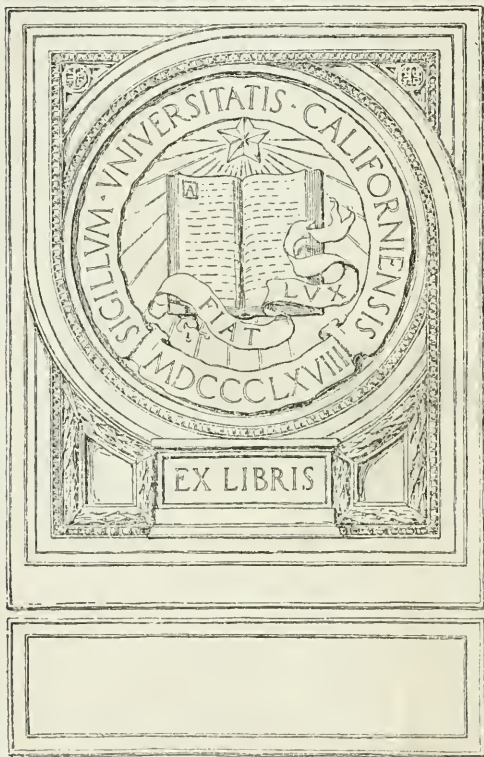


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STANFORD'S
COMPENDIUM OF GEOGRAPHY AND TRAVEL
(NEW ISSUE)

NORTH AMERICA

VOL. I

CANADA & NEWFOUNDLAND

EDITED BY

HENRY M. AMI

M.A., D.SC., F.G.S., F.R.G.S., F.R.S.C.

MAPS AND ILLUSTRATIONS

SECOND EDITION, REVISED

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TO THE MEMORY OF

THE RIGHT HONOURABLE

BARON STRATHCONA AND MOUNT ROYAL

G.C.M.G., G.C.V.O., ETC.

WHO PLAYED SUCH A CONSPICUOUS PART IN
THE RECENT SOCIAL, COMMERCIAL, EDUCATIONAL,
AND ECONOMIC DEVELOPMENT OF CANADA



9.7.1

Am 5 n 2

PREFACE

Omnes artes inter se continentur.—CICERO.

IN time of war, as in time of peace, a thorough knowledge of the geography of a country is of prime importance. To be acquainted with all the detailed facts regarding the face of the earth in a given war zone furnishes a true and rational basis, as well as a key, for the solution of many military problems. So also a detailed knowledge of the geography of British North America, involving detailed information on the face and crust of that portion of the earth which appertains to the Dominion of Canada and to Newfoundland, bathed by three oceans—the Atlantic, the Arctic, and the Pacific—has much to do with a successful solution of numerous human problems embodying economic as well as social relations.

An accurate knowledge of the geography of Canada to-day involves a knowledge of many sciences which are so intimately linked together as to form a chain of information of endless value, whether we deal with the earth's crust and surface features in which geology, orography, hydrography, and topography are deeply involved; or whether we deal with a knowledge of the distribution of life in zones or provinces in which the various subdivisions of biology are concerned.

Many changes have taken place in the geography of British North America since the last edition of this work was issued. The Dominion of Canada now comprises nine organised provinces: Nova Scotia, New Brunswick, Prince Edward Island, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia, and two territories, the Yukon Territory and the North-West Territories, the last mentioned including the whole of the Arctic Archipelago. The North-West Territories, as well as several provinces, have undergone marked changes in their boundaries in recent years, readjustments having taken place in 1905, when Alberta and Saskatchewan were erected into provinces; and in 1912, when the areas of Quebec, Ontario, and Manitoba were greatly increased. For the sake of reference it seems reasonable to suggest the restoration of the three names applied to three old subdivisions of the North-West Territories, namely, Mackenzie, Keewatin, and Franklin.

Formal possession and control of all the islands of the Arctic Archipelago was taken by Commander A. P. Low, in the name of the Crown and by order of the Parliament of Canada, confirmed by the Imperial Order-in-Council of 1st September 1880. The Canadian Government has established customs and inland revenue stations throughout arctic and subarctic Canada, where officers and men of the Royal North-West Mounted Police maintain order, collect federal dues, and effect the permanent occupation of northernmost Canada, whose natural resources are known to be of enormous value.

The boundaries of the province of British Columbia

and of the Yukon Territory have suffered change according to the terms of the Canada-Alaska award of London in 1903. The precise delimitation of the 141st meridian across the sea of mountains occurring along the Alaska-Yukon boundary, and the careful survey of that narrow irregular strip of United States coast opposite the British Columbia mainland as far south as the Portland Canal, were entrusted to a joint international body of United States and Canadian astronomers and geographers, who have carried out the terms of the "award" in the precise spirit as well as the letter of the Treaty, and according to the latest and most approved scientific methods.

Since the last edition of Stanford's *Compendium of Geography and Travel. North America*, Vol. I. (Canada and Newfoundland), by Dr. S. E. Dawson, C.M.G., British North America has made such rapid strides, knowledge concerning its geography has so greatly increased, that the chapters dealing with the geographical features of the provinces of the Dominion and of Newfoundland had to be practically all rewritten, and entirely new chapters prepared dealing with the new provinces organised in 1905 and the extension of three old provinces in 1912.

A complete revision of facts and figures respecting the size, areas, and boundaries of the provinces, the lands, rivers, and all natural phenomena as known in 1897, has been made, whilst most recent available statistics as to the geographical distribution of plant and animal life, of population, agriculture, trade, and commerce, as well as other questions of human interest, have been embodied in the text.

The settlement of the "French shore" controversy in Newfoundland has paved the way not only for better understanding and good mutual relations between the French nation and Great Britain, but also among the various Colonies and representatives of these throughout the world. In the great war of 1914 the *entente cordiale* so thoroughly established through the good offices of King Edward VII. has been further strengthened, and in Ontario and Quebec provinces English- and French-speaking Canadians have gone to the front in support of their two mother countries with a willingness and courage worthy of their sires.

Since the last edition of this *Compendium* was issued our knowledge of the geography of Canada has greatly increased. The establishment of a Geodetic Survey of Canada, the enlargement and continued good work of the Surveyor-General's office and staff, the Chief Geographer's branch of the Department of the Interior, together with the excellent work of the Geological Survey and the work of explorers in the Arctic and Rocky Mountain regions of Canada, have made known the greater half at least of the 1,000,000 square miles of Canada which were still unknown in 1895 when Dr. George M. Dawson wrote his summary of the "larger unexplored regions of Canada." The Department of Militia and Defence has also issued a most important series of topographical maps of great accuracy and value. Many other departments of the Government service in Canada carry on geographical or cartographical work.

Canada's railway mileage has increased enormously of late. Whereas it had 19,431 miles of railway in operation in 1904, there are more than 43,000 miles in 1915. The total tonnage hauled by Canadian railways in 1913 was 23,032,951,596 tons. The third of the transcontinental railways of Canada is now practically completed as this book goes to press; the driving of the last (golden) spike at the western end of the line is to mark the completion of this great highway which opens up many new sections and belts of country possessing great natural resources.

Since the last edition was issued the old districts of Assiniboia, Saskatchewan, Alberta, and Athabasca, which had been carved out of the North-West Territories, have been deleted from the map, and two provinces, Saskatchewan and Alberta, erected in their stead. These, however, are not co-extensive with the limits of the old districts. In contrast with these two new provinces occupying part of the great central prairie region, the province of Manitoba was very small, and the promises made to extend its boundaries were effectively carried out in 1912. Ontario and Quebec also had their boundaries extended on the north.

This new edition of Stanford's *Compendium of Geography and Travel for British North America* (Canada and Newfoundland), though considerably enlarged, is, at best, a condensed account of the leading characteristics of two portions of the British Empire whose position between western Europe and easternmost Asia makes them a natural highway of commerce and travel, as well

as a bond of union of great importance between the Far East and the Near West.

This volume is also intended to be of special interest and use to travellers. "How to travel" is both a science and an art; for a knowledge of the ground, or information respecting the country traversed, is a necessity, whilst a useful selection of suitable routes and localities to visit, adds much to the enjoyment and educational value of the journey. Viscount Bryce's recent utterances on the subject before the Royal Geographical Society are particularly timely, and his suggestions are strongly recommended.

My grateful thanks are especially due to Dr. Samuel E. Dawson, C.M.G., F.R.S.C., etc., who was the author of the last edition, for having allowed me full privilege to use any portion of his 1897 text as mine in the present 1915 edition. Dr. Dawson's keen love for the history and geography of Canada has marked him out as one of our foremost contributors on these subjects, his writings on the St. Lawrence River and the Cabots constituting works of reference of great value. Of the latter, Fridtjof Nansen stated: "It is the very best and most reliable treatise on the subject."

My best thanks are due to the Director of the Geological Survey of Canada for the use of photographs illustrating northernmost Canada, also for valuable information and courtesies received on numerous occasions during the preparation of this work; and from my own former colleagues in the same department. The illustrations on pages 651, 698, and 868 are reproduced by the courtesy of the Emigration Branch of the

Department of the Interior, while those on pages 818, 821, and 822 are from photographs kindly lent by the Agent-General for British Columbia. I desire to acknowledge with thanks valuable assistance from the executive as well as the political heads and officers of numerous departments of the Civil Service of Canada and Newfoundland, including those of the Interior, Marine and Naval Service, Militia and Defence, Mines, Agriculture, Fisheries, Finance, Indian Affairs, and others residing in Ottawa; also for similar assistance from the executive heads and officers in the various departments of the provincial Governments of Canada from Halifax to Victoria. Special thanks are also due to numerous individuals—geographers, explorers, and authors—for information without which this edition would have been lacking of many facts and figures of special interest and value: Prof. Vélain, Prof. Joubin, Dr. Gentil, Baron Berget, and others of the University of France; Dr. Scott Keltie, of the Royal Geographical Society of London; the Under-Secretary of State for the Colonies, London; Col. C. E. Hutton, Messrs. John Howard, J. Obed Smith, D. Lewis Poole, and others of London, England. To Dr. A. H. MacKay, F.R.S.C., of Halifax, Nova Scotia; Prof. H. T. Barnes, F.R.S., of M'Gill University, Montreal; Dr. A. G. Doughty, C.M.G., Dominion Archivist, Ottawa; James White, Esq., F.R.G.S., etc., of the Conservation Commission of Canada; Messrs. Fridtjof Nansen, Roald Amundsen, J. B. Tyrrell, R. G. McConnell, Omer Sénécal, J. E. Chalifour, W. J. Sykes, Dr. W. F. King, Dr. E. Deville, D. B. Dowling, James Robertson, C.M.G.,

R. H. Campbell, Charles Camsell, and to all who have so generously assisted me I desire to return sincere thanks. To my brother, Samuel T. Ami, Chief Editor of Parliamentary Documents at Ottawa, I owe an especial debt of gratitude for help in revising the work when nearing completion, and for valuable suggestions during its preparation.

To the great railway companies of Canada, which have done so much to develop and point out in a practical way the resources of the Dominion, I desire to express my indebtedness for numerous favours in the form of information regarding routes of travel and settlement, pleasure and profitable resorts in the numerous scenic and beauty spots of Canada, whether in the better known East or in the fascinating West, with its numberless attractions of prairie, virgin forest, alpine and mountain scenery, or in the delightful fjords, bays, inlets, and waters of the Pacific coast. The Canadian Pacific Railway Company's officers, both in Canada and Europe, President Chamberlin, and many other officers of the Grand Trunk Railway Company, have generously furnished me with views and information that have proved useful in the preparation of several portions of the text; whilst the Government railway officials at Ottawa and those of the Canadian Northern Railway Company have also been most kind in furnishing views or desired information. To all of them my best thanks.

H. M. A.

"HILLSIDE," STRATHCONA PARK,
OTTAWA, CANADA, *July 1915.*

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THE DOMINION OF CANADA

AND

NEWFOUNDLAND

CHAPTER I

INTRODUCTORY

A COMPENDIUM of the geography of British America must be prefaced by a disclaimer of all pretension to originality. Such a book can only be a presentation in logical order of an immense number of facts recorded and observations made originally by explorers and found in books of travel or in official reports. To give credit in due proportion to each of the authorities from which this work has been compiled would be an impossible task, and, if it were possible, would confuse the reader with unnecessary details; moreover, many works of authority are themselves built up on the labours of officials whose names have been merged in the routine of their duties. A short list of authorities, where fuller details of the subjects herein treated may be found, is given at the end of the volume; but it will be convenient here, at the commencement, to acknowledge the main sources from whence the information given has been derived.

First, and before all, no treatise on the physical features of British America can be written without drawing largely from the reports of the very able staff of scientific men who have been connected with the Geological and Natural History Survey of Canada, from its inception under Sir William Logan down to the present day. Before his death the main physical facts concerning the two provinces of old Canada had been collected in the great report of 1863. About the time of the appointment of Dr. Selwyn came the necessity of extending the operations of the Survey over the immense and little-known region of the North-West. It seems almost invidious to make special mention of any single member of a staff which has collectively done so great a work, for the gaps on the maps of the Dominion have been necessarily filled up by those to whose lot it fell to work in the newer territories.

In this way it has happened that the name of Dr. G. M. Dawson, Director of the Survey from 1895 to 1901, has become bound up with the geography and geology of British Columbia and the adjacent territories to the north, as well as with the belt along the 49th parallel. The regions round Hudson Bay will always be associated with the name of Low and Bell, and the Rocky Mountains and sources of the Mackenzie with that of Mr. R. G. McConnell. Mr. J. B. Tyrrell's explorations in northern Manitoba and Ontario, and in the Barren Grounds must always be referred to when writing about those regions, and Messrs. Low and Eaton, in a two years' exploration attended with great hardships, have filled up the map of central Labrador, previously less known than the interior of Africa. Similarly, the geological resources of the maritime provinces have been described by Messrs. R. W. Eells, Hugh Fletcher, and E. R. Faribault; and those of

Ontario and Quebec by Barlow, Ells, Adams, besides Coleman, Miller, Parks, Walker, etc., of Toronto.

The Dominion Lands Branch of the Department of the Interior, under the direction of the Surveyor-General, Doctor Deville, has been doing, in addition to its more prosaic task of settlement surveys, a large amount of scientific exploration. The most inaccessible recesses of the mountain ranges at the west are now being mapped by a method of photographic survey first introduced in this department. Mr. William Ogilvie has, through a series of years, made many most arduous explorations in the immense territories about the Yukon and Mackenzie rivers.

To the labours of Mr. James White, formerly Chief Geographer of the Department of the Interior, now Assistant to the Chairman of the Conservation Commission of Canada, we owe the *Atlas of Canada*, a treasury of most valuable information, presented in graphic form.

In like manner the Acadian provinces of the Dominion can never be studied without reference to the classic work of Sir William Dawson, *Acadian Geology*, for therein is to be found the most complete collection and statement of the geographical and geological facts concerning the provinces on the Atlantic seaboard. The natural history, and especially the botany, of the Dominion have been the life study of Professor Macoun, whose published papers must be referred to on these subjects.

In treating upon the separate divisions of British America older names must be mentioned. It will be impossible to write about Quebec without allusion to La Salle and Jolliet, the discoverers and pioneers of the Great West, and to La Verendrye, who carried the French flag to the Rocky Mountains, or about Montreal without allusion to Sir Alexander Mackenzie and the daring and

hardy north-westerners who found the way overland to the Polar Ocean and the great South Sea.

Nor should David Thompson be forgotten, the astronomer of the North-West Company, who explored so many of the passes across the mountains in the early years of last century, and was the first white man on the Upper Columbia. The Thompson river recalls his name. Many have profited by his labours, but he died in poverty at Longueuil near Montreal at an advanced age. The Yukon will always suggest the name of its discoverer, Robert Campbell, and recall his wonderful journey of 9700 miles, and his snow-shoe tramp of 3000 miles, through the wilderness. He was the pioneer in that remotest north-west.

Hudson Bay must of necessity recall the explorations of Hearne and Dease, and Simpson and Rae, and other officers of the great fur company of the North; and the Arctic regions of the Dominion are for ever associated with memories of Franklin, Richardson, and Back.

Parry, "the prince of Arctic navigators," must be mentioned whenever the farthest north is spoken of. The western shores of the Dominion will ever be associated with the name of Vancouver, whose exact and thorough surveys are still the basis of all our maps.

To the late Sir John Murray, Amundsen, Scott Keltie, Hjort, His Serene Highness the Prince of Monaco, Joubin, and Vélain, geographers, oceanographers, and workers in the science of geography, we owe special acknowledgment of help and encouragement.

It would, however, be a heavy task to attempt to make mention of all those whose labours, and whose lives even, have been expended in the exploration of the northern half of this continent; it must suffice to make a general acknowledgment of indebtedness once for all.

THE GULF STREAM & C

To face page 5



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CHAPTER II

THE THRESHOLD OF THE NEW WORLD

THE westward voyager in the higher latitudes of the North Atlantic will meet with many indications of the western continent long before he sees its shores. Suddenly, almost as if at a definite line between 30° and 40° west longitude, the ship will pass from the warm and deep blue water of the Gulf Stream into the light green of the colder current flowing from the far North. These two great ocean streams are such important factors in the climatic conditions of the countries on the opposite sides of the North Atlantic that it is necessary to dwell for a short time upon their direction and characteristic features; for they are the great thermal influences which differentiate the climates of north-east America from that of countries in north-western Europe situated under the same parallels of latitude.

The Gulf Stream, gathering its momentum in the tropical basin of the Gulf of Mexico, transfers by its heated waters to the shores of Europe warmth generated in the western hemisphere which softens the climate of western Europe. New York city is in the latitude of Naples, St. John's, Newfoundland, in that of Paris, and the Strait of Belle-isle in that of London. Vessels sailing westwards cross the Stream at a higher or lower latitude,

according to the season, for its northern limit is not constant. Taken at the meridian of Cape Race its northern edge is at 40° to 41° in winter, while in September, when the sea is warmest, it stretches up as far as 45° or 46° north latitude. The difference in temperature in the depth of winter off the Grand Banks of Newfoundland between its waters and those of the surrounding ocean ranges from 20° to 30° Fahrenheit.

This remarkable current, after issuing from the Florida Strait, flows north-eastwardly, following the general direction of the American coast but at a distance from it; for the colder Arctic water runs inside in a contrary direction along the land. About the latitude of Cape Cod the Gulf Stream curves more outwards and flows across the ocean. In longitude west about 20° it divides—one branch envelops the British Isles, the other flows more to the north, prevents the lakes in the Shetland and Faroe Islands from freezing, keeps the harbour of Hammerfest, the most northern port in Norway, open all winter, and makes its influence felt as far north as Spitzbergen. To steer westwards against this drift is, in sailor's language, to sail uphill, and the usual ocean routes cross its course. The Gulf Stream and its attendant fogs acted as a veil which hid America through long ages from the sailors of western Europe in those latitudes where, from the converging of the meridians, the distance between the two worlds grows continually less and less.

Such are the benefits which the old world had been unconsciously receiving for ages from the unknown and hidden western continent. On the north-west coast of America the Japan current tempers the climate of Vancouver island and the whole coast of British Columbia generally; but here on the north-east coast the provinces of British America and the north-eastern United States

are affected unfavourably as to climate by this ocean circulation. The Arctic current flows along their coasts in a southerly direction and washes the whole eastern shore of the continent down to Florida, flowing inside the Gulf Stream as a river of cooler water of varying surface-width, and dipping finally under the Gulf Stream in its course to the Equator to renew the circuits of the oceans. The Gulf Stream, originating in the tropics where the diurnal motion of the globe is swiftest, passes to the slower moving regions of the north and, by its accumulated momentum, is projected towards the east, while the Arctic current, originating in the polar ocean, starts with a deficiency of momentum and, as it flows southwards, is, from the same cause, thrown westward upon the eastern coast of the western continent. Other conditions no doubt exist—conditions of varying specific gravity, of varying heat and prevailing winds—which operate to modify or intensify the interaction of these great rivers of the North Atlantic ocean; but the dominant cause of the opposite direction of these currents is now admitted to be the varying speed of the surface of the globe revolving on its axis upon water unequally heated and flowing northward and southward towards an equilibrium. It is the existence of this south-west Arctic current which renders credible the voyages of the Northmen to America in the tenth and eleventh centuries; for, by means of it, they could sail from Greenland or Iceland, as it were downhill, along the coasts of Newfoundland, and in rear of the veil which was to hide the new world for four more centuries from the enterprise of nations less advantageously situated in that respect.

Without, however, diverging to discuss the inviting problem of the Viking discoveries, the reader's attention must be strongly directed to this Arctic current and its

wide-reaching effects upon the American continent. The polar overflow seeks the south in several convergent streams. The current which flows out of Baffin Bay is reinforced at Cape Farewell by a strong current down the eastern shore of Greenland. A current is also laid down on some charts as issuing from Hudson Strait; but, from the report of Lieutenant Gordon, R.N., it would seem that bergs from Davis Strait are often seen to pass in along the north shore of Hudson Strait, almost as far as the Bay, and out again along the southern shore; the strong tidal currents, moreover, confuse the problem and render it uncertain how far the outward current on the south shore of the Hudson Strait is or is not a swirl of the current from Baffin Bay. However this may be, the currents east and west of Greenland unite to form the great stream of cold water which is thrown upon Labrador, and is often called "the Labrador current." Down this stream pass a stately procession of icebergs, and, in the proper season, immense masses of field ice. The bergs are the product of the glaciers of the Greenland ice-cap and of the high polar sea. These continue steadily on their southward course into the Gulf Stream, where they melt, impelled onward into the warmer waters by the deep-down current from the north still acting upon the submerged seven-eighths of their bulk, and carrying them steadily across the eastward flowing surface stream.

Other indications of the western world soon present themselves to the observant traveller long before land is seen. In longitude 48° west the ship commences to cross the submarine threshold of America—that remarkable plateau known as the "Banks of Newfoundland." Signs of the change will not be wanting. The largely increasing number of sea-fowl will, during the fishing season, proclaim some unusual condition; but chiefly will be

remarked the persistence of fogs caused by the contact of opposing currents of water very different in temperature. In summer the Gulf Stream flows over the southern end of the Grand Bank with a velocity of one knot an hour, and laps along the eastern border of the Arctic current at no great distance from the outer edge of the Bank along its whole length. At the line of contact of these currents, even in the quietest weather, a disagreeable tumbling sea is experienced; but over the Grand Bank itself the sea is not so heavy as outside. Among sailors the Gulf Stream is called the "weather breeder" of the North Atlantic, and the records show that the great hurricanes have usually followed its course. The French fishermen in the last century called it "the storm king," *roi des tempêtes*, and when they found the sea very heavy they supposed they were "debanked," and used to say that they had got "away from home," *qu'ils ne sont pas chez eux*. These, with many similar sayings of men whose lives are spent among the dangers of these seas, go to show that the sea upon the Banks is quieter than outside, although a landsman may not be able to detect much difference. It will appear then that the conditions which produce vapour are never far distant, and, in fact, any wind in which east or south preponderates in ever so small a degree will bring upon the banks and neighbouring coasts dense and persistent fogs. The colour of the sea over the banks is a characteristic light green, not only because the water is shallower, but because, from the melting of enormous masses of ice, it is distinctly less salt than the deep blue water of the profounder ocean.

According to Schott the average salinity of sea water at the surface is 35 per cent. From results obtained for the Atlantic waters along the coasts of Baffin Island, Labrador, Newfoundland, Nova Scotia, and New

Brunswick, 32 per cent of salinity is given; and precisely the same figure was obtained for the coast of British Columbia and Vancouver island in the Pacific. The enormous addition of fresh-water, in the shape of melted ice in the north, accounts for the diminution of the salinity in those regions.

It has been supposed by some writers of weight that the Banks are the result of detritus carried down by the secular stream of Arctic icebergs and deposited at their melting—that they are, as Reclus expresses it, “the general moraine for the glaciers of Greenland and the polar archipelago”; but, if that were the case, the edges of the plateau might be expected to slope gradually down to the deeper abysses. On the contrary these uplands of ocean terminate, at their eastern and southern edges especially, in veritable submarine precipices over which the sounding line drops from a depth of 22 or 32 fathoms to one of many hundreds. The outline of soundings is most marked around the whole contour of the plateau, as well as over its surface, and the lead line is an infallible guide to the sailor in ascertaining his position. The bottom also is very characteristic, consisting of sand, gravel, and broken shells, with mud only occasionally in some channels or deeper valleys.

Smaller marine plateaus lie out before the coast of Nova Scotia and New England, and, in long. $44^{\circ} 38'$ west, there is an outlier called “the Flemish Cap,” extending 60 miles north and south by 25 miles broad, upon which the soundings are less than 100 fathoms. There is also an elevation of the ocean bed along the whole North American coast, due probably to the secular waste of the continent; but the bank off Newfoundland is known as the “Grand Bank,” because of its immense area and striking characteristics.

The Grand Bank of Newfoundland extends from 43° to 48° north latitude and from 48° to 55° west longitude. It outlies the coast-line of Newfoundland from Cape Bonavista on the north-east round by Cape Race and along the south as far as the Ramea islands. It is practically one and the same plateau, although portions of it are designated by special names, as the St. Pierre Bank, the Green Bank, the Ballard Bank, and are separated by channels of somewhat deeper water. The usual depth over the Bank is from 30 to 45 fathoms. On the southern edge it decreases to 22 fathoms, and at one point, not far from Cape Race, submarine reefs of small extent occur known as the "Virgin Rocks." Over the highest peak of this ridge the water shoals to 3 fathoms. These rocks are recognised, in heavy weather only, by the sea breaking over them. The Grand Bank is approximately 300 miles from north to south and 280 miles from east to west; its area is therefore equal to that of the whole island of Newfoundland.

Across this plateau in the spring and summer the Arctic current sweeps large numbers of icebergs in slow procession from the far north. These islands of floating ice are sometimes 100 feet high out of the water, and, as only one-eighth of their bulk is visible, they frequently ground in the shallower places. They all are of clear, clean ice and show no marks of carrying detritus of any kind. They are all of fresh water and in the cavities on their surfaces are ponds of fresh water. During dense fogs these ice islands are a continual source of anxiety to the careful navigator to any port of British America or the northern United States, for fogs and icebergs are by no means limited to the Banks of Newfoundland. The bergs travel far south, and the Gulf Stream is everywhere fruitful in fogs which require only appropriate winds to

waft them in any direction. The only drawback peculiar to the coasts north of Halifax is the field ice in spring.

It is in this region that the cold Arctic current, flowing through a deep submerged valley between Greenland and northernmost Canada, bearing an abundant cold water fauna, meets the warm waters of the Gulf Stream freighted with Antillean types of marine organisms. Here, at the contact of these two currents, a veritable catastrophe is continually going on. The Arctic fauna is suddenly thrust into the warm waters from the south, and *vice versa*; and there results an abundant supply of excellent food for the cod, and similar eurytherm fishes which varying temperatures do not in the least inconvenience.

Off the coast of America and continental shelf there is the Valley of the west Atlantic, beginning at the Gulf of Greenland and extending south-easterly between the most southerly point of Greenland and the Labrador coast, in a direction parallel to the latter as far as Newfoundland, where it takes a sweep and bends in a south-westerly direction, and proceeds in a straight line to a point due east of the southern extremity of Florida—thence in a south-east line generally parallel to the coast of South America.

Although, as described above, the two great rivers of the North Atlantic flow on their great courses, there are many local currents, eddies, and indraughts well known to skilful sailors, and these are affected by the prevailing winds and by the tidal wave in the infinite diversity of circumstances which surround its progress and recession. All of these are laid down in charts and sailing directions compiled by highly skilled and scientific sailors, and will be found in publications specially issued for the use of mariners.





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CHAPTER III

DOMINION OF CANADA

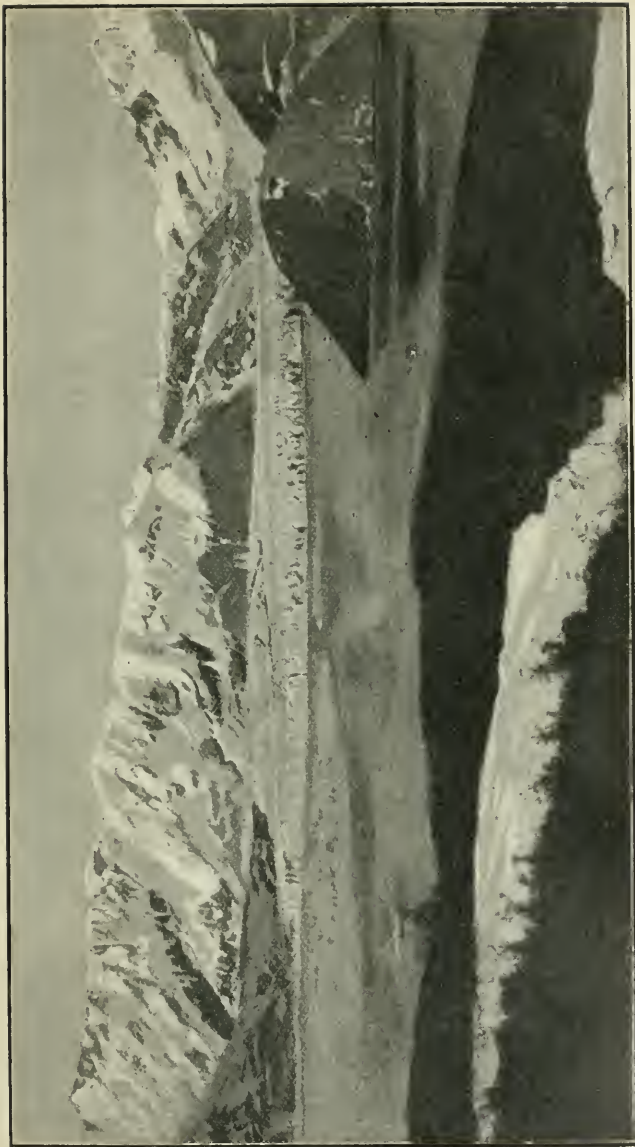
THE continent of North America is most conveniently considered in three divisions. The most southern, or Spanish, consists of Mexico and the other Spanish American republics (953,930 miles) and the colony of British Honduras (7562 miles), containing a total area of 961,492 square miles. The central consists of the United States proper between Canada and Mexico (2,973,890 miles), to which must be added Alaska (590,884 miles); for Alaska, though on the extreme north-western corner of the continent, is a territory of the United States, purchased from Russia in 1867—the aggregate area of this division is 3,564,774 square miles. The British, or northern division, consists of the Dominion of Canada (3,729,665 square miles) and the island of Newfoundland (42,734 square miles), with the part of Labrador belonging to it, making a total area of 3,772,400 square miles. It would appear, therefore, that British America is the largest of the three. The Dominion region is all subject to the British Crown, save the small islands of St. Pierre and Miquelon, on the south-west coast of Newfoundland, which belong to France. The coming volume will be devoted exclusively to an account of the geography and resources of this last

division. The extent of this region is within five per cent of the area of the entire continent of Europe, and as the aggregate area of the whole British Empire with its protectorates is 11,429,078 square miles, the North American possessions of the Crown are not far from one-third of the whole. At the farthest east the landmark is Cape Race—one-third of the distance across the



CAPE RACE, NEWFOUNDLAND.

Atlantic—the most salient headland of the continent, at long. $53^{\circ} 4' 20''$; and on the farthest west the gigantic mass of Mount St. Elias marks the limit of British rule as by a beacon 18,024 feet high at long. 141° W. Between these two points are eighty-eight degrees of longitude, almost one-fourth of the entire circuit of the globe; and, in latitude, from the parallels of 42° , 45° , and 49° Canada extends to the unknown regions of the Pole. Much of this territory is, no doubt, inhospitable; but there is a belt, on an average 500 miles in width across the whole, available for settlement. The extreme distance from east to west being 3400 miles, there is, therefore,



ST. ELIAS RANGE AND HUBBARD GLACIER.

From the crest of Haenke Island in 1910. The peaks are 10,000 to 16,000 feet high.

an area, roughly approximating, of 1,800,000 square miles, suitable to be the home of a settled, civilised, and prosperous people. This last area is as large as all Europe with the omission of Russia.

The colony of Newfoundland has not yet joined the confederation of British American colonies; and, as the Dominion of Canada is enormously the larger, it will be more convenient to commence with it and to dwell upon its more general characteristics before considering the separate provinces of which it is composed.

Boundaries

The boundaries of British America are, on the north, the Polar Ocean, and on the east the Atlantic Ocean, Davis Strait, Baffin Bay, and Smith Sound to the Arctic Sea. On the west the Alaskan boundary starts from Demarcation Point on the shore of the Arctic Ocean at long. 141° W. and follows that meridian southwards until it strikes the summit of the mountain range. This intersection occurs at Mount St. Elias, which is just within Canadian territory. So far the boundary is an astronomical one; the remainder has been ascertained with scientific precision, and is being marked by monuments and posts. From the summit of Mount St. Elias, in a south-easterly direction to the Portland Canal, the boundary is that contained in the terms of the award of the Convention of October 20th 1903, when the dispute as to the divers boundaries claimed by Great Britain and Canada on the one hand and the United States on the other, was definitely settled. Since that date, the International Commission appointed to delimit the new boundary line has been actively engaged in the work entrusted to them.

The southern boundary of Canada is 3260 miles long, and is remarkable for many reasons, and among others, because it won for its negotiator the thanks of the Imperial Parliament, and for the state of Maine so large a portion of Canadian territory as to have retarded for forty years the union of the British provinces. This most untoward result ought not, however, to be attributed to the United States people, inasmuch as President Andrew Jackson, in 1835, offered a fair and equitable solution of the questions in dispute. This was refused, and the golden hour of sweet reasonableness passed away never to return. The thanks of Parliament were equally due to many others who contributed to shape this boundary. Indeed, almost everybody seemed to have had a hand in it—provided he was not a Canadian—for the time of the Canadians had not then come.

The boundary between French Canada and the old colonies of England was well enough known to the *voyageurs* and borderers of old colony days. It was taken to be the water-parting between the streams falling into the Atlantic and those falling into the St. Lawrence river. The boundary between Acadia and the English colonies was supposed by the French to be the Penobscot and by the English to be the St. Croix. The general idea was that the boundary should be the water-parting of the streams flowing into the Bay of Fundy and those flowing into the main ocean. When, in 1783, England divided her possessions in America with her revolted colonies the treaty of peace was negotiated by Franklin, Jay, and Adams for the United States—all three perfectly acquainted with the question. The boundary line between Eastern Canada and the United States, commonly known as the "Maine Boundary," was in dispute almost from the date of the Treaty of Paris in

1783 until 1842, when it was finally settled by the Ashburton Treaty. The first point to determine was the identification of, and "the source of the St. Croix river." This was determined by the Jay Treaty of 1798. The territory, later in dispute, included an area of 12,000 square miles, drained by the St. John river, and lying to the west of the "due north" line from the source of the St. Croix. The Ashburton Treaty awarded 5000 square miles to Great Britain and 7000 square miles to the United States. The intention was clearly to reserve in their entirety Canada and Acadia to England. The treaty recognised the watershed of the Atlantic as distinct from that of the Bay of Fundy. It marked the termination of the Atlantic at the St. Croix river. Beyond that point was the Bay of Fundy. The natural division was simple—the St. Croix was to be the boundary of the United States on the east, and the St. Lawrence watershed the boundary on the north. These natural features, however, are not conterminous, for the drainage basin of the St. John, falling into the Bay of Fundy, runs round the head of the St. Croix and the water-parting between the St. Lawrence and the Atlantic does not extend so far east as a line due north from the head of the St. Croix. This fact was not known at that time, for the region was a wilderness and the maps were inaccurate; but the treaty is not difficult to read in the light of the knowledge of that period. The northern boundary was a fixed line, "the highlands which divide those rivers that empty themselves into the River St. Lawrence from those which fall into the Atlantic Ocean." The eastern boundary had also a natural object as a mark, to wit, the St. Croix river to its source, and a line was to be drawn from one to the other; but, unfortunately, the treaty said the line was to

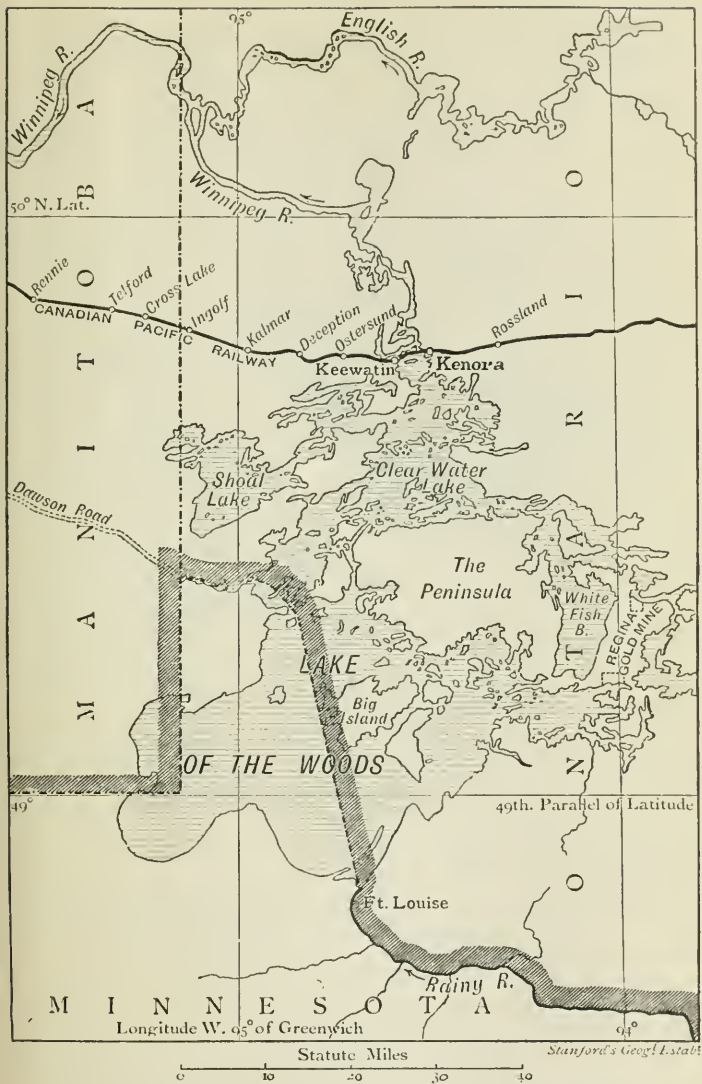
be a "north line," and a due north line from one to the other is not possible, for the termination of the highlands is not north but north-west from the source of the St. Croix. Hence the difficulty which arose.

The Ashburton Treaty defined the boundary as a due north line from the source of the St. Croix river to intersect with the St. John river, thence up the St. John river to the mouth of the St. Francis, thence up the St. Francis to the outlet of Pohenagamuk lake, thence south-westerly in a straight line to a point on the north-west branch on the river St. John, which point should be ten miles distant from the main stream of the St. John, thence in a straight line on a course about south 8° west to the point where the parallel of $46^{\circ} 25'$ north intersects the south-west branch of the St. John river, thence southerly by the south-west branch to its source in the highlands at Metjarmette portage, thence following the Height-of-Land between the waters that flow into the St. Lawrence and those that flow into the Atlantic to the head of Hall stream, a branch of the Connecticut river, thence down the latter to approximate latitude 45° , thence following the old "Valentine and Collin's line" in approximate latitude 45° , to the St. Lawrence river near Cornwall.

The basic idea in drawing this line was to give us the due north line to the St. John, and the St. John and St. Francis rivers as a boundary, except that, from a point on the St. Francis about half-way between its confluence with the St. John and its source, an arbitrary line was drawn to intersect the Height-of-Land, thus giving Canada an area of 900 square miles in the basin of the St. John river above its confluence with the St. Francis, this being the area gained by Lord Ashburton

over and above that awarded to British America (Canada) by the king of the Netherlands.

The line of 45° intersects the St. Lawrence at St. Regis, and from thence, westwards, the boundary follows the mid-channel of the connecting rivers and the middle of the lakes. This part of the boundary was settled in 1822 by commissioners, but they did not get past the St. Mary's river near the Sault Ste. Marie. There a difficulty arose, and the delimitation was postponed, unfortunately, until 1842, for the Ashburton treaty. In this case the geography of the treaty of 1783 was far wrong. The boundary, as specified in the treaty of 1783, was to pass from Lake Superior through Long Lake to the north-west angle of Lake of the Woods, and thence to the Mississippi. But there is no Long Lake, and the source of the Mississippi is far south of Lake of the Woods. By the Ashburton treaty the line is carried, according to its real intention, along the Pigeon river, and the portages and small lakes to Lake of the Woods. Then it runs north-west across the lake to a bay, whence it drops due south to the parallel of 49° , snipping off on the way a little promontory projecting from British territory. This projection into Canadian soil is indescribable without a map on a large scale. After this sortie into Canada the line does not go south into the United States to seek the source of the Mississippi, which also was expressly made a point in the treaty of 1783, but continues along the parallel of 49° to the Strait of Georgia, and thence by the Haro Channel to the Pacific Ocean. This part of the boundary is more particularly described in the chapter on British Columbia. One little projection, not visible save on a map of a very large scale, just large enough to be a foothold for impartial smugglers into both countries, is cut off here, and then the Haro Channel, of three



THE INTERNATIONAL BOUNDARY AT LAKE OF THE WOODS.

navigable channels the nearest to Canada, is followed to the Strait of Juan de Fuca. Such is the southern boundary of Canada.

Relief of the Land

The nucleus of the continent of North America is an enormous area of Azoic rocks, called Laurentian by the Geological Survey of Canada, because of their immense development north of the St. Lawrence. The name is now accepted everywhere to denote the series of primitive crystalline rocks which probably underlie all formations. They are found in detached areas in the state of New York and elsewhere in the United States, in the west of Scotland, in Scandinavia, in Bohemia, in Central and Eastern Asia, and in South America; but nowhere else are there such extensive and continuous exposures of these rocks as in Canada. This Laurentian nucleus is V-shaped on the outer margin, and the remainder of the continent has grown upon it while still preserving the same angular shape. The later ranges of the Rocky Mountains and Appalachian chain run at the same angles, and the coast-lines run parallel to these, forming triangles within each other, based on the north and having their apexes to the south. The sketch shows in an approximate way the gradual growth of the continent as well as its Laurentian core, contained almost wholly within the Dominion of Canada.

