation has enabled work to be carried on notwithstanding the heavy transportation charge. At the time of our visit operations were in full swing and they were mining ore that would run close to twenty-five per cent. copper. The

stopes in places were twenty feet wide and a couple of miners could set up and break down ten thousand dollars' worth of ore in one round. Men coming out of the mine were covered with dark yellowish green dust and looked as if they had been gone over with metallic paint.

The ore is barged several miles to a stock pile on Schist lake. Over 5,000 tons were piled up there last September, all washed bright and yellow by the rain, and to one used to one per cent. ore it made a striking picture. In the winter 200 teams transport it thirty-five miles to another stock pile at Sturgeon Landing, and with the opening of navigation it is barged to The Pas and thence by rail to the Trail smelter. It takes a year after the ore is mined before it is smelted. Recent newspaper advices are to the effect that this rich ore zone has been worked out, and that mining operations have ceased pending the construction of a railway and erec-

*Further details of Mandy and Flin Flon may be found in "Amisk-Athapapuskow Lake District," by E. L. Bruce, published by Department of Mines.

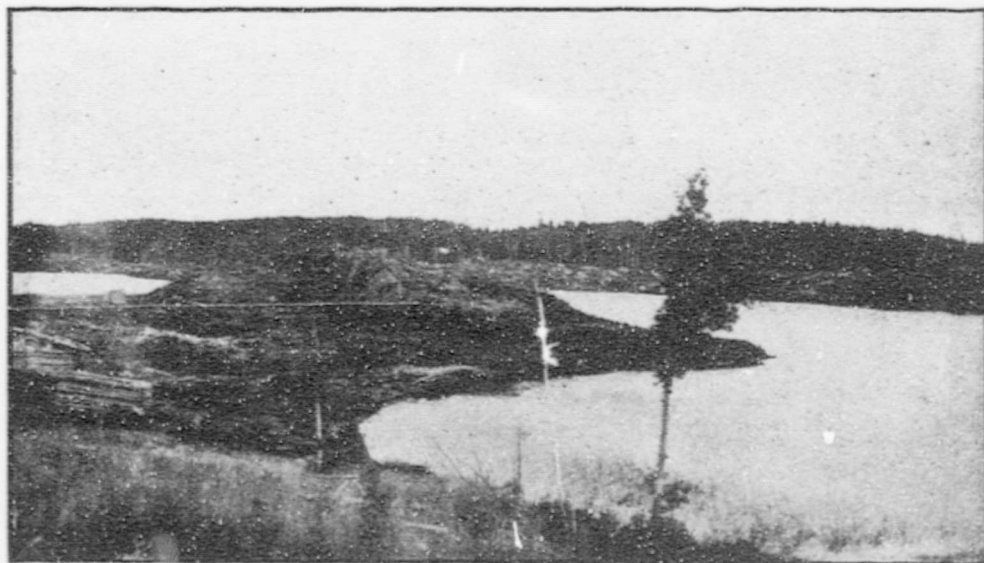
tion: of a local smelter to treat the lower grade ore. Based on the dimensions given, this ore body has approximately 200,000 tons. With a local smelter it will still produce considerable copper, while its zinc content is high enough to justify treatment. Diamond drilling is in progress and further ore may be located.

Four miles northwest of the Mandy is the Flin Flon pyrite deposit, which according to government pamphlets contains close to 20,000,000 tons. The pyrite carries copper, gold, silver and zinc values so that a profit can be made by smelting locally after railroad connection is obtained. The photo of the outcrop will give an idea of the nature of this deposit. The piece of land jutting out into the lake represents a cross section about the middle of the ore body. The high part of this peninsula is a green stone horse which has withstood the weathering action better than the softer sulphide which surrounds it on all sides, and which has been worn down to the lake level. The strike of the

deposit is nearly parallel to the shore and the outcrop with the exception of what can be seen in the picture is covered with water. The level of the lake or at least part of it will therefore have to be lowered. The deposit dips at a steep angle towards the shore.

The Flin Flon proposition has some interesting features as mining in Manitoba will be different to some extent from mining in British Columbia. There are no tunnel sites in Manitoba, and the companies operating there will miss the letters from optimistic prospectors describing "mountains" of ore. Every mine in Manitoba is therefore a shaft proposition, and in the case of the Flin Flon the shafts of necessity will have to be located in the hanging wall and considerable tonnage will have to be left in place to prevent caving.