Commencing in the far north-west of the continent, the outer edge of the Laurentian area skirts the valley of the Mackenzie river in almost its whole length. It commences near the Arctic coast and passes through Great Bear Lake, Great Slave Lake, and includes almost all of Lake Athabaska. The line then passes, still to the south-east, to the head of Lake Winnipeg, and includes

the eastern shore of that lake. It includes the northern shore of Lake Superior, the northern part of the province



Stanford's Geog. Estab.

of Ontario, and touches the St. Lawrence at the Thousand Islands, where it throws out across the river an outlier into the state of New York. The Thousand Islands are

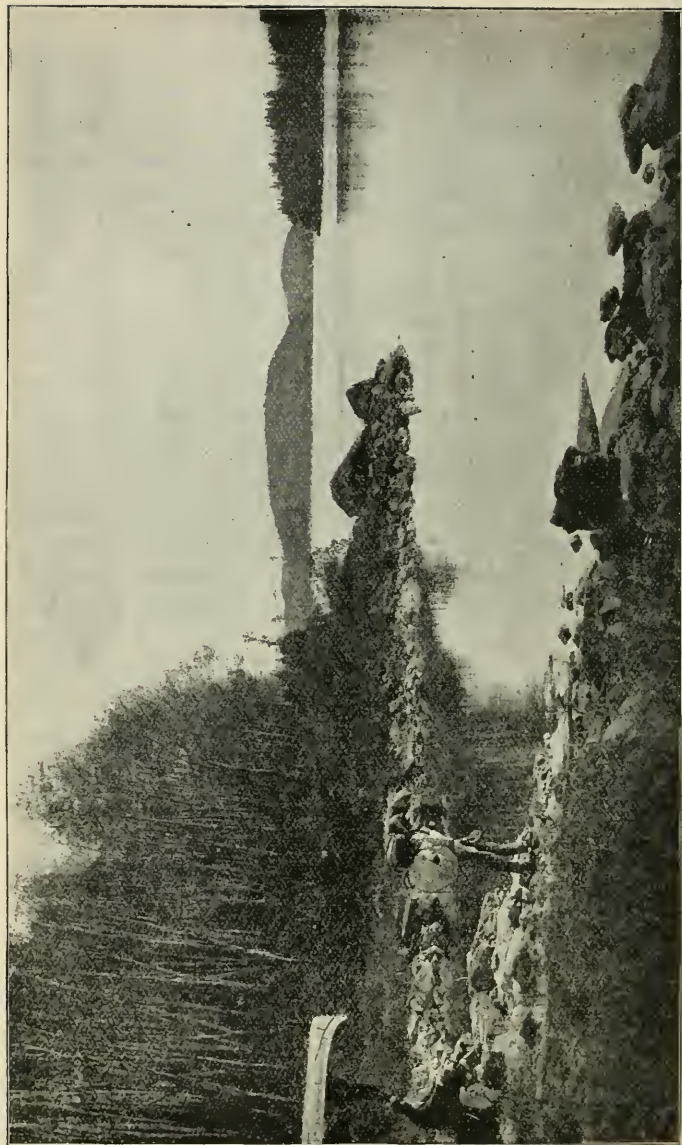
of this formation, and are the southern apex of the triangle; the line then turns away to the north-east, crosses the Ottawa, and follows the general course of this river and the St. Lawrence at varying distances, until it comes out on the St. Lawrence river and Gulf below Quebec City, some thirty miles, forming high and precipitous cliffs at the mouth of the Saguenay, till it reaches the Atlantic coast in Labrador. Nearly the whole of the Labrador peninsula is of this formation.

While it is quite true, speaking in a general way, to call this immense area Laurentian, there are within it large areas of more recent formation. On the margins and throughout its extent are wide bands of Huronian rocks, a series generally metalliferous, so called from their great development on the north shore of Lake Huron. In the valleys of the rivers and on the plains of western Ontario are later formations, but behind all these the Laurentian formation forms the main mass.

This V-shaped nucleus is frequently described as the Laurentian mountains. The word is a little strong, because the height of the plateau is not more than from 1000 to 1600 feet above the sea. It is a country, several hundred miles wide, of rounded, weather-worn hills, densely wooded and abounding with lakes and streams. In remote geological ages these most ancient of all hills were doubtless high mountains, but they have been worn down to their present moderate height by the wear and tear of countless ages. Their outline is characteristic, and they bound the horizon with undulations rather than with peaks. The rivers have not cut deeply into these hard rocks. They flow with currents brimming between their banks, fed perennially by the highland streams which hurry down their clear and bright waters to the greater rivers. There is no malaria in the Laurentian

country. Every brook may be drunk of with impunity, and the clearing up of new land generates no fevers. In the extreme east the mountains of Labrador attain in some places a height of 6000 feet, but the mountains farther west become more like a hummocky plateau. The mountains on the Saguenay are 1500 to 1800 feet high, and Trembling Mountain, north of Montreal, rises to a height of 2380 feet. These are the highest summits of this formation near the settlements, and none higher are recorded in the territory to the north. When the height of land is reached the country slopes down to Hudson Bay with a gentle descent, and, though the surface may be broken with rocks and streams, the portages from stream to stream are low.

Parallel to the coast-lines, on both oceans, two great mountain systems preserve the original type of the continent; the ranges of the Pacific Cordillera running north-west and south-east, and the Appalaehian ranges running north-east and south-west. These are both of later date than the Laurentian plateau, and rise to a much greater height. The mountains on the Pacific coast will be described in the chapter on British Columbia. The Appalachian ranges on the Atlantic side cross into Canada from the states of Vermont and New Hampshire, where they are known as the White and Green mountains. They cross the south-eastern corner of the province of Quebec with a much lower elevation until they strike the St. Lawrence where, under the name of the Notre Dame mountains, they follow down the shore into the Gaspé peninsula and form a table-land of an average height of 1500 feet. Here they are known as the Shickshock mountains, and rise to elevations of 3000 to 4000 feet. Where these mountains cross the eastern townships of Quebec they make a rolling hilly country, suitable for



A CORNER OF LAKE TIMISKAMING : AN EXPANSION OF THE OTTAWA RIVER.

A typical Lac Beauport scene.

agriculture and pasturing; but the interior of Gaspé is a rough and mountainous plateau.

The maritime provinces of the Dominion form a group by themselves and belong to the Appalachian system. A range of hills runs from Cape Chignecto on the Bay of Fundy to the north-east point of Nova Scotia, and is continued, through Cape Breton Island, to its extreme point at Cape North; but their elevation is not greater than 1200 feet. In New Brunswick two ranges of hills from 500 to 1000 feet high diverge from the south-west corner of the province. One runs up in a north-east direction to the Bay Chaleur, and the other is a lower hilly tract, with no conspicuous peaks, running in the general direction of the shore of the Bay of Fundy. These may all be considered as outliers of the Appalachians. The province of Prince Edward Island is a gently undulating country—a garden land where rock or stone can seldom be seen. All the Maritime provinces lie outside of the Laurentian nucleus.

The Dominion of Canada, then, presents to the east the Atlantic provinces with a rocky coast-line and an interior contour diversified with mountain and river and farm land. The provinces of old Canada form the basin of the St. Lawrence—in Quebec a broad and rich valley between mountain ranges—in Ontario a broad plain from Lake Ontario to the Laurentide hills and a fertile peninsula inclosed by three great lakes. This passes into the broken Laurentian region north of lakes Huron and Superior. Then commences the great interior Cretaceous and Tertiary plain stretching to the Rocky Mountains and the Polar Sea; and, lastly, the Cordillera or mountain region of British Columbia.

Hydrography

The history of Canada is explicable only by its waterways. There is nothing which so impresses the mind of an intelligent traveller as the prodigality with which Providence has endowed the Dominion of Canada with one of her choicest gifts. It is above all others the land of abundance of water. Thousands of miles of deeply indented sea-board extend along the Atlantic and thousands along the Pacific, with harbours on both oceans unrivalled in the world. Both oceans search far into the land—the Gulf of St. Lawrence and the great mediterranean sea of Hudson Bay, on the east, and the Strait of Georgia, with the deep fiords of British Columbia, on the west. It is a country of broad lakes and flowing waters; a country where the abundance of streams and the regularity of summer rains preclude the possibility of drought, and secure the widest area of vegetable growth, a land of grass and forest containing by far the larger portion of all the fresh water of the globe, where, 2000 miles from the ocean, the traveller may lose sight of land and be prostrated by sea-sickness; where thrilling adventures and shipwrecks may occur in mid-continent—in the very heart of North America at its widest expansion.

This description applies more especially to the great central provinces; but New Brunswick has a most extensive river system of its own; and, for Nova Scotia and Prince Edward Island, the Atlantic Ocean and the Gulf of St. Lawrence are the waterways. While mountains and a deeply indented coast-line are the peculiar characteristics of the Pacific province, old Canada contains the most extensive system of interior waterways in the world, and such breaks as occur in their continuous navigation are overcome by a series of canals, so that with only one

DRAINAGE BASINS



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transshipment at Montreal, freight from the largest ocean steamships may be carried to the head of Lake Superior 2384 miles from the Strait of Belle-isle.

There are four great *drainage basins* in Canada, exclusive of that small tract of country covering some 12,365 square miles of Southern Alberta and Southern Saskatchewan, south of Medicine Hat and Swift Current respectively, which drains into the Gulf of Mexico basin by way of the Mississippi.

These four basins are as follows:—

	Square miles.
I. The Atlantic Basin	554,000
II. The Pacific Basin	387,000
III. The Arctic Basin	1,290,000
IV. The Hudson Bay Basin	1,486,000

The Atlantic Basin

The Atlantic basin, exclusive of Hudson Bay and its enormous drainage areas from the Rocky Mountains to the Atlantic Ocean, covers 554,000 square miles, and includes portions of Labrador, the entire St. Lawrence river sub-basin, and the Acadian sub-basin with rivers flowing into the Bay of Fundy, the Gulf of St. Lawrence and the Atlantic Ocean—covering generally the maritime provinces of Nova Scotia, New Brunswick, and Prince Edward Island. The Hamilton river, of Labrador, whose length is 350 miles to the head of Lake Ashuanipi, has a drainage basin of 29,100 square miles, whilst the Miramichi and St. John rivers of New Brunswick have drainage areas, 5400 square miles and 21,500 square miles respectively forming part of the Acadian sub-basin.

The St. Lawrence sub-basin.—The area drained by the St. Lawrence river basin comprises 309,500 square miles,

whilst the Saguenay river with its source in Lake St. John has a drainage basin covering 35,900 square miles, the St. Maurice 16,200 square miles, the St. John 21,500 square miles, and the Miramichi 5400 square miles.

Farther west, the following rivers and their tributaries constitute minor basins as follows:—

	Square miles.
The Ottawa river basin	56,700
The Lièvre „	3,500
The Gatineau „	9,100
The French „	8,000
The Nipigon „	9,000

The St. Lawrence river, whose total length from its source to the sea is 1900 miles, is essentially a northern river; for all its large tributaries fall in from the north. It flows on the southern side of its drainage basin, and Lakes Champlain and George, and their outlet, the Richelieu river, are the only important contribution it receives from the south. The River St. Louis, which falls in at the head of Lake Superior, close to Duluth, in Minnesota, is taken as its source, and it widens out into the most remarkable sequence of ocean-like lakes in the world. It is known by various names throughout its course—the River St. Mary, the outlet of Lake Superior; the St. Clair river, from Lake Huron to Lake St. Clair; the Detroit river from Lake St. Clair to Lake Erie. The outlet of Lake Erie is the Niagara river, and it is only from the outlet of Lake Ontario that it is called the St. Lawrence; to the older French writers it was also known as the Cataraqui. The total length of navigation to Port Arthur, in Ontario, from the open ocean at the Strait of Belle-isle, is 2264 miles. As far as Montreal, 986 miles are navigable for the largest ocean steamships. A few miles above Montreal is the Sault St. Louis, or Lachine Rapids, the first break from the ocean. This, and all

subsequent impediments, are overcome by a series of magnificent canals with an aggregate length of 74 miles, so that steamers 255 feet long and drawing 14 feet may pass up the whole distance, 1278 miles, from Montreal to Port Arthur and Fort William on Lake Superior. Duluth, at the head of the lake, is 124 miles farther.

The width of the St. Lawrence varies very much, for, besides the immense expansions of the upper lakes, it widens into Lake St. Francis (5 miles), St. Louis (7 miles), and St. Peter (9 miles), on its course north-east from Lake Ontario. The average width of the river proper is about a ¹/₄ mile and three-quarters, and the narrowest point on its whole course is at Cap Rouge, a few miles above Quebec. Below Quebec it widens to 20 and 30 miles, and across its mouth, at the west point of Anticosti where it is considered to end, the distance is 100 miles.

The lakes of the St. Lawrence system, as before stated, contain more than one-half the fresh water of the globe. The water in them is clear and bright, for they are the gigantic settling basins of the upper streams. At Three Rivers, half-way between Montreal and Quebec, the influence of the tide ceases, about 30 miles below Quebec the water becomes brackish, and at the mouth of the Saguenay it is salt. The aggregate area of these fresh-water seas is 101,058 square miles, and the total fall, from Lake Superior to tide water at Three Rivers, is 602 feet, half of which is in the Niagara river. The St. Lawrence is thus a broad and deep avenue to the very heart of North America; for the central point of the continent is only 250 miles in a straight line west of the head of Lake Superior. No wonder the early French explorers were continually dreaming of a passage to China.

The dimensions of the chief lakes of the St. Lawrence

system are given below; Lake Michigan is included though wholly in the United States. The Strait of Mackinaw connects it with Lake Huron.

TABLE OF ST. LAWRENCE LAKES

Lakes.	Statute miles.		Area. Square miles.	Average depth. Feet.	Height above sea. Feet.
	Length.	Breadth.			
Superior . . .	354	162	31,800	688	602
Michigan . . .	316	118	25,590	690	581
Huron	207	101	23,200	700	581
St. Clair . . .	25	20	441	15	570
Erie	239	59	10,000	90	572
Ontario	193	53	7,260	412	246
St. Francis . .	38	4	83	36	142
St. Louis . . .	15	5	57	30	58
St. Peter . . .	30	7	130	8	0
St. John	28	20	350	3 to 50	314
Nipigon	70	40	1,730	540	852
Simcoe	30	18	300	125	701
Timiskaming . .	75	7	117	600	515

It will be seen by the above table that the bottoms of some of the great lakes are below the sea-level, and the surface of the highest is only 600 feet above the sea. This great system of waterways is like an arm of the ocean itself.

The river system tributary to the St. Lawrence is remarkable for the length and number of its streams. As before stated, the river flows on the southern edge of its basin, and all the great tributaries are from the north. It is a Canadian river, for seven-eighths of its drainage is on Canadian soil. It will be impossible even to mention more than a very few of the tributaries of this immense system. They will be treated of more in detail in the chapters on the separate provinces to which they belong.

Commencing on the north, it must be noted that the central plateau of Labrador is on an average 1800 feet

high, and not far distant from the shores of the gulf. The rivers are very numerous, but are not navigable; for many falls and rapids are encountered before the level of the sea is reached. Almost the longest is the Manikouagan (325 miles long), a rapid stream falling into the River St. Lawrence west of Pointe de Monts. Its source is a lake with a double outflow—one by the Koksoak river to the north into Hudson Strait, and the other to the south in a course of 224 miles, with short reaches of lake, and with much broken water. The Outarde, which falls in near it, is 234 miles long. Farther west is the Saguenay, a profound and gloomy stream like a Norway fiord, flanked by precipitous cliffs. The largest man-of-war may steam up for sixty miles between the mountains on its shores. At Chicoutimi (71 miles) navigation is interrupted by rapids. The Saguenay is the outlet of Lake St. John, a lake 28 miles by 20, almost a circular basin, which collects the water of several large streams. The Ashuapmuchuan, one of its tributaries, leads up to the portage to Lake Mistassini, whence Rupert river flows into Hudson Bay. The length of the Saguenay from the outlet of Lake St. John is 112 miles. Father Albanel was the first white man to explore this route when, in 1672, he followed it to Hudson Bay.

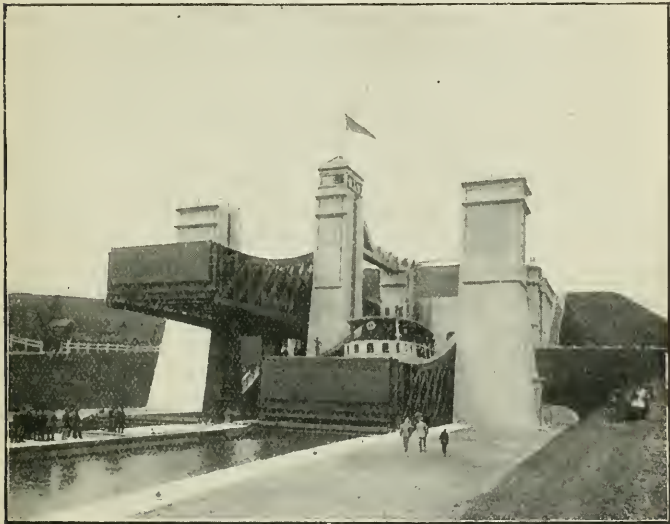
The Ottawa, with its total length of 685 miles, is the most important tributary to the St. Lawrence. The city of Montreal is built on an island, formed at its confluence with the St. Lawrence where, flowing in from the west, it strikes with its darker water the clear flood of the larger river flowing in an acute angle from the south-west. The waters do not mingle, but flow side by side until they reach the tide. Navigation on the lower Ottawa is obstructed by the St. Anne's Rapids and the rapids of the Long Sault at Carillon.

These are overcome by short canals, and steamers may go up as far as Ottawa city, where the falls of the Chaudière bar further progress. There are, however, steamers on all the upper reaches of the river. The Ottawa was the fur-traders' route to the great west. In 1615 Champlain went up the Ottawa and followed the Mattawa, one of its tributaries, to Lake Nipissing. From thence he passed down French river into Lake Huron, and wintered there with the Hurons. A ship canal has been projected to follow the same route, and so cut off the peninsula of south-west Ontario. Such a canal would lie on a direct east and west line from the junction of three great lakes at the Strait of Mackinaw, and would save 570 miles of navigation. In 1686 the Chevalier de Troyes led an expedition up the Ottawa to capture the English forts on Hudson Bay. He passed up by the short portage leading to Lake Abitibi, which discharges into Hudson Bay by a river of the same name.

The most important of the tributaries to Lake Ontario, from the north, is the River Trent, which opens up a world of lakes in the heart of that province. In 1616 Champlain came down with a great Huron war party from Lake Huron by the River Severn, and Lake Simcoe, and over the portage to the River Trent, into Lake Ontario. This route is now being improved for modern business by canals and dams. The largest lift-lock on the North American continent has been constructed along the Trent Valley Canal near Peterborough, Ontario. There are no rivers of importance on the northern shores of Lakes Huron and Superior, because the water-parting of Hudson Bay approaches very close to their shores. At Michipicoton is the main route for the Moose river, and at Nipigon is the route for the Albany river—both large rivers falling into Hudson Bay. Their head waters are

close to the lake, and the portages to these waters have been used from the early times of the fur companies.

Returning now to the east and following the south shore of the St. Lawrence, the tributaries are comparatively small; but they are important because they open up adjacent river systems to the south. At Rivière du



LIFT-LOCK ON TRENT VALLEY CANAL, NEAR PETERBOROUGH, ONTARIO.

Loup the head waters of the St. John river of New Brunswick are only 25 miles distant, and the old route of the war parties of the Mohawks was from there to the Madawaska. The Chaudière river, falling in near Quebec, rises close to the head waters of the Kennebec, and by that route Arnold came in 1775 from Maine to besiege Quebec. The Richelieu river was called, in the early French days, the *Rivière aux Iroquois*, for it was the track of their invasions. The Richelieu is navigable

for large vessels from St. Johns to the head of Lake Champlain. A canal, 12 miles long, overcomes the rapids and completes the navigation from the St. Lawrence to Whitehall, in the state of New York, at the head of the lake. The Richelieu discharges the water of Lakes George and Champlain, and down its valley swept the tides of invasion to and fro in the wars of old colony days. Crown Point and Ticonderoga were the French fortresses, and Fort William Henry and Fort Edward the chief English defences. The head waters of the Hudson are very close to those of the Richelieu, and they are connected by a canal. There was the most vulnerable point both of the English and French provinces, and nearly every headland and stream have romantic historic memories. Fenimore Cooper has made this region, as well as the route by the Mohawk river to Oswego, classic by his "Leather Stocking Tales."

Farther west, from the south shore of Lake Erie, the whole valley of the Ohio lay open from the St. Lawrence. At Presqu'isle, on the site of the present city of Erie, the head waters of the Alleghany river approach the shores of the lake, and from this river the French had a line of forts to the present Pittsburg, Fort Duquesne. This is the region of Braddock's defeat, and of Washington's early services for the king. Where Toledo is now built the Maumee river leads to the head waters of the Wabash, which falls into the Ohio, and that was another favourite route of the French.

From Lake Michigan the upper Mississippi lay open ; for at Chicago the Des Plaines river approaches so close to the lake shore, and the divide is so low, that it is proposed to carry the city drainage, not into the lake, but into the Mississippi. By that route, in 1682, La Salle led his followers and, first of white men, traced the great

Mississippi to the Gulf of Mexico, and took possession for the king of France of that magnificent valley now the centre of the power of the United States. At the foot of Green Bay, on the west side of the lake, the Fox river falls in, from whose head waters a portage of a mile and a half leads to the Wisconsin river. In 1673, by this route, Louis Jolliet and Father Marquette reached the Mississippi and followed it as far as the Arkansas.

These are the main portage routes, and they show how the St. Lawrence valley cuts all the communications of the interior of the continent with a transverse band of deep and navigable water, and, although railways have to a great extent superseded water-ways, these facts are yet necessary to elucidate the history of North America and show how it was possible for the small population of New France to keep the English Colonies in check for so many years. The settlements of the English colonists were taken in rear, where they were weak and straggling, and the incursions of the French and their Indian allies retarded for a long time the advancing line of settlers westwards.

In the same manner to the south, the head waters of the Red river lie far south of the source of the Mississippi, and the divide is so low that in the glacial period the whole outflow of the Winnipeg sub-basin was by the Mississippi. Farther west the Souris river, a tributary of the Assiniboine, affords access to the Missouri, and, indeed, the basin of the Missouri actually enters Canada in the province of Saskatchewan, whilst the main river itself flows close to the international boundary of 49° . It was by the Souris that the Sioux used to send their war parties into the Cree country, and the River Assiniboine means "River of the Stony Sioux"—a tribe of the Dakota nation. The Saskatchewan sub-basin continues to the Rocky Mountains, and the function of

the St. Lawrence in the east is that of intervening between the great southern and northern watersheds of the continent and of supplying a key to both.

These two basins, thus traversing the water systems of the continent, are not continuous; for the height of land of the Hudson Bay basin follows the north shore of Lake Superior at no great distance, turns to the south at the head of the lake, and reaches south, within the United States, to gather in the waters of Red river. To pass from Lake Superior into the Winnipeg basin it is therefore necessary to cross this height of land, which is from 1500 to 1600 feet above the sea-level, and as the watershed on the St. Lawrence side is narrow, the way is rough and many falls and rapids have to be overcome.

The country between Lake Superior and Lake Winnipeg is a tangle of forests and lakes and swiftly flowing streams—a wilderness of rock and morass and foaming rapids and precipitous waterfalls. It is the summit level of four great watersheds. To the northeast the Albany river drains directly into Hudson Bay; to the west the Lake of the Woods collects the waters of innumerable streams to pour them down by the Winnipeg river into Lake Winnipeg; to the east are the streams flowing into Lake Superior; and not far away across the border in Minnesota to the south, the head waters of the Mississippi begin to form the great river which pours its flood into the tropical basin of the Gulf of Mexico. Kenora, formerly Rat Portage, at the outlet of the Lake of the Woods, is a centre of business activity where there are immense lumber and flour mills. This region is also the centre of a number of gold-mining enterprises. A long belt of good farm land runs along the north shore of Rainy river, but the country generally can never be other than a mining and lumbering region.

The great hydrographical feature of this country is the Lake of the Woods. It is the pivot of that great circle of lakes stretching down the St. Lawrence and sweeping up past the Arctic circle to Great Bear Lake. It is 70 miles long and 60 wide; but its outline is indented to an extraordinary degree, and its northern portion is filled with islands. The water area is given as 1851 square miles. The lake drains a basin of 36,000 square miles. Its main tributary is Rainy river, a noble stream flowing from Rainy Lake. Steamers and steam-tugs ply over it, and, if the lock at Fort Frances were completed, there would be a continuous navigation for steamers through Rainy Lake and river and the Lake of the Woods for 250 miles. At the northern corner of the Lake of the Woods is Kenora, where the Winnipeg river commences its swift career and, through falls and rapids, drops 300 feet in a comparatively short distance.

Before the construction of the "Dawson Route" through this territory there were but two great water routes. One is now the line of the international boundary, and was called the Grand Portage; and Grand Portage Bay, still on the maps, marks its eastern end. The other commenced at Thunder Bay, and was used by the French fur-traders and adopted by the North-West and Hudson Bay Companies. By the Grand Portage it is only 60 miles to the height of land. The route is by Pigeon river, and through a succession of lakes to South Lake, 1535 feet above the sea, or 935 feet above Lake Superior. Many laborious portages have to be made to overcome falls and rapids, but the distance across the summit to North Lake is very short. The descent is also laborious through many lakes by Rainy Lake and Rainy river to the Lake of the Woods. The fall from the summit

to the Lake of the Woods, which is 1057 feet above the sea, is 516 feet. The remainder of the fall to the level of Lake Winnipeg (347 feet) is by a series of falls and rapids on the turbulent Winnipeg river in its course of 163 miles.

The fur-traders' route to the Lake of the Woods from Fort William on Thunder Bay was the one adopted by Colonel Wolseley in his expedition to Red river, with the difference that the old canoe route went up the Kaministikwia into Dog Lake, and up Dog river to the height of land. He led his force of 1048 men up the Kaministikwia and the Matawin rivers into Lake Shebandowan, and crossed the summit almost at the shore of Lac des Mille Lacs. From thence he followed the old canoe route, by way of Sturgeon Lake and river, into Rainy Lake, and thence by Rainy river into the Lake of the Woods. The divide is 1570 feet high, about the same as on the other route, but the main lift is in the 48 miles from Lake Superior to Lake Shebandowan, which is 800 feet above it and close to the summit portage. At Lake La Croix both routes unite and pass by way of Rainy Lake into the Lake of the Woods—the central basin.

It will thus be seen that a dividing ridge 1000 feet high separates the navigable water of Lake Superior from that of Lake Winnipeg, and that the whole band of intervening country is studded with lakes and streams. The distance is 400 miles, and no doubt the long stretches of quiet water would have been utilized before now in some system of communication had not the Canadian Pacific Railway intervened to make the required connection. The days when the old fur-traders kept high state at Fort William, and when these lonely river reaches were vocal with the songs of the *voyageurs*, are gone; but the town of Kenora is stirring with active enterprise, and

the railway has become the link between the two great basins of the continent.

The St. Lawrence river basin has been described here because it extends throughout the whole of old Canada and cannot be treated of excepting as a whole. A brief enumeration and tabulation of the other hydrographic basins included within the Arctic basin and within the Pacific basin are added, but a fuller description of these will fall conveniently into other chapters—the Winnipeg river system into the chapter on Manitoba and the North-West, the Mackenzie valley in the chapter on the Mackenzie Basin, the Hudson Bay, the Yukon, and the Arctic in their respective chapters. The object of this section is to show the paramount importance of the St. Lawrence valley as the key to the whole inner continent. In the far west of Canada there is a place with a radius of not many miles where rise the sources of the Saskatchewan flowing east, the Mackenzie flowing north, the Missouri flowing south-east, the Columbia flowing south-west, and the Fraser flowing west. This is the critical geographical point of Dr. Oliver Wendell Holmes's poem, *The Two Streams*, from whence he has drawn a deep moral lesson.

Yon stream whose sources run
 Turned by a pebble's edge
 Is Athabaska rolling toward the sun
 Through the cleft mountain-ledge.

The slender rill had strayed,
 But for the slanting stone,
 To evening's ocean, with the tangled braid
 Of foam-flecked Oregon.

So from the heights of will
 Life's parting stream descends,
 And, as a moment turns its slender rill,
 Each widening torrent bends.

From the same cradle's side,
From the same mother's knee,
One to long darkness and the frozen tide,
One to the Peaceful Sea.

Note.—In common with the United States to the south, the Dominion of Canada shares equally in all the benefits which accrue from those vast bodies of fresh water known as the "Great Lakes," which form so potent a factor for good in the economical development of both countries. With much wisdom and forethought these natural resources have been utilized, with other waters and water-ways, as the International Boundary Line under the special charge of a Joint non-political Waterways Commission, whose function is to guard the interests of both peoples in an equitable and just distribution of the valuable assets they represent.

Lake Winnipeg Basin.—This basin is 350,000 square miles in extent, being nearly the size of France and Spain, which have together a population of 58,000,000 souls. The Saskatchewan river, draining 158,000 square miles of this basin, extends west to the Rocky Mountains, and from Edmonton to the forty-ninth parallel. The Winnipeg river has a drainage area of the same size as that of Ottawa, namely, 55,000 square miles, equal in size to England and Wales.

The Mackenzie River Basin has a drainage area of nearly 700,000 square miles. The chief tributaries of the Mackenzie are the Athabaska and Peace rivers. Except at Grand Rapids and Fort Smith Rapids, navigation in this basin is uninterrupted from Athabaska Landing to the Arctic, a distance equivalent to that from Halifax to Winnipeg.

The prairie rivers of Manitoba, Saskatchewan, and Alberta drain a territory of nearly 1,000,000 square

miles, through two outlets, the Nelson and the Mackenzie rivers.

British Columbia.—The Fraser river, 400 miles long; the Okanagan river and lake, nearly 80 miles in length; the Columbia river and its expansions in the Arrow lakes, some 200 miles, together with the Kootenay river, form a series of parallel north and south valleys dividing the mountains.

St. Lawrence Basin.—The watershed area of the St. Lawrence river is 550,000 square miles, one-sixth of which is the water system of the Great Lakes, which constitutes the most remarkable reservoir system in the world. The Great Lakes and the St. Lawrence afford the greatest inland navigation route known. West of Montreal a system of canals has been constructed at a cost of \$80,000,000, so that a 2200-ton boat can sail from the Atlantic 2264 miles into the interior of the continent through St. Lawrence waters, whilst ocean liners of thirty feet draught freely ascend to Montreal.

The Pacific Basin

The river basins included in the Pacific Drainage Basin and the areas which they cover are here enumerated:—

Alsek river basin	11,200 square miles.
Blackwater ,,	5,600 ,,
Chilcotin ,,	7,500 ,,
Columbia ,,	39,300 ,,
Fraser ,,	91,700 ,,
Kootenay ,,	15,500 ,,
Lewes ,,	35,100 ,,
Nachako ,,	15,700 ,,
Nass ,,	400 ,,
Pelly ,,	21,300 ,,
Porenpine ,,	24,600 ,,
Stewart ,,	21,900 ,,

Stikine river basin	.	.	.	300 square miles.
Skeena	„	.	.	19,300 „
Taku	„	.	.	7,600 „
Thompson	„	.	.	21,800 „
White	„	.	.	15,000 „
Yukon	„	.	.	145,800 „

The Arctic Basin

The river drainage systems of the northernmost portion of the Dominion discharge their waters into the Arctic Ocean, and include the following:—

Athabaska river basin	.	.	.	58,900 square miles.
Back's	„	.	.	47,500 „
Coppermine	„	.	.	28,100 „
Hay	„	.	.	25,700 „
Peace	„	.	.	117,100 „
Liard	„	.	.	100,700 „
Mackenzie	„	.	.	682,000 „

Part of the Arctic basin lies in the western half of the great V-shaped mass of Archæan crystalline rocks, in the Barren Grounds region west and north-west of the Hudson Bay basin, where lakes and swift-flowing rivers connecting them form a network of water-ways of greatest value to travellers in those remote regions. By far the greatest basin is that of the Mackenzie river, with many large streams and tributaries flowing from the Cordillera, some of which still await the explorer and geographer for more accurate information than we possess up to the present time.

The Hudson Bay Basin

North and west of the Atlantic basin, just described, lies the great interior basin of Hudson Bay with a total

drainage area of 1,486,000 square miles, extending from the Rocky Mountains on the west to Cape Chidley on the east (*i.e.* between 65° and 117° west longitude, and from 46° north latitude on the south, in Minnesota, to 72° north latitude in Cockburn Land). A low col separates the waters of the Hudson Bay basin from those of the Arctic basin, as represented in its most important sub-basin of the Mackenzie river, so that the great fur companies of the west had several ways of ready and unobstructed access open to them to Hudson Bay or to the Arctic Ocean.

The different river sub-basins of the Hudson Bay basin include the following:—

River.	Square Miles.	River.	Square Miles.
George	20,000	Nelson	370,800
Koksoak	62,400	English	20,600
Big	26,300	Winnipeg	44,000
Eastmain	25,500	Red	63,400
Rupert	15,700	Assiniboine	52,600
Broadback	9,800	South Saskatchewan . .	63,300
Nottaway	29,800	Belly	8,900
Abitibi	11,300	Bow	11,100
Missinaibi	10,600	Red Deer	18,300
Moose	42,100	North Saskatchewan . .	54,700
Kenogami	20,700	Saskatchewan	158,800
Albany	53,800	Churchill	115,500
Attawapiskat	18,700	Kazan	32,700
Winisk	24,100	Dubawnt	58,500
Severn	38,600		

The climatic and physical conditions of the country around Hudson Bay differ so much from those of the rest of Canada that they must be considered in a separate chapter; nevertheless, as the great Laurentian V-shaped plateau has been shown to be the nucleus of the continent, so Hudson Bay, which occupies the interior of the plateau, is, geographically, a most important feature

of the Dominion. South and south-east of it stretches the St. Lawrence basin, to the south-west the sub-basin of the Winnipeg system, and to the west the basin of the Mackenzie.

The interior of the Laurentian nucleus is occupied by the inland salt-water sea of Hudson Bay, and its outward edge is encircled by a succession of immense inland expanses of fresh water, extending from the Great Bear Lake in the Polar circle on the west, round by the south. The water-parting of the Hudson Bay basin is far within the Laurentian plateau, and is not marked by bold highlands, but near it on both sides is an inner circle of smaller lakes or lake-like expanses of the streams.

The Lakes of Canada

Canada is *par excellence* a country of lakes. Besides the Great Lakes, Superior, Huron, St. Clair, Erie, and Ontario, forming part of the St. Lawrence river system, we have not only the innumerable series of large and small lakes, dotting the Laurentide country as the firmament is dotted with stars by night, but an almost continuous zone of fresh-water lakes, varying in size from a hundred square miles and less to upwards of 11,000 square miles, occurs along the contact of the disturbed and contorted primitive crystalline rocks of the "Great Shield" of Suess with the palæozoic and for the most part flat-lying sedimentaries. In this zone are noted Lakes Simcoe, Nipissing, Nipigon, Rainy Lake, Lac Seul, the Lake of the Woods, Lake Winnipeg, Lake Manitoba, Winnipegosis, Moose, Cumberland, Bear, Montreal, La Rouge, Doré, La Plonge, Clear, Buffalo, Ile à la Crosse, La Cloche, Reindeer, Wollaston, Black, Athabaska, Claire, Great Slave, and La Martre Lake, together with a double

chain of lakes, without names, extending to Great Bear Lake. North of this latter lies another series of some eighteen lakes extending towards Franklin Bay, also unnamed, and varying in size from upwards of 400 square miles to less each. Then from Lake Ontario north and eastward to Hudson Bay and the Atlantic chains and zones of lakes occur in vast numbers, among which are those of the Laurentide Hills and Labrador, as well as those of the St. Lawrence river, which latter form expansions of this great stream which flows to the ocean as a highway of civilization and commerce in a comparatively recent channel, lakes alternating with rapids and shallows as is the case with young rivers. Thus, from the city of Kingston, at the foot of Lake Ontario to Montreal, by way of the Thousand Islands, we have the Galops, Cedar, and Long Sault Rapids, Lake St. Francis and Lake St. Louis, Lachine Rapids, and the Hochelaga current with Lake St. Peter forty miles below Montreal. At the head waters of the Richelieu river lies Lake Champlain, a magnificent sheet of fresh water, the tercentenary of whose discovery was celebrated in 1910, whilst the eastern townships of Quebec, with their superb well-wooded mountains and fertile valleys, have charming lakes, of which Memphremagog, Brome, Megantic, and Magog are typical examples. Throughout its entire area the Labrador peninsula, and south-westerly to the boundary between Ontario and Quebec, is dotted with lakes of considerable and small size, including Tinniskaming, Abitibi, Grand Lake Victoria, Mattagami, Expance, Quinze, Mistassini, Albanel, St. John, Chibougamau, Atikonak, Ashuanipi, Evans, and Lake Melville near Hamilton Inlet.

THE NORTH-WEST TERRITORIES, ETC.

The lakes of these Territories given by White as the most important, together with dimensions, are as follows:—

	Square miles.		Square miles.
Aberdeen	515	MacKay	980
Apiskigamish	392	Maguse	490
Atikameg	90	Martre, Lac la	1225
Aylmer	612	Minto	235
Baker	1,029	Mishikamats	123
Cedar	285	Mishikamau	613
Clearwater	478	Moose	552
Clinton-Colden	674	Nichikun	208
Cormorant	141	North Indian	184
Dubawnt	1,654	Nueltin	303
Etawney	625	Nutarait	343
Franklin	123	Payne	747
Garry	680	Pelly	331
Gods	319	Playgreen	223
Granville	392	Red Deer	97
Gras, Lac la	674	Reeds	86
Great Bear	11,821	Richmond	270
Great Long	245	Sandy	245
Great Slave	10,719	Setting	58
Indian House	308	Shultz	123
Island	551	South Indian	1531
Kaminuriak	368	Thaolintoa	184
Kaniapiskan	441	Todatara	208
Kiskitto	69	Trent (English river)	134
Kiskittogisu	122	Trent (Severn river)	233
Lansdowne	98	Upper Seal	270
Lower Seal	221	Wekusko	83
MacDougall	319	Yattikyed	858

BRITISH COLUMBIA

The lakes of British Columbia are most picturesquely situated amid a sea of mountains, with snow-clad peaks and forested slopes, forming gems of beauty and purity in a land of virgin grandeur. The following list is selected from White's Atlas of 1906:—

	Square miles.		Square miles.
Adams	52	Owikano	98
Atlin	343	Quesnel	147
Babine	306	Shuswap	124
Chilko	171	Stuart	221
Harrison	123	Tagish	139
Kootenay	221	Taku	135
Lower Arrow	64	Teslin	245
Okanagan	136	Upper Arrow	99

NOVA SCOTIA

	Square miles.
Bras d'Or	230
Little Bras d'Or	130

These are the two largest bodies of water which Nova Scotia can claim within its land surface. There are, however, a number of lakes and lakelets as well as ponds which afford excellent scenery and fine fishing in many parts of this peninsula of Acadia.

NEW BRUNSWICK

Grand Lake, 74 square miles in area, is the most important body of fresh water in this province.

Romance of the Great Lakes

Campbell caught the true spirit of these inland waters of Canada when he wrote :—

Domed with the azure of heaven,
 Floored with a pavement of pearl,
 Clothed all about with a brightness
 Soft as the eyes of a girl ;
 Girt with a magical girdle,
 Rimmed with a vapour of rest,
 These are the inland waters,
 These are the lakes of the West.
 Voices of slumberous music,
 Spirits of mist and of flame,
 Moonlit memories left here
 By gods, who long ago came,

And vanishing, left but an echo
In silence of moon-dim caves,
Where haze-wrapt the August night slumbers,
Or the wild heart of October raves.

Here where the jewels of Nature
Are set in the light of God's smile,
Far from the world's wild throbbing,
I will stay me and rest me awhile,

And store in my heart old music,
Melodies gathered and sung
By the genius of love and of beauty
When the heart of the world was young.

Lake Superior (Lac Bourbon of French explorers, Gotchegami and Missisagiegon of the aborigines) forms a crescentic basin some 540 miles in length with a coast line of 1700 miles, and is the largest body of fresh water known at present on the surface of the globe, covering an area of 31,800 square miles. "One is impressed more and more with the lonely grandeur of this vast reservoir of fresh water," Campbell writes, "with its marine area of 32,000 square miles. It is here alone among all the lakes that there is witnessed that wild, rugged aspect of coast and lake scenery, which belongs to this lake alone. Along its northern and western shores, lofty cliffs and rock-piled headlands loom in titan grandeur from their silent wilds of unbroken forest, save where the pioneer has made his presence felt in the wasteful destruction of Nature's noblest resources." . . . "Lake Superior has a fourfold interest for the student of its waters and shores. To the admirers of natural scenery it offers some of the most sublime and picturesque coast-line and water expanse to be found in either hemisphere. To the disciple of history and exploration it has been the historic highway and haunt of *voyageur* and explorer from Radisson to

Henry. To the geologist and mineralogist it is a field of perhaps the most wonderful deposits of silver and copper ore known to the modern world, while its iron and other mines are world-famed. But by far its greatest importance to the true student is because of its prehistoric remains of the ancient civilisation which, at a remote period, peopled its shores and sailed its waters."

With the lakes of Canada Campbell holds converse in the following illuminating words:—

You lie in moon-white splendour
 Beneath the northern sky ;
 Your voices, soft and tender,
 In dream-worlds fade and die,
 In whispering beaches, haunted bays and capes,
 Where mists of dawn and midnight
 Drift past in spectral shapes.

Beside your far north beaches
 Comes, late, the quickening spring :
 With soft, voluptuous speeches
 The summer, lingering,
 Fans, with hot winds, your breasts so still and wide,
 When June, with tranced silence,
 Drifts over shore and tide.

Here, the white winter's fingers
 Tips with dull fires the dawn ;
 Where the pale morning lingers
 By stretches bleak and wan ;
 Kindling the iced capes with heatless glow,
 That renders cold and colder
 Lone waters, rocks, and snow.

Here in the glad September,
 When all the woods are red
 And gold, and hearts remember
 The gone days that are dead ;
 And all the world is mantled in a haze ;
 And the wind, a mad musician,
 Melodious makes the days.

And the nights are still, and slumber
 Holds all the frosty ground ;
 And the pale stars whose number
 In God's great books are found,
 Gird with pale flames the spangled, frosty sky ;
 By white, moon-curved beaches
 The haunted hours go by.

Of the beautiful and much-visited Muskoka region in the highlands of Ontario, the same writer states:—
 “This district is a vast stretch of country mostly rock-covered with forest, and dotted over with hundreds of picturesque lakes of all shapes, sizes, and depths, from miles wide to mere ponds. It is many hundreds of square miles in extent, and bears the same natural characteristics as the great Laurentian range of which it forms a part. It is rich in a magnificent forest of pines, hemlocks, maples, and balsams, all of splendid growth. Its fertile forest life on its stratum of almost nude rocks is a marvel to the naturalist.

“Here are to be found those ancient primæval

Walls of green where the wind and the sunlight stir,
 Rippling windows of light where the sun looks through,
 And spaces of day that widen, and blue beyond
 Out to the haze-rimmed, purple edge of the world :

Aisles, whose pavements are etched with ghosts of moving
 Leaves, and phantom branches rafted above,
 Wind-swayed arches racking under the blue,
 Breathing under the dim, stirred peace of the world.

“Here, to-day, in this seemingly wild region of water and verdure-clad rocks, are some of the most delightful and healthful summer resorts and retreats on the American continent. All through the vast maze of their islands and bays and capes, and curved shores, are to be found secluded cottages, or summer hotels in some instances reaching the palatial in their appearance, equipment, and power of entertaining their guests. As a

rest-resort, especially for tired nerves and feeble lungs, Muskoka has no rival anywhere."

About the lakes and in the forests of the "Algonquin National Park" of Ontario, the sheltered and peaceful home of the feathered tribe, the

Haunted monarch of the drear,
Wide palaces of leafy gleams,
Swift of nostril, hoof, and ear;
Who through a thousand years of fear
Hath fled the wolf-rack in his dreams,

no longer fears the chase—and "on its shores in the rocks and woods, chickadees, nuthatches, brown creepers, red-starts, woodpeckers, kingfishers, and night-hawks, are among the shy denizens of those remote haunts."

The song of the hermit-thrush is heard
By some grave gateway, large, of evening dream,
When all the sunset world seems ages old
In sad romance and aching of dead wrong;
And all the beauty of life is poignant gold
In the hermit-thrush's song.

By their shores, yellow, black, and white warblers are heard and seen; and the whip-poor-will utters at evening its plaintive note; while game, such as partridge and duck, haunt the wood, roads, and the reedy shores; and on still early autumn days are seen and heard in the hazy, marshy places the meditative crane, and

Here by some lonesome marshy lake
Is heard the loon's lone cry.

Evolution of the Great Lakes

The following sketch of the history of the Great Lakes, giving their origin and extent as glacial lakes, their outlets, and various interesting phases through which they passed during and subsequent to the glacial

epoch, as revealed in the phenomena surrounding them, has been prepared from Professor Frank Leverett's latest pronouncement on the subject, the result of many years of careful studies in the Lake region of Canada and the United States.

The Great Lakes primarily owe their origin to glaciation, nevertheless the factors of erosion and chemical dissolution play a considerable part. The Ice Age was preceded by high elevation in north-eastern America, as attested by the presence of a deep submerged valley in the Gulf of St. Lawrence and elsewhere, and it is highly probable that this elevation also affected the great Lake region from Superior to Ontario; but no bodies of water existed where the Great Lakes now stand before the last Glacial epoch. The area, in all likelihood, consisted in broad lowlands bordered by belts of higher land. "The bed of Lake Ontario reaches now the lowest altitude of any of the Great Lakes. This and many features in erosion drift deposition, as well as weighting and depression by ice accumulation in the glacial and interglacial periods, present a succession of events of great importance and value. The pre-glacial valleys of this region were so modified by the invasion of the ice sheet as to form peculiar basins which the melting ice and snows of the warmer times that accompanied the recession of the ice-mass filled, giving rise to the Great Lakes, at first "glacial lakes" of varying sizes, and flowing by different outlets in different directions at different times.

In the last stage of glaciation the Labradorean ice sheet, defined by Tyrrell and traced in its shifting centres of dispersion by Low, had a general and maximum direction of movement to the south-west, whilst the Keewatin ice mass moved in a southerly direction, but anteriorly, so that the mantle of drift or "till" covering

Diagrammatic representation of successive positions of ice border, by Frank Leverett & Frank B. Taylor

1910.

(Data for Eastern Wisconsin from Alden & Weidman)

To face p. 55



much of north-eastern America from the Labradorian Glacier covered the sheet of Keewatin "till," or drift deposits. A study of the succession and origin of the Great Lakes during the recession of the Labrador ice sheet shows that there was "no great difference in the dates of the beginning of the lakes in the south-west end of the Superior, Green Bay, Lake Michigan, and Lake Erie basins, whereas the lakes formed in the Huron and Ontario basins were much later. A lake in the Saginaw basin south-west of Lake Huron was earlier than in the southern end of Lake Huron. The lake in the Ontario basin came in the latest of any in the large basins, being situated farthest north-east, and consequently nearest the centre of dispersion of the ice."

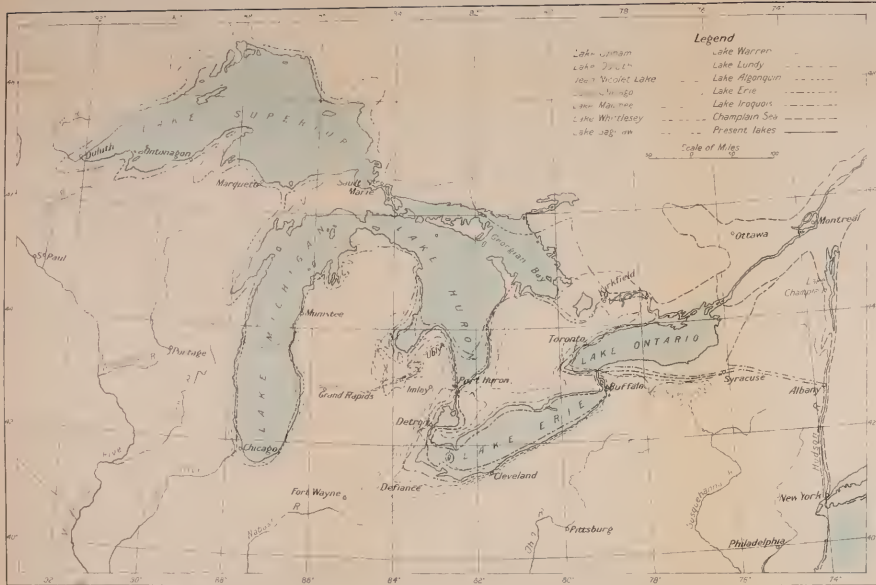
LAKE SUPERIOR BASIN

Lake Superior waters began some time after a few minor lakes had formed along the ice border, of which "*Lake Upham*," in the St. Louis river district, constitutes the first though transient body of water which occupied the earliest part of the drainage basin of Lake Superior after the melting of the ice sheet, and "*Lake St. Louis*," a name applied by Winchell to a body of water formed by the shrinking of the ice border, having a lower level in the St. Louis river drainage basin. Later, again, "*Lake Nemadji*," about thirty square miles only in extent, was formed after a little more shrinkage of the ice border some 500 feet above Lake Superior of to-day. During the life of these latter the ice sheet still covered completely the area of Lake Superior. "*Lake Duluth*."—This lake came into existence as the ice fringe continued to melt at the south-western extremity of the present Lake Superior basin. A little farther east "*Lake*

Otonagon" arose in the north-west portion of Michigan while Lake Duluth was still young. A little more shrinking of the ice mass made "Lake Duluth" and "Lake Otonagon" one, the St. Croix outlet acting as the line of discharge of the United Glacial Lake. The highest shore of Lake Duluth is 1016 feet above sea-level, whilst at Calumet it reached an altitude of 1303 feet above sea-level, due to a differential uplift. With further withdrawal of ice on the southern part of the Lake Superior basin, the waters became connected with those in the Lake Michigan and Lake Huron basins to form the Great Glacial Lake "*Algonquin*," of which more will be said later.

HURON-ERIE BASIN

Besides "*Lake Maumee*," formed by the waters of the melting Huron-Erie ice sheet lobe, "*Lake Chicago*" came into existence at the southern extremity of the Michigan lobe by the surplus discharge of the waters of Lake Maumee through the Grand Imlay outlet formed southwest of the Saginaw lobe of the ice sheet. "*Lake Arkona*" is the name given to that large glacial lake which preceded the advance of the ice. Its limits north are not well known, though it probably included part of the Saginaw basin and the district east of the Thumb, and extended south and easterly beyond the site of Buffalo—near Alden—where its beaches are well seen duplicating the features observable on the Thumb. "*Lake Whittlesey*," with the best-defined beach in this basin, marks an advance of the ice sheet accompanied by drainage through the Uby outlet between the Saginaw lobe and the Huron lobe of the ice front, covering a wide area of Ontario, New York, Ohio, and Michigan. The Uby outlet discharged to a small lake—" *Lake Saginaw* "



Map of the Glacial Great Lakes of North America, compiled from data by Leverett, Taylor and others

—in the portion of the Saginaw basin south-west of Saginaw Bay, and thence through the Grand River outlet to Lake Chicago. "*Lake Warren*" was formed by dint of a renewed recession of the ice border from the northern part of the Thumb, when Lake Whittlesey abandoned the Ubyly outlet and the Huron-Erie waters joined with those of the Saginaw. This lake covered a vast area extending over the Finger lake region of Central New York and "on all sides of Lake Erie." The ice prevalent in the Ontario basin at this time prevented an eastward discharge, and its waters flowed through the Grand River to Lake Chicago. "The water-level was sufficiently high to submerge the site of Niagara Falls to a depth of 250 feet."

In the further shrinkage of the ice border in the Ontario basin and the opening of passages eastward, came an abandonment of the Grand River outlet through the Mississippi basin to the Gulf of Mexico, and the establishment of a new outlet for the Great Lakes through the Mohawk Valley to the Atlantic Ocean by way of the Hudson Valley, together with the inception of the Niagara cataract due to a lowering of the water-level some 150 feet below that of the crest of the Falls. "*Lake Erie*." — Inasmuch as the eastern part of the Erie basin had suffered considerable differential uplift subsequent to the draining of Lake Warren, the beginning of Lake Erie was a small body of water in the eastern part of its basin, which has been extended westward with the raising of the outlet.

ONTARIO BASIN

Lake Iroquois.—This lake began as a narrow strip along the southern border of the ice sheet at the south

side of the Ontario basin, and expanded gradually northward as the ice melted back. The discharge continued through the Mohawk valley as the ice still blocked the Frontenac Axis, preventing discharge to the sea by way of the St. Lawrence valley. The level of glacial Lake Iroquois was much higher than the present level of Lake Ontario.

Champlain Sea.—Further melting of the ice sheet to the north-east allowed the Atlantic waters from the St. Lawrence and Lake Champlain marine areas to come into the Ontario basin, the level of the sea standing at a level slightly higher than the present shore of Lake Ontario; “but in the remainder of the basin the old sea-level shore passed beneath the waters of Lake Ontario. The differential uplift subsequent to this invasion of the sea has given Lake Ontario its present extent and level.”

LAKE ALGONQUIN

“Upon the extinction of *Lake Warren*, and the withdrawal of the ice from the vicinity of the Straits of Mackinac and the Saint Mary’s river, a single large river, known as ‘*Lake Algonquin*,’ occupied the basins of the three upper lakes Superior, Michigan, and Huron, and part of the intervening territory. Some time during the life of glacial *Lake Iroquois* the ice uncovered the Trent valley in Ontario, and gave an outlet for the waters of Lake Algonquin into Lake Iroquois in the Ontario basin. Prior to this the discharge had been either through the Chicago outlet or through the St. Clair outlet, or perhaps both of these outlets.” Professor Coleman has noted shore features on the north-east border of Lake Superior basin up to an altitude of about 1400 feet above the sea, or 800 feet above Lake Superior, which are thought to represent the work of Lake Algonquin.

The *Algonquin Lake* stage was brought to an end by this opening of an eastward passage along the ice border into the Ottawa Valley, just as "*Lake Warren*" was brought to an end by the opening of a passage along the ice border into the Mohawk Valley. The Ottawa Valley is several miles in width, and the ice border appears to have shrunk across it from south to north so that the earliest discharge was along the face of the south bluff.

NIPISSING GREAT LAKES

These lakes, so called "because of the close association of the Nipissing shore at its latest stage with the shore of the modern lakes in the Huron, Michigan, and Superior basins," began with the complete lowering of the lake waters to the level of the low pass that leads from Georgian Bay eastward past Lake Nipissing into the Ottawa Valley. "The present small lake (330 square miles), known as Lake Nipissing, lies near the head of the old outlet." Uplift followed and progressed, accompanied by eastward discharge and subsequent resumption of the St. Clair river outlet. The "*Nipissing Beach*," of long duration, was formed after the lake had expanded so as to have two outlets, (1) by the St. Clair, and (2) by the Ottawa river. "It is therefore the beach of the two-outlet stage."

The tilt-lines of the Nipissing and of the Algonquin shores do not coincide, the amount of tilting in the former being much less than that affecting the latter.

The horizontal portion of both beaches extends over about the same area, including Saginaw Bay, Lake Huron, two-thirds of Lake Michigan, and the tilting affects the entire area of the Superior basin. There has been about 100 feet of uplift at the head of the Ottawa outlet since

it was abandoned. The abandonment of this (Ottawa) outlet marks the beginning of the modern Great Lakes.

The uplift, which Gilbert has determined to be still in progress, and in about the same direction as that in the Nipissing shores, that is, in a general north-north-east direction, if extended, would naturally bring the waters of Lake Erie to the level of those of Lake Huron and Lake Michigan, the present difference of level being only 7 or 8 feet, and in the course of time would bring the waters at Chicago high enough to flow once more into the Mississippi basin. There might then be a two-outlet stage (such as occurred in the case of Lake Nipissing), one outlet as at present over Niagara Falls, and the other outlet south-westward along the old Chicago outlet. A further continuation of the uplift might result in the abandonment of the Niagara outlet, as the rate of uplift, determined by Professor Gilbert, is only .42 feet per 100 miles in a century, that is, somewhat less than 2 feet in 100 years at the opposite extremities of the Georgian Bay and Lake Michigan body of water.

THE NIAGARA GORGE

The gorge at Niagara bears on its sides earmarks of the past history of the Great Lakes. When only Lake Erie discharged over the Falls, the bed of the gorge was excavated to a shallow depth, but when the abundant discharge of "*Lake Algonquin*" was added, a deeper excavation took place in the vicinity of the whirlpool. Again, when the Nipissing Great Lakes had an eastward discharge, and Lake Erie once more discharged alone over the Falls, a shallow portion of the bed of the Gorge between the whirlpool and the Suspension Bridge marks the work done by the small Lake Erie outlet. Since

the modern Great Lakes came into existence at the abandonment of the Ottawa outlet and the close of the Nipissing Great Lakes, a deep excavation of the bed of the gorge set in which continues to the base of the present Canadian or Horseshoe Fall. The rate of recession of Niagara Falls has been variously estimated. Professor Leverett contends, and his determinations appear sound, that not less than 15,000 years as a minimum, and perhaps 30,000 years as a maximum, have elapsed since the cataract came into operation when Lake Warren had given place to Lake Erie.

It would then follow that the time involved in the entire lake-history from the beginning of glacial *Lake Chicago* and *Lake Maumee* down to the present cannot well be less than 20,000 to 25,000 years, and it would considerably exceed 30,000 years on the basis of the larger estimate of the recession of Niagara. "This places the culmination of the last stage of glaciation back some 50,000 years or more," and serves to indicate in a rude way the order of magnitude of the time involved in the changes shown in the history of the Great Lakes which owe their origin to glaciation as stated at the outset.

Water Powers

No accurate estimate has ever been made of Canada's water powers. They are, however, very extensive and widely distributed. The most reliable information available is that of the "Commission of Conservation for Canada," as given by the Hon. Clifford Sifton, M.P., at the First Annual Meeting of the Commission held at Ottawa in January 1910, when the following figures on this subject (p. 16) were submitted:—

	Possible horse-power.	Developed horse-power.
Yukon	470,000	3,000
British Columbia	2,065,500	73,100
Alberta	1,144,000	1,333
Saskatchewan	500,000	...
Manitoba	504,000	18,000
North-West Territories	600,000	...
Ontario	4,308,479	331,157
Quebec (exclusive of Ungava)	6,900,000	about 75,000
New Brunswick	150,000	...
Nova Scotia	54,300	13,300
Totals	16,696,279	514,890

At 22 tons of coal per horse-power per annum (24-hour day), the total possible horse-power is equivalent to 367,318,118 tons of coal per annum, so that actually developed horse-power in Canada—514,890—used to the full extent, replaces 11,327,580 tons of coal per annum.

Water Powers.—The Interior Department estimate of Canadian water powers aggregates 25,682,907 horse-power, of which only 500,000 horse-power is developed. The largest power is that on the Hamilton river in Labrador, where 9,000,000 horse-power are available, whilst the Canadian or Horse-Shoe Falls at Niagara comes next in order of importance. These powers are divided as follows:—

	Horse-power.
Quebec	17,075,939
Ontario	3,129,168
British Columbia	2,000,000
Alberta	1,000,000
North-West Territories	600,000
Saskatchewan	500,000
Manitoba	504,000
New Brunswick	150,000
Nova Scotia	54,300

Of the above, the Ontario Hydro-Electric Commission has the largest scheme of transmission in the world, and

electric power can be transmitted at highest voltage known, 110,000. Fifteen municipalities have already arranged for hydro-electric power in Ontario (January 1910), at an average cost to the consumer of \$22 per horse-power per year as against \$60 per horse-power for the same period, from coal or steam plant, for 24-hour day, thus effecting an annual saving of \$1,039,300.

Engineer Coutlee of the Ottawa Storage Survey has estimated that the Ottawa river drains an area of 55,700 square miles. Of these 10,000 lie to the south, and are drained by the Madawaska, Mississippi, Rideau and South Nation rivers. To the north, 40,000 square miles are drained by the Dumoine, Black, Coulonge, Gatineau, Lièvre, and Rouge rivers in the corner basin, and the streams and lakes above Mattawa comprise the upper basin of 20,000 square miles, with Lake Victoria, Quinze, Expanse, Kamshigama, Kapitachuan, and Shoshokwan, to which must be added the areas drained by the Kinojevis, Montreal, and Opatatika systems of Lake Timiskaming, Lake Timagami, and Lake Kipawa.

The record of flow, storage, and estimated horse-power available from the Ottawa river at and above Ottawa is here given.

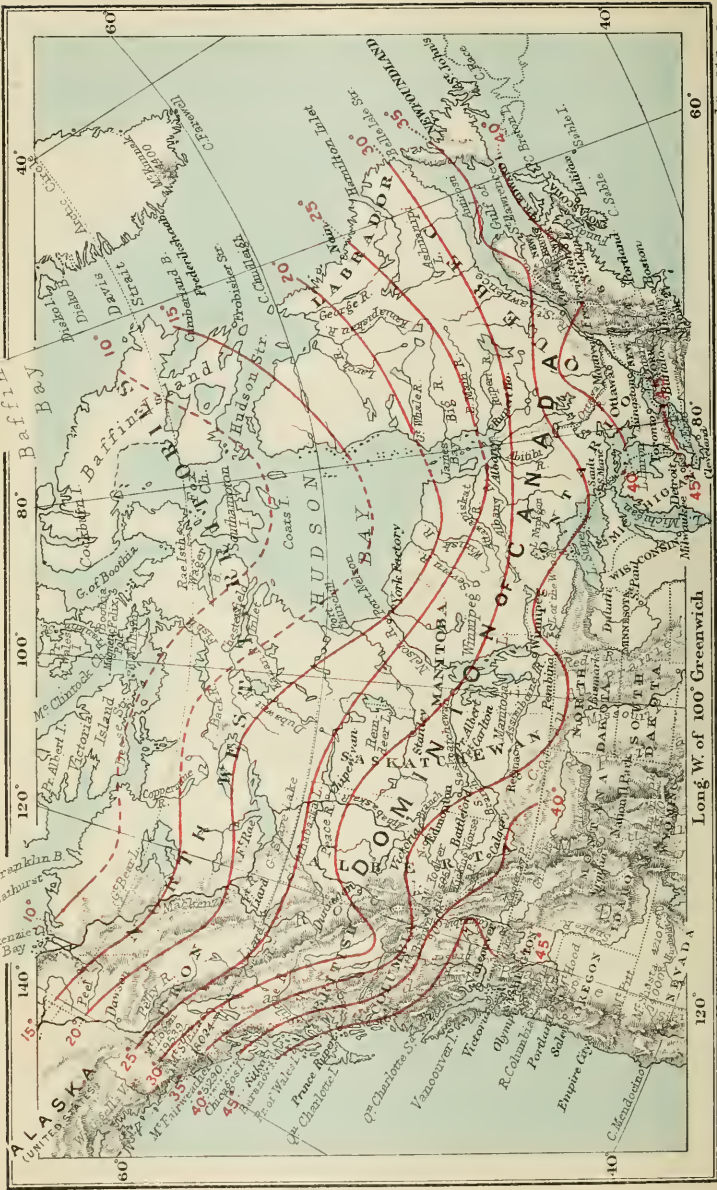
Extreme low-water flow near Ottawa	15,000 cubic feet per second.
Extreme high-water flow near Ottawa	250,000 " "
Possible storage : Lac des Quinze and Lac Expanse, 100 square miles, 20 feet deep	2,000 square-mile feet.
Possible storage : Lake Kipawa, 100 square miles, 20 feet deep	2,000 " "
Possible storage : Lake Timiskaming, 100 square miles, 20 feet deep	2,000 " "
Present development, horse-power at Ottawa (1910)	50,000 horse-power.
Possible development at Ottawa, maxi- mum when augmented by conserva- tion reservoirs	160,000 "
Area drained by Ottawa river above con- fluence with St. Lawrence at Montreal	55,700 square miles.

Climate

In a previous chapter it has been shown that the Arctic current, in its south-western course, lowers the temperature along the north-east coast of the American continent, and that parallel geographical conditions existing in the Pacific Ocean elevate the temperature along the north-west coast; of necessity, therefore, the isothermal lines cross the continent in a north-west direction. The meteorological charts of Dr. Buchan in the *Challenger Report* show a line of mean January temperature of $+15^{\circ}$ Fahrenheit alike at Halifax in lat. 45° as in Alaska at lat. 62° , and the mean temperature of the year is shown to be nearly 45° at Montreal, not far from lat. 45° N., and in Alaska at lat. 56° . The mean temperature of 70° in July in like manner is shown to extend from Montreal to lat. 55° in the far west. These figures are approximately correct; the scale of the maps is too small to show minor differences, but the main proposition is confirmed that there are across the continent lines of equal summer and of equal winter temperature as well as a line of equal annual temperature extending north-westwardly through fifteen degrees of latitude. In central Canada these lines bend in waves of greater or less amplitude according to local circumstances and as affected by great bodies of water, or by such influences as the Chinook winds, but the general result is that spring opens as early on the Upper Peace river in lat. 56° as at Montreal in lat. $45^{\circ} 30'$, and the seeding time is actually earlier.

The maps annexed are compiled from the recorded observations of the Meteorological Service of Canada, the result of many years' work. They show the mean annual

MEAN ANNUAL TEMPERATURE



0 100 200 300 400 500
SCALE OF ENGLISH MILES

Long W. of 100° Greenwich

London : Edward Stanford, Ltd., 12, 13, & 14, Long Acre, W.C.

Stanford's Geogr. Estab^y London.

isotherms and the total annual precipitation in inches reduced to terms of rain.

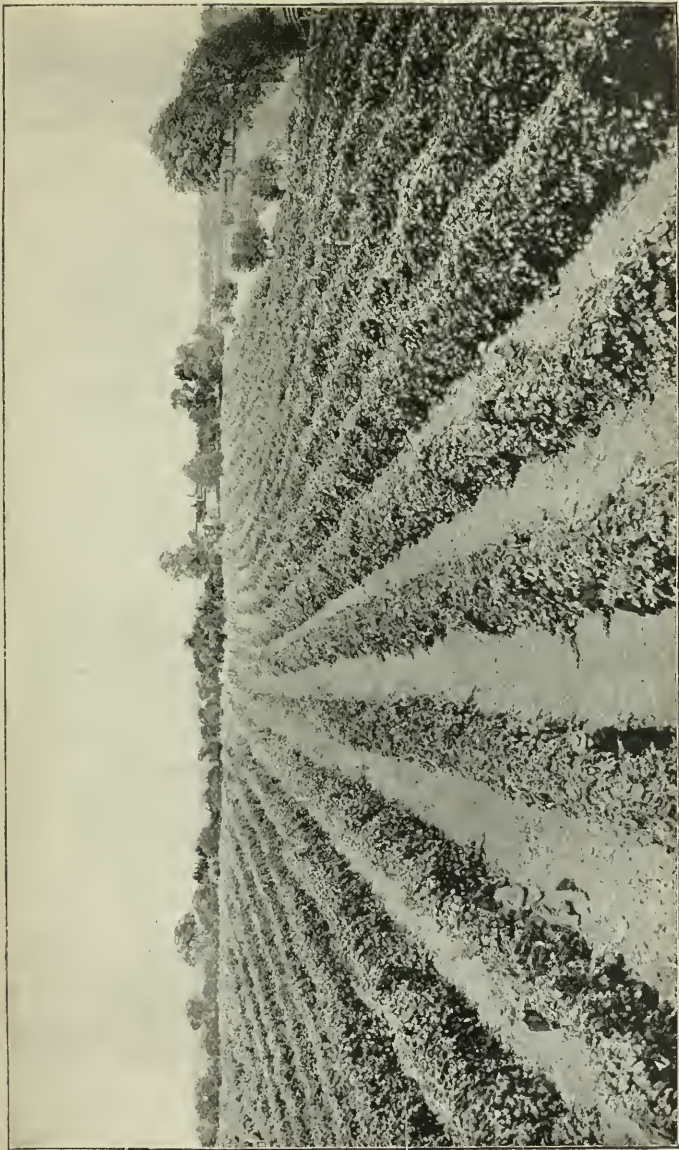
In treating of the several provinces of Canada it will be necessary to recur frequently to the question of climate as it is affected by the different physical circumstances of each. Many false ideas of the climate have been rooted



CROP OF MAIZE—NEAR OTTAWA.

in the minds of Europeans by the exuberant vitality of the promoters of winter carnivals, who, in their anxiety to show the pleasures of open-air life in winter, have disseminated views of ice-palaces and such like things until the name of Canada has in many minds become indissolubly associated with ice and snow. Nevertheless, a Canadian winter is "a thing of beauty and a joy for ever," as Sir Wilfrid Laurier once remarked on

a July first celebration of the Canadian Confederation in a well-known London Hotel. And, even if Mr. Kipling still persists in calling Canada "Our Lady of the Snows," no Canadian is offended or disapproves. It will, however, assist the reader to form a truer conception of the climate of Canada if he will remember that maize, which cannot be grown as a crop in any part of England, is a staple crop throughout Ontario and Quebec. On page 65 is a reproduction of a photograph taken at the Central Experimental Farm at Ottawa. The luxuriance of the growth is shown by its proportion beyond the height of a man of more than average stature standing in contact with the plants. Neither melons nor tomatoes are grown as crops in England, but they are extensively grown in Canada. In many parts of Canada grapes are grown in the open air. The illustration opposite is from a photograph of a large vineyard near Ottawa. In the more southern part of Ontario grapes are extensively grown for the manufacture of wine, and the business of grape-growing and wine-making has increased very rapidly during the last few years, as may be seen in the chapter on the province of Ontario. In the same province peach-growing gives a livelihood to a number of people. There is nothing wonderful or exceptional about this, for the Huron-Iroquois Indians cultivated maize, pumpkins, and tobacco on the site of Montreal and north of Toronto on the shores of Lake Huron, before the arrival of the whites. In the region west of Nottawasaga Bay, Champlain in 1616 visited a nation of sedentary Indians, who, because of their extensive crops of tobacco, were known as the Tobacco Nation—*Nation du Petun*; but tobacco can hardly yet be said to be grown in England. All of England is north of 50° north latitude and southern Ontario is in the latitude of Rome. The agriculture of a country does



VINEYARD, WHERE SOME FORTY VARIETIES OF GRAPES GROW AND RIPEN IN THE OPEN AIR, NEAR OTTAWA, ONTARIO.

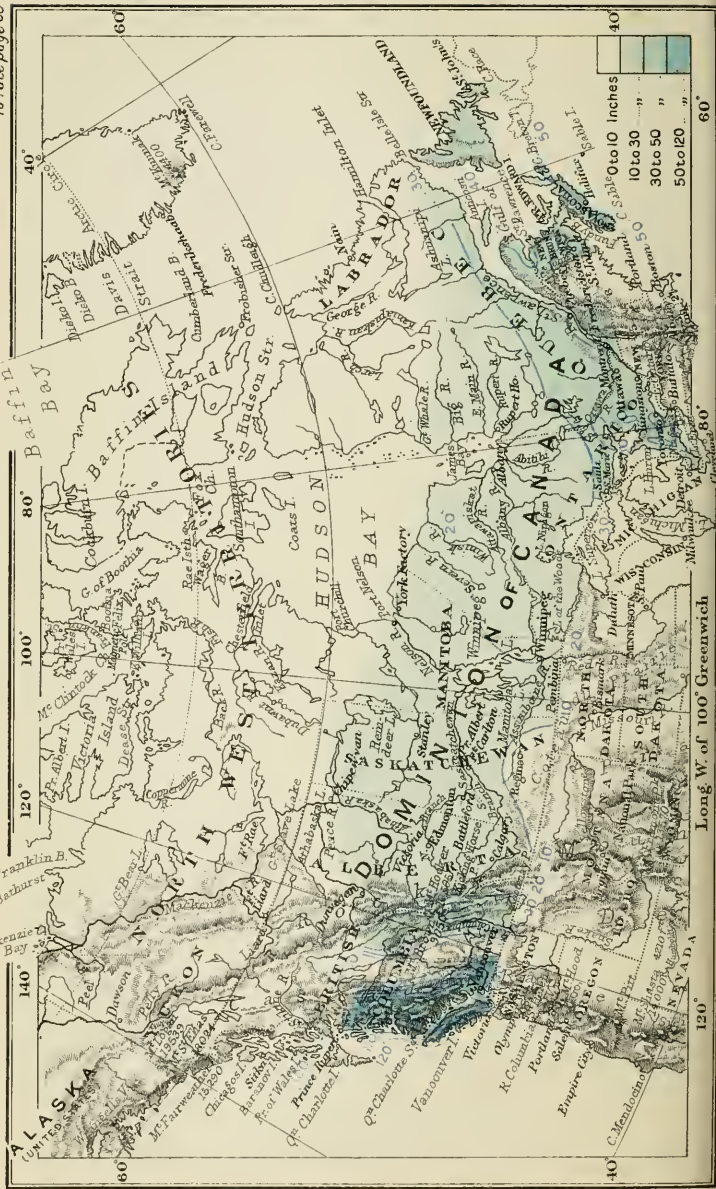
not, however, depend entirely upon latitude, but rather upon the degree of the summer isotherms. Melons, maize, pumpkins, beans, and tomatoes are crops in Manitoba, and may be grown even in latitude 53° north, on the North Saskatchewan.

These facts are also manifest by the high latitudes in which wheat is grown. It is not suggested that settlers should take up land on Lake Athabaska while millions of acres of excellent vacant wheat-lands are waiting to be tilled in Manitoba, Saskatchewan, and Alberta. These more northern lands are the reserves of Canada coming into use as the other provinces are filling up. It is true, nevertheless, that wheat has been grown for one hundred years at Dunvegan on the Peace river in lat. 56° , and that wheat grown at Fort Chipewyan in lat. 58° took a prize at the Centennial Exhibition held in Philadelphia in 1876.

The climate of Canada is continental—one of cold winters and warm summers. The average temperature of July is the same, 70° Fahr., at Battleford on the North Saskatchewan, at Montreal on the St. Lawrence, in the Biscayan provinces of Spain, and throughout the plains of Lombardy in Italy; but the winter temperatures are the same as those of Stockholm in Sweden, or of Riga on the Baltic. It is impossible, however, to generalise upon the climate of Canada, for the conditions vary over so immense an area. South-west Ontario is a wine-growing country, and grapes and peaches are staple fruit crops, while on the Arctic coast vegetation fades out altogether. It will therefore be better to refer questions of temperature to the chapters on the separate provinces. From the winter climate of the south of England to the Arctic night of the Polar circle is a wide range.

MEAN ANNUAL RAINFALL

To face page 69



Long W. of 100° Greenwich

60°

120°

40°

ALASKA
UNITED STATES

140°

120°

100°

80°

60°

0 to 10 inches

10 to 30 "

30 to 50 "

50 to 120 "

60°

60°

80°

100°

120°

140°

40°

60°

To face page 69

Rainfall

Concerning the rainfall in Canada little need be said. The hydrography proves that there can be no deficiency in precipitation, for the innumerable lakes and streams are constantly full. There is very little difference in this respect between Canada and the countries of the centre and north of Europe lying in the same latitudes. In southern Alberta and Saskatchewan what is called the "American Desert" projects north of the boundary over an area of 20,000 square miles, and in the ranching region of southern Alberta, while there is rain enough for grass, irrigation is necessary to secure farming crops with certainty. There are dry belts under the lee of the mountain ranges of British Columbia, and a belt of excessive moisture on the Pacific coast, but Canada is a country of abundance of water. Grass and forest cover it from one ocean to the other, and follow the Mackenzie northwards to its mouth on the Arctic Ocean. The immense areas of water in the great central lakes modify the climate by imparting humidity to the air and moderating those extremes of a continental climate which are developed in the centre of northern Asia. In this respect the immense inland sea of Hudson Bay, with its enormous area of 567,000 square miles of water, is of great benefit in preventing the aridity which obtains on the plains to the south of the international boundary line known as "the great American Desert."

Forests

It results, from the hydrographic and climatic conditions before recited, that Canada is a land of forest. At its discovery one dense continuous forest covered it

from the Atlantic to Lake Winnipeg; and, north of the great fertile prairies, the sub-arctic forest still sweeps round until the head waters of the great western rivers are reached, where the British Columbia forest stretches southward and westward to the Pacific. All the settled parts of old Canada and the maritime provinces have been wrested from the forest, and the rivers were the roads and lanes through the sylvan wilderness, penetrating into its darkest recesses with threads of silver. In summer the *voyageur's* canoe, and in winter the *habitant's* sleigh, made the mesh of water-ways available for locomotion long before the settler had time or means to build roads or bridges.

The forests of Canada are beginning to receive the care and attention they deserve. For nearly three centuries the forest of Old Canada was considered *the* enemy of the pioneer settler, and it had to go. To-day, the forests of the Dominion are held to be one of its greatest and most valuable assets, not only in supplying fuel and building materials, but also tempering the climate, holding back the waters that fall as rain and snow, supplying streams with abundant water during the summer and drier season, for the beverage of man and beast, for irrigation purposes, water power and the numerous industries depending upon this commodity for the health and prosperity of the nation.

Six distinct types of forests are recognized in Canada, which with their areas are as follows:—

	Square miles.
1. The Cordilleran Forest	250,000
2. The Northern Forest, densely wooded	680,000
3. The Northern Forest, not densely wooded	800,000
4. The Southern Forest	200,000
5. The Southern Forest, largely cleared	80,000
6. Mixed Prairie and Woodland	75,000
7. The Prairie	125,000

1. *The Cordilleran Forest.*—This type of forest occupies the greater portion of British Columbia mainland, Vancouver Island, the Queen Charlotte Islands, part of Western Yukon Territory, and in its eastern extent a small part of Southern Alberta. It has a great and luxuriant forest growth peculiarly its own. In the humid coast region the Douglas fir attains a height of 300 feet, and a diameter of from 10 to 12 feet, and the Western Cedar (*Thuja gigantea*) reaches even to greater proportions. Ninety per cent of this forest is made up of five species, namely, Engelmann's spruce (*Picea Engelmanni*), black pine (*Pinus Murrayana*), white spruce (*Picea Canadensis*), Douglas fir (*Pseudotsuga Douglasii*), and balsam fir (*Abies subalpina*).

Other trees of importance include: western white oak (*Quercus Garryana*), peculiar to Vancouver Island only, the broad-leaved maple (*Acer macrophyllum*), vine maple (*Acer circinatum*), bearberry (*Rhamnus Purshiana*), mountain fir (*Abies amabilis*), white fir (*Abies grandis*), western yew (*Taxus brevifolia*), Menzies spruce (*Picea Sitchensis*), western bird-cherry (*Prunus emarginata*), madrona (*Arbutus Menziesii*), and willow, alder, and cypress are also found along the Pacific coast.

From the southern interior of British Columbia in the heart of the Cordilleran forest are found: western larch (*Larix occidentalis*), western hemlock (*Tsuga Mertensiana*), mountain hemlock (*Tsuga Pattoniana*), yellow pine (*Pinus ponderosa*), western white pine (*Pinus monticola*), western white cedar (*Thuja plicata*), red cedar (*Juniperus scopulorum*), and western balsam poplar (*Populus trichocarpa*).

Besides the five species first cited from the Rocky Mountain region and those of British Columbia generally, the following additional species also occur:—

Douglas fir	<i>Pseudotsuga mucronata.</i>
Rocky Mountain pine	<i>Pinus flexilis.</i>
Black pine	<i>Pinus Murrayana.</i>
White-barked pine	<i>Pinus albicaulis.</i>
Mountain larch	<i>Larix Lyallii.</i>

2. *The Northern Forest, densely wooded.*—This forest stretches from the Mount St. Elias Range to Dawson City in North-Western Yukon, as a zone upwards of 200 miles in breadth on the Yukon-Alaska boundary line, south-easterly, through part of the Rocky Mountains, across the continent to the shores of the Gulf of St. Lawrence, traversing Northern British Columbia, a portion of Southern Alberta, Northern Saskatchewan, Northern Manitoba, as well as portions of Ontario and Quebec, together with the heart of New Brunswick and Nova Scotia.

Its greatest breadth lies between Rocky Mountain Park,¹ near Banff on the Canadian Pacific Railway, and Chipeweyan, on Lake Athabaska, more than 500 miles distant, beyond which it is suddenly pinched by the zone of "prairie" and "prairie and woodland" country, to the south and east in the provinces of Alberta, Saskatchewan, and Manitoba, until it enters the province of Ontario 400 miles broad, then narrows down to 200 miles, on the interprovincial line between Lake Abitibi and the foot of James Bay, widening again as it proceeds eastward in Quebec province, as far as Lake Mistassini, diminishing gradually to a wedge on the St. Lawrence river and Gulf between the Bay of Seven Islands and Grand Mekattina, opposite the west face of Newfoundland. This broad zone comprises not less than 680,000 square miles of densely forested land.

¹ This park, or forest reserve, lies immediately west of the prairie and woodland section, for the most part within the Cordilleran forest, but one section in its north-east corner forms part of this northern forest, densely wooded.

Some of the principal trees occurring in this zone include the following species:

—Yukon Territory and British Columbia: Balsam fir (*Abies balsamea*), Douglas fir (*Pseudotsuga mucronata*), Engelmann's spruce (*Picea Engelmanni*), black pine (*Pinus Murrayana*), mountain larch (*Larix Lyalli*), aspen (*Populus tremuloides*), Rocky Mountain pine (*Pinus flexilis*), white-barked pine (*Pinus albicaulis*), mountain balsam (*Abies subalpina*), tamarack (*Larix Americana*).

Northern Alberta, Northern Saskatchewan, and Northern Manitoba: Balsam fir (*Abies balsamea*), canoe birch (*Betula papyrifera*), ash-leaved maple (*Negundo aceroides*), aspen (*Populus tremuloides*), green ash (*Fraxinus lanceolata*), red ash (*Fraxinus racemosa*), black ash (*Fraxinus nigra*), yellow birch (*Betula lutea*), black birch (*Betula fontinalis*), tamarack (*Larix Americana*), black spruce (*Picea Mariana*), white spruce



DOUGLAS FIRS, NEAR VANCOUVER, B. C.

(*Picea Canudensis*), black pine (*Pinus Murrayana*), Jack or Banksian pine (*Pinus Banksiana*), black cottonwood (*Populus angustifolia*), cottonwood (*Populus deltoides*), balsam poplar (*Populus balsamifera*), burr oak (*Quercus macrocarpa*), bird-cherry (*Prunus Pennsylvanica*); with the following forms occurring in Manitoba only: bass-wood (*Tilia Americana*), white cedar (*Thuja occidentalis*), white elm (*Ulmus Americana*), and white pine (*Pinus Strobus*), with red pine (*Pinus resinosa*), peculiar to the south-eastern part of that province.

In Ontario and Quebec this zone of forest is traversed for a distance of 1200 miles by the new National Trans-continental Railway, and the principal trees occurring therein comprise the following species:—

Black spruce (*Picea Mariana*), white spruce (*Picea Canudensis*), white cedar (*Thuja occidentalis*), tamarack (*Larix Americana*), Jack pine (*Pinus Banksiana*), red pine (*Pinus resinosa*), white pine, occasionally (*Pinus Strobus*), white birch (*Betula populifolia*), white elm (*Ulmus Americana*), balsam poplar (*Populus balsamifera*), mountain maple (*Acer spicatum*), paper birch (*Betula papyrifera*), balsam fir (*Abies balsamea*), bird-cherry (*Prunus Pennsylvanica*), aspen (*Populus tremuloides*).

In the Hamilton river basin of Labrador there is what may be termed an outlier of this type of forest with a growth of black spruce, white spruce, larch or tamarack, balsam poplar, canoe birch, balsam fir, bird-cherry and aspen, amongst the most characteristic and valuable trees.