To reduce this stoping loss it may be desirable to build the smelter directly adjoining the mine, and use the slag for stope filling. While red hot slag against a sulphide ore may not be feasible, granulated



The Flin Flon Outcrop, Northern Manitoba



The Schist Lake Ore Stock Pile

slag can at least be flushed into the stoves and doubtless experiment will suggest some arrangements that will be satisfactory.

There is no agricultural ground around the Flin Flon, and though the smelter smoke will kill all vegetation in sight, the operators need have no fear of damage suits from farmers. If the smelter smoke is only strong enough to kill the mosquitos, the advantages thus secured will compensate for almost any other handicap.

Mines are the great tonnage producers for railroads, and the Manitoba mines will be no exception. A property like the Flin Flon will absorb hundreds of tons of freight per day in the shape of lime and quartz fluxes. Its power plant will need coal or cordwood fuel. Many carloads of dynamite, steel and lumber will be used. The stulls will probably be fir from British Columbia. At Grand Forks, fourteen per cent. of the charge is coke. The sulphide

properties of Manitoba will need only about half that amount, but even that is a large tonnage. In this respect they are fortunate as the cost of coke per ton of ore will not prohibit them from procuring their supply from Pennsylvania, and they will not be dependent on the Crow's Nest fields and will therefore not be subject to frequent shut downs on account of shortage of coke due to the everlasting strikes in that district.

A steam power plant has been mentioned. All mines in Northern Manitoba have them. This may seem strange in a country which advertises its water-power resources. The fact of the matter is that the mineral district is located on the height of land between the Churchill and the Saskatchewan river systems. While there are numerous water powers in the area they are comparatively small and the winter minimum flow is in most cases negligible. The nearest power of note is at Birch Falls on the Sturgeonweir, thirty-five miles from Flin

Flon. This is rated at less than 1,000 h.p., but can be increased by storage. Island and Bloodstone Falls on the Churchill have ample power, 80,000 h.p. is reported, but they are seventy or eighty miles distant in the northern wilderness. Grand Rapids with 30,000 h.p. on the Saskatchewan has been talked of, while Whitemud Falls with 100,000 h.p. is the ideal location on the Nelson. These last two are not far distant from the eastern end of the area, but they are over one hundred and fifty miles from the other end. None of the powers mentioned have railroad connections, and for the necessary roads or railways, dams and headworks, canals, conduits, power station, sub-stations and transmission lines, a million dollars will not go very far these days. It will, therefore, doubtless be some years before the mining and other industries are sufficiently organized to justify large power installations, and until then the different plants will continue to get along with steam power, though it is a pity that cordwood that could be used for pulpwood should be burned as fuel. There is room at once for a great deal more detailed work in regard to the most desirable plan of power development for this north country.

If the sulphide deposits of Manitoba were located in a populous area they would have an additional value as their sulphur content could be recovered as a by-product and used in the sulphuric acid and sulphite pulp industries. The value of pyrite in New York before the war was 12 cents per unit and now it is 17 cents. An outline of the future prospects of pyrite in Manitoba may not be out of place.*

In the eastern United States during the months of June, July and August, 1918,

the following industries consumed approximately the following tonnage of acid:**

Industries	Tons per month Basis 100% H ₂ SO ₄
1.—Domestic explosives	7,500
2.—Fertilizers	109,400
3.—Chemicals and drugs, including nitric acid, hydrochloric acid and ammonium sulphate	37,600
4.—Oil refining	28,790
5.—Steel pickling and galvanizing	36,200
6.—Fabrics, textiles, tanning, rubber, paper and bleaching	5,100
7.—Paints, dyes, glue, glycerine and alcohol	7,200
8.—Storage batteries, metallurgical work	4,700
9.—Miscellaneous and unknown	3,600
Total	240,000



Through the Poplar Groves Along the Goose River, Manitoba

*See "Pyrites in Canada," by Dr Wilson, and published by Department of Mines, for information in regard to that mineral.