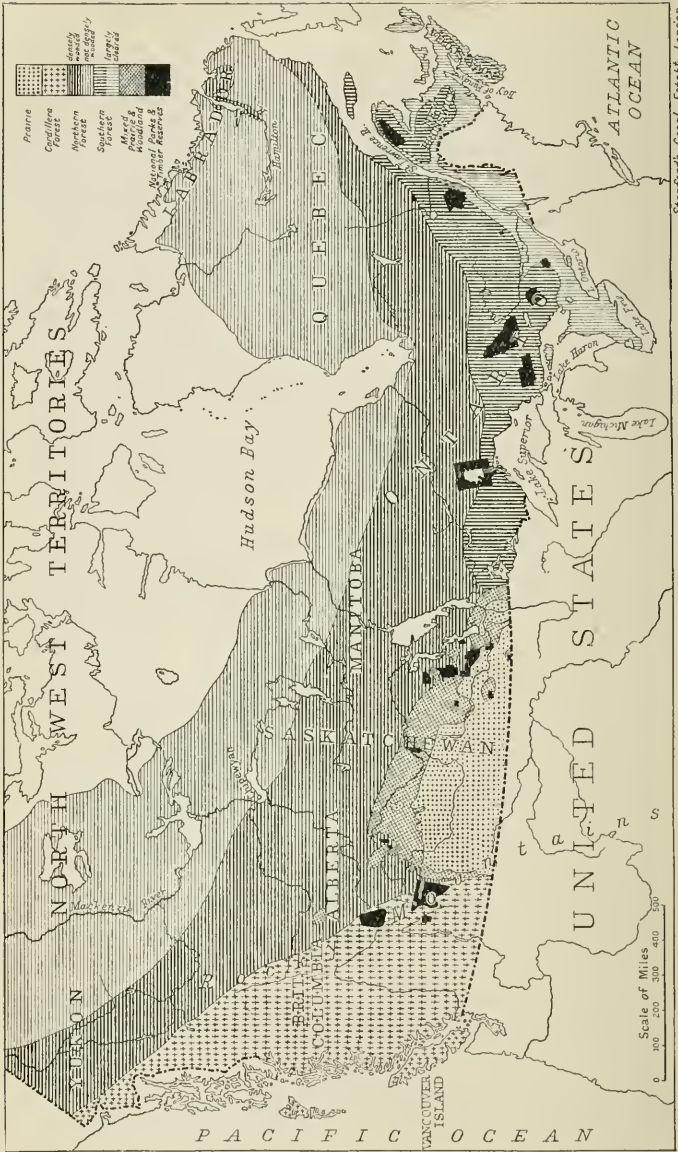
3. *The Northern Forest, not densely wooded.*—This is in part the “Sub-Arctic forest” of Professor Macoun. The line of its northern limit starts at about latitude 56° in Labrador, and passes near Churchill on the west coast of Hudson Bay; thence it proceeds in a north-west

direction to the shore of the Polar Sea at the mouth of the Mackenzie river. To the north-east of this line is the region known as the Barren Lands. The sub-arctic forest region varies in width, but it may be approximately given as from 200 to 300 miles, and this width across the continent would make its area about 1,000,000 square miles. At its southern limit the coniferous trees of the sub-arctic forest gradually change into the aspen forests of the North-West Provinces, and the mixed forests of old Canada and the maritime provinces. The coniferous trees extend down along the Atlantic coast-line under the cooler and moister conditions there existing; but, in the interior, the forest is made up chiefly of hard-wood trees and of the more valuable pines.

The sub-arctic forest, east of the Mackenzie, in what is now designated as the North-West Territories, according to Professor Macoun, is made up almost exclusively of only eight species:—

Scrub or Jack pine	<i>Pinus Banksiana.</i>
White spruce	<i>Picea alba.</i>
Black spruce	<i>Picea nigra.</i>
Tamarack, larch	<i>Larix Americana.</i>
Aspen	<i>Populus tremuloides.</i>
Balsam poplar	<i>Populus balsamifera.</i>
Paper or canoe birch	<i>Betula papyrifera.</i>
Canada balsam fir	<i>Abies balsamea.</i>

The first four of these trees are the most characteristic, and they are the last to disappear on the barren grounds at the north and east. They are not dwarfed, but retain their size and importance to the last, only withdrawing from the colder and wetter ground and occupying drier and warmer oases of soil at their extreme northern limit. The trees change their character also. Thus the Banksian pine along the northern shore of Lake Superior increases



Stanford's Geog. Essais, London.

in size, and in Northern Alberta attains a height of 100 feet and a diameter of 24 inches. In the same manner the aspen, of small account in the east, becomes in the west an important tree. The forest of the Peace river valley is composed of spruce and aspen, and this latter tree it is which touches the edge of the prairies, making the oases of woodland on the western plains, and penetrating the coniferous forest at the north. It occupies dry situations, and is considered to be an indication of good soil. The region of aspen forest extends from Winnipeg to Edmonton, a distance of 900 miles on a breadth of 50 miles, or over an area of 45,000 square miles. Balsam poplar also becomes a very large tree on the Mackenzie river and its larger tributaries. This and the white spruce are the characteristic trees of the Mackenzie valley, and attain a diameter of four feet and over. On the other hand, it is in the forests of Eastern Canada that the paper birch reaches its highest perfection. It is a much poorer tree on the Pacific coast.

4. *The Southern Forest.*—This forest covers an area of some 200,000 square miles, stretching across part of the western boundary of Manitoba and Ontario, south to the United States boundary line as far as Lake Superior and the Georgian Bay, occupying the area of Archæan crystalline rocks between the height of land on the north and the edge of the more settled flat lands of Ontario and Quebec to the south, eastwards as far as the Bay of Seven Islands on the St. Lawrence, varying from a few miles to nearly 300 miles in breadth.

This is the great White and Red Pine Forest of Old Canada, which has been the source of such valuable timber for home consumption and exportation. Only 3 per cent is held to have been cut by man, whilst forest fires have devastated enormous tracts—due either

to natural causes, such as lightning and rock slides, or, more usually to carelessness on the part of settlers, hunters, campers, locomotive engineers, etc. Fortunately enough areas of forested pine country exist to seed the remainder. The Laurentide hills are eminently suited to forest culture, and it is pleasing to note that the governments of the provinces of Ontario, Quebec, and New Brunswick, as well as the authorities at Ottawa, are interested in this southern forest, with a view of conserving and protecting it from fires by the employment of a large number of fire rangers, and establishing fire roads, guards, etc. Tree-planting on the broad and formerly treeless prairie is also in progress in the far West, but reforestation in the East is no less desirable and pursued.

The principal trees of this southern forest comprise the oaks, maples, ash-trees, etc. Red oak (*Quercus rubra*), burr oak (*Quercus macrocarpa*), white oak (*Quercus alba*), sugar maple (*Acer saccharinum*), red maple (*Acer rubrum*), striped maple (*Acer Pennsylvanicum*), white elm (*Ulmus Americana*), slippery elm (*Ulmus fulva*), rock elm (*Ulmus racemosa*), black ash (*Fraxinus nigra*), white ash (*Fraxinus Americana*), red ash (*Fraxinus Pennsylvanica*).

Butternut (*Juglans cinerea*), iron-wood (*Ostrya Virginica*), beech (*Fagus Americana*), white birch (*Betula populifolia*), canoe birch (*Betula papyrifera*), black birch (*Betula lenta*), yellow birch (*Betula lutea*), black cherry (*Prunus serotina*), bird-cherry (*Prunus Pennsylvanica*), aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*).

White pine (*Pinus Strobus*), red pine (*Pinus resinosa*), Jack or Banksian pine (*Pinus Banksiana*), white spruce (*Picea Canadensis*), black spruce (*Picea Mariana*), red

spruce (*Picea rubens*), balsam fir (*Abies balsamea*), hemlock (*Tsuga Canadensis*), tamarack (*Larix Americana*), white cedar (*Thuja occidentalis*), basswood (*Tilia Americana*), and black willow (*Salix nigra*).

The above species of forest trees abound throughout this wide area, and hard-wood as well as pine forest zones dovetail into each other in sections where diversity of exposure and soil furnish a suitable habitat. It is in the *Southern Forest* that the maples, oaks, birches, and elms with their beautiful and at times brilliant foliage and graceful form attain their highest perfection.

All the species above enumerated belong equally to Quebec and to Ontario, and also, for the most part, to Nova Scotia, and New Brunswick, where, however, basswood, butternut, and black willow are found, but not in Nova Scotia.

5. *The Southern Forest, largely cleared.*—This covers an area of nearly 80,000 square miles, and includes those low-lying portions of Ontario, Quebec, and the maritime provinces, which are most densely populated. In the mild climate and rich soil of southern Ontario, where forest growth is different from that of the zone farther north, the black walnut, tulip tree, buttonwood, chestnut, and hickories flourish. The following species are recognised:—Blue ash (*Fraxinus quadrangulata*), black walnut (*Juglans nigra*), swamp white oak (*Quercus bicolor*), scarlet oak (*Quercus coccinea*), swamp oak (*Quercus palustris*), black oak (*Quercus velutina*), white-heart hickory (*Carya alba*), small-fruited hickory (*Carya microcarpa*), hog-nut hickory (*Carya porcina*), shellback hickory (*Carya ovata*), bitter hickory (*Carya amara*), cucumber tree (*Asimina triloba*), tulip tree (*Liriodendron tulipifera*), Kentucky coffee-tree (*Gymnocladus Canadensis*), Judas tree (*Cercis Canadensis*), honey locust (*Gleditschia*

tricanthos), crab-apple (*Malus coronaria*), June-berry (*Amelanchier Canadensis*), cockspur thorn (*Crataegus Crus-galli*), downy-leaved thorn (*Crataegus tomentosa*), flowering dogwood (*Cornus florida*), sour gum (*Nyssa sylvatica*), sassafras (*Sassafras officinale*), buttonwood (*Platanus occidentalis*), chestnut (*Castanea dentata*). In the valley of the Ottawa and that of the St. Lawrence above Quebec, as well as in other parts of Ontario, the following species are recorded:— Nettle tree (*Celtis occidentalis*), red cedar (*Juniperus Virginiana*), blue beech (*Carpinus Caroliniana*), red-fruited thorn (*Crataegus coccinea*).

In the maritime provinces, the maples, birches, elms, and beeches are abundant, especially in the central parts of New Brunswick, but on the sea-level of the Atlantic and the Bay of Fundy the cooler climate brings back the spruces and firs, and pushes the deciduous trees away from the coast-line. The maple, the national emblem of Canada, is widely spread from the Atlantic to Manitoba in four species—the striped maple, mountain maple, sugar maple, and red maple. Two species, the broad-leaved maple (*Acer macrophyllum*) and vine maple (*Acer circinatum*), are found in British Columbia.

6. *Mixed Prairie and Woodland*.—North of the treeless prairie (which forms part of the great wheat-growing belt in the southern portion of the provinces of Manitoba, Saskatchewan, and Alberta, comprising some 125,000 square miles, which in ages past supported a luxuriant growth of conifers and deciduous trees, as the rock-formations underlying it attest in a marked degree), and surrounding it as a zone of semi-forested land, is found a promising type of woodland prairie, covering an estimated area of 75,000 square miles. It has also been termed the aspen forest, which extends from

Winnipeg to Edmonton, a distance of 900 miles in a breadth of 50 miles. Aspen poplar (*Populus tremuloides*), Jack or Banksian pine (*Pinus Banksiana*), ash-leaved maple (*Negundo aceroides*), green ash (*Fraxinus lanceolata*), black pine (*Pinus Murrayana*), burr oak (*Quercus macrocarpa*), white cedar (*Thuja occidentalis*), and some white pine (*Pinus Strobus*) occur here, the last two only in the south-eastern portion of this zone or type of forest.

7. *The Prairie*.—The treeless prairie, treeless by nature, except in the river valleys and sheltered spots where the fatal fires have not destroyed its prospects, covers an area of at least 125,000 square miles where many species of shade and fruit trees have been and are successfully grown. Much has been done in this respect, especially as regards fruit trees, by Dr. Wm. Saunders and the late Dr. Jas. Fletcher, of the Central Experimental Farm at Ottawa, who have been superintending the work of reforestation so hopefully begun, which, in spite of reverses, is highly promising, and bids fair to restore some day a primeval character to that land so fertile and so rich in agricultural and horticultural capabilities.

Production.—According to figures furnished by the Interior Department Report, the total value of the output of the forest products during the year 1912 was as follows:—

Lumber, lath, and shingles	\$84,000,000
Firewood	50,000,000
Pulpwood	12,000,000
Posts and rails	10,000,000
Cross ties	8,000,000
Square timber exported	1,900,000
Cooperage	1,700,000
Poles	1,200,000
Logs exported	1,100,000

Tanning material	\$1,000,000
Round mining timber	600,000
Miscellaneous exports	300,000
Miscellaneous products	10,500,000
Total	<u>\$182,300,000</u>

The lumber products by species of trees employed give the following interesting items covering the same period:—

	Fect. Board measure.
Spruce	1,409,311,000
White pine	911,427,000
Douglas fir	889,861,000
Hemlock	333,238,000
Cedar	156,022,000
Red pine	142,294,000
Birch	100,267,000
Balsam	78,841,000
Maple	77,827,000
Tamarack	73,177,000
Bull-pine	53,960,000
Basswood	52,921,000
Elm	32,949,000
Jack-pine	31,605,000
Beech	15,417,000
Western hemlock	11,856,000
Ash	12,386,000
Poplar	7,523,000
Western white pine	7,630,000
Oak	7,283,000
Chestnut	1,538,000
Hickory	667,000
Butternut	573,000
Cherry	351,000
Julip	150,000
Walnut	61,000

Forest Reserves.—Forest reserves have been created in various portions of Manitoba, Saskatchewan, Alberta, and British Columbia, as well as in the older provinces of Ontario and Quebec. Large sections have been recently added to the original reserves by an Act of Parliament,

and the total area of forest reserves in the Dominion of Canada is 150,000,000 acres. Among the most important of these forest reserves are: (1) the Rocky Mountains Reserve, comprising the whole eastern slope of the Rocky Mountains, an area of 13,000,000 acres, forming the watershed for the prairies; and (2) the reserves in the province of Quebec, which include the whole of the Great Laurentide ridge in that province.

Under the care and management of Mr. R. H. Campbell, Director of Forestry, and under the general supervision and interest paid to this branch by the Honourable the Minister of the Interior, besides the Prime Minister himself and His Excellency the Governor-General, there is no doubt that a great interest has been awakened within the Dominion, and the excellent work done by the Canadian Forestry Association, as well as by the Canadian Conservation Commission, with the Hon. Clifford Sifton at its head, and Mr. James White, Deputy-Head, will do much towards placing this great asset of Canada's forests in the forefront, to the end that permanent forests may exist and assist as they effectively do in controlling rivers and streams, preventing floods, and supplying fuel, and other materials for the manufacture of paper, lumber, and various other industries into which woody tissues enter so largely.

The total area of wooded land in Canada has been estimated at 1,248,798 square miles, or 535,000,000 acres; of this 70,000 square miles are white and red pine lands in the provinces of Quebec and Ontario.

The yearly increasing use of wood-pulp for the manufacture of paper, and of many other articles of less extensive use, gives great importance to the immense area of coniferous trees and poplars, and especially the spruces. Areas of woodland passed over by the lumber-

men afford the precise kind of wood most desirable for paper-making. Spruce is used almost exclusively for mechanical pulp, and poplar, basswood, and Banksian pine for chemical pulp. Almost anywhere at the edge of the Laurentian plateau is an ideal situation for a pulp-mill, with the forests in rear, and the water, for motive power and washing, flowing rapidly down to the plain of the St. Lawrence. Pulp-mills are being built in all the provinces of the Dominion, and the industry is flourishing in a marked degree.

In the year 1912 the province of Quebec provided wood-pulp, chemical and mechanical, to the value of \$7,810,000; Ontario, \$2,418,369; New Brunswick, \$501,925; Nova Scotia, \$444,492; and British Columbia, \$429,318; in all, \$11,604,104, this being the latest return available. Wood blocks and other, for pulp exported to the United States in 1913, amounted to 1,003,594 cords, valued at \$6,806,445.

Quantity and value of wood-pulp exported from Canada during the fiscal year ended March 31, 1913, was as follows:—

Countries.	Chemically Prepared.		Countries.	Mechanically Prepared.	
	Cwt.	\$.		Cwt.	\$.
Great Britain .	322	643	Great Britain .	1,434,649	827,490
United States .	1,055,380	1,995,817	United States .	3,313,950	2,580,462
Japan .	54,027	99,148	Japan .	1,120	750
Other Countries	2,728	5,234			
Total . . .	1,112,457	2,100,842	Total . . .	4,749,719	3,408,702

The conditions existing in Canada for the development of the wood-pulp industry are the most favourable that can be conceived.

The total yield of lumber for all Canada during the year 1913 was 3,816,642,000 board feet valued at \$65,796,438. Twenty-nine native species were cut in 1912, out of which the first *six* were soft woods. Spruce forms over a third of the total cut, whilst spruce and pine together furnished a little over one-half of the total. The output of Douglas fir in British Columbia was little less than that of white pine. Up to 1907 white pine led in the production.

Fauna

The Dominion of Canada extends from ocean to ocean along parallels of latitude, and the physical conditions of the forest region of the east, the prairie region of the centre, and the mountain region of the Pacific are different; but, now that the bison of the prairie country has been almost exterminated, there is not the diversity in the land animals which might be expected. The sub-arctic forest region to the north is a bond of union across the whole continent in which similar conditions prevail.

Commencing with the animals of the widest range: the moose (*Alce Americanus*) is common throughout the forest regions of the east, in the forests of the Mackenzie valley, and of the northern part of British Columbia. The most accessible regions for moose-hunting now are in Nova Scotia and New Brunswick and in eastern Quebec, but the moose may be found everywhere in the northern forests. The woodland caribou (*Rangifer caribou*) is now almost extinct in Nova Scotia, but is found in the forest regions of the Dominion from New Brunswick to British Columbia. This animal should be distinguished

from the Barren Ground caribou (*Rangifer Groenlandicus*) which roam in immense herds in the most northern parts of Canada, on the Arctic coasts and islands, and in northern Labrador. It is practically the same animal as the reindeer of Lapland, and inhabits the treeless plains of the uttermost north. The Virginia deer (*Cariacus Virginianus*) is the deer still hunted in the more southern forests of New Brunswick, Quebec, and Ontario, and is found also sparingly in British Columbia.

Of the Carnivora the largest is the puma, cougar, or mountain lion (*Felis concolor*), still met with occasionally in the forest recesses of southern Quebec and in the Rocky Mountains and Pacific regions. The wild cat and Canada lynx are found throughout the wooded country from east to west, and, in summer, the lynx migrates down the Mackenzie valley to the Arctic coast. The wolf (*Canis lupus occidentalis*) is another animal found throughout the unsettled portions of Canada. The variety found east of the Rocky Mountains is the grey wolf. It is almost extinct in the maritime provinces, but is sometimes heard of in the wilder parts of Ontario and Quebec, and in the North-West and Pacific territories. The black wolf is found from the Mackenzie valley to the Pacific, and the white wolf inhabits the barren grounds and the islands of the far northern regions.

Many varieties of foxes (*Vulpes vulgaris*) occur in Canada. Throughout the wooded regions are the red fox, the cross fox, the silver or grey fox; on the prairies the prairie fox (*Vulpes macrourus*) and the kit fox (*Vulpes velox*); on the Barren Grounds and to the farthest north, the Arctic or white fox (*Vulpes lagopus*) and the blue fox (*Vulpes fuliginosus*). The wolverine (*Gulo luscus*) has disappeared in the maritime provinces, and is rare in

Quebec and Ontario, but in the wooded regions of the North-west and British Columbia it is still common enough.

The following are found everywhere in Canada from ocean to ocean, and as far north as the forests reach:—the fisher or pekan (*Mustela Pennanti*), the marten, pine marten (*Mustela Americana*), the weasel (*Putorius vulgaris*), the ermine (*Putorius erminius*), the mink (*Putorius lutreolus*). The skunk (*Mephitis mephitica*) is also common throughout Canada, and, secure in its unique power of defence, is often found close to the settlements, where poultry are the objects of attraction—a playful animal not in the least anxious to get out of the way, and one which it is well rather to go round than to hurry up. The otter (*Lutra Canadensis*) is found also throughout the breadth of the Dominion, and far north beyond the Arctic circle. The habitat of the raccoon (*Procyon lotor*) is more limited; it is found in the eastern and Pacific provinces, but not far north nor in the prairie regions.

Bears of several kinds occur; the black bear (*Ursus Americanus*) is the common bear of the country, though now it is seldom met with near the settlements. It is a somewhat inoffensive animal when let alone, and prefers wild fruits as a diet, though, if very hungry, it will scarcely let anything pass. The grizzly bear (*Ursus horribilis*) is a different animal, but its habitat is restricted to the central part of British Columbia and to the Rocky Mountains, though in fact it is not often seen. This is the most formidable animal of the continent. The Barren Ground bear (*Ursus arctos*) is accounted a variety, for the common black or brown bear does not stray far from the wooded country. The polar bear (*Thalassarctos maritimus*) is a true carnivorous bear,

for it can get no vegetable food, and lives upon seals and upon fish. It is found on the coasts and islands of the Arctic Ocean and on the shores of northern Labrador.

The Rodentia occurring in Canada extend across the continent, and there are many varieties, *e.g.* the deer mouse, the wood rat, and meadow mice of several kinds. Lemmings of two kinds occur north of latitude 56° —the Hudson Bay lemming (*Cuniculus torquatus*) from Labrador to the Arctic coast and islands, and the tawny lemming (*Myodes Obensis*) around Great Bear Lake and in the Rocky Mountain region. The musk-rat (*Fiber zibethicus*) is met with everywhere throughout the Dominion, and the beaver (*Castor fiber*)—the most important creature of this order—is found throughout from east to west, and as far north as the tree line extends. This very intelligent animal is the chosen emblem of Canada, for it is at home both in the woods and waters. Hares are found also in several varieties—the polar hare (*Lepus timidus*) in the Barren Grounds and along the Arctic coasts, the prairie hare or “Jack rabbit” (*Lepus campestris*) on the western plains, the rabbit (*Lepus Americanus*) throughout the whole country to the limit of trees, and the wood hare, a grey rabbit (*Lepus sylvaticus*), common in Ontario. The Canada porcupine (*Erethizon dorsatus*) extends from the Atlantic coast to the Mackenzie, and the yellow-haired porcupine (*E. epixanthus*) from thence to the Pacific.

Of the squirrels there are very many kinds. Those chiefly met in Canada are the striped squirrel, chipmunk (*Tamias striatus*); the grey squirrel or black squirrel (*Sciurus Carolinensis*), best known in southern Canada; the red squirrel (*Sciurus Hulsonius*) from the Atlantic to the Rocky Mountains; two varieties (*S. Richardsoni* and

S. Douglassi) continue the range of this squirrel to the Pacific; the woodchuck (*Arctomys monax*), reaching from the maritime provinces round the shores of Hudson Bay to the Mackenzie river; and the flying squirrel (*Sciuropterus volucella*), which is found everywhere as far north as Great Slave Lake. Then there are the squirrels of the Rocky Mountain region, viz. Say's chipmunk (*Tamias lateralis*) and those of the western plains, viz. the grey-headed spermophile and Richardson's spermophile; and the squirrels of the far north, such as the northern chipmunk (*Tamias Asiaticus*, var. *borealis*)—Parry's spermophile (*Spermophilus empetra*)—these extend over the Barren Grounds and beyond the Arctic circle. There are also a few others of a more limited range.

Of the Insectivora the most widely distributed are moles, shrews, and bats. The star-nosed mole, the marsh shrew, and Foster's shrew are found from the Atlantic to the Rocky Mountains. The red bat, the blunt-nosed bat, and the silvery-haired bat are found all over the Dominion, and other species of this order exist with more local range.

Certain animals there are peculiar to central Canada; these are the mule deer (*Cariacus macrotis*), which extends up to, but not beyond, the coast range of British Columbia; and the prong-horned antelope (*Antilocapra*



HEAD OF PRONG-HORNED
ANTELOPE.

Americana), which is a creature of the plains. The American elk (*Cervus Canadensis*) was formerly found in eastern Canada, but is only met with now from western Manitoba to the Pacific and north of the plains. It is the same animal as the red deer; it is sometimes called



HEAD OF ELK OR CANADIAN STAG.

“wapiti,” and is most common in British Columbia, for it has been hunted to extinction almost everywhere else. The pest of the prairies is the gopher (*Thomomys talpoides*). There are several varieties of gophers and prairie dogs; they burrow in the ground and undermine the surface with their colonies and villages, so that horses' feet break through, and riding becomes in places unpleasant and

even dangerous. They are a great annoyance to farmers. Badgers also are common on the plains. The coyote (*Canis latrans*) is also an inhabitant of the western plains.

The story of the bison, or western buffalo (*Bos Americanus*), is disgraceful to civilisation. The animal is



BISON AT SILVER HEIGHTS, MANITOBA.

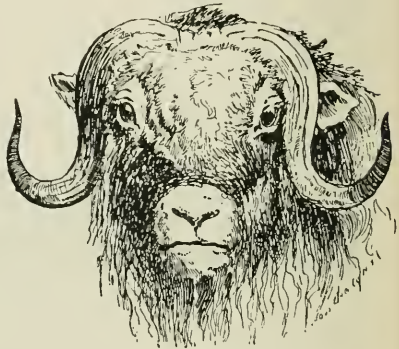
practically extinct. The Indians used to live upon buffalo, and if they alone had hunted it the species would still survive; but the white men, when the railways crossed the plains, brought all the destructive forces of civilisation to bear, and never rested until the last accessible buffalo was killed. The bones of the slaughtered creatures whitened the plains and were sold for fertilisers and other purposes. A few individuals are

preserved on Lord Strathcona's farm, near Winnipeg, and there are rumours of a few wood buffalo surviving somewhere in the Mackenzie valley. As late as 1858 a traveller across the plains drove with ponies for ten successive days through a continuous herd, and the prairie was black with animals as far as the eye could reach.

Some animals are peculiar to the Rocky Mountains and British Columbia. The Rocky Mountain goat (*Aploccerus*



ROCKY MOUNTAIN SHEEP.



HEAD OF MUSK OX.

montanus) is still common on the mountains, and is even increasing in numbers, as well as the Rocky Mountain sheep or big horn (*Ovis montana*). The horns of this latter animal are curved like those of a ram and are very large. It does not seek the highest peaks like the goat. Both these animals are limited in their range to the Rocky Mountains, but the goat delights in the precipitous cliffs and snowy peaks. There is also a small deer (*Cariacus Columbianus*) met with on the coast.

Besides these animals already mentioned as extending

their range beyond the Arctic circle, the musk ox (*Ovibos moschatus*) must be mentioned. It does not come south of lat. 59° , and its range is through the Barren Lands to and along the Arctic coast and over the islands of the Arctic archipelago. The Eskimo dog must also be included in any list of Arctic animals. It is found wherever the Eskimos have been met with, whether on the Atlantic or Arctic coast, or on the islands of the Arctic archipelago.

The marine animals of Canada, on the Atlantic and Arctic coasts, differ from those found on the Pacific. Only one variety of seal—the harbour seal or fresh water seal (*Phoca vitulina*) is found on both oceans. Its range does not extend far north, but it is met with in Hudson Strait. The other varieties extend from the Gulf of St. Lawrence and the coasts of Newfoundland, far away along the coast of Labrador, and along the Arctic coast and islands. It is the main support of the Eskimo, and provides his food and clothing, his light and warmth. His canoes and all his implements of war or peace are derived almost entirely from the seal. The ringed seal (*Phoca fatida*) is most common in Hudson Strait. The harp seal (*Phoca Grœnlandica*) is the most common seal on the coasts of Newfoundland and Labrador. The hooded seal (*Cystophora cristata*) is found from the Gulf of St. Lawrence to the Arctic Ocean, and the bearded seal (*Erignathus barbatus*) has the same range to the south, but reaches far along the Arctic islands as well. Besides the seals, the walrus (*Odobenus rosmarus*) is a common denizen of the Arctic seas of Canada. In the times of the early sailors its range was as far south as Nova Scotia and the Gulf of St. Lawrence. It has been driven by hunters away north to Labrador, Hudson Bay, and the Arctic Ocean.

Although these animals are found in the Polar ocean

as far north as explorers have penetrated, they do not, save in the one instance above cited, extend down Bering Strait into the Pacific.

The animals of the latter ocean are the northern fur-seal (*Callorhinus ursinus*) on the west coast of British Columbia; the sea-lion (*Eumatopius Stelleri*), which goes north of the fur-seal; the California sea-lion, which has a farther southern range; and the sea otter (*Euhydria lutris*) on the British Columbian coast. It was the trade with China in the fur of this last animal that brought British Columbia first into notice.

Birds

Both Professor John Macoun, Dominion Naturalist, and Montague Chamberlain, in their catalogues of *Canadian Birds*, enumerate some six hundred varieties. These, for the most part, migrate to the south in winter when the streams and ponds freeze over and the ground is covered with snow. They breed and rear their young in the north, but must follow the open ground and water to find their food. Those birds which live upon buds and berries remain all winter.

Among the birds of prey are the golden eagle and the bald eagle, four varieties of gyrfalcon, twelve of hawks, and twelve of owls. Some of these breed within the Arctic circle and winter in southern Canada. Of the smaller birds the woodpeckers are most widely extended and are represented by nine varieties. The perchers are very numerous, there being over a hundred varieties—thrushes, warblers, jays, sparrows—the most showy of these birds are the belted kingfisher, the scarlet tanager, the humming birds, and the orioles. Among the thrushes are the sweetest singers—the robin or red-breasted thrush is very common all summer in the parks and gardens of

the cities. Of gallinaceous birds many varieties of partridge, ruffed grouse, and ptarmigan are found abundantly over all Canada in summer and winter and up to the Arctic circle. The passenger or wild pigeons, which used to darken the air in their migrations, are now very rarely met with, the wild turkey, which used to be plentiful in southern Ontario, has also become very rare. The waders are numerous represented by plover, snipe, and woodcock, and by herons and bitterns. The great blue heron is a common variety.

It is, however, in the order of *Natatores* that Canada is pre-eminent—the ducks and geese are natives of the northern part of the Dominion, and there they breed in prodigious numbers on the thousands of lakes remote from the haunts of men. In the fall they migrate southwards, stopping on their way in southern Canada until the lakes and streams begin to freeze, when they go south as far as the southern states and the Gulf of Mexico. As many as thirty varieties are enumerated, and, to adopt the theory laid down by the United States in the fur-seal controversy, they are all Canadian born subjects visiting the south for a short time in winter, but always *animo revertendi*; for their domiciles are in Labrador, Hudson Bay, and the great northern lakes. The number of these birds shot for food in the north is immense, and they form a large part of the staple food-supply of the Hudson Bay posts. One of the old officers of the Company calculated that 80,000 geese are annually killed for the posts around the Bay alone, besides those killed along the Mackenzie and in other parts of the fur countries. They pass in immense numbers to the south late in fall and return early in spring, generally flying very high, and they come back invariably to the place of their birth to breed.

The coasts of the Dominion abound with waterfowl, gulls, puffins, auks, guillemots, murre, besides ducks and geese. The islands in the Gulf are clouded with sea-fowl—the Bird Rocks, the Percé Rock, and the uninhabited rocky islets of the long Labrador coast are the breeding-grounds of almost every kind of water birds. More than half of the fresh water of the world is in the Dominion, and is gathered up in myriads of lakes from the still pools of innumerable streams to the sea-like expanses of the great lakes. There is no other country like the Dominion for water, and it is not wonderful that there is no other country like it for water-fowl.

Fishes

The sea-fisheries of Canada are well known. The Atlantic coast waters abound with cod, mackerel, herring, shad, haddock, halibut, and its shores with lobsters and oysters. Some of the largest items of export from Canada are products of the fisheries, and their money values will be found in the tables of exports. Many foreign vessels flock to Canadian waters to share in these treasures, and the Dominion employs a regular fleet of cruisers to enforce the fishing laws and to guard the rights of Canadian fishermen. The Pacific waters of the Dominion also swarm with food fishes. The prodigious runs of salmon in the rivers of the Pacific coast are widely known by the immense quantities of canned fish exported. Large numbers of salmon, identical in species with the salmon of the British rivers, are caught in the streams tributary to the river and gulf of St. Lawrence. Many of the salmon rivers are leased to fishing clubs of sportsmen, foreigners as well as natives, who camp upon them in the summer.

While the wealth of the Dominion in its sea-fisheries is well known, it is not so generally known that practically all the great lakes and rivers of the Dominion, up to the Arctic coast, abound with food fishes. Lake trout, salmon trout, speckled trout, and white-fish are caught in the farthest north in great numbers by the Indians for food and for the use of the Hudson Bay Company's posts. In one season 75,000 white-fish were caught in Great Slave Lake for the use of the Hudson Bay Company's post on the lake. The value of the fish caught in the waters of the province of Ontario alone in the year 1912-13 was \$2,842,878. In Manitoba, Alberta, Saskatchewan, and Yukon for the same period it was \$1,074,843. The production of British Columbia fisheries for 1912-13 was \$14,455,488; with 15,167 men employed, and a total value of equipment, including sealing fleet, of \$8,903,000. These were the produce of the settled parts of Canada, but beyond them are the great northern lakes, Athabaska, Great and Little Slave Lakes, and Great Bear Lake, and all the far northern waters abounding in fish. The total product of the fisheries of Canada brought to market in the year 1912-13 was \$33,389,464.

Great attention is given, not only by the Dominion Government but by the provincial Governments, to the protection of fish and game. The penalties for infringement of the close seasons are rigorously exacted, and, warned by the fate of the buffalo of the prairies, public opinion supports the laws. In some parts the number of wild animals is increasing. Parties are not now allowed to go into the woods and kill as many wild creatures as they can. Indians are allowed a necessary latitude; but the wanton destructiveness of cultivated white men is held in check. Fish-breeding establishments have been established on the shores of the ocean and inland waters, and

lobster and oyster culture is also carried on under Government officials supervised by a scientific officer. The attractions the Dominion offers to sportsmen in every one of its provinces are very great, and the people everywhere are alive to the importance of strictly enforcing the laws in this respect.

Aborigines

The wild tribes of the western world are still known by the general name, Indian, given them by the early sailors who thought they had discovered the Asiatic continent. Whatever vague traditions they have, all point to the north-west as the direction from whence they came, and to the north-west the spirits of the dead are believed to travel on their journey to the abodes of the departed. Without expressing any opinion as to the tribes of Central and South America, it seems natural to suppose that the Indians of northern America crossed from Asia by Bering Strait, and the opening of trade relations with Japan tends continually to confirm this opinion, as greater opportunities are developed for comparison between the people on both sides of the Pacific. The different tribes of Indians in the Dominion, excepting the Indians of British Columbia, are grouped according to affinities of language into the following families: 1. Eskimo. 2. Algonquin. 3. Huron-Iroquois. 4. Chipe-wyan. The island of Newfoundland was inhabited at the time of its discovery by a race of savages, the Beothiks or Red Indians, who seem to have been superior to the tribes on the adjacent coasts. They were exterminated by the whites and by the Micmacs, who were brought in by the French at Placentia, and the last of them perished some time about A.D. 1827. They had been treated with such cruelty and treachery that they

retired into the inaccessible recesses of the centre of the island, and would never trust the overtures of the Government in its later attempts to make amends for past injuries. There they passed away in silence, and their last traces were found at Red Indian Lake. The Indians of North America are called savages, and were cruel in war, but in America the whites have often been cruel in war and peace, unjust, and relentless. From the discovery of the continent they stole the unsuspecting natives and sold them into slavery—the very first name on the continent, Labrador, tells of man-stealing. What poet or painter can ever depict the last remnant of the Beothiks, which proudly and silently passed away on the shores of Red Indian Lake, spurning the proffered overtures of the whites who had persecuted them to the last family with their superior weapons! From the scanty vocabularies which have been preserved it cannot be pronounced with certainty whether or not they belonged to the Algonquin race; though the weight of authority inclines to the belief they did.

The Eskimo—Innuits as they call themselves—extend from northern Labrador to the northern shores of Hudson Bay and along the coasts and islands of the Arctic Ocean. They seldom penetrate far inland or leave the haunts of the seals that provide them with all they need—food, clothing, and implements. At some not very remote period the Eskimo crossed over into Greenland. From Alaska, along the whole immense stretch of several thousand miles of coast to Greenland, they all speak the same language and are supposed to have crossed from Asia by Bering Strait. They are a good-natured and peaceful people, and, although their first contact with the Europeans on the Labrador coast was hostile, it was the fault of the whites, who, by their violence and cupidity,

alienated and terrified them. The natural disposition of the Eskimo is seen by the assistance they have always given to Arctic explorers, and by the fact that they have never attacked isolated parties no matter how enfeebled by hunger, and yet these starving and helpless white strangers must have possessed many objects tempting to the poor natives. They are intelligent and support themselves with ease in those far northern regions where white men, with all the resources of civilisation, have seemed unequal to the task. They have much artistic capacity. Eskimo, who had never before seen pencil or paper, drew surprisingly accurate maps for Parry, Ross, and other Arctic voyagers. They are fond of music and learn to sing in harmony, and to play on various musical instruments with great readiness, and they alone of the American tribes have trained an animal, the Eskimo dog, to do their bidding. They are of middle stature, not dwarfed, as often represented, square-shouldered and very hardy beyond all other races. They are bold and daring on the water, attacking alone in their frail kayaks on the open sea the largest sea animals and yet always at peace with each other. The Indians at the south have always been their enemies. The name Eskimo is Algonquin and means "eater of raw meat," as a term of reproach, and, beyond doubt, whatever their artistic tastes may be they have not been directed to the culinary art. The Moravian missionaries have christianised the Labrador Eskimo, and those around Hudson Bay, Baffin land, and the mouth of the Mackenzie have come under the influence of the Anglican missions.

The most widely distributed race of Indians in the Dominion is the Algonquin. This great family extends from the Atlantic to the Rocky Mountains. In the maritime provinces the Micmacs, Malicetes, and Aben-

akis; in Labrador and eastern Quebec the Naskapees and Montagnais; in western Quebec and Ontario the Mississaugas, the Ojibways, and the numerous tribes which assisted the French in the old colony wars, generally grouped under the name Algonquin; in Manitoba, Saskatchewan, and Alberta, the Crees and Saulteux—all these are Algonquins, and their languages are reducible to the same stock. The Cree is the typical language of this group and is a key to the others. This race of Indians were great hunters and warriors, but had not the political organisation nor capacity of some of the races with which they came in contact. They stretched away to the south along the Atlantic coast, and were the kinsmen of the Delawares, Shawnees, and other tribes in the present United States.

The Iroquois-Huron race and its varying fortunes are inseparably interwoven with the history of Canada. A few facts seem to stand out with sufficient distinctness from the shadowy pre-historic traditions of this remarkable race. When Cartier first opened up to Europe the valley of the St. Lawrence, he found at Hochelaga (Montreal) a fortified, palisaded town inhabited by a people who cultivated the soil. These were people of the Iroquois-Huron race. The Algonquins roamed over the country to the north, and probably to the east of Three Rivers; and there were even then hostile relations between the two races, for the Quebec Indians sought to prevent Cartier from going farther up the river by stories of the fierceness of Indians, whom Cartier calls Toudamans, and in fact a people of that name are placed on a celebrated map of 1544 (Sebastian Cabot's map), near the site of Hochelaga. That map was based upon information derived from Cartier's voyages, but when Champlain arrived, seventy years later, the town of Hochelaga had dis-

appeared—not a trace remained; the Iroquois were living in the region now known as northern New York, and the Algonquins occupied the whole of the St. Lawrence valley, if roaming over the territory in war parties and hunting parties can be called occupation. The country round Montreal was without inhabitants—a debatable land—the border march of two hostile races. The Iroquois, with their fixed abodes and more civilised habits, had been driven away and Champlain had arrived just at the time when they were recovering from their disasters.

The Iroquois were the Romans of this continent in their genius for political government. Under their misfortunes their spirit rose and they organised themselves into a confederacy. There were five tribes at first—the Mohawks, the Oneidas, the Onondagas, the Cayugas and the Senecas. These last are the Toudamans of the French maps, and were called by the French Tsonnontouans in after years. They were on the extreme west, near Niagara, and the Mohawks were on the extreme east, near Lake Champlain. The council house of the confederacy was in the centre with the Onondagas. The Tuscaroras, a kindred tribe to the south, joined the confederacy later, and it was thenceforth known as the Six Nations, or generally as the Iroquois. This politic people held the balance between the English and French for many years. They were really six independent republics, organised for united defence, and the unorganised Algonquins were unable to bear up against a policy so subtle and persistent. During the seventy years between Cartier and Champlain some revolution had occurred to alienate the Iroquois from the Hurons, due, say the traditions of the Hurons (Wyandots), to a dusky Helen (so history keeps repeating the old story),

and the Hurons had been driven far away to the country between Lake Simcoe and Georgian Bay on Lake Huron. They were pursued by the Iroquois with relentless hatred and utterly destroyed as a nation. It was a political maxim of the Iroquois, as of the Romans, never to carry on more than one great war at a time and utterly to crush and root out an enemy, so as never to have the work to do over again. Having terrorised the Algonquins and ruined the Hurons, they proceeded to exterminate the Neuter nation and the Tobacco nation then living in the peninsula of Ontario. Then came the turn of the Eries and the Andastes, and their ruthless career was only arrested by contact with the powerful tribes of the Sioux. Their position was central. They were surrounded on all sides by Algonquin tribes who had not the political sense to unite and act in concert. The Iroquois were a nation of orators as well as of warriors, and they dissembled until they were in a position to strike. For more than one hundred years they were a terror to the surrounding tribes, an anxiety to the English, and a menace to the French. With most profound policy they massacred all the adults of each tribe they conquered and adopted the children, who grew up as Iroquois, and thus their numbers were kept up. Their warfare was cruel, but not more cruel than that of Cæsar in his Gallic wars—not more cruel than that of Simon de Montfort in Languedoc—nor than that of Tilly and Wallenstein in the Thirty Years' War: nor more cruel than the wars on the Turkish and Tartar frontiers down indeed to our own time. A remnant of the Hurons took shelter at Lorette near Quebec after the ruin of their nation, and a few are left, but of mixed blood. The Iroquois survive still on their reserves at St. Regis, and Caughnawaga in Quebec, and on the Grand river and

Bay of Quinté in Ontario. Of the descendants of the Six Nations there are about 9000 surviving in Canada and 7000 in the United States, without counting the Cherokees, who are of the same race.

The language of the Iroquois-Huron race is more musical than that of the surrounding people. To them we owe many of our most sonorous names, such as Toronto, Ontario, Niagara, and in their political confederacy was the germ idea of the union of the English colonies.

The fourth great group of Indian tribes is the Chipe-wyan or Athabaskan, called also the Tinneh. These roam over the region between the Algonquin Creeks and the Eskimo; west of Hudson Bay and north-west of Little Slave Lake and Lake Athabaska, including the interior of Alaska and a part of British Columbia. The different tribes are known as Dogribs, Yellow-knives, Slaves, Hares, Loucheux, Sicannie, Nahanic—and there are many others. There are outliers of this race to the south such as the Apaches and Navajos, and one of the tribes of the Blackfeet, the Sarcees, is of the same stock. In the north these Indians are of a peaceable disposition, although the Apaches and Navajos are the most untamable savages of the plains. This group of Indians is inferior to the Algonquin in intellectual capacity and civilisation as well as in physical strength.

The four great races above described are grouped by the affinities of language, although their habits differ according to their surroundings. The northern Chipe-wyans live on fish and game and have no horses, while the Apaches and Navajos are equestrian tribes. In British Columbia are many smaller tribes differing in language. In the northern part of the interior are the Tinneh already mentioned; in the southern part are the Salish or

Shuswap, and in the south-east the Kootanie Indians. On the coast the divisions are more numerous. The Haidas occupy the Queen Charlotte Islands. Along the coast



Topley, Photo.

CROWFOOT, THE GREAT CHIEF OF THE BLACKFEET.

and on Vancouver Island are the Tahimsian, the Kuakiool, the Bilhoola, and the Aht or Nootka Indians. These last are the Indians known to the first traders. A more general name, Kawitshin, includes several other tribes, probably of Salish stock, living round the Strait of Georgia.

Besides these are the Chinooks of the lower Columbia. All these are maritime tribes and build good canoes, which they manage with skill and are able to paddle almost any distance along the coast of the Pacific. Many of these Columbian Indians have settled down to steady work, and



INDIAN BOY, EIGHT YEARS OLD, BEFORE BEING SENT TO SCHOOL.

earn good wages at the salmon canneries along the coast. They seem more adaptable to the methods of civilisation than the tribes of the interior, and some even live in good houses with furniture. Since the discovery of the country a trade language has been developed known as the Chinook jargon. It is a mixture of Chinook, English, French, Nootka, and other tongues, corresponding to the pidgin-

English of the Chinese coast. By means of this "hotch-potch" trade has been carried on along the coast since the English fur-traders arrived. It is the *lingua franca* of the Pacific coast.

The Dominion has relations also with some of the



THE SAME BOY, TWELVE YEARS OLD, IN THE UNIFORM OF THE GOVERNMENT SCHOOL.

tribes of the great Sioux or Dakota race which overlap the frontier along the Missouri Coteau. The Assiniboines or Stony Sioux have given their name as before stated to one of the chief rivers of Manitoba. The Blackfeet, a powerful tribal confederation of this race, have large reservations in Alberta, and are still formidable as regards numbers.

After the great rising in Minnesota, some others of the Sioux implicated removed into British territory, where ever since they have peacefully resided.

Distribution of Aborigines

In the southern portion of Canada the natives are living on reserves. The Iroquois occupy reserves in South - Eastern Ontario and South - Western Quebec, whilst the Algonquins occupy the eastern and central provinces and Southern Ungava and Keewatin, and the Eskimos Northern Ungava, Baffin Island, and a fringe of the mainland from Hamilton Inlet, Labrador, to the Gulf of Alaska. The Athabaskans occupy Central and North-Western Canada between latitude 55° and the Eskimo country on the north and south respectively. Noteworthy is the small remnant of the once powerful Huron-Iroquois at Jeune Lorette near Quebec city, also the two small bands of Iroquois near Edmonton, and on the headwaters of the Athabaska river, who are the descendants of the hunters employed by the North-West Fur Company, and the remnant of Athabaskans, Sarcees, near Calgary; the isolated Sioux bands; and the colony of Shuswaps surrounded by Kootenays near Upper Columbia Lake.

In dealing with the natives the Canadian Government has acquired the land by definite purchase, granting certain annual subsidies and making certain defined reservations of land for their support and welfare. Great care has always been taken to see that they are not cheated by white people, and intoxicating liquors of all kinds are excluded from the "Indian" reservations. Schools for the young, and industrial schools for teaching trades to youth, are carried on, and farm instructors are stationed on the

reserves to teach the natives to cultivate the ground. Good results have followed, and much greater success is hoped for. The Dominion Government has now in hand a capital sum of \$7,287,153·24 belonging to the Indians and administered for their benefit. Official returns are made, from every agency, of the individual earnings of Indians, and they amounted in the aggregate to \$5,666,085 for the year ending March 31, 1913. This was earned throughout the Dominion by fishing, hunting, lumbering, helping farmers, and acting as guides or labourers, together with the sale of hay and other produce raised by their own hands. In British Columbia there are many Indians in good circumstances, even from a white settler's point of view.

The last report of the Indian Department, up to March 31, 1913, gives the numbers of resident and nomadic Indians as follows:—

INDIAN POPULATION OF CANADA	
Alberta	8,229
British Columbia	25,172
Manitoba	10,822
Nova Scotia	2,018
New Brunswick	1,920
Prince Edward Island	292
Ontario	26,077
Quebec	12,842
Saskatchewan	9,699
North-West Territories	8,030
Yukon	1,389
<hr/>	
Total Indians in Canada	106,490
„ Eskimos „	3,447
<hr/>	
	109,937

There are 11,144 Indian young people subjected to educational influences: 5631 males and 5513 females.

The Superintendent, Duncan C. Scott, assigns the aborigines of Canada to the following religious bodies:—

Religious body.	Adherents.
Anglicans	17,101
Baptists	1,336
Congregationalists	40
Methodists	13,058
Presbyterians	1,780
Romanists	41,918
Other Christian beliefs	1,001
Pagan	9,428
Religious belief unknown	20,828

Total 106,490 *

* Not including Eskimos.

There is no justification, writes the Superintendent, for regarding the Indian race as moribund in the Dominion. From 86,379 Indians engaged in agriculture in 1909 the number increased to 97,071 in 1913; and upwards of 65,000 acres of land were cropped, amounting in value to \$1,647,916 in 1913.

Political Divisions

The Dominion of Canada is composed of provinces, each having a Government of its own, independent for local purposes. It has also a number of territories, and as yet unorganised areas. Commencing on the east, the provinces are as follows:—

PROVINCES

1. NOVA SCOTIA Capital, Halifax
2. NEW BRUNSWICK ,, Fredericton
3. PRINCE EDWARD ISLAND ,, Charlottetown

These three form a group—the maritime provinces—similar in climate, population, and general conditions. They are the Acadia, *L'Acadie* of French history.

4. QUEBEC Capital, Quebec
5. ONTARIO ,, Toronto

These are sometimes called Old Canada. They are diverse in population and language, but similar in

climate and physical conditions. They are *La Nouvelle France* of French history.

6. MANITOBA	.	.	Capital, Winnipeg
7. SASKATCHEWAN	.	.	„ Regina
8. ALBERTA	.	.	„ Edmonton

These constitute the three Central prairie provinces, with remarkable agricultural possibilities, a fast-growing, young, and vigorous population in the great wheat-belt of the Dominion.

9. BRITISH COLUMBIA	.	.	Capital, Victoria
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The Pacific province stretching from Alaska to the United States. The Yukon Territory is under the care of a Commissioner appointed by the Dominion Government at Ottawa, as are also the North-West Territories and their outlying posts in the unorganised portions of northernmost Canada, where the Royal North-West Mounted Police control Customs and licences for trade and fisheries, besides keeping order.

Population

From the first census of the Dominion in 1871 to the fifth in 1911, a period of 40 years, the population increased from 3,689,257 to 7,206,643, or nearly 100 per cent.

In Ontario, during the same period, the increase was 902,423; Quebec, 811,716; Manitoba, 430,386; British Columbia, 356,233.

Alberta and Saskatchewan, organised in 1905, show for the former an increase from 1901 of 301,641, and for the latter 401,153.

Nova Scotia shows an increase of 104,538 in 40 years, and New Brunswick an increase of 66,295; Prince Edward Island's population in the same period fell off by 293, and the decrease in the North-West Territories is accounted for by the fact that Alberta and Saskatchewan have been organised out of the territories.

The area of Canada, according to the Census tables of 1911, is 3,729,665 square miles of land and water, which is 15,909 square miles less than in 1901. This is partly due to the reduction following the award of the Alaska Boundary Treaty of 1903, and also to new map measurements.

POPULATION PER SQUARE MILE

	1911.	1901.
Canada	1·93	1·44
Alberta	1·47	·28
British Columbia	1·09	·50
Manitoba	6·18	3·46
New Brunswick	12·61	11·83
Nova Scotia	22·98	21·45
Ontario	9·67	8·37
Prince Edward Island	42·91	47·27
Quebec	5·69	4·69
Saskatchewan	1·95	·36

In the Yukon and North-West Territories there were large decreases in the 1911 Census.

POPULATION BY PROVINCES

Provinces.	1911.	1901.	Increase.	Increase per cent.
Alberta	374,663	73,022	301,641	413·08
British Columbia	392,480	178,657	213,823	119·68
Manitoba	455,614	255,211	200,403	78·52
New Brunswick	351,889	331,120	20,769	6·27
Nova Scotia	492,338	459,574	32,764	7·13
Ontario	2,523,274	2,182,947	340,327	15·58
Prince Edward Island	93,728	103,259	-9,531	-9·23
Quebec	2,003,232	1,648,898	354,334	21·49
Saskatchewan	492,432	91,279	401,153	439·48
Yukon	8,512	27,219	-18,707	-68·73
North-West Territories	18,481	20,129	-1,648	-8·19
Total for Canada	7,206,643	5,371,315	1,835,328	34·17

Classes.	Sex.	1901.	1911.
	Male	2,751,708	3,821,995
	Female	2,619,607	3,384,643
		5,371,315	7,206,643
Single . . .	Male	1,748,582	2,369,776
	Female	1,564,011	1,941,886
		3,312,593	4,311,662
Married . . .	Male	928,952	1,331,853
	Female	904,091	1,251,468
		1,833,043	2,583,321
Widowed . . .	Male	73,837	89,154
	Female	151,181	179,656
		225,018	268,810

Cities.—In the year 1911 the cities and towns of Canada with a population of 4000 and over numbered 107; in 1901 they numbered 74, whilst in 1871 there were only 28. In 1871 there was only one city with 100,000 and over, the same number in 1881, two in 1891, two in 1901, and four in 1911. There were two with 200,000 and over in 1901 and 1911, two with 300,000 and over in 1911, and one with 400,000 and over in 1911.

The city of Montreal made the largest gain in the period of forty years, Toronto next, and Winnipeg third, Vancouver's growth in less than thirty years was 100,401.

The population of the principal cities and towns of Canada, according to the census returns of 1901 and 1911, is here added.

Cities.	Provinces.	1911.	1901.
Montreal	Quebec	470,480	267,730
Toronto	Ontario	376,538	208,040
Winnipeg	Manitoba	136,035	42,340
Vancouver	British Columbia	101,401	27,010
Ottawa	Ontario	87,062	59,928
Hamilton	"	81,969	52,634
Quebec	Quebec	78,710	68,840
Halifax	Nova Scotia	46,619	40,832
London	Ontario	46,300	37,976
Calgary	Alberta	43,704	4,392
St. John	New Brunswick	42,511	40,711
Victoria	British Columbia	31,660	20,919
Regina	Saskatchewan	30,213	2,249
Edmonton	Alberta	24,900	2,626
Brantford	Ontario	23,132	16,619
Kingston	"	18,874	17,961
Maisonneuve	Quebec	18,684	3,958
Peterborough	Ontario	18,360	11,239
Hull	Quebec	18,222	13,993
Windsor	Nova Scotia	17,829	12,153
Sydney	"	17,723	9,909
Glace Bay	"	16,562	6,945
Fort William	Ontario	16,499	3,633
Sherbrooke	Quebec	16,405	11,765
Berlin	Ontario	15,196	9,747
Guelph	"	15,175	11,496
Westmount	Quebec	14,579	8,856
St. Thomas	Ontario	14,054	11,485
Brandon	Manitoba	18,839	5,620
Moosejaw	Saskatchewan	13,823	1,558
Trois Rivières	Quebec	13,691	9,981
New Westminster	British Columbia	13,199	6,499
Stratford	Ontario	12,946	9,959
Owen Sound	"	12,558	8,776
St. Catharines	"	12,484	9,946
Saskatoon	Saskatchewan	12,004	113
Verdun	Quebec	11,629	1,898
Moncton	New Brunswick	11,345	9,026
Port Arthur	Ontario	11,220	3,214
Charlottetown	Prince Edward Island	11,203	12,080
Sault Ste. Marie	Ontario	10,984	7,169
Chatham	"	10,770	9,068
Lachine	Quebec	10,699	5,561
Galt	Ontario	10,299	7,866

The latest returns of the Canadian population by race or origin are those of the fifth census:—

	1911.
British	3,896,985
English	1,823,950
Irish	1,050,384
Scotch	997,880
Others	25,571
French	2,054,890
German	393,320
Aborigines, etc.	105,492
Scandinavian	107,535
Russian	43,142
Negro	16,877
Italians	45,411
Dutch	54,986
Chinese and Japanese	36,795
Austro-Hungarian	129,103
Jewish	75,681
Other races	99,081
Not specified	147,345

A comparative statement of the rural and urban population of Canada for the years 1901 and 1911 is given in the following table:—

Class.	1901.	1911.
Country	3,349,516	3,925,502
Town	2,021,799	3,281,141

There is thus an increase of 17·20 per cent of rural population in the last decade, and of 62·29 per cent for the urban or city population of the Dominion.

A careful calculation has recently been made in the department of census and statistics, and the population of the Dominion has been estimated at 8,075,000 at the end of March 1914.

The French language is, by law, upon an equal footing with the English in the Dominion Parliament. Members

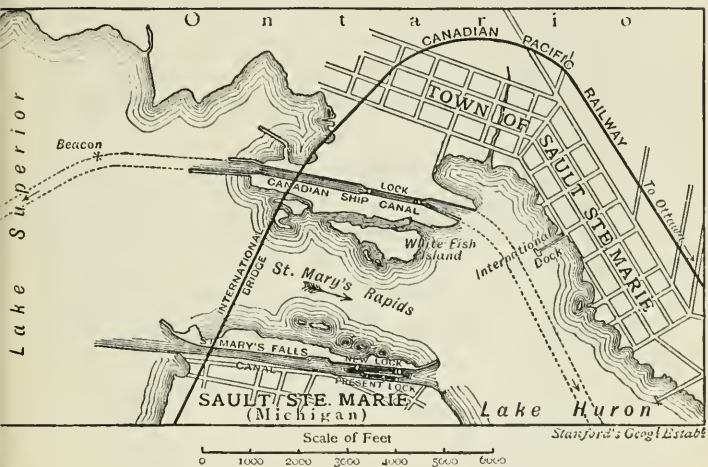
may speak in either language, and all public proceedings and documents are printed in French as well as in English. This is due to the fact that, excepting in British Columbia, French was the first European language spoken; the French having first explored and occupied by settlements or posts every province in the Dominion south of Hudson Bay from the Atlantic to the Rocky Mountains.

Communications

The hydrography of the Dominion and its history show that it is, by nature, a country of easy communications, and before the era of railways great efforts were made to improve the water-ways by canals and develop them to the utmost extent possible. The total expenditure by Government for canals on capital account amounts to \$104,152,120 to March 31, 1913. There are three chief systems: 1. The St. Lawrence system by canals having an aggregate length of 74 miles. These have been deepened to 14 feet. Their former depth was from 9 feet upwards as the work progressed. The locks are 45 feet wide and 270 to 280 feet long. Ocean steamers, drawing 32 feet, pass up to Montreal, 986 miles from the Strait of Belle Isle. From there to the head of Lake Superior there are eight canals, with 48 locks in all, overcoming a total rise of 553 feet, and rendering available to large inland steamers an additional stretch of 1274 miles to Port Arthur. The Sault Ste. Marie Canal makes a continuous connection throughout on the Canadian side of the lakes. 2. The Ottawa and Rideau system, giving an interior connection between Montreal and Lake Ontario. 3. The Richelieu system, rendering available by a few locks the whole course of

the Richelieu river into Lake Champlain. There are other canals, but these are on the main arteries of commerce.

In 1913, on the St. Lawrence Canals, 4,302,427 tons were moved; on the Welland Canal, 3,570,714 tons; on the Ottawa Canals, 365,438; on the Richelieu Canals,



SAULT STE. MARIE CANALS.

555,602. On the Sault Ste. Marie Canal, 42,699,324 tons were moved, comprising agricultural products, 5,253,665 tons; animal products, 198 tons; manufactures, 733,910 tons; products of forest (lumber), 62,958 tons; and product of mines, 36,648,593 tons, mainly iron ore.

On the Red river of Manitoba, 15 miles north of Winnipeg, the St. Andrew's lock affords communication between Winnipeg and Lake Winnipeg.

When the railway era began the water communica-

tions of Canada were complete to the head of Lake Huron. The people saw the necessity of keeping up with the advancing age, and the Government (for in Canada it is a people's Government) has, over a period of more than half a century, consistently and liberally encouraged railway enterprise within the Dominion by large annual subsidies. On a basis of population, Canada has the highest ratio of railway mileage of any country in the world. In 1850 there were 66 miles of railway in operation, and in 1913 there were 29,303 miles in operation and 12,090 miles of railway in course of construction.

In 1836 "Lower Canada" had 16 miles of railway of a most primitive character. To-day the Dominion has the greatest railway mileage per head of population in the world, namely, one mile of railway to 240 people; in all (June 1913) 29,303 miles, not reckoning the 8919 miles of siding. Railway mileage by province is as follows:—

Ontario	9000
Quebec	3986
Manitoba	3993
Saskatchewan	4651
British Columbia	1951
New Brunswick	1545
Nova Scotia	1359
Alberta	2212
Prince Edward Island	279
Yukon (Territory)	102
In United States	225
	<hr/>
Total	29,303

Of the total railway mileage there are 1742 miles of Government owned and operated lines costing \$105,929,173. The capital expenditure on the Eastern Division of the National Transcontinental

Railway, which is being constructed by the Government, amounted to \$152,000,000 on December 31, 1913. Canadian railways received \$217,830,158 in cash subsidies besides land grants of over 56,000,000 acres.

The capital invested, exclusive of Government railways, amounts to \$1,588,937,526, including stocks to the value of \$770,459,351. The Federal Government at Ottawa has granted subsidies to the amount of \$163,251,469, to which may be added \$36,500,015 granted them by provincial governments together with \$18,078,673 from municipalities. The actual number of miles in operation is (June 1913) 29,303, with gross earnings amounting to \$256,702,703, and working expenses \$182,011,690 for a train mileage of 113,437,208 miles.

Grand Trunk Pacific Railway.—The total mileage from Halifax, on the Atlantic seaboard, to Prince Rupert on the Pacific Ocean on this trans-continental route, completed April 9, 1914, is 3746 miles as follows:—

	Miles.
1. Halifax to Moncton	186
2. Moncton to Quebec Bridge	460
3. Quebec Bridge to Winnipeg	1345
4. Winnipeg to Edmonton	793
5. Edmonton to Prince Rupert	962
	—
Total	3746

Of the above divisions, the Intercolonial, the National Transcontinental, and the Grand Trunk Pacific Railways unite in forming one great highway across all Canada from ocean to ocean without touching any territory appertaining to the United States.

The Canadian Northern Railway extends from Winnipeg to The Pas, on the Saskatchewan, a distance of 480

miles from Fort Churehill, and about the same distance from Port Nelson on Hudson Bay.

From The Pas Station to a point east of Nelson House to Port Nelson, on the bay, the Canadian Government has undertaken the construction of a line of railway with a view of giving a northern outlet along the seaboard of Hudson Bay to the North-West trade during the four months of open navigation in that bay and through Hudson Strait. The sea-voyage from Port Nelson to Liverpool is only 2966 miles.

The railways of Canada have a uniform gauge of 4 ft. $8\frac{1}{2}$ in., and the great trunk lines are provided with parlour, dining, and sleeping and colonists' cars, and all other conveniences for the luxurious travellers of the present day. The number of passengers carried in 1913 was 46,230,765, and there were 106,992,710 tons of freight moved. The gross earnings were \$256,702,703, and the net earnings were \$59,597,011. The total paid-up capital invested in railways up to 1912 was \$1,588,937,526, of which amount about one-seventh was supplied by state or municipal subsidies.

The building of the Canadian Pacific Railway across the fertile prairie regions of the west to the Pacific Coast through the heart of the Cordilleran belt marked a new era in the life of Canada. It bound the east and west together into a homogeneous whole. The Grand Trunk Pacific has completed, and the Canadian Northern will shortly have completed its trans-continental system, and are following up the settlement and colonisation throughout the great wheat belt of Manitoba, Saskatchewan, and Alberta, also in the broad and fertile valleys of British Columbia, where vast resources of an agricultural as well as of a mining nature abound. This realises the aspirations



THE CHIEF TRUNK RAILWAYS OF
THE DOMINION OF CANADA
AND OF
THE NORTHERN PART OF
THE UNITED STATES

Scale of English Miles
0 25 50 75 100 200 300 400



REFERENCE
 Railways in operation - ———
 Railways under construction - - - -
 The International Boundary Line - - - -

of every Canadian from Champlain down to our own day by opening up a western passage to the great South Sea through its natural portal, the Gulf of St. Lawrence. The following table of distances gives the length of the chief routes from England to Shanghai, and it will appear that not only is the route through Canada shorter in summer, when the ocean steamers go direct to Montreal, but that in winter, whether the traveller lands at Halifax, St. John, Boston, or New York, the shortest route is still by way of Montreal, the Canadian Pacific and Grand Trunk Pacific Railways to Vancouver and Prince Rupert.

DISTANCES FROM LIVERPOOL TO SHANGHAI

A. By the St. Lawrence route—steamer direct to Montreal.

	Miles.
<i>Via</i> Canadian Pacific and Vancouver	11,065
„ Chicago, Northern Pacific, and Tacoma	11,387
„ Chicago, Union Pacific, and San Francisco	11,549

B. By Halifax, N.S., as the Atlantic port, and from thence by rail to Montreal.

	Miles.
<i>Via</i> Montreal, C. P. R., and Vancouver	11,504
„ Montreal, Chicago, N. P. R., and Tacoma	11,823
„ Montreal, Chicago, U. P. R., and San Francisco	11,987

C. By Boston, Mass., as the Atlantic port, and from thence by rail to Montreal or Chicago.

	Miles.
<i>Via</i> Montreal, C. P. R., and Vancouver	11,556
„ Chicago, N. P. R., and Tacoma	11,723
„ Chicago, U. P. R., and San Francisco	11,885

D. By New York as the Atlantic port, and thence by rail to Brockville in Canada and Chicago.

	Miles.
<i>Via</i> Brockville, C. P. R., and Vancouver	11,586
„ Chicago, N. P. R., and Tacoma	11,770
„ Chicago, U. P. R., and San Francisco	11,932

It will be convenient to record for reference in this connection the distances between some of the chief ports of the world and Canada:—

DISTANCES TO-POINTS ON THE ATLANTIC

	Miles.
Antwerp to Halifax	2767
„ St. John, N.B.	3017
Belfast to Quebec <i>via</i> north of Ireland and Belle-isle	2521
„ Halifax	2349
„ St. John, N.B.	2590
Cape Race to Halifax	470
„ St. John, N.B.	720
Glasgow to Halifax	2381
„ Quebec <i>via</i> north of Ireland and Belle-isle	2564
„ St. John, N.B.	2631
„ Sydney, Cape Breton	2212
Halifax to Portland, Me.	336
„ St. John, N.B.	277
Liverpool to Boston, Mass., <i>via</i> north of Ireland and Cape Race	2807
„ Boston, Mass., <i>via</i> south of Ireland and Cape Race	2830
„ Halifax <i>via</i> north of Ireland and Cape Race	2450
„ „ south of Ireland and Cape Race	2475
„ New York, average distance, mail steamers route	3105
„ Quebec <i>via</i> north of Ireland and Belle-isle	2633
„ „ „ Cape Race	2801
„ „ south „ „	2826
„ St. John, N.B., <i>via</i> north of Ireland and Cape Race	2700
„ St. John, N.B., <i>via</i> south of Ireland and Cape Race	2723
„ Sydney, Cape Breton	2282
Loch Ryan to Quebec <i>via</i> north of Ireland and Belle-isle	2513
„ Halifax	2330
„ Sydney, Cape Breton	2161
„ St. John, N.B.	2580
Milford Haven to Halifax	2353
„ Quebec <i>via</i> Belle-isle	2587
„ Sydney, Cape Breton	2186
„ St. John, N.B.	2603
Quebec to Montreal (from the Market Wharf, Quebec, to the Allan Wharf, Montreal)	140

DISTANCES TO POINTS ON THE PACIFIC

	Miles.
Liverpool to Hong-Kong <i>via</i> San Francisco	12,883
" " " Vancover	11,649
San Francisco to New York	3266
" Boston	3370
Sydney to Liverpool <i>via</i> Vancouver	12,663
" " San Francisco	13,032

SAILING DISTANCES BETWEEN CANADIAN AND OTHER PORTS.

From Vancouver.

	Miles.		Miles.
To Adelaide	7,753	To Montreal <i>via</i> Panama	
" Aden	10,727	Canal	8,500
" Bombay	9,536	" Montevideo	8,276
" Buenos Ayres	8,336	" Melbourne	7,347
" Calcutta	8,719	" Havre	14,212
" Cape Town	11,017	" Genoa <i>via</i> (Suez).	13,530
" Colombo	8,586	" Naples "	13,237
" Copenhagen	14,830	" Port Said "	12,124
" Hong-Kong	5,800	" Swansea "	14,170
" Madras	9,721	" St. Paul	1,226
" Quebec	14,355	" Dutch Harbour	1,726
" New York City	13,907	" Kobe	4,630
" Suva, Fiji	5,214	" Nagasaki	5,028
" Sydney (N.S.W.)	6,848	" Honolulu	2,435
" Valparaiso	5,938	" Auckland	6,205
" Yokohama	4,280	" Sitka	808
" Victoria	82	" Rupert	210
" Shanghai	5,230	" Tongas	515
" Seattle	125	" Essington	452
" San Francisco	820	" Skagway	900
" Montreal <i>via</i> Magellan	14,490	" Wrangel	630

From Prince Rupert and Port Simpson.

	Miles.		Miles.
To Hong-Kong	5,315	To Kobe	4,145
" Shanghai	4,745	" Nagasaki	4,523
" Yokohama	3,795		

Through the railway and steam navigation of Western Canada access has been gained to the markets of China,

Japan, New Zealand, Australia, India and the Pacific Coast of South America which had formerly been closed.

DISTANCE BETWEEN CANADIAN AND OTHER PORTS.

Via Strait of Belle Isle.

	Miles.		Miles.
Montreal to Moville . . .	2,583	Quebec to Moville . . .	2,448
„ Glasgow . . .	2,693	„ Glasgow . . .	2,558
„ Liverpool . . .	2,760	„ Liverpool . . .	2,625
„ Belfast . . .	2,645	„ Belfast . . .	2,510
„ Londonderry . . .	2,596	„ Londonderry . . .	2,461

Via Strait of Cabot.

	Miles.		Miles.
Montreal to Moville . . .	2,820	Quebec to Moville . . .	2,685
„ Glasgow . . .	2,930	„ Glasgow . . .	2,795
„ Queenstown . . .	2,779	„ Queenstown . . .	2,642
„ Liverpool . . .	3,007	„ Liverpool . . .	2,872
„ London . . .	3,241	„ London . . .	3,106
„ Antwerp . . .	3,281	„ Antwerp . . .	3,146
„ Hamburg . . .	3,548	„ Hamburg . . .	3,413
	Miles.		Miles.
Halifax to Quebec . . .	737	Halifax to Sydney . . .	246
„ Montreal . . .	872	„ Antwerp . . .	2,759
„ St. John's, New-		„ St. Vincent . . .	2,561
foundland . . .	540	„ Cape Town . . .	6,423
„ Bristol . . .	2,462	„ Rio de Janeiro . . .	4,611
„ Glasgow . . .	2,408	„ Havana . . .	1,630
„ Hamburg . . .	3,026	„ New York City . . .	599
„ Liverpool . . .	2,485	„ Boston . . .	369
„ London . . .	2,719	„ St. John . . .	262
„ Queenstown . . .	2,255	„ Yarmouth . . .	162
„ Louisburg . . .	186		
	Miles.		Miles.
Yarmouth to Portland . . .	183	Yarmouth to St. John . . .	100
„ Boston . . .	235		

DISTANCES IN STATUTE MILES FROM MONTREAL, THE HEAD OF NAVIGATION FOR LARGE OCEAN STEAMSHIPS, TO DIFFERENT POINTS WITHIN THE DOMINION OF CANADA.

	Miles.		Miles.
Montreal to Halifax . . .	758	Montreal to Winnipeg . . .	1415
„ St. John . . .	481	„ Brandon . . .	1548
„ Quebec . . .	172	„ Prince Albert . . .	1884
„ Toronto . . .	333	„ Saskatoon . . .	1885
„ Hamilton . . .	372	„ Edmonton . . .	2242
„ London . . .	448	„ Regina . . .	1773
„ Ottawa . . .	111	„ Medicine Hat . . .	2075
„ Port Arthur . . .	992	„ Calgary . . .	2255
„ Fort William . . .	995	„ Vancouver . . .	2897
Montreal to Lethbridge . . .	2176 statute miles.		

DISTANCES FROM MONTREAL AND HALIFAX TO VARIOUS PORTS OF THE UNITED STATES, WESTERN EUROPE, AND SOUTHERN EUROPE.

	Geographical miles.		Geographical miles.
Montreal to Antwerp . . .	3281	Halifax to Antwerp . . .	2759
„ Bremen . . .	3530	„ Bermuda . . .	760
„ Boston . . .	1222	„ Bremen . . .	3008
„ Cape Town . . .	7108	„ Boston . . .	369
„ Gibraltar . . .	3194	„ Cape Town . . .	6423
„ Glasgow . . .	2693	„ Gibraltar . . .	2671
„ Havre . . .	3102	„ Glasgow . . .	2408
„ Liverpool . . .	2760	„ Havre . . .	2680
„ London . . .	3241	„ Liverpool . . .	2485
„ Marseilles . . .	3884	„ London . . .	2719
„ Naples . . .	4164	„ Marseilles . . .	3361
„ New York . . .	1451	„ Naples . . .	3641
„ St. John's . . .	1025	„ New York . . .	599
„ Southampton . . .	3062	„ St John's . . .	540
		„ Southampton . . .	2540

The distance from Churchill Harbour in Manitoba to Liverpool in Lancashire is 2926 geographical miles, and from Port Nelson to Liverpool 2966 miles. From Montreal to Liverpool, via Strait of Belle-isle, 2760 miles, and via Cape Race, 2887 miles. From Quebec to Liverpool, via Belle-isle, the distance is 2625 miles, and

via Cape Race, 2752 miles. From Halifax to Liverpool, 2485 miles, and from St. John, New Brunswick, to Liverpool, 2747 miles.

The main water route by Montreal is of necessity the shortest, because the higher the latitude the closer are the meridians of longitude, and the quicker will a traveller reach the longitude of Shanghai. This is in effect the passage to Cathay which Cabot set out to find some four hundred years ago, for he first fully apprehended the fact that the great circle on the globe from Europe to Japan was by the north. The railway communications of each province are given more in detail in the separate chapters. Forthcoming years may prove the still shorter route via Port Nelson to be quite practicable.

Government

The government of Canada is, like that of Great Britain, monarchical *in form* but democratic in substance. Theoretically the Crown with the Imperial Parliament is supreme, and, on rare occasions, on petition of the colonial governments, these supreme powers are put in motion ; as, for instance, in the case of the British North America Act, 1867, which formed the separate provinces into a confederation, and redistributed all their existing powers into new groups. Practically, however, the Dominion is self-governing, and the King and Parliament of Canada carry on the government under all the forms, the implied understandings, and the conventions, written or unwritten, which obtain in the Mother Country, so far as they are applicable. Precisely as the King by his ministers, and together with the Imperial Parliament, governs the British Isles, so the King's representative, the Governor-General, by his ministers and with the Canadian Parlia-

ment, governs the Dominion of Canada. Both parliaments enact the laws under similar forms, and raise and vote away the taxes under the same safeguards. Both parliaments have certain of their number, in form appointed by the Crown, but responsible to parliament, who nominally, as a committee of the King's Privy Council, but effectually, as a committee of the majority in parliament, administer the laws and collect and expend the revenues. The parallel is precise as between the government of the Mother Country and that of the Dominion.

Up to the Act of 1905, erecting the two new provinces of Saskatchewan and Alberta, the Dominion of Canada was a confederation of distinct colonies or provinces, each of which had previously a constitution of its own. At confederation the existing laws remained in force in each province until altered by competent authority; but the political powers and capacities merged for a moment into the central *imperium* immediately to emerge newly grouped. The powers of a more general nature were vested in a new creation, to wit the Dominion Government, and the powers of a more local nature were re-granted to the provincial governments. The provincial governments are presided over by lieutenant-governors appointed by the Dominion Government, and their proceedings and administration are carried on under similar forms; but whether the lieutenant-governors are representatives of the King or of the Dominion Government is a moot point in political theory concerning which much has been said on both sides.

The seat of the Government of the Dominion is at Ottawa. The Government consists of the Governor-General, appointed by the King in Council, the Senate of 87 members, appointed for life by the Governor-General

on the recommendation of his Privy Council, and the House of Commons of 234 members, elected for five years by the people under a franchise so popular as almost to amount to manhood suffrage.

The powers which reside in the Dominion Parliament are such as relate to the regulation of trade and commerce, the post-office, the customs and all indirect taxation, militia and defence, navigation, banks, currency, bills of exchange, interest, Indian affairs, the public debt, the criminal law, naturalisation, patents, copyrights, marriage and divorce, weights and measures, commercial treaties, creation of provinces, sea-coast and inland fisheries, and a general reserve of all powers not specially allotted to the provincial governments.

Weights and Measures.—By Act of Parliament and Amendments, the Imperial yard, Imperial pound avoirdupois, Imperial gallon, and the Imperial bushel are the legal weights and measures for the Dominion. Unless a *bushel measure* be specially agreed upon, the weight equivalent to a bushel of various products is as follows:—

Article.	Lbs.	Article.	Lbs.	Article.	Lbs.
Wheat . . .	60	Beans . . .	60	Soft coal . . .	70
Indian corn . . .	56	Flax seed . . .	56	Castor beans . . .	40
Rye . . .	56	Clover seed . . .	60	Potatoes . . .	60
Pease . . .	60	Hemp . . .	44	Turnips . . .	60
Barley . . .	48	Blue grass		Carrots . . .	60
Malt . . .	36	seed . . .	14	Parsnips . . .	60
Oats . . .	34	Timothy . . .	48	Beets . . .	60
Buckwheat . . .	48	Lime . . .	80	Onions . . .	50

By the same Act of Parliament, Canada declared the "hundredweight" (cwt.) to be 100 pounds and the "ton" to be 2000 pounds avoirdupois.

The provincial governments consist of a lieutenant-governor and a legislature of one or two chambers, for

the provinces are not all alike in this respect. The subjects under the control of the provincial governments are—direct taxation for local purposes, the public lands of the province, municipal institutions, property and civil rights in the province, education, hospitals and charitable institutions, administration of justice in the province, and generally all matters of a local nature. The provincial governments make laws, each for its own province within the limits of their powers, and the Dominion Government legislates in the subjects allotted to it and its laws extend over the Dominion. The sum total of political power may be considered as divisible into four classes. (a) Powers reserved exclusively to the Dominion Parliament. (b) Powers reserved to the provincial legislatures exclusively. (c) Concurrent powers. (d) Residuum of powers unenumerated or unprovided for, vested in the Dominion Parliament.

Two courts sit at Ottawa and have jurisdiction over the whole Dominion—the Exchequer Court, having also vice-admiralty jurisdiction, and the Supreme Court, to which appeals may be carried from any court of the country. From all the courts in Canada an appeal may be taken to the Imperial Privy Council or, as it is called, to the King in Council. The provinces differ in their interior organisation; some have excellent municipal institutions, self-governing in matters of roads, bridges, licences, and such like local matters, and others are not so well organised. One important point must be noted, that, as the Imperial Government has power to disallow within two years any act of the Dominion Parliament, so the Dominion Government has the power to disallow any act of a provincial legislature.

The government of Canada, in its federal aspect, has some points of resemblance to that of the United States :

but, in its spirit and administration, is the outgrowth of the constitution and political genius of the Mother Country. It is the aim of the members of all political bodies in Canada to follow English parliamentary rules, to quote English authorities, and to be guided by English precedents. In its system of local self-government is found the most practical method of governing the enormous area of the Dominion, and every municipal council is a school of instruction in public administration.

While the fundamental political law of the Dominion is, as above stated, the British North America Act of 1867, the fundamental civil law in all the provinces but one is the common law of England, and the fundamental criminal law for all the provinces without exception is the criminal law of England. In the province of Quebec, for reasons stated in a later chapter, the fundamental civil law is the law of France before the Revolution, in other words, it is the Roman Civil Law as prevailing on the continent of Europe, based on the code of Justinian. It happened that the law of Quebec had just been consolidated into a code by a commission of very capable lawyers, and the province of Quebec entered confederation with this code and, as property and civil rights are subjects reserved to the provinces, the French law cannot be changed by the Dominion Parliament. Many who have lived under both laws prefer it to the English law, but the procedure is more cumbrous.

The judges are appointed for life by the Governor-General in Council and can be removed only by impeachment. The civil service also is a body of permanent officials as in Great Britain and all her colonies.

The militia force of Canada to-day consists of three portions: the permanent force, the active militia, and the reserve militia.

“All the male inhabitants of Canada of the age of eighteen years and upwards, and under sixty, not exempt or disqualified by law, and being British subjects, shall be liable to service in the militia; provided that the Governor-General may require all the male inhabitants of Canada capable of bearing arms to serve in the case of a *levée en masse*.” Thus runs section 10 of the Reserve Militia Act of Canada. Up to 1904 there was an authorised strength of 1000 men in the established permanent force, which has since been increased to 5000. In 1912 the actual numbers were:—3118 officers and non-commissioned officers and men. The stations of the permanent force of Canada are:—Quebec, Ottawa, St. Jean, Toronto, Winnipeg, Kingston, Halifax, London, Fredericton. The active militia numbers at present about 5000 men who drill only at schools of instruction, or at regimental headquarters. The idea is that with a partially trained force of this kind there shall be an organisation which will allow of its expansion to 100,000 should they be required for an emergency.

In 1895, 19,000 men and 1125 horses were trained. In 1911-12, no less than 66,000 officers and men, with 15,503 horses, went through a period of instruction. The Royal Military College, Kingston, Ontario, is filled to its utmost capacity, and its graduates now enter the permanent militia force, as was originally intended.

For the youth of Canada, and to inculcate in them a spirit of patriotism, the late Lord Strathcona founded a Trust which provides military drill for boys and physical education for both sexes. The Royal North-West Mounted Police has been in existence as a force of military character since 1873, and under the control of the Dominion Government. On September 30, 1912,

the strength of the force was 1000, with 54 officers, 600 non-commissioned officers and constables, and 586 horses, whose detachments cover an enormous stretch of territory, including the new provinces of Saskatchewan and Alberta, the Yukon territory, and the unorganised districts of Mackenzie and Keewatin. Prior to the formation of the provinces of Saskatchewan and Alberta out of the enormous stretch of territory between Manitoba and the Rocky Mountains, the maintenance of law and order in that section of Canada rested with the Royal North-West Mounted Police. By mutual agreement between the new provinces and the federal authorities the two provinces now contribute a portion of the cost of maintaining the force, and this arrangement has worked very satisfactorily.

The Naval Service of Canada was established by Act of the Dominion Parliament in 1910. The Royal Naval College of Canada, located at Halifax, was instituted for the purpose of training naval cadets, and corresponds to that of the Royal Military College at Kingston, only on a naval basis. In 1912 the Right Honourable (now Sir) Robert Borden and colleagues conferred with the British Government and Admiralty upon the whole question of naval defence, and the conditions confronting the British Empire. To satisfy a long-felt want in the hearts of all truly loyal Canadians, as well as to be an earnest of their indebtedness to the Mother Country, the Government of Canada decided to vote \$35,000,000 for the immediate construction of *three* super-dreadnoughts as a contribution towards the defences of the Empire. The Opposition, however, with a majority of votes in the Senate, rejected the Government's proposal, and the Bill consequently failed of enactment.

A policy of closer relations with Great Britain and the various members of the British Empire throughout the world, for defence as well as for commerce, has been steadily rising in Canada for the past fifty years—a policy in which the very existence, interests, and welfare of French-speaking as well as English-speaking Canadians are fundamentally involved. In relation to the Empire, Canada is bound by imperial treaties. It has, however, been customary of recent years to call in the assistance of Canadian representatives in the negotiation of all matters affecting the Dominion, and Imperial conferences have been held which are doing much to cement firmly all the countries represented. Customs duties are imposed by the Dominion Parliament, but on goods imported from the Mother Country a preference of $33\frac{1}{3}$ per cent is given. A *Zollverein* of the Empire has been proposed, and public opinion in its favour both in Great Britain and the colonies is rapidly increasing in favour of closer relations.

BRITISH PREFERENTIAL TARIFF, 1898.

Its chief features were (1) a completion of the pro-British tariff of 1897, provided that beginning on 1st of August 1898 all imports from Britain shall come into Canada on paying a duty of customs, twenty-five (25) per cent less than that levied on goods from foreign countries; (2) a provision to aid the West Indies by admitting their products at the full reduction of 25 per cent; a similar provision for any other British colony or possession the customs tariff of which is on the whole as favourable to Canada as the British preferential tariff is to such colony or possession; provided, however, (*a*) that manufactured articles admitted under such preferential tariff are *bona fide* manufactures of a country or countries

entitled to the benefits of such tariff, (b) that such benefits shall not extend to the importation of articles into the production of which there has not entered a substantial portion of the labour of such countries, (3) a provision that the reduction is not to apply to wines, malt liquors, spirits, spirituous liquors, liquid medicines and articles containing alcohol; tobacco, cigars and cigarettes.