**Mining and Scientific Press, March 1st, 1919, page 295.

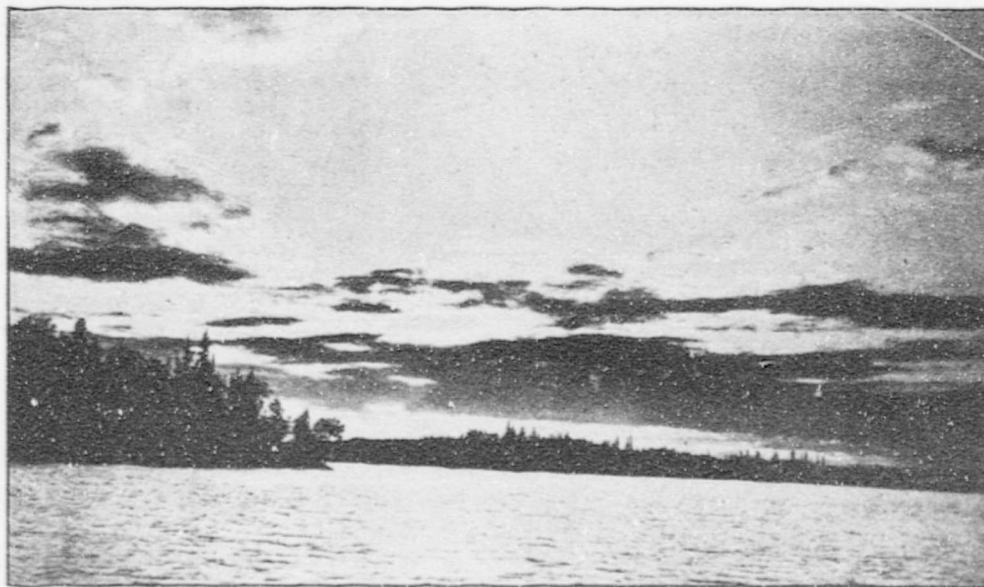
These industries do not exist to any extent on the prairies. In time, however, they will be developed, and when the adjoining territory in the United States is included the future possibilities for a by-product industry should not be underestimated.

Item No. 1 refers to dynamite, and though it is hoped that there will be need for a plant of this nature very shortly, its call for sulphuric acid will be very small.

It is in the production of fertilizers that there would appear to be the main demand. A vast agricultural area is tributary to this mineral district. We have been told that due to fertilizers Britain produces half as much wheat again to the acre as Manitoba, while pictures are common showing a row of splendid fertilized potatoes side by side with a very inferior row grown without artificial aid. There is no doubt that fertilizers, if reasonable in price, will be used in large quantities particularly for such money crops as potatoes.

It should, however, be noted that the farmer by the use of manures and suitable rotation crops can maintain the fertility of his farm to a very large extent without outside help. A series of fertilizer experiments were conducted at the experimental farms at Brandon and Indian Head on fertile soil for a period of ten years. Plots were dressed, singly and in combination, with nitrogen, phosphorus and potash fertilizer,—the ones used almost exclusively—and the results failed to indicate any increase in the yields of the fertilized plots over the unfertilized. It is the opinion, however, that the time will come when phosphates will be found useful, as the prairie soils are least rich in phosphoric acid, and the addition of this fertilizer also induces an earlier maturity of the crop—a matter of much importance where early frosts appear.*

*This and much additional interesting information on the fertilizer question will be found in the Conservation Commission Annual Report for 1917.



Evening on Lake Athapapuskow, Northern Manitoba

In regard to the fertilizers mentioned—nitrogen, phosphorus and potash—present indications are that whatever potash is required will have to be imported. Nitrogen can be produced in a suitable condition by means of electrical plants, and this is therefore considered one of Manitoba's future industries.

Phosphorus in the shape of soluble phosphates is the product of sulphuric acid and phosphate rock. Years ago Canada with her apatite deposits promised large quantities of fertilizer material. The discovery of the Florida phosphates brought the price down from \$18 per ton to about one-third that figure and the apatites could not compete. It is doubtful if the Laurentian areas in Northern Manitoba will produce apatite bodies that can be mined more cheaply than those in eastern Canada, so that the production of phosphate fertilizer may have to depend on importations from the southern States by way of the Hudson Bay route. In recent years, immense deposits of phosphate rock have been discovered in Utah and neighboring states, and about 1913 a deposit was discovered near Banff. While this deposit is too small to be of com-

mercial use, there is the possibility that further prospecting will locate suitable deposits in the Canadian Rockies. Should this be the case, the production of phosphate fertilizers will have a more hopeful prospect.*

The third item on the list refers to the manufacture of other chemicals. The great increase in chemical productions in Canada during the war is an indication that the Canadian chemical industry may in future reach large proportions.