The following parts of the British Empire are included in the British preferential tariff arrangement:—The United Kingdom: Bermuda. British West Indies: Bahamas, Jamaica, Turks and Caicos Islands, Leeward Islands, Windward Islands, Barbadoes, Trinidad and Tobago, British Guiana, British India, Ceylon, Straits Settlements, New Zealand.

By the Budget of 1900 the preference given to the above parts of the Empire was increased from 25 per cent to $33\frac{1}{3}$ per cent from July 1, 1900.

History

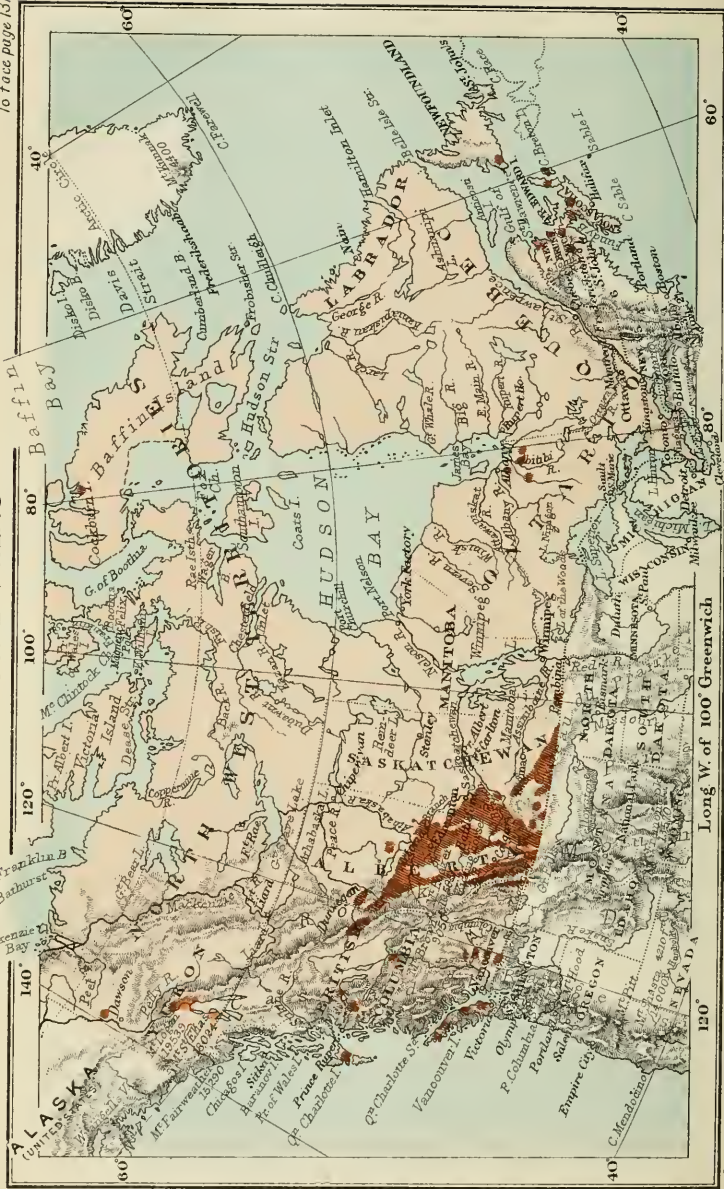
While the separate provinces of Canada have histories full of interest and romance, the annals of the collective Dominion date only from 1867, when the British North America Act came into effect. Since then the history of the country's development has not been made up of incidents either startling or picturesque in character. The country has steadily advanced, and as each province cast its lot in with the first four, national spirit grew, and, as the provinces were knit together by railways, and the provincial delegates continued to meet at a common centre and discuss measures for the general good, the people of the provinces learned to know each other and began to take pride in the potentialities of their common country. Local jealousies began to fade away, and the

mental horizon of every man widened out to the scope of an enlarged citizenship. Two events are dominant in this short period: the building of the Intercolonial Railway and the building of the Canadian Pacific Railway. Without these confederation would have been impossible, and to secure them the people of Canada have made great sacrifices. In despite of fears within and jealousies without, the Canadian people went on in its own way to fulfil its own destiny, and beyond doubt will go on to perform the part assigned to it hidden in the counsels of Providence, whatever that part may be. Only Newfoundland stands aloof bearing her burdens alone. Whenever she shall think fit to join the union of sister provinces, the dream of many generations of colonial statesmen will be realised.

Trade and Commerce

The resources of Canada have been developing rapidly during the last few years. The Dominion possesses for grazing and wheat lands the broadest prairies, for lumbering the most extensive forests, and in its seas and lakes the most productive fisheries in the world. It has coal cropping out on the shores of the Atlantic, and coal cropping out on the shores of the Pacific, and coal underlying large areas of the interior plains. The output in 1912 was 14,512,829 tons, valued at \$36,019,044. Gold has been mined in Nova Scotia, British Columbia, and the Yukon for many years, whilst the nickel deposits of Sudbury and Cobalt, silver ores of Ontario, and the asbestos mines of Quebec, prove to be of inestimable value. The total mineral production of Canada in 1913 was \$144,031,047. These are most important factors, which are drawing the attention of

COAL AREAS



Long W. of 100° Greenwich

0 100 200 300 400 500
SCALE OF ENGLISH MILES

London : Edward Stanford, Ltd., 12, B. & 14, Long Acre, W.C.

Stanford's Geog. Estab., London.

capitalists and others to the mineral resources of the Dominion.

It was natural that the attention of the people should in the first instance have been directed to the sea; for the deeply indented coast-line on the Atlantic is calculated to be 10,000 miles in length, and the Pacific coast in all its sinuous length is estimated at 7000 miles. Such a conformation of coast-line produces good harbours, and the forests at the water's edge suggest shipbuilding. Added to these conditions, the immense inland waterways were, before the railway age, the only lines of communication, and naturally the people turned in the first instance to the water. The introduction of iron for shipbuilding, and the adoption of steam as a motive power struck a severe blow at the chief industry of the maritime provinces, and the amount of registered tonnage has been decreasing. In 1878 it reached its highest point, being then 7468 vessels, aggregating 1,333,015 tons.

Canada, however, still holds a foremost place among the nations as an owner of shipping.

The following tables give an idea of the activity of shipping in the ocean and inland ports:—

The following table of the movement of shipping in Canada in the year 1913 gives the total number of vessels (sea-going and inland waters) arrived at and departed from Canadian ports (exclusive of coastwise vessels):—

Countries.	No. of Vessels.	Tons Register.
British	7,307	13,896,353
Canadian	42,624	20,677,938
Foreign	47,303	23,275,492
Total	97,234	57,849,783

The following is a statement of the total number of vessels, British, Canadian, and Foreign, entered *inwards* from sea, by ports and outports, etc., in the Dominion of Canada during the year ended March 31, 1913, in cargo :—

Countries.	No. of Vessels.	Tons Register.	Quantity of Tons Weight.	Freight-tons Measurement.	Crew Number.
British . . .	2504	6,300,433	1,589,980	355,734	232,790
Canadian . . .	3150	1,536,787	276,963	13,522	80,498
Foreign . . .	4067	2,441,991	1,816,844	151,039	98,819
Total . . .	9721	10,279,211	3,683,787	520,295	412,107

The following statement respecting the same in ballast is here given :—

Countries.	No. of Vessels.	Tons Register.	Crew.
British	1431	1,433,461	51,529
Canadian	2520	543,509	23,758
Foreign	4415	1,319,012	55,740
Total	8366	3,295,982	131,027

The two statements taken conjointly give an aggregate shipping of 18,087 vessels, with 13,575,193 tons register, manned by a crew of 543,134.

The following is a statement of the total number of British, Canadian, and foreign vessels entered *outwards* for sea in Canada during the fiscal year ended March 31, 1913, *with cargoes* :—

Countries	No. of Vessels.	Tons Register.	Freight.		Crew.
			Tons Weight.	Tons Measurement.	
British	2,850	5,515,988	3,120,361	977,672	187,429
Canadian	3,270	1,673,058	566,369	219,374	82,255
Foreign	4,167	2,401,509	1,243,658	690,947	79,830
Total	10,287	9,590,555	4,930,388	1,887,993	349,514

The same for vessels *in ballast* :—

Countries.	No. of Vessels.	Tons Register.	Crew.
British	522	646,471	28,770
Canadian	2870	777,481	33,048
Foreign	3900	1,641,398	73,237
Total	7292	3,065,350	135,055

Which two above statements taken together furnish an aggregate number of 17,579 vessels, with 12,655,905 tons register, manned by a crew of 484,569.

Statement of vessels *arrived* and *departed* (exclusive of coasting vessels) in Canada during the fiscal year ended March 31, 1913 :—

SEA-GOING VESSELS—INWARDS AND OUTWARDS.

Countries.	No. of Vessels.	Tons Register.	Crew Number.
British	7,307	13,896,353	500,518
Canadian	11,810	4,530,835	219,559
Foreign	16,549	7,803,910	307,626
Total	35,666	26,231,098	1,027,703

Statement of vessels of the *Inland waters* plying between Canada and the United States during the fiscal year ending March 31, 1913 :—

Countries.	No. of Vessels.	Tons Register.	Crew Number.
Canadian	30,814	16,147,103	445,214
Other Countries	30,754	15,471,582	423,255
Total	61,568	31,618,685	868,469

There were 324 steamers and sailing vessels, of 24,325 tons tonnage, built in Canada during the twelve months ending March 31, 1913, and 328 were registered in Canada with a total tonnage of 30,225 tons. Besides these, 20 ships were sold to other countries during the year, valued at \$610,650, with a tonnage of 7976 tons.

The total shipping (exclusive of coasting vessels) inwards and outwards during the fiscal year ending March 31, 1913, is as follows:—

Countries.	No. of Vessels.	Tons Register.	Crew Number.
British	7,307	13,896,353	500,518
Canadian	42,624	20,677,938	664,773
Foreign	47,303	23,275,492	730,881
Total	97,234	57,849,783	1,896,172

The total tonnage of vessels entered *inwards* and *outwards*, *sea-going* and *inland* navigation, exclusive of coasting vessels, amounted on March 31, 1913, to 57,849,783 tons; whilst the tonnage of vessels employed in the coasting trade entered *inwards* and *outwards* amounted to 73,644,713 tons.

The total foreign trade of Canada for the fiscal year ended—

March 31, 1909, was \$559,718,116	|	March 31, 1912, was \$862,699,832
„ 1910 „ 677,191,545		„ 1913 „ 1,085,264,449
„ 1911 „ 759,147,683		„ 1914 „ 1,129,744,725

The aggregate trade of Canada with British countries during the fiscal year ended March 31, 1913, is as follows:

Countries.	Total Exports.	Total Imports.	Total Trade.
British Empire—			
Great Britain	\$177,982,002	\$139,656,330	\$317,638,332
Australia	3,996,387	438,669	4,435,056
Bermuda	438,511	34,736	473,247
British East and West Africa	133,858	1,994	135,852
,, South Africa	3,340,513	267,689	3,608,202
,, East Indies, all other	7,243	1,727,028	1,734,271
,, West Indies	3,960,625	6,058,959	10,019,584
,, Guiana	630,480	3,384,434	4,014,914
Straits Settlements	228,606	521,994	750,600
Hong Kong	776,613	895,488	1,672,101
India	226,600	4,673,279	4,899,879
Newfoundland and Labrador	4,728,142	2,058,097	6,786,239
New Zealand	1,698,093	3,066,585	4,764,678
Other British Possessions . .	239,007	597,603	836,610
Total British Empire	\$198,386,680	\$163,382,885	\$361,769,565

Statement showing the value of goods exported from Canada during the fiscal year ending March 31, 1913:—

Products.	Value 1912.	Value 1913.	British Empire.	All other Countries.
Produce of the Mine	\$41,510,582	\$57,583,030	\$13,245,339	\$44,337,691
Produce of the Fisheries	16,815,192	16,442,822	6,326,531	10,116,291
Produce of the Forest	41,104,887	43,679,623	11,445,485	32,234,138
Animals and their products	49,220,897	45,773,227	31,166,757	14,606,470
Agricultural products	115,454,486	158,955,695	120,163,369	38,792,326
Manufactures	42,508,985	52,525,082	15,993,049	36,532,033
Miscellaneous	1,101,122	2,108,876	44,060	2,064,816
Total	\$307,716,151	\$377,068,355	\$198,384,590	\$178,683,765
Coin and Bullion	7,601,099	16,163,702	2,090	16,161,612
Grand Total Exports	\$315,317,250	\$393,232,057	\$198,386,680	\$194,845,377

The following statement gives the aggregate trade of Canada with Great Britain and other countries on the basis of goods entered for consumption and exported during the fiscal years 1901 and 1913 respectively:—

Countries.	1901.	1913.
United Kingdom . . .	\$148,347,120	\$316,743,570
United States . . .	182,867,238	608,252,975
France	6,979,352	17,944,367
Germany	9,162,957	17,616,941
Spain	897,893	1,307,598
Portugal	181,707	392,391
Italy	642,424	2,319,304
Holland	984,840	5,851,267
Belgium	6,634,592	8,829,175
Newfoundland	2,886,067	6,785,116
West Indies	4,707,677	16,814,434
South America	2,567,278	10,699,890
China and Japan . . .	3,149,591	6,137,859
Switzerland	603,397	4,312,054
Other Countries . . .	7,113,487	44,742,161
Total Trade	\$377,725,620	\$1,068,749,102

The value of the total exports in the Dominion for the fiscal year ended June 30, 1901, was \$196,487,632; the total imports covering the same period was \$190,415,525. The total value of goods entered for consumption was \$181,237,988, and the Customs duty collected for the same year was \$29,106,979.89.

Progress is shown in the 1913 returns, where the total exports of Canada are valued at \$393,232,057, the total imports for the same period being \$692,032,392, whilst the value of goods entered for consumption alone was \$675,517,045, and the Customs duty collected amounted to \$115,063,687.93.

TABLE SHOWING THE VALUE OF EXPORTS, ETC., BY PROVINCES, 1913.

Provinces.	Exports.	Imports.	Entered for Consumption.	Duty Collected.
Ontario	\$132,756,532	\$301,651,328	\$297,192,227	\$4,808,591·20
Quebec	147,723,907	187,301,493	176,953,036	29,531,515·25
Nova Scotia	24,201,473	20,753,369	20,569,210	3,265,378·14
New Brunswick	34,634,156	14,445,811	14,410,406	2,303,246·34
Manitoba	5,259,436	58,898,284	58,581,587	12,475,110·12
British Columbia	27,087,369	66,596,479	65,436,553	13,763,024·46
Prince Edward Island	573,078	975,683	978,055	147,445·80
Alberta	162,171	21,078,779	20,924,904	4,970,758·95
Saskatchewan	17,153,688	19,011,005	19,138,507	3,611,030·70
Yukon	3,680,247	1,231,284	1,243,683	163,054·96
Territories . . . . .	...	...	...	...
Total	\$393,232,057	\$691,943,515	\$675,428,168	\$115,039,155·92
British prepaid postal parcels received through P.O. Department . . . . .	...	88,877	88,877	24,532·01
Grand total	\$393,232,057	\$692,032,392	\$675,517,045	\$115,063,687·93

From home and foreign produce, as well as from coin and bullion, merchandise was exported to the value of \$393,232,057, made up as follows:—

Home produce	\$355,754,600
Foreign	21,313,755
Coin and bullion	16,163,702
Total	\$393,232,057

The value of the exports to different countries for the year ending March 31, 1913, was as follows:—

United Kingdom	\$177,982,002	Newfoundland	\$4,727,522
United States	150,961,675	West Indies	6,237,468
France	2,564,603	South America	3,721,798
Germany	3,402,394	China and Japan	1,881,558
Spain	48,628	Australia	3,996,387
Portugal	49,142	Other Countries	29,502,451
Italy	605,719		
Holland	2,741,713	Total value of	
Belgium	4,808,997	Exports	\$393,232,057

Canada's trade with the Empire has been on the increase. In 1901 the value of imports into Canada from all parts of the Empire totalled \$46,000,000, whilst in 1913 they amounted to \$163,000,000.

The exports from Canada to various countries of the Empire in 1901 totalled \$130,000,000, whilst in 1913 they amounted to \$198,000,000.

The value of goods entered for consumption in Canada from various countries for the Canadian fiscal year ending March 31, 1913, is as follows:—

United Kingdom	\$138,761,568	Newfoundland	\$2,056,974
United States	441,142,593	West Indies	10,576,966
France	15,379,764	South America	6,978,092
Germany	14,214,547	China and Japan	4,256,301
Spain	1,258,970	Switzerland	4,296,702
Portugal	343,249	Other Countries	27,408,002
Italy	1,713,585		
Holland	3,109,554	Total	\$675,517,045
Belgium	4,020,178		

This trade is chiefly with Great Britain and the United States, and, as the natural course of trade has been deflected by outside legislation, it is necessary to consider the items separately. The exports do not seem to be much affected by the incessant efforts of the United States Congress to check them by new customs duties, for in fact most of them are of food and raw material. It is very difficult for any country in this present age completely to isolate itself. The trade of the Dominion is steadily growing, and the hostile legislation which aims to drive Canadian trade away from the United States does not kill the trade, but simply diverts it into new channels, and opens up wider avenues and safer markets.

The Statistical Year Book of Canada (1912) shows that while articles of agricultural and animal products

make up 21.12 per cent of the imports into the United States, they form but 11.58 per cent of the imports into Canada; the people of Canada raise all necessary articles of food, but of course import tea, coffee, and raw sugar. They manufacture cotton and woollen goods, boots and shoes, soaps, paper, sugar, beer, whisky, agricultural implements, furniture, and edge tools, with a large number of other articles. The following classification of the sources of their exports will show the way in which the people of Canada procure such foreign goods as they require:—

CHIEF EXPORTS, SHOWING SOURCES WHENCE DERIVED.

	1908-09.	1911-12.	1912-13.
Produce of the Mine . . .	\$37,257,699	\$41,324,516	\$57,442,546
Produce of the Fisheries . . .	13,319,664	16,704,678	16,336,721
Produce of the Forest . . .	39,667,387	40,892,674	43,255,060
Animals and their products . . .	51,349,646	48,210,654	44,784,379
Agricultural products . . .	71,997,207	107,143,375	150,145,661
Manufactures	28,957,050	35,836,284	43,692,708
Totals	\$242,548,653	\$290,112,181	\$355,657,075

The course and tendency of trade relations is shown also by the following table:—

EXPORTS OF TOTAL MERCHANDISE THE PRODUCE OF CANADA DURING THE YEAR ENDED MARCH 31, 1913

Britain	\$170,161,903
United States	139,725,953
Other Countries	45,769,433
Total	<u>\$355,657,289</u>

VALUE OF GOODS ENTERED FOR CONSUMPTION AT EIGHTEEN CANADIAN PORTS DURING THE YEAR ENDED MARCH 31, 1913

Dutiable goods	\$344,200,183
Free goods	159,285,443
Total	<u>\$503,485,626</u>

For the fiscal year ending March 31, 1913, there was imported as dutiable, free, or as coin and bullion, merchandise to the value of \$692,032,392, made up as follows:—

Coin and bullion	\$5,427,979
Free merchandise	230,518,226
Dutiable merchandise	456,086,187
	<hr/>
Total	\$692,032,392

The following figures bearing on the Trade and Commerce of the Dominion during the year ended March 31, 1913, omitting the less important articles of value, will give at a glance the export trade of Canada, not only to Great Britain and the United States, its best customers, but also to all other countries in the various classes specified:—

EXPORTS OF CANADA TO GREAT BRITAIN DURING THE FISCAL YEAR
ENDED MARCH 31, 1913

Agricultural Products:—Total, \$106,537,156

Apples	\$3,804,967	Hay	\$759,241
Barley	3,315,172	Cereal foods	1,382,331
Wheat	74,978,155	Oatmeal	830,417
Flour of Wheat	12,442,479	Oats	3,592,247
Clover seed	310,629	Peas (whole)	43,299
Flax seed	4,537,360	Buckwheat	53,432

Animals and their Products:—Total, \$30,335,784

Cattle	\$913,954	Hams	316,047
Horses	14,400	Cheese	20,497,195
Bacon	5,313,711	Furs (undressed)	2,628,994

Fisheries:—Total, \$3,946,471

Lobsters	\$883,120	Fish oil (whale)	\$243,604
Salmon	2,668,678		

Forest Products :—Total, \$10,103,469

Deals, pine	\$1,285,863	Planks and Boards	\$1,825,549
Deals, spruce, and other	4,683,821	Square timber	1,337,244

(Products of the forest imported from all countries and entered for consumption during the twelve months ended March 31, 1913, as free goods, lumber and timber to the value of \$15,983,456; wood for fuel, \$149,677 entered during the same period.)

Manufactures :—Total, \$7,158,746

Agricultural implements	\$437,006	Aluminium, pigs, bars, ingots, etc.	\$459,150
Drugs, chemicals, medi- cines	521,566	Leather	1,151,021
Typewriters	152,555	Musical instruments	131,721
Books, pamphlets, maps, etc.	148,086	Paper, all kinds	584,423
		Woodware	1,141,991

Mineral Products :—Total, \$12,066,622

Nickel	\$718,141	Asbestos	\$211,450
Silver	10,318,158	Mica	34,912
Copper	854,031		

EXPORTS OF CANADA TO THE UNITED STATES DURING THE FISCAL
YEAR ENDED MARCH 31, 1913*Agricultural Products* :—Total, \$27,215,879

Fruits	\$151,944	Hay	\$2,978,682
Grains (wheat, etc.)	9,740,382	Maple sugar	100,419
Flour of wheat	134,743	Clover seed	292,801
Bran	888,432	Vegetables	348,700

Animals and their Products :—Total, \$12,866,948

Cattle	\$210,196	Meats	\$85,835
Horses	473,025	Furs (undressed)	2,184,275
Sheep	29,982	Hides	7,162,287
Sheep (over one year old)	38,600		

Fisheries :—Total, \$5,747,688

Codfish	\$894,310	Mackerel	\$298,692
Herring	329,103	Salmon	208,557
Lobsters	1,478,874	Fish (other and fresh)	1,318,868

Forest Products :—Total, \$29,951,880

Bark for tanning	\$29,842	Shingles	\$1,374,569
Logs, various	950,630	Sleepers and railroad	
Spruce deals, etc.	743,561	ties	195,901
Laths	1,743,248	Square timber	11,197
Planks and boards	16,247,450	Wood for pulp	6,806,445

Manufactures :—Total, \$21,321,458

Agricultural implements	\$54,087	Iron and steel (manu-	
Books, pamphlets, and		facture of)	\$1,255,260
maps	191,413	Liquors	842,461
Cordage, rope, twine	7,112	Paper	4,367,081
Drugs, chemicals, medi-		Wood-pulp	4,576,279
cine	542,179	Vehicles, all kinds	271,177
Fertilisers	1,592,185		

Mineral Products :—Total, \$42,541,751

Asbestos	\$1,965,246	Nickel	\$4,327,056
Coal	4,130,435	Silver	8,828,897
Gold-bearing quartz,		Mica	282,063
nuggets, etc.	11,169,239	Ores	918,697
Gypsum	439,488	Pyrites	7,007
Copper	9,504,091	Sand and Gravel	443,618

EXPORTS OF CANADA TO OTHER COUNTRIES THAN GREAT BRITAIN
AND THE UNITED STATES BY CLASSES AND VALUES DURING THE
YEAR ENDED MARCH 31, 1913

Agricultural Products :—Total, \$16,392,626

Animals and their Products :—Total, \$1,581,647

Fisheries Products :—Total, \$6,642,562

Forest Products :—Total, \$3,199,711

Manufactures :—Total, \$15,212,504

Mineral Products :—Total, \$2,834,173

EXPORTS OF CANADA TO ALL COUNTRIES FOR YEAR ENDED
MARCH 31, 1913

Agricultural Products :—Total, \$150,145,661

Apples	\$4,047,806	Oatmeal	\$837,079
<i>Total Fruits</i>	4,679,183	Hay	3,950,058
Barley	3,851,660	Clover, flax, and grass	
Oats	5,067,950	seeds	17,357,056
Wheat	88,608,730	Potatoes	749,363
Flour of wheat	19,970,689	<i>Vegetables</i>	1,024,110

Animals and their Products :—Total, \$44,784,593

Cattle (over 1 year old)	\$2,183,311	Cheese	\$20,697,144
Sheep	81,253	Furs, undressed	5,150,833
Bacon	5,350,845	Hides	7,196,250
Hams	322,669	Wool	193,500
Butter	223,578		

Fisheries Products :—Total, \$16,336,721

Codfish	\$4,416,621	Salmon	\$4,027,977
Herring	908,463	Fish (other), fresh	1,318,868
Lobsters	3,677,829	Whale oil	532,396
Mackerel	352,764		

Forest Products :—Total, \$43,255,060

Logs, various	\$1,028,456	Shingles	\$1,409,116
Pine deals	1,386,708	Railroad ties, sleepers	195,901
Spruce deals	5,513,543	Square timber	1,363,200
Laths	1,789,969	Wood for pulp	6,806,445
Planks and Boards	20,839,098		

Manufactures :—Total, \$43,692,708

Agricultural imple- ments	\$6,365,824	Fertilisers	\$1,677,703
Aluminium, pigs, bars, etc.	1,631,287	Iron and steel articles	2,844,913
Books, maps, etc.	377,686	Leather	1,423,583
Coke	269,383	Liquors	1,348,646
Cordage, rope, twine	31,282	Musical instruments	254,012
Drugs, chemicals, medi- cine	1,746,528	Oil cake	1,074,701
		Paper	6,324,810
		Wood pulp	5,509,544

Mineral Products:—Total, \$57,442,546

Asbestos	\$2,486,769	Lead	\$8,442
Coal	5,555,099	Nickel	5,045,197
Gold	11,226,573	Silver	20,202,559
Copper	9,551,899	Ores	1,191,147

The steady progress in Canada's export trade will be seen at a glance by the following table:—

VALUE OF EXPORTS FROM CANADA TO ALL COUNTRIES,
EXCLUSIVE OF BULLION.

1905	\$201,472,061	1910	\$298,763,993
1906	246,657,802	1911	290,000,210
1907 (9 months)	192,087,233	1912	307,716,151
1908	263,368,952	1913	377,068,355
1909	259,922,366	1914	455,437,224

The manufacturing interests of Canada have developed very rapidly in recent years, not solely on account of the natural advantages in water power, electrical energy, and the like, but also by dint of the tariff regulations with foreign countries.

In 1906 the Canadian Government altered the British Preferential Tariff from a flat rate of 25 per cent rebate by particularising for every item imported, holding that on the whole the preference to Great Britain was larger than formerly. An *intermediate tariff* was also set up for application to countries giving reciprocity to Canada. In order to qualify for the British Preference, imports must have 25 per cent of their value made up of British labour.

On August 1, 1898, a rebate of 25 per cent was given the United Kingdom and West Indies, and to such other countries in the British Empire as accorded reciprocal treatment to Canada. In 1900 the preferential treatment was increased from 25 per cent to $33\frac{1}{3}$ per cent.

A commercial Convention with France was signed

on September 19, 1907, ratified by Canada, April 3, 1908, and by France in 1909, giving Canada the benefit of the French minimum tariff, and extending to France the benefit of Canada's intermediate tariff for certain products, and a special tariff for others. A supplementary convention, signed January 1909, and put into force in 1910, admitted certain French exports on terms generally identical with and in some few cases lower than those accorded to British goods by the preferential tariff.

Trade and commerce returns, giving in values the *exports* which may be classed as *manufactures*, indicate to what degree Canada is pushing her products in foreign lands. For the fiscal year ended March 31, 1912, the following figures are given:—

Agricultural products	\$19,722,412	Forest products . . .	\$32,441,533
Animal products . . .	23,455,486	Mineral products . . .	25,312,637
Fisheries	8,051,364	Total	\$108,986,432

But the products of Canada as a nation, in its various spheres of agriculture and manufactures, as recorded in the last Census returns of 1911, furnish figures which give the actual productivity of the country. The figures for the last Census:—

Agriculture:—Total, \$782,298,569

Alberta	\$50,483,534	Saskatchewan	\$109,493,322
British Columbia	17,934,932	Ontario	314,943,556
Manitoba	70,975,465	Prince Edward Island	11,967,425
New Brunswick	24,966,621	Quebec	154,568,936
Nova Scotia	26,964,768		

Returns for the industries of Canada in 1911 give, as value of the products, the figures \$1,165,975,639: wages for labour \$197,228,701; wage-earners 471,126; with a capital outlay of \$1,247,583,609 distributed in 19,218 establishments.

These are grouped as follows :—

Food products	\$245,669,321
Textiles	135,902,441
Iron and steel products	113,640,610
Timber, lumber, etc.,	184,630,376
Leather	62,850,412
Paper and printing	46,458,053
Liquors and beverages	28,936,782
Chemicals	27,798,833
Clay, glass and stone products	25,781,860
Metals and products (other than steel)	73,241,796
Tobacco	25,329,323
Vehicles (land transportation)	69,712,114
Vessels (water transportation)	6,575,417
Miscellaneous	104,618,560
Hand trades	14,829,741
Total	<u>\$1,165,975,639</u>

By provinces, the returns of values of products in the industries for the year 1911 are as follows :—

Alberta	\$18,788,825
British Columbia	65,204,236
Manitoba	53,673,609
New Brunswick	35,422,302
Nova Scotia	52,706,184
Ontario	579,810,225
Prince Edward Island	3,136,470
Quebec	350,901,656
Saskatchewan	6,332,132

The total trade of the Dominion for the year 1914 amounted to \$1,129,744,725, divided as follows :—Imports \$650,746,797, exports \$478,997,928, showing an increase of \$44,480,276 over the figures for the preceding twelve months, and creating a record figure to that date.

Whilst there are no figures available for gauging the growth of Canada's internal trade, there can be little doubt, if the dealings of certain eastern houses with the

west be a criterion, that the increase for the past year on this score is probably not less than 20 per cent above that of the previous fiscal year.

The refusal, on the part of Canada, to adopt a Reciprocity Treaty with the United States is full of significance for the future and progress of the provinces of the Dominion. The very *raison d'être* of this nation implies a strong British policy.

Financial

The total net public debt of the Dominion is \$335,966,658. The revenue for the year ending March 31, 1914, was \$163,174,394, and the total expenditure \$183,570,693, of which \$127,353,981 was chargeable to Consolidated Fund. The aggregate revenue of the Dominion for the fiscal year ending March 31, 1913, was \$168,690,427. The deposits in the Government savings banks stood on the same date at \$57,140,483, or \$7.37 per head of the population at its latest estimate.

The banking system of Canada is framed upon that of Scotland, and is carried on by a comparatively small number of institutions with large capitals and having many branches, so that every town of importance has one or more banks to assist in developing its trade, while each branch has the entire resources of the central bank to fall back upon, and its accumulated experience to guide its operations.

The currency of the country is redeemable in gold. The "Royal Mint" of England in 1901 established a branch at Ottawa, with a deputy master as head, where gold, silver, and bronze coins are struck in various denominations. A new currency was established by Act of Parliament in 1910. It provides that gold, silver, and

bronze coins, of specified weight and fineness, struck on the authority of the Crown for circulation in Canada, should be equal to and pass current for the sums in the currency of the Dominion:—Twenty dollars, ten dollars, five dollars, two-and-a-half dollars, fifty cents, twenty-five cents, ten cents, five cents, and one cent; that gold coin should be a legal tender for any amount, silver coin for a payment of not more than ten dollars, and bronze for a payment of not more than twenty-five cents. The British sovereign and half-sovereign were legalised as currency, as were the gold coins of the United States of America, the \$5, \$10, and \$20 coins being declared to be a legal tender and to pass current in Canada for similar amounts. The currency in actual use, however, is paper, and consists of notes issued by the Government and notes of \$5 and upwards issued by the banks. The Government issues notes of many denominations, but has a monopoly of notes under five dollars.

The banks may issue notes to the amount of their paid-up capital, and these must be kept at par throughout the Dominion. They are bound to make monthly statements to the Government, certified under oath, of their assets and liabilities. The statement is in considerable detail, and all loans are classified under heads to show their nature. The reserves are also set forth, with such other information as may have any important general bearing on the bank's business. These statements are published in the official Gazette. Many other conditions are laid down in the interest of the public, but these are the most important.

The amount of Dominion notes in circulation in December 1912 was \$110,048,357, and the average amount of the bank notes in circulation the same year was \$100,146,541. The aggregate paid-up capital of the

banks is \$114,881,914. The leading bank is the Bank of Montreal, which was organised in 1817 and has a capital of \$16,000,000, and a rest of \$16,000,000. Its total assets amount to \$247,092,650. It is the financial agent of the Dominion of Canada. The *second* largest bank in Canada, the Canadian Bank of Commerce, with headquarters in Toronto, has a paid-up capital of \$15,000,000, and assets totalling \$260,030,720. The Royal Bank of Canada ranks *third* with capital paid-up of \$11,560,000 and its total assets amount to \$180,246,785.

Canadian Credit.—It is a long established practice of Canadian banks to carry a large safety fund in the shape of bank balances and call loans in London and New York City. For example, in August 1912 Canada had in net balances in London banks \$13,805,601, whilst the balances in New York City, Paris, and Berlin combined amounted to \$33,397,793, whilst the call loans in London and New York City were \$114,847,864, making a total call or command over the resources of the great markets of the world amounting to \$162,051,258. Besides this, Canadian banks held in August 1912, \$97,850,740 in investment securities, of which some \$60,000,000 at least probably had international value, consisting of United States railway bonds, Dominion of Canada bonds, some British Consols, Japanese Government stock and Indian Government stock; so that, all told, Canadian banks could command some \$220,000,000 of outside funds in the event of trouble.

The Dominion Government gold reserve is a factor of strength to Canada's credit. The specie in the Dominion Treasury at Ottawa rose from \$43,705,485 on August 31, 1907, to \$103,014,276 on August 31, 1912.

The following table affords some evidence of the remarkable expansion in Canadian banking business since 1869 :—

Year.	Authorised Capital.	Paid-up Capital.	No. of Banks.	Average Paid-up Capital per bank.
1869	\$38,166,000	\$27,663,367	27	\$1,024,569
1874	76,566,666	63,212,035	40	1,580,300
1879	67,266,666	60,351,505	40	1,508,787
1884	71,896,666	61,605,520	40	1,540,138
1889	75,779,999	60,189,356	41	1,468,033
1894	73,458,685	61,669,355	38	1,622,877
1899	76,108,664	63,584,022	38	1,673,263
1904	100,546,666	80,055,596	34	2,354,572
1909	140,466,666	97,808,617	30	3,260,287
1910	154,266,666	99,676,093	28	3,417,003
1911	169,866,666	107,994,604	29	3,723,952
1912	196,866,666	114,881,914	27	4,254,886

There were 2968 branches of the chartered banks throughout the Dominion on October 31, 1913.

A summary of Canada's industrial production for 1910 was issued during October 1912. The capital invested in manufacturing industries is given at \$1,245,000,000 as against \$450,000,000 in 1900. The manufacturing establishments number 19,202, employing 511,844 hands, who earned in wages and salaries the sum of \$240,000,000. Raw materials valued at \$600,000,000 were converted into manufactured products valued at \$1,165,000,000. These figures show enormous advances on the position in 1900. There has been an increase of the average wage earned per person employed of \$136 per annum, or 40 per cent over the year 1900, while the value of the output of products per person employed has risen from \$1418 in 1900 to \$2275 in 1910, an increase of \$875 per head. (See pages 150 and 151.)

CHAPTER IV

HISTORY OF ACADIA

NOVA SCOTIA, New Brunswick, and Prince Edward Island together constitute Acadia. The histories of the three maritime provinces are inextricably interwoven. To the general reader, familiar with narratives of the rise and fall of great empires, the theatre may seem small and the number of combatants insignificant, but the great duel between France and England commenced in the forests and harbours of Acadia, and there two different systems of colonisation came into the strongest contrast. The French system failed because the king was a human being and had not supernatural powers of controlling events occurring in a world utterly remote from anything he or his courtiers could conceive of. The French Government had regard primarily to the interests of France. The English Parliament were always content if the colonies did not trouble them with their existence, and the colonists carried on their affairs primarily in their own local interests. There was no science or political wisdom about it, but the English colonists, living in the country, did what seemed necessary to be done, while the French officials were toiling to get the truth out of voluminous and contradictory reports. The English Parliament meddled more with Newfoundland than with any other colony in America, and the result is manifest now to all.

The combatants were indeed few in number, but the stake was one of the greatest that was ever fought for by two great nations. Had there been a succession of kings of France like Henry IV. all North America would probably have been at this moment French, and the English people would be in the ideal position coveted by some of their own statesmen: shut up in the two islands to manufacture generally for well-disposed foreigners. The battle on the heights of Quebec was one of the great decisive battles of the world, and the first skirmish of the conflict opened in Acadia.

The history of Acadia commences far back in the times before the pacification of King Canute, during the great overflow of the Scandinavian people. Step by step they passed over the western ocean to Iceland in A.D. 874, to Greenland in A.D. 986, and to Acadia in A.D. 1000. Concerning this there can now be no dispute. The Icelandic records are admitted to be genuine, and it is now conceded that Helluland, Markland, and Vinland were places on the north-east coast of America. Whether we take Helluland to be Labrador or Newfoundland, whether Markland be Newfoundland or Nova Scotia, or whether Vinland be Nova Scotia or New England, on any theory yet propounded by scholars some part of Nova Scotia was seen by the Northmen in A.D. 1000.

There is nothing in the Norse voyages to America beyond the ordinary achievements of these daring sea rovers. From Greenland to Labrador is the same distance on the chart as from Iceland to Scotland, and less than the distance from Iceland to Norway; and whether Leif Ericson sailed from the east or the west coast of Greenland, he would equally have had the assistance of the Arctic current flowing on both sides of Greenland, to impinge on the Labrador coast and follow down the coast

of Newfoundland and Nova Scotia. It is sailing down hill all the way. The ships of the Northmen were fitted to contend with the stormiest seas; for, from Norway or Iceland, across the Bay of Biscay and into the Mediterranean sea, was a very frequent course of their piratical expeditions. No more formidable seas are encountered in the North Atlantic than those around the north of Scotland and Norway, in the Bay of Biscay and on the Atlantic coast of Spain. Their ships could make use of oars as auxiliary to their square sails, and this was of much assistance in their long coasting voyages.

The scope of this volume will not permit of a discussion of these early Norse voyages to America. It is sufficient to point out that three steps upon the coast are plainly indicated. If Labrador be the first, Newfoundland is the second, and Nova Scotia the third. If, however, Newfoundland be the first, Nova Scotia is the second, and New England the third. It might well be that some part of Newfoundland was indicated by the word Helluland. In the saga of Erie the Red, Leif Erierson is said to have given the name on the spot because of the appearance of the land. In Rafn's *Antiquitates Americanæ* the passage is translated from the Icelandic: *jam terræ nomen imponam et Hellulandiam (terram saxæ planitici) appellabo*. This is not, as often translated, a land of flat stones, but a land of stony flatness. So far as the name is concerned (and there can be no higher authority than Rafn for the meaning of it) it would apply to a long stretch of coast near Cape Race. The very earliest Portuguese sailors on the coast were struck by the peculiar appearance of that headland, and called it *Cabo Raso*—the flat cape. At p. 14 is an illustration, taken from a photograph. The name appears on the King map of 1502 and has continued to this day. Much of the coast in that part of Newfound-

land is rocky table-land of the same character. One merit of this theory is that it will enable Leif Ericson to have reached Boston, where a statue has been erected to commemorate his visit.

Turning away with reluctance from this enchanting region of American history, it must be observed once more that Nova Scotia is clearly within the scope of these voyages, whether it be taken as Vinland or Mark-



STONE FOUND NEAR YARMOUTH, WITH SUPPOSED RUNIC INSCRIPTION.

land, and as, upon the coast of Massachusetts, the famous Dighton rock with its inscription, convinced Professor Rafn and some other scholars of the former presence of the Northmen, so near Yarmouth, Nova Scotia, a rock inscribed with characters supposed to be Runic was found at the end of the last century, and has been the subject of speculation among those who are interested in the præ-Columbian discovery of America. As a matter of antiquarian speculative interest, and because it has not often been reproduced, a cut of the inscription is given above. The rock is about two feet thick, with one smooth surface, and was found at high-water mark on

the shore of a small inlet at the head of the harbour. Whatever these characters may be, or may mean, the curious inquirer may be sure that they are genuine and that no fraud has been practised. The inscription was never deciphered until a copy was sent to Mr. Henry Phillips, an antiquarian scholar of Philadelphia, who, after a study extending at intervals over nine years, read it, *Harkussen men varu*, "Harko's son addressed the men." He made it the subject of a communication to the American Philosophical Society in 1884, and connected it with Hake, a Scotchman, who was with Thorfinn on the voyage of A.D. 1007.

Without expressing any opinion as to either this or the Dighton rock, and referring those readers who may be interested in the subject to the authorities cited at the end of this volume and to the rock itself, which is carefully preserved at Yarmouth, it is necessary to pass on to the voyages of the Cabots in 1497 and 1498. The landfall of the first voyage has been the subject of a long controversy as to whether it was at Labrador, Newfoundland, or Cape Breton. Dr. Samuel Dawson has stated the reasons of his conviction that the landfall was at the east point of Cape Breton, which has given its name to the whole island. It is sufficient to observe that beyond all question Cabot in the second voyage, that of 1498, coasted along the shores of Acadia, New England, and Virginia; and upon these voyages the English always based a claim by discovery upon the mainland of America. It is necessary to remember that such claims must be read in the light of the notions of international law existing at that period.

The voyage of Verrazano in 1524, under a commission from Francis I. of France, has also been the subject of controversy, and has been disputed, but without reason-

able grounds. Upon this voyage the French founded a right of discovery from 30° to 46° north latitude. In 1525 Estevan Gomez, a Portuguese sailor in the employ of Spain, sailed along the coast from Florida to Cape Race, and the Spaniards also laid claim to the territory up to 45° by discovery, although they did not press it as against the Portuguese, inasmuch as the vague geographical notions of the day drew Acadia and Newfoundland east of the line of demarcation of Pope Alexander VI.

The more closely the early records are searched the clearer it will appear that the Portuguese and French were the first to resort regularly to the shores of Acadia and the first to make attempts at settlement. The early nomenclature of the coast bears witness to that, for French and Portuguese names still linger along its whole length. To these must be added the Basques, Spanish and French, who were the most daring and skilful sailors of that age. As late as the treaty of Utrecht the king of Spain made claim to a share in the fisheries of southern Newfoundland for the Basques of Guipuzcoa. From the year 1504 French vessels from St. Malo, Dieppe, and La Rochelle frequented the Acadian harbours and those of southern Newfoundland. In 1607 Champlain met on the coast an old sailor called Savalet from St. Jean de Luz, who had made forty-two voyages to Acadia. Lescarbot called the harbour where the old sailor was fishing, Savalette. It was the present Whitehaven. The English probably resorted more to Newfoundland, for there are no clear records of their being on the Acadian coast at so early a date. From the earliest times the kings of Portugal claimed sovereign rights there, not only under the Bull of Pope Alexander, but because of the voyages of the Corte Real family in 1500-1 and 1502; and in 1521 the Portuguese court

made a grant along the coast of Acadia to João Alvarez Fagundez, who would seem to have made some attempt to settle. Gradually, however, the Portuguese withdrew; for their richer possessions in the east absorbed their energies, and the sixty years' domination of Spain cramped their enterprise.

In 1534 and 1535 Jacques Cartier, under a commission from Francis I., discovered the Gulf of St. Lawrence, and sailed around it and up the river to the site of the present city of Montreal. Not only did he coast along Labrador and the western shore of Newfoundland, but he discovered the islands in the Gulf and touched the north shore of Prince Edward Island, the gulf shore of New Brunswick, and the shores on both sides of the Bay Chaleur. He was the unwitting discoverer of Prince Edward Island, for he thought it was part of the mainland. The idea that Cabot discovered it is an afterthought of recent years without solid foundation. Neither Cabot, nor Corte Real, nor Verrazano, nor Gomez, nor Fagundez, can be shown to have penetrated either the Bay of Fundy or the Gulf of St. Lawrence; and until Jacques Cartier's discoveries were made known, the maps of America were drawn in such a way as to prove that nothing beyond the Atlantic coast was known.

As the English did not follow up the discoveries of the Cabots for a long time so the French did not follow up, by permanent settlement, the discoveries of Cartier; nevertheless fishermen and traders, unknown to fame, continually frequented the coasts and, year by year, the maps became more accurate from their reports. In the meantime the whole energies of the European governments were consumed in religious wars and internal dissensions. What went on in American waters is shown by one salient

fact. The coast of Cape Breton was the favourite fishing resort, and the old name for Louisburg was Havre aux Anglais, and for Sydney, Havre aux Espagnols, while St. Anne's Bay was the resort of the French. The fishermen fished in peace, and the different nationalities resorted to different harbours. There were harbours and fish enough for all.

France emerged from her troubles when Henry IV. was settled firmly on the throne, and with his characteristic breadth of mind he recognised the importance of western plantations. In 1603 he gave to M. de Monts a commission as governor of the country of *La Cadia* from 40° to 46° north latitude (from Philadelphia to Newfoundland). In like manner the English monarch, James I., following his example, granted a charter to two companies to settle "Virginia," extending from 33° to 46° north latitude, that is from South Carolina to Newfoundland, thus the whole coast of America, north of the part generally conceded to Spain, was claimed by both powers before either had sent out a single permanent settler. In 1620 King James granted the country under the name of New England, from the 40th to the 48th degree, in absolute property to a company of noblemen. It is not necessary to follow farther the history of these overlapping charters, except to point out that Acadia was claimed by the English as a part of northern Virginia, or New England, and King James again, in 1621, set off from the New England territory, under the name, then first used, of Nova Scotia, all the country known as Acadia from the St. Croix to Gaspé inclusive. The grant was made to Sir William Alexander, Earl of Stirling, although at the time the French were actually settled at Port Royal, Tadoussac, and Quebec.

To return, however, to the grant of Henry IV. of 1603 ;

—in the following year de Monts sailed with two ships, and with him were the Baron de Poutrincourt, Hebert, Pont-gravé, and Champlain. Concerning the last many things will require to be said elsewhere, for he is the true hero of Acadia as well as of Canada. They sailed along the coast of Nova Scotia, and most of the names they gave still survive. La Hève, Port Mouton, Cape Negro, Cape Sable, Long Island, St. Mary's Bay, and many others, are either names then in use or given by de Monts and Champlain. The Bay of Fundy was named La Baie Française by de Monts and the name persisted on the French maps. Champlain visited Annapolis basin and sailed up to the head of the Bay of Fundy. He visited and named St. John harbour, because he arrived there on St. John's day, and went on to the river Schoodic or St. Croix. On an island in this river, now called Neutral (Douchet) island, de Monts built a fort, and the Boundary Commissioners in 1798 found its remains and thus identified the Schoodic river as the true St. Croix. There de Monts passed a very uncomfortable winter. The next spring the whole party moved across the bay to the Annapolis basin. Champlain had been charmed with this basin, and it was named Port Royal. There they settled, and thus, in 1605, was made the first permanent settlement of Europeans north of St. Augustine, for although the grant to de Monts was cancelled in 1607 and the adventurers returned to France, yet it was renewed in 1610, and they came back and found all their buildings just as they had left them.

Two years later, in 1607, Jamestown in Virginia was founded. It should be noted, however, that the first Port Royal, that of de Monts and Champlain, was not on the site of the present Annapolis but lower down on the Granville side opposite Goat island. The Baron de

Poutrincourt was so delighted with the place that he procured a grant of it from de Monts and made up his mind to settle there for life; for the French of those days could live happily out of reach of Paris. Game was plenty, the Indians were friendly, and the adventurers were full of resources.

After spending in all three and a half years in Acadia, Champlain on his return gave up his Acadian connection to found Quebec; but Poutrincourt brought his son out and continued the enterprise. Lescarbot, a clever Paris lawyer, was out for a while. He wrote an account of the country, and the first American poetry was *Les Muses de la Nouvelle France*, meditated if not written at Granville on the Annapolis river. The little colony had many difficulties but it gave promise of success.

There was peace at that time between England and France, but the colonists at Jamestown, when they heard of a settlement at Port Royal, sent Samuel Argall with three ships to destroy it, under the pretext that it was within the limits of the grant of northern Virginia. He burned the houses, and the French took refuge with the Indians in the woods. Whatever colour of reason may have existed for the destruction of St. Sauveur on the coast of Maine, the French were clearly within their right at Port Royal, and with this wanton and unjustifiable act commenced the struggle for supremacy in the new world. Poutrincourt, ruined in fortune by the failure of his colony, was killed in battle in Europe, and his son Biencourt took his name, and it has been generally supposed that with some companions he lived with the Indians in different parts of Nova Scotia until his death, but recent researches have thrown doubt upon this.

Sir William Alexander in the meantime was making unsuccessful attempts to utilise the grant of 1621 when

King Charles first instituted, in 1625, the order of Baronets of Nova Scotia, and commenced to regrant the country in tracts six miles long by three wide. The western boundary of his charter of 1621 was that intended by the treaty of 1783, and is so far of interest, otherwise all these documents only demonstrate the prevailing ignorance concerning the country. The younger Poutrincourt had in some way conveyed to his favourite companion, Charles de La Tour, all his rights in Acadia, and his command as governor for the king of France, when Kirke, in 1628, took possession of Port Royal for Alexander, and planted there a colony of Scotch settlers, without however troubling the other small posts the French had in Acadia. Charles de La Tour was then residing at Port La Tour near Cape Sable, and his father, Claude de La Tour, had gone to France to obtain a confirmation of his son's command. The elder La Tour was taken prisoner while returning to Quebec in Roquemont's fleet, and sent to England, where he forgot his nationality, married an English lady of rank, and undertook to hand over all Acadia to the English. Sir William Alexander appointed him and his son baronets of Nova Scotia, and, reserving to himself Port Royal, he transferred to the La Tours his remaining rights in Acadia. The son, however, resisted all the entreaties of his father, held to his allegiance, and defeated an English force led by his father to take the fort at Port La Tour. The fate of the Scotch settlers is obscure. Some were killed by the Indians, and some married and were absorbed among the French and natives, and some doubtless returned when the country was given up, for in 1630 the treaty of St. Germain en Laye conceded to France all Acadia, Cape Breton, and Canada, and closed the first chapter of Acadian history.

The second chapter opens with the arrival of a very distinguished officer, the Commander Isaac de Razilly, allied to the family of Richelieu. He was appointed lieutenant-general in New France for the king and for the Cardinal de Richelieu, with a grant for himself of the river and bay of St. Croix. There came with him two men,—Nicholas Denys, Sieur de Fronsac, and Charles d'Aulnay de Charnisay,—and he found in Acadia Charles de La Tour. The history of Acadia during a long period is nothing beyond the history of these most capable and energetic men. Razilly fixed his residence at La Hève, and appointed Charnisay and La Tour his lieutenants. The peaceful Denys established a shore fishery in partnership with Razilly at Port Rossignol (now Liverpool), and La Tour received a grant of the territory at the mouth of the St. John river. There he built a fort known as Fort La Tour, and founded a large fishery and trading establishment. It was in the harbour of the present city of St. John, New Brunswick, but its precise site is disputed by antiquaries. Charnisay's lieutenancy was along the coast of New Brunswick and Maine, and La Tour's was in Nova Scotia, but La Tour's grant on the St. John was expressly excepted from Charnisay's jurisdiction.

De Razilly seems to have died in Acadia, and an internecine feud broke out between his two lieutenants. Both were confirmed in their governments by the court of France, but Charnisay had strong family influence in France. Both were supported by companies of merchants with which they were connected in their fishing and trading concerns. Charnisay was bold and haughty, and made aggressions on the New Englanders. He seized Pentagoet at the mouth of the Penobscot and fortified it, and maintained himself there, making it his chief place

of residence. On Razilly's death he inherited the establishments at Port Royal and La Hève, and he removed the former to the site of the present Annapolis. These establishments were excepted from La Tour's jurisdiction, so that Charnisay's posts were exemptions in La Tour's government and La Tour's post was an exemption in Charnisay's government. La Tour's family was Huguenot, and although Charles de La Tour was a Catholic his relations with the English were more friendly than those of Charnisay.

The quarrel between these two lieutenants of the French king assumed the intensity of a war, and many romantic and interesting incidents occurred which are related in the histories. Madame de La Tour joined her husband at Fort La Tour in 1645 bringing supplies, and Charnisay, finding out that La Tour had gone on an expedition with most of his men, suddenly appeared before the fort and summoned it to surrender. But Madame de La Tour defended the place with a handful of men for four days, until one of the garrison, corrupted by Charnisay, turned traitor. Even then she held out and obtained honourable terms of surrender. When Charnisay got possession of the place he violated his promise and hanged all the garrison save one whom he forced to act as hangman. He compelled Madame de La Tour to witness, with a rope round her neck, the execution of her followers. Three weeks after the lady died broken-hearted with grief, and Charles de La Tour retired to Boston a ruined man. For five years Charnisay ruled alone in Acadia and distressed the settlers by his harsh rule. In 1650 he died, and in a short time La Tour was established in his government and married his widow.

But there was not yet peace for Acadia. One Le Borgne, a merchant of La Rochelle, was a creditor of

Charnisay, and he proceeded to harass La Tour and Denys who succeeded to the conduct of affairs by processes and seizures. Denys had obtained from the government at Quebec a grant of all the shore from Cape Rosier in Gaspé to Cape Canso in Nova Scotia. He had establishments at Chedabucto (Guysborough) and at St. Pierre and St. Anne's Bay in Cape Breton. It was he who first discovered and made use of Cape Breton coal. An expedition under Le Borgne seized him, plundered his chief post at St. Pierre, and forced him to retire to Chedabucto. Under such circumstances as these Acadia could not prosper, and in the midst of all these contentions, while the French courts were considering the claims and the French ministers were considering the reports, Cromwell sent an expedition under Sedgwicke in 1654 and seized the whole country; together with M. Le Borgne at Port Royal—thus closed the second chapter.

In 1656 a grant was made of Acadia to Sir Thomas Temple, William Crowne, and Charles de La Tour; for La Tour had laid his case before Cromwell, showing in full all his claims by inheritance and marriage. Their justice was acknowledged and he was associated in the patent with Temple and Crowne. Weary of strife, he sold his interest to his associates and settled on a small holding where he passed ten quiet years until his death in 1666. Acadia was governed by Sir Thomas Temple until, by the treaty of Breda in 1667, it was again restored to France by Charles II., sorely against the will of the New England people. This closed the third chapter of Acadian history.

Acadia was now under French rule once more. Governors were sent down from Quebec, and the officials carried on their petty disputes in a double series of recriminatory despatches to headquarters. The governors

resided at first at Pentagoet and St. John. The settlers were oppressed by the monopolies of the trading companies, and no attempt was made to reinforce the colony by sending out new settlers. The Intendant, De Meules, who visited Acadia in 1686, was shocked by the desolation he saw. The New England people encroached on their fisheries, and there was no force to protect them from the pirates who harried the coasts. In 1689 William III. became king of England, and war broke out with France, and, as always, the poor Acadians had to bear the brunt of it. Sir William Phips, with an expedition from New England, seized and plundered Port Royal and the other posts, but did not retain military possession of the country, although the colonists of Massachusetts claimed it as theirs. The French governors retired up the St. John river to Jemseg and then to Nashwaak opposite the present Fredericton; from thence they incited the Indians to attack the English colonies, and the most atrocious cruelties were practised all along the frontier. The colonies had gained great strength and the French were weak, but the Micmacs, Malicetes, and Abenakis were numerous and they hated the English colonists, whom they called "Bastonnais." The English frontiers were wrapped in fire and blood. The tomahawk and scalping-knife were busy, and midnight attacks and massacres were continual. The Massachusetts colonists were exasperated to madness and retaliated upon the Indians with desperate energy, and adopted, moreover, some of the methods of their savage enemies. Frontenac was also harassing the back settlements from Canada in the same way. The English colonists felt the French hand behind all these attacks and the antagonism of Puritan and Catholic intensified the feeling. All this prepared for the Acadians the

unique tragedy which they were to endure in after years. An expedition under Iberville appeared on the coast and reconquered their posts, but privateers and pirates still harried them and, although Port Royal was fortified, the farms were uncultivated and famine even threatened the people. At last in 1710 General Nicholson, with a formidable expedition from Boston, attacked and carried Port Royal and seized the whole country. This time the conquest was final. The remonstrances of the New England colonies were successful and, at the treaty of Utrecht, the whole of Acadia "in its ancient limits" was ceded to the English, and the French retained only Cape Breton and the islands in the Gulf. The fourth chapter of Acadian history closes also with disaster.

At the period of the treaty of Utrecht there were no settlements on the island of Cape Breton, save the fishing establishments, under the grant to Denys, at St. Anne's Bay and St. Peter's. When the French Government relinquished Newfoundland and the mainland of Acadia it resolved to found a first-class fortress on the island to guard the gulf and give a firm foothold for the power of France in America. The place known as English Harbour was chosen, its name was changed to Louisburg, the island was called Île Royale, and during the following years over thirty millions of livres were expended by the French Government in fortifications. All the inhabitants of Placentia in Newfoundland but four removed thither. Few of the Acadians, however, could be induced to settle anywhere on the island. They were not sailors and did not care for the fisheries; they were farmers, and Cape Breton did not attract them.

Prince Edward Island was then called Île Saint Jean. For a long period it was not recognised as separate from the mainland. Even as late as 1600 it was not known,

and on Champlain's two first maps it does not appear. In his voyages of 1603 he seems to have heard of such an island, and on his map of 1613 he has laid down a very small island with that name, but it was not until 1632 that it appeared in its proper situation and proportions. It is, no doubt, the fact that on the so-called Cabot map of 1544 there is an island in the gulf named St. John, but that has been shown to be in reality the Magdalen group, and the map itself is clearly based on Cartier's discoveries. Cartier, as before stated, touched the north shore of the island, but it has been demonstrated that he passed over to the Miramichi shore, supposing the strait to be a deep bay. In 1663 the company of New France made a concession of the island of St. John, the Magdalens, Brion island, and the Bird islands to Doublet, and a company was formed to carry on the fisheries. It was to be a sub-fief to the Miscou company and the fur-trade was reserved. Later, in 1720, these islands, together with Miscou, were granted to the Count de St. Pierre, but there appear to have been no settlements on the island of St. John at that time. Attempts were made with more success to induce the Acadians to settle there, and towards the year 1729 a little colony was formed, at Port La Joie on the site of Charlottetown. The Acadians removed very slowly, but, about 1733, as Louisburg attained strength, a garrison was sent and a fort and barracks were erected at Port La Joie. After the dispersion of the Acadians many settled on the island, so that in 1758, when the French evacuated it, about 4000 souls were left. They had been scarcely three years there when the fortune of war again compelled them to leave.

In the treaty of Utrecht, when Acadia was ceded, it had been stipulated that the Acadians were to have

liberty to remove elsewhere within a specified period with all their effects, but the documents show that the English did not wish them to remove, and threw obstacles in their way. The reasons are stated plainly. They did not wish them to go to strengthen the new and threatening establishment on Cape Breton, and, moreover, if the Acadians left, supplies would fail to the garrison at Port Royal; for English farmers could not be got to settle in a country infested by Indians so bitterly hostile to the English name. A few left, but by far the greater part remained on their farms and increased in numbers and prospered under English rule more rapidly than under the government of the French court. The position was, however, a very difficult one. The Acadians were the only inhabitants, excepting the Indians, and although they never had experienced any trouble from the Indians, it was because they remained French. The Indians were controlled entirely from Canada and Cape Breton, and, if the Acadians had taken an active part against the French, beyond doubt the Indians would have massacred them, for the only force the English had in the country was about 200 men in garrison at Annapolis, and in later years a small garrison at Canso. Moreover, the Acadians were Roman Catholics of the intensest kind and received all their impressions through their missionaries, who were sent from Quebec. They had no schools, and were so ignorant that, in a document signed by 227 of the heads of families in Annapolis, 160 signed with a cross, being unable to write. Not knowing what was going on in the world, save through Quebec, they expected that as Acadia had always been restored to France before, it would be so again, and besides, in their simplicity, they could not imagine that any other power equal to France existed in the world, and to take part against their own Catholic

mother-land on behalf of a heretical people was utterly abhorrent to them.

On the other hand the English—and by English must chiefly be understood the colonists of Massachusetts—had suffered greatly from the Indian tribes which the French in Canada had incited to harry their frontiers. In their common conversation the French and Indians were always grouped in one phrase, and as they were Puritan Protestants of the most intense type they looked on the French with aversion, while for the Indian allies of the French no words the English language possessed were sufficiently strong to express their abhorrence. They looked with suspicion on the missionaries and their connection with Canada, and they endeavoured to exact an oath of allegiance from the Acadians, which the latter were obstinate in refusing to give. At last, after many difficulties, General Phillips, the governor, obtained from them a modified form of oath, which was accepted with an understanding that they were not to be called upon to bear arms against the French or Indians. This oath, though the home authorities at first considered it not quite precise enough, was nevertheless accepted, and so the Acadians came to be called “the neutral French.” The understanding that their allegiance was a limited one is nowhere recorded, but that it had some basis is evident from the sequel of events.

They lived peaceably on the whole with the New England garrison, although occasional friction would arise between the governors and the priests; but the Indians, incited by the Canadian and Cape Breton French, kept up an incessant warfare, and when the English complained the French commanders affected to consider the Indians as independent nations.

War broke out between England and France, and the

French and Indians made several unsuccessful attempts to take Annapolis, until the New England colonies, exasperated beyond endurance, undertook the hazardous enterprise of attacking Louisburg. They raised an army solely of provincial troops and put a merchant of Kittery, William Pepperrell, in command. At the last moment, and after the expedition had sailed, the English admiral joined it, and the singular spectacle was presented of a colonial army assisted by an English fleet attacking a first-class fortress containing a garrison of regular troops, and all without orders of the British Government. It was an impromptu enterprise, but fortune favoured the courage of the New Englanders, and religious enthusiasm made it a veritable crusade. The New England troops, 4000 in number, landed on 1st May, 1747. Admiral Warren intercepted succour from France and attacked the town with his ships and on the 17th of June the place surrendered. The garrison and inhabitants were sent to France. There were 650 regular troops, 1310 militia, and 2000 inhabitants in all surrendered. It was a very brilliant feat of arms for men whose experience had been gained only in border warfare and bush-fighting. The New England troops remained to garrison the place. The island of St. John was also seized and the inhabitants sent to France.

Stung by the mortification of a defeat by colonial troops, the French Government fitted out a formidable armament for the recapture of Louisburg and the conquest of Acadia. It consisted of 70 sail. There were 11 ships of the line, 20 frigates, 5 bombs, and the remainder were transports conveying 3150 regular troops, all under the command of the Duke d'Anville, an experienced and capable officer. But the stars in their courses fought against him. He encountered storms of

great severity. His fleet was scattered. Some ships were disabled and were captured in trying to return, some were wrecked, and the remainder reached Chebucto harbour (now Halifax) shattered by a passage of ninety days. The duke died four days after his arrival and the next in command killed himself. Pestilence broke out among the troops and sailors and was communicated to the Indians who had flocked round to co-operate. More than one-third of the whole Miemac tribe perished. Twelve hundred and seventy men had been lost at sea, 1130 had been buried at Chebucto, and all the rest were weakened by disease. The remainder of the fleet returned to France but received further damage in a terrific gale off Cape Sable. So a great danger was averted from the British colonies, and they were saved without striking a blow for themselves.

By the treaty of Utrecht Acadia or Nova Scotia, in its ancient extension, had been ceded to England, but the French Government drew a distinction and insisted that the territory ceded included only a part of the peninsula, now Nova Scotia, and not any part of what is now known as New Brunswick. They drew an imaginary line from Cape Canso to the head of the basin of Minas (now Truro) and sought to shut out the English from the richest part of the peninsula. On the declaration of war in 1744, an expedition from Louisburg seized the English fort at Canso, and a large body of Indians under French leaders attacked Annapolis before the English had received intelligence of hostilities.

And now, when the supreme crisis of the struggle for empire in America was imminent, and the anomalous political relations existing in Acadia were to undergo the severest strain, appeared the evil genius of the Acadian people—the Abbé Le Loutre, missionary to the Miemaes

on the Shubenacadie. If the Acadians had been let alone they would gradually have become reconciled to English rule, for they were naturally a peaceful and contented people. They had increased in number and, secure from the oppressive monopolies of the former régime, had prospered greatly. They paid no taxes and enjoyed absolute freedom of religion. The handful of soldiers in the ruinous fort of Annapolis were the only English among them; for British settlers were deterred by the incessant incursions of the Indians. Le Loutre at first resided at Cobequid (Truro). His immediate care was a band of 200 Indians, but his influence extended over all the Micmacs. He afterwards removed to Chignecto on the border of the territory then in dispute and, provided with abundant resources from Canada and France, he exercised complete control over the Indians, and by their assistance induced or terrified the Acadians on the border to take up arms against the British Government.

In 1748 peace was declared, and the English Government, resolving to colonise Acadia, sent out in 1749 a strong colony and laid the foundations of Halifax at Chebucto. The governor, Colonel Cornwallis, then called upon the Acadians to take an oath of loyalty to the English crown. This they flatly and persistently refused to do, in spite of repeated urging, unless with the reserve that neither they nor their heirs should be called upon to bear arms against the French or their Indian allies. One sentence in an address, signed by 1000 of the chief men among them, expresses the real underlying idea: "What causes us all very great pain is that the English wish to live amongst us. This is the general sentiment of the undersigned inhabitants." But the English could not understand such a feeling, for Acadia had been ceded to England for thirty-six years.

The Acadians at Chignecto had renounced allegiance to the English, and when the governor sent a force under Lawrence to reduce them to obedience, they burned their houses under the orders or threats of Le Loutre and retired across the Missiguash to join the force from Canada under the Chevalier de La Corne, which had built Fort Beauséjour on the other side of the river, and Fort Gasperaux on the shore of the gulf at Baye Verte. The next spring Lawrence returned with a thousand men and built Fort Lawrence on the Nova Scotia side of the Missiguash. The Abbé Le Loutre with his Indians and Acadians opposed his landing, but, after a sharp skirmish, Lawrence was successful, and the Abbé with his following retired across the river, where the French troops stood ready to receive him.

There was ostensibly peace at that time between England and France, but Le Loutre carried on, with his Indians, incessant attacks on the English; and the French governors, when appealed to, protested that they had no power over the Micmacs, who were an independent people. These incursions exasperated the English beyond measure; for they consisted in scalping detached settlers and their families around Halifax or Dartmouth, or any soldier who might stray beyond the palisades of the forts. These attacks were secretly encouraged by the French commanders, and a letter from the Intendant at Louisburg to the minister at Paris reports that the Indians were continually harassing the English and had brought to Fort Beauséjour eighteen English scalps, for which Le Loutre had paid them 1800 livres. Le Loutre had been to France, and was supplied with abundant funds for his work. He so far lost all sense of moderation as to write to the English governor and offer to divide the peninsula with the English, the Micmacs to have what was really

the richest part of Acadia on which English forts were then existing. In all these matters Le Loutre was acting contrary to the instructions of the Bishop of Quebec, who warned him of the wickedness and danger of compromising the Acadians.

In 1755 the decisive war broke out, and at first fortune favoured the French in the west; but, in Acadia, Colonel Moncton captured Fort Beauséjour. Three hundred Acadians were taken, but the Abbé Le Loutre escaped to Quebec. He had to bear the reproaches of his bishop for the ruin he had brought on the Acadians. He was not, however, solely to blame, for the French commanders and the government had supported him, but he was a missionary priest and had disregarded the injunctions of his ecclesiastical superior.

While the English were exasperated by these proceedings, the news of Braddock's defeat and the failure of the western campaign arrived. The idea that nothing but the deportation of the Acadians would secure the safety of the frontier had previously suggested itself to Governor Shirley of Massachusetts, but it had not been entertained. The final resolution was taken by Governor Lawrence and his council at Halifax in July, 1755, upon the occasion of another formal and unanimous refusal of deputies from all the French settlements to take an unqualified oath of allegiance to the king of England. It must have been a sudden resolution, for the governor had received no orders from England. He had not formally proposed it, although in one of his letters he expressed an opinion that the Acadians were better away if they would not take the oath, but he added he would do nothing without submitting it to the approbation of the British Government. That approbation cannot be found, nor even any definite submission of a plan to the English authorities.

The resolution was concealed until the Acadians had got in their crops, and then the blow suddenly fell. Without inquiry, guilty and innocent together, the people were suddenly seized and put into transports and despatched to the different English colonies. No preparation had been made for their reception, and some of the colonies refused to receive them. Families were separated, and many were never reunited on this earth. Many died of privation, exposure, and sorrow. In Acadia the dykes were cut and the houses burned, and the English found themselves alone in the province. The charge that the New England colonies instigated the measure in order to obtain the lands of the exiles is without foundation; for it was a long time before settlers could be induced to take up land in a province so harried by Indian scalping parties. The settlers began to arrive in 1760, and they came slowly, for there was an abundance of land in all the colonies.

Nothing in history is precisely like this pitiful exile, for it was not the outcome of religious intolerance. There never was any doubt of the free exercise of the Catholic religion, excepting such apprehensions as might be suggested to a simple and pious people by emissaries who sought to shake their fidelity. Their ignorance was profound, and while they may have had the petty faults of peasants shut out from all real knowledge of the outside world, the large majority of them were innocent of treason to the English. Their longing for their Acadian homes was like that of the Jews by the waters of Babylon. Many found their way back coasting along the shores of the colonies. Many hid in the woods or escaped to Miramichi and the islands of the gulf. After the peace they settled near Digby and Yarmouth and around St. Mary's Bay. There are settlements of Acadians

also at Chezzetcook in the eastern part of the province, and along the north shore of Prince Edward Island, and in New Brunswick, especially on the Madawaska. Wherever they are found they retain their old simple habits and manners.

All that can be said in respect to this tragedy must be in palliation, not in justification. The English Government is clear of blame, for nothing has been found to show its complicity in the matter. The English colonists, however, are not alone to be charged with cruelty. It was cruel in the French Government—in the French commanders—to use this simple people for their political purposes, and exploit their blind attachment to their king and their religion for temporary political ends, and thus bring down upon them the anger of a race not easily appeased when thoroughly aroused. Those, however, who care to take all the circumstances into consideration may look to Alsace and Lorraine, and to Savoy and Nice, and ask how long the French and German Governments would, even at the present day, endure it if the people of those provinces were to declare themselves neutral when war was on their borders! Still, if such a measure as this were indeed necessary for self-defence in time of war, the fate of the exiles might have been greatly softened without prejudice to the result.

The events recited in the pages just preceding are well summarised in the following figures showing the movement of the Acadian population on the peninsula:—

1714. Population when ceded to England	. . .	1773
1737. Population under English rule	. . .	7598
1749. Population under English rule estimated at	. . .	13,000

after the troubles about the oath commenced—

1752. Population depleted by emigration	. . .	9300
1755. Just before the expulsion	. . .	8200
1756. After the expulsion, estimated at	. . .	1200

so that in all over 6000 souls were deported to different destinations.

The history of Acadia is henceforth very simple. The Micmacs continued their depredations and murders until the complete triumph of the English arms left them no support. A peace was concluded in 1761, and proved to be final. Soon after, settlers began to come in to take up the vacated land, and the successful revolt of the southern colonies sent a large number of expatriated loyalists into the province, who settled chiefly at Guysborough, Windsor, Annapolis, and Shelburne. The civil government went through the usual stages of colonial evolution, until at last the province attained the status of a self-governing colony. Cape Breton in 1784 was erected into a separate government, and so remained until 1820, when it was re-united to Nova Scotia. The little town of Halifax, on account of its unrivalled harbour, became the centre of operations of the Royal Navy in the western Atlantic, and grew rapidly under the stimulus of the war expenditure during the great wars of the American and French Revolutions; but the romance died out of Acadian history, and its annals record commercial and industrial events until in 1867 the province entered the confederation of the Dominion of Canada.

The province of New Brunswick at the time of the peace of 1763 was an absolute wilderness. Although it was, in reality, included in the cession of Acadia at Utrecht, the French clung to it to the last, though they never colonised it in any effective way. Nicholas Denys, under his grant of 1653 (confirmed later), had establishments at Miscou, Miramichi, and Richibucto. The French had also a fort at Nashwaak, opposite the present Fredericton, and another at Jemseg at the outlet of Grand Lake. They had a fort, also, at St. John, at

the mouth of the St. John river, but it was often abandoned because of incessant attacks from the English colonies. They kept control of the Indians by means of communications with Canada guarded by the two interior forts.

The fort at St. John was garrisoned by English troops for some time after the peace. The first exploration of the river was made in 1761, but the province of New Brunswick is the creation of the American Revolution. In 1783 a fleet left New York with 3000 loyalists to found at the mouth of the St. John river a new home in the wilderness. The exiles were destitute of everything, for their property had been confiscated, but they were high-spirited and intelligent, because it was not the uninstructed classes in the old colonies who sided with the king. Some of the brightest names in the old colony annals were among them, and Colonel Edward Winslow might then have experienced some of the sorrows of the Acadian exiles whom his uncle expelled from Grand Pré. They were made of sterner stuff than the poor Acadians, and with unconquerable energy they opened up the forest wilderness, and soon their vessels sailed on every sea, for the instincts of maritime adventure were strong in them. The name of the settlement, at first Parr-town, was changed to St. John. In 1784 the province of New Brunswick, with its present limits, was set off from Nova Scotia, and entered upon a course of peaceful progress. During the wars with the United States and France these provinces were not the theatre of conflict. An occasional privateer was the only warlike excitement, and they understood privateering as well as any other people, and made more than they lost by it. During the war of 1812-14 an expedition from Halifax seized the coast of Maine and held it until the peace. The original en-

dowment of Dalhousie College at Halifax was a sum of £9250, collected as customs duties at the port of Machias while the British troops were in possession of Maine. After the peace, as in the case of the other provinces, the civil government gradually developed, until New Brunswick became a self-governing colony. In 1867 it became one of the confederated provinces of the Dominion.

Prince Edward Island was known as Isle Saint Jean from the time it first appeared upon the map. There were so many places of that name that confusion arose, and in 1799 it was called Prince Edward Island in honour of the father of the late Queen Victoria, who was then commanding the troops in Nova Scotia. The island contained very little of the marsh land so dear to the Acadians and few had settled there; for it was covered with forest and the Acadians did not like the labour of clearing land. In 1749 the population was estimated at 1000; but, for a while, the ready market at Louisburg for all kinds of farm produce induced settlers from Nova Scotia, and in 1755 the number was rated at 3000. The population increased rapidly in consequence of the expulsion of the Acadians, and in 1758 it had increased to 6500. When the English took possession they found 4100 souls on the island. Many of them left for the mainland and some were deported, so that by the year 1771 the French population had decreased to about 1270.

In 1767 the whole island was granted in large holdings to a limited number of persons, and a mischievous system of absentee proprietorship was established which led in after years to incessant trouble between the tenants and landlords. The government was separated from Nova Scotia in 1769, and remained separate until the

year 1873 when the province entered the confederation. The land question was settled by the proprietors selling out under a valuation by a commission to the Government, which then resold to the tenants on favourable terms.

THE MARITIME PROVINCES

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SCALE OF STATUTE MILES

London Edward Stanford, Ltd. 12, 13, & 14 Long Acre, W.C

Stanford's Geog. Estab^l, London

CHAPTER V

THE MARITIME PROVINCES

General View

NOVA SCOTIA, New Brunswick, and Prince Edward Island form a group of provinces on the eastern flank of the Dominion which have many common characteristics differentiating them from the provinces of old Canada. They are sometimes called collectively Acadia—a euphonious word derived from the old French name L'Acadie, which itself is simply the Micmac *cadie*, used in composition to signify a place where anything expressed by the other word in the compound is found in abundance. Such a word would naturally often occur in the limited vocabulary of the natives in their early communications with white men. The French took it up and applied it to the whole maritime region. The Malicetes, a kindred tribe to the Micmacs, pronounced the same word *quoddy*, and it occurs in that form frequently in New Brunswick and eastern Maine; as Passamaquoddy Bay and Quoddy Head. During the French domination these provinces by the sea were administered by officials, who, although in rank subordinate to the governors of Canada, corresponded also directly with the ministers of the king at Paris. When, by the treaty of Utrecht in 1713, Acadia was ceded to the

English Crown a contention immediately arose as to its true boundaries—the French seeking to narrow them to one-half of the peninsula of Nova Scotia, and the English to extend them to the utmost limit of the wording of the treaty. The English used the name Nova Scotia as the equivalent of Acadia and included the present New Brunswick within its limits. The boundaries of Sir William Alexander's patent of 1625 extended to Gaspé; but, since the setting off of New Brunswick, the name of Nova Scotia has been restricted to the present province of that name. The English claimed the country by right of the discovery of the Cabots in 1497 and 1498, the French by right of the voyage of Verrazano. If such voyages as these could give a title, under the rudimentary international law of that period, the Cabot voyages were clearly the first, but the French title was by far the stronger, because they made the first actual settlements. After a struggle of one hundred and fifty years of varying fortunes the question was decided by the sword.

The maritime provinces on the Atlantic correspond in many ways with the province of British Columbia on the Pacific. The Dominion of Canada widens towards the north; the coast-lines and mountain ridges in the western province all trend south-east and north-west, and, in the eastern province, they trend south-west and north-east, in each case following the basic plan of each respective side of the continent. The peninsula of Nova Scotia, 268 miles long and connected midway with the rest of Acadia, corresponds to the island of Vancouver, 285 miles long and connected, within only half a mile of open channel, by the dense archipelago half way along its coast, with the rest of British Columbia. As the mountains of Vancouver Island are outliers of the western Cordilleras, so the highlands of Nova Scotia

and its appendage, Cape Breton, are outliers of the Appalachian system of the east. There is a singular parallelism between the provinces on the two great oceans which might be set forth at great length; but no doubt this will suggest itself in the study of their productions and of the pursuits of their inhabitants.

The geological structure of the maritime provinces is different from that of the adjoining province of Quebec. The Laurentian system has very small space in the geology of Acadia, and the Carboniferous system has no place in the geology of old Canada. The centre of New Brunswick is a great triangular basin of horizontal Carboniferous rocks, faced on the Atlantic seaboard to the south by a rampart of primordial rock, and flanked by the Silurian of the north-western corner of the province and of the adjoining province of Quebec. The northern limit of the Carboniferous system touches the Gulf of St. Lawrence at Miscou Head, and it sweeps along the shore of the gulf, extends in a broad band along all the inner coast of Nova Scotia and into Cape Breton, and comes out near Sydney upon the shore of the Atlantic where the waves wash the coal seams on the sea-shore. The Carboniferous formation underlies the New Red Sandstone of Prince Edward Island; it is recognised in the rocks of the Magdalen islands, and comes to the surface again at the south-western point of Newfoundland where a seam of coal three feet thick crops out near the shore.

The people of Nova Scotia and New Brunswick are seafaring by instinct, and turn to the ocean with the hereditary impulses of many generations of sailors. The adoption of iron has centred the shipbuilding industry in the United Kingdom, but vessels from Halifax, Yarmouth, and St. John will still be met with in every seaport in the world; for the people of these provinces have an

innate capacity for managing such property, and are able to sail a ship at a profit where the merchants of other nations are unable to meet the competition of the iron steamships.

The people of the maritime provinces are alike in their component nationalities. In all three provinces over ninety per cent are Canadian-born. The inhabitants of the eastern part of Nova Scotia, especially in the counties of Antigonish, Pictou, and the island of Cape Breton, are of Highland Scotch race, and Gaelic as well as English is commonly spoken there. Nearly all New Brunswick and many parts of Nova Scotia were settled by loyalist exiles from the United States at the close of the Revolution. Of the six per cent not born in Canada not more than one per cent were born outside of the British Empire.

Climate

The climate of the Acadian provinces is more equable than that of the interior provinces of the Dominion, and from the large extent of their sea-board, it is not so dry. The latitude of Halifax is nearly the same as that of Bordeaux, but, as explained in a previous chapter, the Arctic current hugs the coast of America, and the warm waters of the Gulf Stream are pushed out to a distance of one hundred miles from the coast. The following tables of the temperature and rainfall at the chief cities of the three Acadian provinces are obtained from official figures of the Meteorological Office :—

TEMPERATURE IN DEGREES—FAHRENHEIT

	Halifax.	St. John.	Charlottetown.
Mean annual temperature .	45·81	42·66	43·64
Highest temperature during year	83·80	86·70	80·80
Lowest ,, ,,	-8·00	-12·00	-14·00

MEAN TEMPERATURE BY SEASONS OF THREE MONTHS

	Spring.	Summer.	Autumn.	Winter.
Halifax, Nova Scotia . . .	51·70	62·87	39·60	29·07
St. John, New Brunswick .	49·47	58·63	36·33	25·90
Charlottetown, Prince Edward Island	51·20	62·83	36·43	24·10

Taking the month of January alone and comparing the temperatures with well-known places in Europe, Halifax and Warsaw, in Poland, have the same mean temperature of 28·9, and taking the month of July alone, Halifax and Hamburg have the same mean temperature of 63·9.

The Atlantic ports of Nova Scotia and New Brunswick do not freeze in winter. Halifax, St. John, Yarmouth, and Louisburg are open all the year round. Sydney is closed not so much by freezing as by the drift ice setting against the coast, while Louisburg is sheltered from drift ice by the conformation of the coast-line. The tremendous tides of the Bay of Fundy prevent the formation of ice in the harbours of St. John and St. Andrews. The ports in the Gulf of St. Lawrence are closed in winter, and the climate on that side of Acadia is a little more severe than upon the ocean coast. The central parts of New Brunswick have a continental climate like that of Quebec.

Tables of temperature are insufficient to give an idea of climate—humidity must be taken into account. The following table gives the annual rainfall and the annual

total precipitation—snow being reduced into terms of rain :—

	Annual Rainfall in Inches.	Annual Total Precipitation.
Halifax	45·34	48·58
St. John	31·75	37·75
Charlottetown	26·71	32·45

The number of days on which rain fell at any time during the twenty-four hours, was, in Halifax, 159 ; in St. John, 119 ; in Charlottetown, 151. Halifax and Yarmouth have a greater rainfall than any other points on the Atlantic coast of Canada, and it is about the same as that of New Westminster on the Pacific and of Penzance on the coast of Cornwall.

In comparing these figures it must be remembered that the interior parts of these provinces have a much drier climate. Thus the rainfall at Digby, Nova Scotia, is only 25 inches, not much more than one-half that of Halifax, and at Bathurst in New Brunswick it is only 20·89 inches. For these reasons the continental climate of the inland provinces of Canada is considered by Canadians preferable in winter to the climate on any part of the North Atlantic coast. Prince Edward Island is low and is also nearly all coast-line, and therefore the climate is everywhere the same as at Charlottetown. Perhaps the best indication of climate is the fact that, in the western parts of Nova Scotia and in the interior of New Brunswick as in Prince Edward Island, maize may be grown as a crop. The Atlantic coast is unsuited to its culture. The greatest drawback to the whole north-east coast of America is the fog generated by the Gulf Stream, which often in summer sweeps in from the sea along the Atlantic coast and the shores of the Bay of Fundy. It never extends inland more than a few miles from the shore, and Prince Edward Island is

largely exempt, but it is a frequent source of danger along the exterior coast.