The oil refining industry is very small at present. There are considerable natural resources in the shape of animal and vegetable oils, but no large reservoirs of mineral oil have been opened up. There are prospects for mineral oil in all the prairie provinces, especially in Alberta. "Along the Athabasca river tar seepages extend from Pelican Rapids to Fort McKay, a distance of over 100 miles. The known occurrences indicate that there is in sight at least six and a half cubic miles of bitumen and the petroleum from which it was derived must have been many times greater. While this enormous amount of pet-

*"Discovery of Phosphate of Lime in the Rocky Mountains," by Dr. Adams, published by the Conservation Commission, Ottawa.



Staff Headquarters and Wireless, Port Nelson, Manitoba

roleum has escaped, there must be untapped reservoirs in the Devonian limestones whence it was derived."**

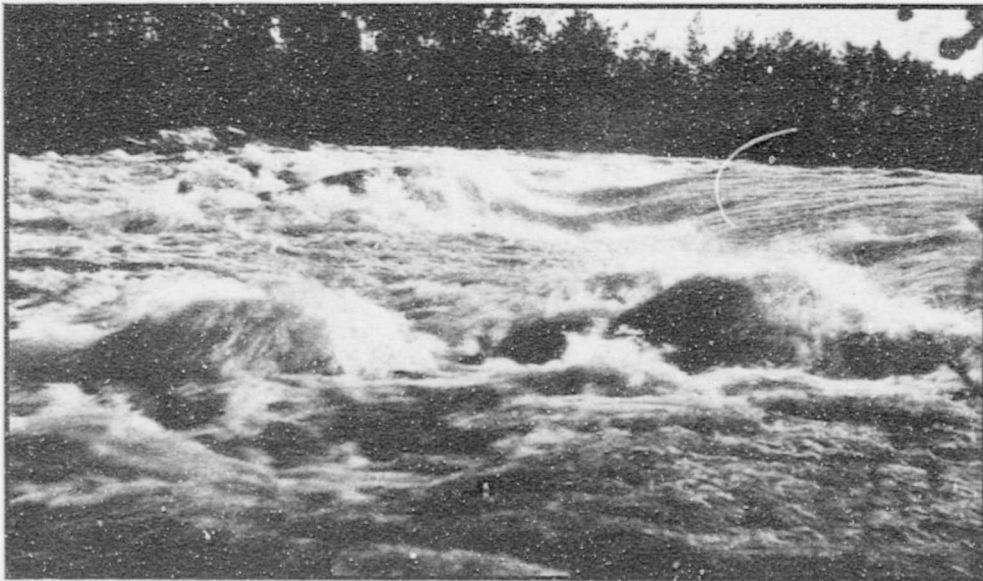
Zinc deposits have been referred to and government reports mention occurrences of magnetite. The iron deposits on the eastern shore of the bay are not reported on favorably. The galvanized iron industry should not therefore be considered seriously at present. The other items Nos. 6, 7, 8 and 9, use sulphuric acid in small amount.

There would seem to be an opening in the mining district for a limited sulphite pulp industry. The timber supply here is about as good as anywhere in the north. The plant should be located near a smelter where railroad facilities and power, when installed, would be available. The sulphide ore could be delivered raw to the mill, where the gas required could be burn-

ed off and the cinder returned to the smelter.

From the above outline it will be seen that there is no serious demand at present for an acid plant. Possibly a pulp and paper project will be considered now that the war is over. By the time the railroads have pushed their branches further north, mines have been opened up, and the necessary smelting facilities erected and tuned up to the economical production of their output, it will be time to take a further inventory of the different plants in the country which call for supplies of sulphuric acid. In the meantime, it will be in line to obtain all the information possible in regard to other resources which with sulphuric acid might form the basis of additional industries.

***"Fuels of Western Canada," James White. Published by Conservation Commission.



A Bit of Rapids

Fort Prince of Wales, Churchill, Manitoba
A View From the Plain in Front