Forests

The forest trees are practically the same in all the Acadian provinces. Along the coast of the Atlantic Ocean and the Bay of Fundy the sea air and frequent fogs favour the growth of birch, spruces, and firs, but on the higher and richer soils the growth is maple, beech, ash and birch, as well as spruce and pine. The nature of the forest growth is determined by the drainage and richness of the land, the hardwood trees preferring a drier soil than the spruces. Along the rivers are found elms and red maples. In Prince Edward Island the hardwood trees grow nearer to the sea level than on the mainland, indicating a drier climate and warmer soil. The forest of the Acadian provinces consists according to lists prepared by Professor John Macoun of the following species:—

Sugar Maple	<i>Acer saccharinum.</i>
Red Maple	<i>Acer rubrum.</i>
Striped Maple	<i>Acer Pennsylvanicum.</i>
Black Cherry	<i>Prunus serotina.</i>
Bird Cherry	<i>Prunus Pennsylvanica.</i>
Black Ash	<i>Fraxinus sambucifolia.</i>
White Ash	<i>Fraxinus Americana.</i>
Elm	<i>Ulmus Americana.</i>
White Birch	<i>Betula alba.</i>
Canoe Birch	<i>Betula papyrifolia.</i>
Yellow Birch	<i>Betula lutea.</i>
Red Oak	<i>Quercus rubra.</i>
Beech	<i>Fagus ferruginea.</i>
Aspen Poplar	<i>Populus tremuloides.</i>
Balsam Poplar	<i>Populus balsamifera.</i>
White Pine	<i>Pinus strobus.</i>
Red Pine	<i>Pinus resinosa.</i>
White Spruce	<i>Picea alba.</i>

Black Spruce	<i>Picea nigra.</i>
Red Spruce	<i>Picea rubra.</i>
Balsam Fir	<i>Abies balsamea.</i>
Hemlock	<i>Tsuga Canadensis.</i>
Tamarack	<i>Larix Americana.</i>
White Cedar	<i>Thuja occidentalis.</i>

The following trees, in addition to the preceding, occur in Nova Scotia and New Brunswick :—

Red Ash	<i>Fraxinus pubescens.</i>
Cherry Birch	<i>Betula lenta.</i>
Iron Wood	<i>Ostrya Virginica.</i>
Black Willow	<i>Salix nigra.</i>
Scrub Pine	<i>Pinus Banksiana.</i>

The following additional species are found in the interior of New Brunswick :—

Basswood	<i>Tilia Americana.</i>
Butternut	<i>Juglans cinerea.</i>
Mossy-cup Oak	<i>Quercus macrocarpa.</i>

These are the indigenous forest trees and are excellent indication of soil and climate. “Everything will grow in Acadia that grows in France,” said the old French writers, “except the olive.”

CHAPTER VI

NOVA SCOTIA

THIS province consists of the peninsula of Nova Scotia proper and the island of Cape Breton. The peninsula is 268 miles long and varies from 60 to 100 miles in breadth; the island is 108 miles long with a very irregular breadth, and is hollowed out in the centre by a remarkable arm of the sea—the Bras d'Or. The total area of the province is 21,428 square miles. It lies between the parallels of $43^{\circ} 30'$ and 47° north latitude, and the meridians of $59^{\circ} 40'$ and $66^{\circ} 20'$ west longitude, and is connected with New Brunswick by a low isthmus only $11\frac{1}{2}$ miles broad at its narrowest point. It faces on the Atlantic Ocean. On one side of the isthmus in rear is the Gulf of St. Lawrence, and on the other is the Bay of Fundy, well known for its high tides. Nova Scotia is about two-thirds the size of Scotland.

The Atlantic Coast

West of the Grand Banks of Newfoundland, a broad and deep ocean channel or submerged valley with soundings averaging 200 fathoms, leads through Cabot Strait and the centre of the gulf far up into the river St. Lawrence. South of this channel a series of banks extend off the whole coast of Nova Scotia, between the inner edge of the Gulf Stream and the land. They are known as the

Banquereau, Misaine, Canso, Sambro, Lahave, Roseway, and Brown Banks and the Middle Grounds. There are 20 to 40 fathoms on these ocean plateaus, and narrow gullies of deeper water separate them from each other; but their edges on the landward side are not so clearly defined. Midway in their length, but on the outer edge of these banks, is Sable Island, lying south-east of Cape Canso at



HALIFAX, NOVA SCOTIA.

Looking north from St. Matthew's Spire.

a distance of about 100 miles. This island of evil omen is a bank of white shifting sand, without soil or trees, rising in one place 60 or 70 feet high, and consisting of a series of low sand dunes usually not over 20 feet high and not easily distinguished in smooth weather from the deck of a passing ship. The island itself is about 18 miles long by a little over a mile wide, and is a double ridge containing a long shallow salt-water lake. Long bars of sand extend from the island at each end, and sandy ridges, with only a few feet of water, lie off the

shores, so that, in heavy weather, the whole sweep of the Atlantic surge curls up in a continuous line of tremendous breakers fifty miles in length. The island was known by the earliest sailors, and the Portuguese left cattle upon it which ran wild and multiplied; for a coarse grass grows there, and there are fresh-water ponds. In 1598 the Marquis de la Roche landed 50 or 60 convicts on the island while he sailed westwards to explore Nova Scotia. A great storm drove his ship back to France, and it was five years before relief was sent to these poor wretches. Only 11 had survived; for murderous quarrels, as well as exposure, had thinned their numbers. They had made shelters out of the timbers of wrecked vessels, and had provided food and clothing from the wild cattle and seals which were plentiful on the island. In the gloomy annals of this "ocean graveyard" novelists have a rich mine as yet untouched. The Dominion Government has erected two powerful lights, and maintains upon it five relief stations with lifeboats and rocket apparatus and every other life-saving appliance. The stations are connected by telephone, and a permanent staff of 18 men reside on the island with their families—about 50 souls in all.

The coast of Nova Scotia is low, but rugged and rocky, and studded with innumerable rocky islets. Mount Aspotogan, a precipitous cliff on the headland between St. Margaret's and Mahone Bays, is 438 feet high, and the promontory of Cape Lahave is 107 feet high. They are the most conspicuous points on the coast, and the first is usually the first land seen by sailors. The western shores are wooded to the water's edge, but on the eastern coast there is only a scanty growth of birch and spruce.

The Atlantic coast differs from the inner coast by being deeply indented with numerous excellent harbours.

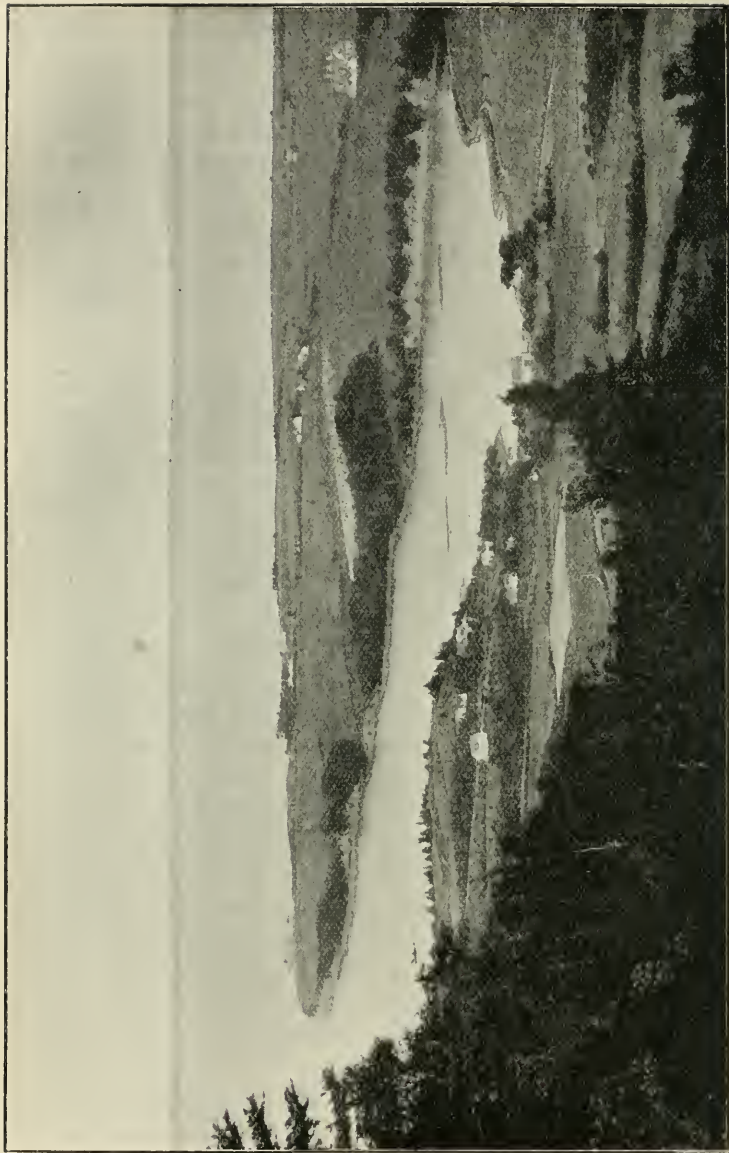
Commencing from the east, Canso harbour is a deep and safe haven—a favourite one in the time of Champlain and Lescarbot, and now used as the terminus of ocean cables. The old sailors used frequently to make Canso their rendezvous, and call there for water in going to and from Europe; and it was the central point for the best fishing on the coast, being always thronged in the fishing season. Following westwards are Country harbour, Lescome harbour, Sheet harbour, Ship harbour, and Jedore harbour, all safe shelters for large vessels. Then follows Halifax harbour, one of the finest havens in the world, deep, commodious, and easy of access. It is fourteen miles long, with nowhere less than six fathoms of water. Beyond the narrows, Bedford basin opens out in an area of ten square miles of excellent anchorage, with water of 8 to 36 fathoms close to the shores. Westward are the harbours of St. Margaret's Bay, Mahone Bay, and Lunenburg. Lahave, Liverpool (the Port Rossignol of Champlain) and Port Mouton are available for small vessels only; but the harbour of Shelburne is excellent, and westward of it are the harbours of Pubnico and Yarmouth. These are only a few out of very many, for the coast is deeply indented and bold.

While the Atlantic coast of the province is protected by a broad belt of hard Cambrian rock broken by eruptions of granite, the western, or Bay of Fundy, shore is protected by a long and narrow rim of trap rock which caps and covers the red sandstone cliffs from abrasion. This guardian ridge rises several hundred feet, and, save at one or two places where it is broken through, there are no harbours throughout its length. St. Mary's Bay is formed by a long projection of this wall of trap. The bay is 30 miles long with deep water. The wall is broken at Grand Passage, forming Brier island. Long island is

formed by Petite Passage, and Digby neck closes in the rest of the bay. Annapolis, or Digby Gut, is a remarkable break in the barrier wall, opening into Annapolis basin.

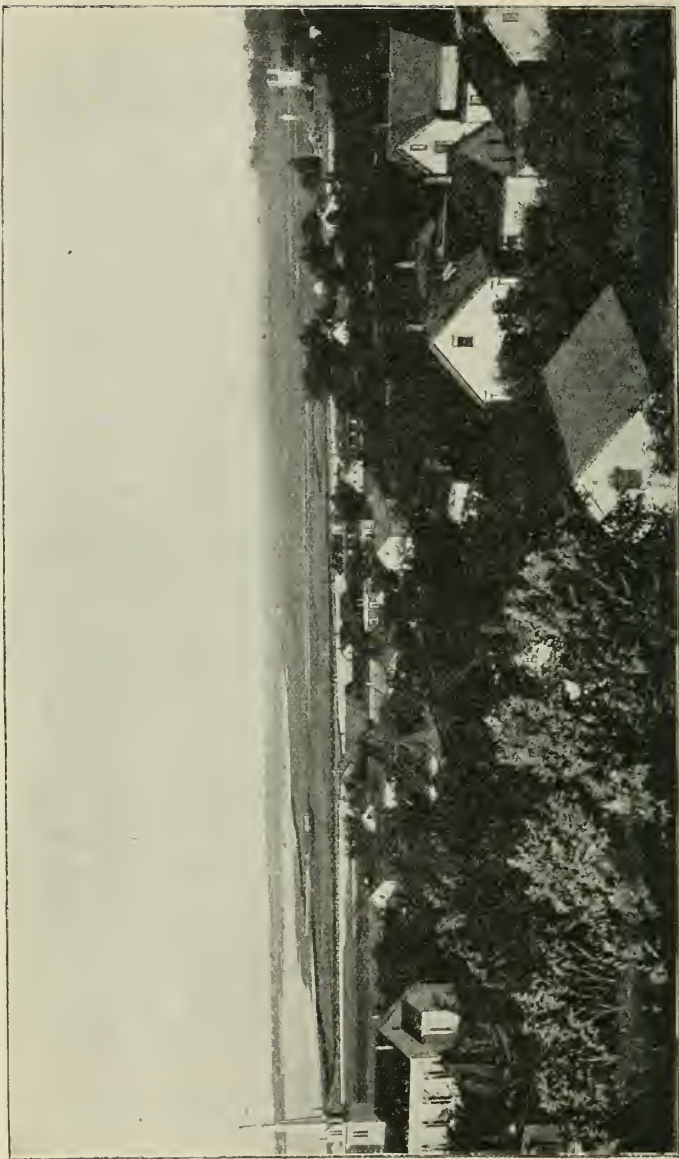
Annapolis basin is an arm of the sea of very great beauty, rendered historic by being the scene of the settlement of de Monts, Champlain, Poutrincourt and Lescarbot. It is five miles wide, bordered by highlands on either side, and it narrows towards the end, as the North mountain and the South mountain ridges draw together. There the valley is about a mile wide and the Annapolis river falls in—a tidal river, up which steamers go as far as Bridgetown, returning by the same tide. The entrance from the Bay of Fundy is barely half a mile wide. It is two miles long, and the basaltic trap rises sheer on either side to heights of 500 to 700 feet. The water is deep and the tides rush through very swiftly.

Farther up the Bay of Fundy the Minas Basin opens up, marked on its southern shore by capes Split and Blomidon, two grand headlands formed by the abrupt termination of the North and South mountains upon the basin. This beautiful sheet of water extends 60 miles into the land, with an extreme breadth of 20 miles. As it gradually narrows, it is called Cobequid Bay. All along its northern shore runs the range of the Cobequid mountains, clothed to their summits with beech and maple, and, on the southern shore, are the rich dyked lands of Grand Pré, made classic by Longfellow's poem of Evangeline. There dwelt the gentle maiden, the creation of a poet's dream, and her people, faithful to France through many sorrows. Near there flows in the Avon, a tidal river like its prototype near Bristol, and the tides rise here 38 feet, sweeping away into the country at their flood, and exposing extensive tracts of unsightly smooth red mud at their ebb.



The Cobequid mountains terminate on the west in the bold headlands of Cape d'Or and Cape Chignecto. Cape d'Or is surmounted by trap, and derives its name from masses of native copper found upon it. This region is well known to mineralogists for its rare minerals. Both capes are precipitous, and the whole region is one of surpassing beauty and interest. Even the imagination of the Micmac Indians has been impressed by the nobility of the prospect, and has placed on these heights the abode of Glooscap, the Algonquin Hiawatha. The majestic dark red mass of Cape Blomidon was a fit abode for a demi-god sent by the Great Spirit to teach the stiff-necked Micmacs. Glooscap is gone, and the melancholy and lonely call of the loons vainly beseech his return, and the Micmacs are nearly all gone as well. They were good Indians according to their lights. They were the first converted to Christianity, and they scalped more Englishmen than any other tribe on the continent. They had a mythology of their own, and their legends are associated with all the more remarkable localities in Acadia.

From Cape Chignecto the Bay of Fundy extends for fifty miles farther; at first as Chignecto channel which forks into two bays—Chepody Bay and Cumberland Basin. The latter washes the coast of Nova Scotia, the former is in New Brunswick. The rocks are softer and the coast is not so bold. On Chignecto channel, at South Joggins, are the celebrated sections of the coal-measures, and the rushing tides of the Bay keep on making new exposures full of instruction. At the head of Cumberland Basin are rich and extensive marsh meadows, and the little river Missiguash falls in—the boundary between Nova Scotia and New Brunswick, famous in the border wars which led to the expulsion of the Acadians. The con-



Rice, Photo.

GRAND PRÉ, NOVA SCOTIA

necting isthmus is narrowest here, and this point is the termination of the half-finished Chignecto Marine railway, projected in order to haul ships across to the Strait of Northumberland, as the prodigious tides of the Bay of Fundy prevent a canal being made.

The northern coast of Nova Scotia on Northumberland Strait consists of a low shore behind which are seen in the distance the highlands in the rear of Pictou and Antigonish counties connecting the Cobequid mountains with the mountains in Cape Breton. The whole stretch of country is Carboniferous. The coast is indented by a number of good harbours, as Pugwash harbour and Wallace harbour; but the finest harbour in the whole north coast of the province is that of Pictou. Here the largest vessels resort to ship coal from the adjacent mines. The harbour forks out into three arms, west, middle and east, and a river falls in at the head of each. The valleys surrounding are fertile and with the highlands in the distance make a scene of much beauty.

The eastern end of the peninsula is characterised by two large bays connected by the Strait of Canso. Cape George, a bold and precipitous headland 600 feet high, marks the western point of a broad bay, St. George's Bay, opening on the Gulf of St. Lawrence. Antigonish harbour running in from the bay is extensive but not deep. At the eastern end of the strait, and opening on the Atlantic, is Chedabucto Bay, $17\frac{1}{2}$ miles wide and 26 miles deep. Isle Madame is at the northern entrance, and upon it is the town of Arichat with a capacious and secure harbour. The island is inhabited chiefly by Acadian French, and is a very important centre for fishing vessels. The town of Guysborough is at the head of Chedabucto Bay, and the harbour and town of Canso is at its southern extremity.

These two bays are connected by a very remarkable passage, the Gut, or Strait of Canso. This is a deep lane of water, available by the largest ships, between the peninsula of Nova Scotia and the island of Cape Breton, $1\frac{1}{2}$ miles long and three-quarters of a mile wide at its narrowest part. It is much frequented by ships and,



STRAIT OF CANSO,

narrow though it is, the depth of water is never less than 15 fathoms. Both shores are bold. Cape Porcupine is a precipitous headland on the Nova Scotia side, 640 feet high, and on the Cape Breton side are the mountains which traverse that island. The headlands interlock so as to conceal the through passage. The scenery is exceedingly beautiful—the wooded shores, the green clearings, the white villages, the deep water, the passing ships, and the fringe of mountains present an unusually attractive scene. For a long time after the discovery of

America this passage was unknown to the cartographers and they did not separate on their maps the island from the peninsula. These seas were the best fishing-grounds in the whole region. Privateers and pirates when pursued sought refuge in their numerous shelters, and a harbour half way through the strait is still called Pirate's harbour. The French name was the *Passage de Fronsac*, from Denys, Sieur de Fronsac, who had his chief establishment at St. Peter's, where a canal, less than half a mile long, now leads to the Bras d'Or and the interior of the island. It is more euphonious than the present name, and Denys was one of the best and most capable men who ever lived in Nova Scotia. His name should be commemorated on the coast where he spent his active and useful life.

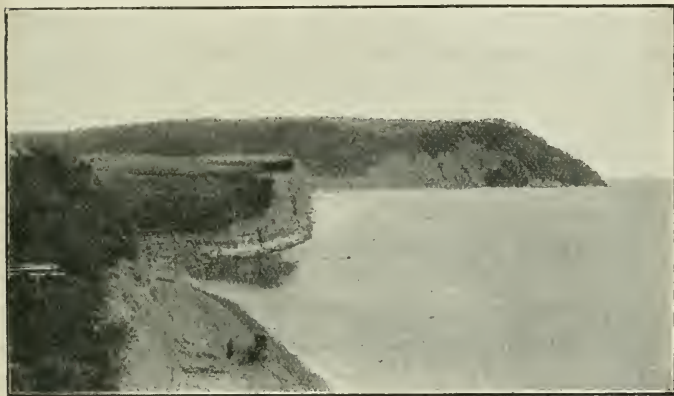
Geology

If a line be drawn lengthwise through the centre of the peninsula, from Digby Gut on the south-west to Cape Canso on the north-east, it will very nearly mark off on its outer or Atlantic side the Cambrian rocks and, on its inner side, later formations of which the Carboniferous is the chief. These may, for convenience, be called the outer and inner geological areas of the peninsula. In this general statement, however, an important modification must be made—a broad band of intrusive granite extends round in an arch from near Cape Sable to Chebucto head near Halifax and touches with its apex the Annapolis valley near Bridgetown. Detached areas of granite also occur in the eastern extension of the Cambrian area and a small outcrop appears at Cape Canso. The outer or Cambrian area presents to the surges of the Atlantic a low barrier of hard rocks, mostly slates, sandstones, and quartzites. These contain veins of quartz carrying gold,

and after making deductions for the granite outcrops there remains a total area of about 3000 square miles of Cambrian in which these gold-bearing veins may be, or have been, found. This outer area, while it contains occasional valleys of good farm land is not agricultural to any considerable extent.

The inner geological area of the peninsula is very different and, while it is in the main Carboniferous, there are some important deductions to be made. Out of the Carboniferous rocks rises the range of the Cobequid mountains, consisting of slates and quartzites and intrusive rocks considered to be of various ages, and extending through the hilly country of Pictou and Antigonish to the Strait of Canso. There is also a narrow band of Upper Silurian and of Devonian extending from the head of the Minas Basin eastward to the head of Chedabucto Bay and intervening between the Cambrian on the Atlantic coast and the Carboniferous of the inner waters. Along the northern shore of the Minas Basin is a narrow strip of Triassic red sandstone, and this formation extends also in a narrow band down the valley of the Annapolis river and along the shore of the Bay of Fundy. The valley is narrow, and while, on the inner side, it is bounded by a range of hills called the South mountain, it is separated from the Bay of Fundy on the other side by a range known as the North mountain, and the red sandstone in this last is capped throughout its whole length, from Cape Blomidon to the extreme end of the peninsula, by an outflow of trap rock. The coast of Nova Scotia therefore presents on that side a very bold outline of precipitous trap rocks forming a rampart, sometimes several hundred feet high, of columnar basaltic cliffs culminating at its eastern end on the Minas Basin in the grand promontory of Cape Blomidon.

The Carboniferous formation extends from the high land of Cape George westwards along the whole coast of the peninsula on the Gulf of St. Lawrence and across the country to Chignecto Bay and the Minas Basin, occupying Cumberland county and the greater part of Pictou, Colchester, and King's counties. The thickness of this formation is estimated by Sir William Dawson at over 16,000 feet. At the Joggins on the shore of Chignecto



MOUNT BLOMIDON, WOLFFVILLE, N.S.

Channel is a unique natural exposure of a section of the middle and upper Carboniferous, which gave Sir Wm. Logan an actual measurement of 14,570 feet. It is a classic region for geologists, and Sir Charles Lyell, who examined it in 1842 and 1845, pronounced it to be "the finest example in the world of a natural exposure in a continuous section ten miles long." Here Sir Charles counted nineteen seams of coal from two inches to four feet thick in vertical section, and the great range of the tides revealed a horizontal section of 200 yards from the base of the cliffs. Here he saw exposed to full daylight

fossil trees erect in ten distinct levels and terminating downwards in seams of coal, and Sir William Dawson, he says, has enumerated over 150 species of plants found in this extraordinary section of the coal-measures. The cliffs on the shore are from 100 to 400 feet high.

The main geological formations of Nova Scotia are continued in Cape Breton Island. The Cambrian of the Atlantic coast extends in a band occupying the south-east corner of the island as far as the cape from which the island takes its name. West and north of that is a wide area of Carboniferous rocks, and from Cape Breton head to the entrance of the Bras d'Or they crop out on the sea beach and the black bands of coal may be seen, in the cliffs, from a passing steamer. The long northern projection from the head of St. Anne's Bay to Cape North is formed of Laurentian gneiss—the only place in Nova Scotia where that formation occurs. It rises in a lofty irregular table-land, but a narrow fringe of Carboniferous rocks extends almost all round the margin upon the gulf shore.

Minerals

The chief resources of Nova Scotia, so far as worked, consist of coal, iron, gypsum, and gold. Other valuable minerals occur, but the above have been developed and utilised. Coal is extensively mined in three chief localities—Cumberland, Pictou, and Cape Breton. The coal-field of Sydney, Cape Breton, extends along the Atlantic shore for 32 miles and covers an area of over 250 square miles. Thirty-four seams occur in the section, but only a few of them have been worked. Less extensive coal-measures occur also on the west coast, at Cheticamp,

and Mabou and at Port Hood, and on the south coast, in Richmond county.

The Pictou coal-field (thirty-five square miles in extent) is remarkable for the great thickness of its seams. In one section the main seam is 34 ft. 7 ins., and what is known as the deep seam is 22 ft. 11 in. thick. Other seams occur 5 ft. 7 in., 3 ft. 6 in., 3 ft. 3 in., 12 ft., 5 ft., 11 ft., and 10 ft. thick, respectively—in all 107 ft. 10 in. of coal. The Cumberland coal-field has an area of 430 square miles, and is worked chiefly at Springhill, where eight seams occur, with an aggregate thickness of 52 ft. 7 in. Mines have been opened at several other places—at river Hébert, at Maccan, and at the Joggins. All the coal of Nova Scotia is bituminous, and the area of the known productive coal-fields of the province is over 700 square miles. Coal has been found in many other places, but there is no profit in opening up new mines as those now in full operation can supply the present demand. The total value of the coal production of Nova Scotia for the year 1914 is estimated at \$21,015,000.

Gold is mined in many places in the outer Cambrian area throughout the whole length of the province on its Atlantic side, and also in several localities in Cape Breton. Gold has been found in numerous localities, and mines are worked in Queen's, Guysborough, and in many places from Halifax to Canso. The total product from 1862 to 1913 was 915,989 oz., value \$17,403,804. The highest values realised were in 1899 and 1902, with \$617,604 and \$627,357 respectively. In 1911 the value was \$160,854, and in 1912, only \$90,638. The area of auriferous rocks is very wide and extends through the roughest part of the province. The forests and swamps of the interior probably cover many rich

districts. The ores are low in grade, but the quantity is very large and, by recent improvements in treatment, the gold can be extracted from ores hitherto unavailable. "The decline in the gold-mining industry must be attributed to a combination of causes: insufficient capital, scarcity of good labour, past wild-cutting, unintelligent direction of operations, cost of fuel, and lack of prospecting."

Iron

Iron ores of great value are found in a broad belt through the whole length of the province and in Cape Breton. Immense masses are found in the coal districts, and the manufacture of iron and steel is carried on by large companies in the Pictou district. There are extensive iron and steel works at Sydney and New Glasgow, also near Londonderry, in the Cumberland coal-field, where specular, magnetic, and hæmatite ores occur in beds of immense extent. Some of the Nova Scotia ores are unequalled except by the best Swedish ores.

The production of iron ore in Nova Scotia during the years 1906-11 is as follows:—

Year.	Tons.	Value.
1906	97,820	\$151,386
1907	89,839	137,161
1908	11,802	17,620
1910	18,134	40,478
1911	22	50

There was no iron ore mined in the province in 1912. Wabana ore from Newfoundland is imported.

The production of pig-iron for the last few years available, 1906-13, shows a marked increase over former years. Whereas in 1896 returns gave the year's output at 32,351 tons of pig-iron, valued at

\$400,829, the following table indicates the recent production :—

Year.	Tons.	Value.
1906	315,008	\$3,439,217
1907	366,456	4,211,913
1908	352,642	3,554,540
1909	345,380	3,453,800
1910	350,287	4,203,444
1911	390,242	4,682,904
1912	424,994	6,374,910
1913	486,962	7,304,430

The Dominion Iron and Steel Company of Sydney, Cape Breton, used 578,807 tons of iron ore (foreign and Canadian), from which 277,951·22 tons of pig-iron were produced, for which a bounty was paid amounting to \$195,474·12. The same company used 279,651·44 tons of Canadian pig-iron, together with 95,346·60 tons of other ingredients, from which it made 332,320·99 tons of steel, for which the Dominion Government paid a bounty of \$348,937·06.

The Nova Scotia Steel and Coal Company, during the same year, used 110,649 tons of foreign ore, from which it produced 57,885 tons of pig-iron, and received a government bounty of \$40,519·50. The same company used 52,006·42 tons of Canadian pig-iron and 20,966·45 tons of other ingredients, from which it made 64,239·94 tons of steel, for which it received a federal bounty of \$67,451·95.

The principal items of production of the Nova Scotia steel works for the year 1910 are as follows :—

Coke	410,000 tons.	Steel rails	140,000 tons.
Pig-iron	255,000 ,,	Steel wire rods	79,000 ,,
Steel ingots	304,000 ,,	Sulphate of ammonia	3,100 ,,
Steel blooms	268,000 ,,	Tar	3,900,000 gallons.
Steel billets	88,000 ,,		

All the coke made is used in the works for smelting purposes. Only a small proportion of the production of pig is sold as such, the greater part being made into steel ingots, which are all rolled into blooms. A considerable tonnage is marketed in this form, but about eighty-five per cent is advanced a further stage, and is sold in the form of rails and wire rods.

Gypsum

The quantity of this mineral existing in the province is incredible. Large masses showing exposures 50 feet thick are frequently seen. On the shores of the Bras d'Or it may be dropped into the holds of sea-going vessels from the masses standing out white upon the green slopes of the mountains, or forming part of their precipitous sides. Gypsum has been exported from the region round the Minas Basin from the earliest settlement of the country.

The output of gypsum in 1896 was 136,590 tons, valued at \$111,251; and the returns for the seven years 1906-12 give the following:—

Year.	Tons.	Value.
1906	333,312	\$345,414
1907	357,411	380,859
1908	234,455	230,433
1909	345,682	364,379
1910	400,455	458,638
1911	353,999	406,457
1912	376,082	481,493

Coal

The output of the Nova Scotia coal-mines in long tons for the years 1908-12 and its value is as follows:—

Year.	Tons.	Value.
1908	6,076,330	\$13,364,476
1909	5,106,135	11,354,643
1910	5,817,109	12,919,705
1911	7,004,420	14,071,379
1912	7,783,888	17,374,750

Tin ores occur in Lunenburg; tungsten in Halifax and Lunenburg; antimony in Hants; whilst oil-shales and fire-clays occur with the coal; and silver, lead, cement materials, and brick clays occur at many localities.

Character of the Land

The peninsula has been, in the previous pages, roughly divided into two parts almost equal in area. One half facing the Atlantic and the other facing the interior waters and, speaking in a general way, the first half may be said to be rocky and barren, and the second for the most part arable and fertile. The Atlantic half corresponds to the region of hard Cambrian rocks and granite, the other to the region of Silurian, Devonian, Carboniferous, and Triassic. The barren band along the coast is about 21 miles broad in its whole length.

The surface on the Atlantic coast at times is rocky, at other times low, and it does not rise more than 200 or 300 feet in the interior. In the central part it is traversed by broken and rocky ridges of very little elevation and interspersed with numerous lakes and streams, especially at its western end in rear of Yarmouth, Shelburne, and Liverpool. There are also many bogs and barrens where the forest has been burned. The country is a paradise for sportsmen where moose and caribou are plentiful, and bears are also to be found, as well as fur animals such as foxes, otters, and minks. The

numberless lakes are full of trout, and the rivers at the coast abound in sea trout. Partridges, snipe, and woodcock are plentiful, and, in their season, all the waters, streams, lakes, and bays are resorts of geese, ducks, and brant. The whole country is covered with forest and, though in the alluvial land along the streams there is agricultural land, the interior is for the most part unsettled and wild.

On the side facing the inner waters of the Bay of Fundy and the Gulf of St. Lawrence it is far different. There continuous hills clothed with beech, maple, and other hard woods run in ranges in the general direction of the coast-lines. The Annapolis valley is flanked on both sides by two such ranges extending from the Minas Basin south-westwardly to the extreme end of the peninsula. These have a general elevation of 500 to 700 feet. Along the north shore of the Minas Basin are the Cobequid mountains which continue along the northern half of the peninsula to Cape George and the Gut of Canso. The mountains are nowhere higher than 1200 feet, and are covered with fertile soil, or where uncleared, with dense forests of hardwood trees. At the eastern end of this region is a rich pasture country, and around the Minas Basin and Chignecto Bay are the fertile marsh lands formed by the tides of the Bay of Fundy.

Hydrography.—The rivers flow across the peninsula, and necessarily are small from the narrowness of the watersheds; but they are very numerous, and the tides running up from the heads of the bays into which they fall make them appear more important than their drainage area would warrant. Many of the lakes in the interior are connected by the rivers, so that it is easy to pass across the country with canoes, for the portages are short. By the Shubenacadie river and chain of lakes, the Micmac Indians in the last century used to cross from the Minas

Basin to the divide within a few miles of Halifax, and, after hiding their canoes, lurk in the woods round Halifax, Lunenburg, and Dartmouth, waiting for the scalp of any English settler who might be found off his guard, or for the scalps of his wife and children if they were alone in the house. From Liverpool and Lunenburg similar chains of lakes with short portages lead across to the Bay of Fundy. Lake Rossignol and the Great Shubenacadie Lake are the largest.

The most important of the rivers are the Shubenacadie, which rises near Halifax and empties into the Minas Basin, the Annapolis, which runs along the western edge of the peninsula, the La Hève river, and the Pietou river; but in a country of great rivers like the Dominion these cannot count for much. The province of Nova Scotia is, like its sister provinces, a land of abundant water.

Soil.—The agricultural lands, as before stated, face along the inner bays. The valley of the Annapolis is celebrated for apples, and during the year ending June 30, 1895, 285,884 barrels were exported, chiefly to England and the United States. This valley, being sheltered throughout by a double range of hills, is warmer than the rest of the province. In Cumberland, Colchester, and Hants counties are the chief part of the dyked lands which never require manuring, and have produced large crops of hay for a hundred years. All the inner counties of the province are productive farming districts, and wherever the tides of the Bay of Fundy reach they have formed meadow land of great fertility. Upon such land, wherever found throughout the province, were the settlements of the French Acadians. They did not clear land with the axe, but took up these fertile meadows and extended them by dykes (called *aboteaux*) with sluices. Whenever these were opened the water of the bay entering deposited a

thin dressing of red mud which renewed the fertility of the soil.

The area of field crops in the province was 730,146 acres in 1900, 712,207 acres in 1910, and 711,387 acres in 1911. Farm lands and buildings were valued in 1911 at \$92,115,676, having increased in value \$33,363,292 in the previous decade. The total values of farms and their products for the year 1911 amounted to \$140,270,293, whilst in 1901 they were \$88,941,545.

Government

The government of Nova Scotia at first extended over all Acadia. Prince Edward Island was erected into a province in 1770, and New Brunswick was set off in 1784. Cape Breton was separated in 1784, but again attached to Nova Scotia in 1820.

The constitutional history of this province passed through the process of evolution usual in British colonies. First came the royal governor, with a council nominated by the Crown. The popular legislative assembly was superadded in due course ; then ensued the usual struggles between the nominated and elected bodies, until in 1847 what is called responsible government was conceded, that is, the popular assembly obtained the dominant influence corresponding to that of the British House of Commons. The subsequent political history is not different from that of other parliamentary governments, and consists of alternate administration by two political parties. In 1867 Nova Scotia became one of the provinces of the Dominion.

It is now governed by a lieutenant-governor appointed by the Dominion Government, a legislative council of twenty members having a property qualification, appointed for life by the Crown in theory, but practically by the

government of the day, and a legislative assembly of thirty-eight members, elected under a franchise narrower than that of the other English provinces, but still on a very popular basis. The executive government or administration consists of eight members, and must be able always to obtain the support of a majority in the popular chamber.

The local government is carried on by the municipal councils either of cities or of rural districts. The first may be regulated by their own special charters or fall under the general law, the second are under the general municipal law of the province. Every electoral division sending a representative to the provincial legislative assembly is a municipality for its own local objects. The municipal council is composed of councillors, elected by the ratepayers, who choose a head—mayor or warden.

Education

The schools of the province are undenominational and free, and the course extends from the primary schools for children of five years to the high schools and academies. The Government maintains a normal school for the training of teachers, and schools for the deaf and dumb and blind. The executive council (or administration of the day) is the supreme governing body, and acts through the superintendent of education. It appoints a board of examiners for teachers and a staff of school inspectors. The province is divided into school districts, for each of which a board of school commissioners is appointed by government. The districts are subdivided by the commissioners into school sections, and these are administered by a board of three trustees elected by the ratepayers.

The schools are supported by legislative grants supplemented by statutory municipal taxation. When any unusual amount is required, it must be voted by a meeting of the ratepayers of the districts concerned. From the high schools those who desire to pursue their studies further may avail themselves of the University of Dalhousie College at Halifax, which is undenominational; or King's College at Windsor, which is Anglican; or Acadia College at Wolfville, which is Baptist; or St. François Xavier College at Antigonish, which is Roman Catholic. The aggregate amount expended on public education in 1912 was \$1,391,100.

Cities

The principal cities of Nova Scotia and their population, according to the census records of 1911, are given in the accompanying table:—

Cities.	Population.	Cities.	Population.
Halifax . . .	46,619	New Glasgow . .	6,383
Sydney . . .	17,723	Truro . . .	6,107
Glace Bay . . .	16,562	Springhill . . .	5,713
Amherst . . .	8,973	North Sydney . .	5,418
Sydney Mines . .	7,470	Dartmouth . . .	5,058
Yarmouth . . .	6,600		

Halifax, the capital of the province, is situated upon a rising ground—a peninsula formed by Bedford basin (the continuation of the harbour) and the North-west Arm, a beautiful sheet of water (a quarter of a mile wide and navigable for large vessels), running into the land in rear. It is very strongly fortified, not only by the citadel, a first-class fortress, which rises over the city, but by forts at the entrance of the harbour which can cross their fire, and by forts upon islands which can rake the channels of

HALIFAX HARBOUR.

To face page 219.



Stanford's Geog. Estab. London

approach from sea. The harbour has been noticed on a previous page. The Halifax Gardens are the pride of Nova Scotians and the admiration of all visitors.

The population of Halifax given in the census of 1911 is 46,619, and the pursuits of its people are chiefly maritime. The total value of the *exports* from Nova



A VIEW IN THE PUBLIC GARDENS, HALIFAX.

Scotia in the year 1913 was \$24,201,473; the imports amounting to \$20,753,369—a total trade of \$44,954,842. Of this amount \$27,577,305 passed through the port of Halifax. Halifax is the winter terminus for the Canadian Atlantic mail service—all mail steamers must call there, and its harbour facilities are unsurpassed.

It is also the terminus of the Intercolonial Railway, and by the Canadian Pacific Railway possessing running powers over it, the distance to Winnipeg by rail is 2172

miles, and to Vancouver 3656 miles. Halifax is a fortified naval station and dockyard, being the headquarters of the Atlantic division of the Canadian Navy.

Halifax is the seat of the provincial government, and the old province building suggests many memories of old



HALIFAX MEMORIAL TOWER.

colony days. Dalhousie College, a non-denominational university with about 900 students, is at Halifax. It was established in 1820, during the administration of the Earl of Dalhousie, and is the chief educational institution of the province.

It was in Halifax that the "First Colonial Parliament of the British Empire" convened, October 2, 1758; in commemoration of which a Memorial Tower has been

erected from contributions by the different colonies, and through the munificent gift of 100 acres of land by Sir Sandford Fleming. The following is the inscription on the Halifax Memorial Tower:—

MDCCLVIII—MCMVIII.

This tower was erected to keep in the grateful memory of a loyal people the grant of Great Britain of representative government in Nova Scotia and in the other provinces of Canada, as well as in the Dominions beyond the seas.

The foundation stone was laid by D. C. Fraser, Lieutenant-Governor of Nova Scotia, October 2nd, 1908, the 150th anniversary of the first meeting of the General Assembly in Nova Scotia. This Assembly—the first elected legislative body in Canada—was constituted in accord and with the settled colonial Policy of Great Britain, and in obedience to the terms of the Commissions issued to the early Governors of Nova Scotia, and has met annually in Halifax during the intervening century and a half. Erected by the Canadian Club of Halifax, aided by contributions from the Canadian Clubs, and Governments, Municipalities, corporations and individuals throughout the Empire, the first Gift being the Park, One Hundred Acres, in which the Tower stands, from Sir Sandford Fleming.

“NISI DOMINUS FRUSTRA.”

Before a large concourse of representatives from the Overseas Dominions, and especially from Canada, this Tower was inaugurated in August 1912 by His Royal Highness the Duke of Connaught and Strathearn, K.G., etc., etc., Governor-General of Canada, whose words of wisdom and counsel on this and other occasions have won the admiration and affection of the young and growing British Nation over whose destinies he governs so gently and well.

Yarmouth has a population of 6600 of the most enterprising people in the whole Dominion, shipping being a peculiar gift of the people of this city. The harbour of Yarmouth is not equal to many others in Nova Scotia, and there is no back country to support it.

The lakes in rear are beautiful, and the region is a sportsman's wilderness and paradise, not a rich farming country, yet Yarmouth is one of the most prosperous towns in the east.

Truro, at the head of Cobequid Bay, is taking a leading place in the province as a railway centre. It is in the heart of a rich farming district, and the provincial Normal School is there. It is also the centre of some important manufacturing industries. It is an exceedingly pretty town. The population is 6107. Lunenburg, with a population of 2681, is a maritime town and depends upon the fisheries, sending out 150 vessels to follow the cod fishery on the banks. Amherst, at the head of Chignecto Bay, is in a rich agricultural district, the fen lands of the upper Bay of Fundy, and is a centre of supply for the Cumberland mining district. With thriving manufactures and noted workshops, its population is now 8973. New Glasgow is the centre of the Pictou mining district, whose population is 6383. Pictou, the shipping port, has remained stationary; the towns closer to the mines grew at its expense. Windsor (the Pisiquid of French and Indian history) is a small town of 3452 inhabitants on the Avon, a tidal river falling into the Minas Basin. Its people are large owners of shipping. King's College, the oldest English college in Canada, is at Windsor. It was founded in 1788 on the plan of an English college, and is under the control of the Anglican Church.

Sydney, a seaport town on the east coast of Cape Breton island, possesses one of the finest and safest harbours in the world, and is one of the principal coaling-stations on the Atlantic coast. It is 277 miles from Halifax, with which it is connected by rail, and steamship service. It is the headquarters of the Dominion

Steel Works. Sydney Mines is a coal-mining town and industrial centre on the north side of Sydney harbour. The Nova Scotia Steel and Coal Company's coal-mines and steel works are located here, employing 3000 men. North Sydney has large piers for the shipment of coal and iron ore, with steamers plying regularly between it and Sydney, Port aux Basques (Newfoundland), St. John (New Brunswick), Charlottetown, Montreal, Quebec, and Halifax. Thorburn, Westville, Stellarton, Port Hood, Dominion, and Springhill are all coal-mining centres; Parrsboro, Canso, Digby, Annapolis, Louisburg, Shelburne, Wolfville, Pictou, Liverpool, Bridgewater, and Windsor are seaport towns and harbours of considerable importance.

Communications

The railway communications of Nova Scotia for the most part form a portion of the Government line of the Intercolonial railway. Halifax is connected by that line with Windsor and Truro at the heads of the two great arms of the Bay of Fundy. The same line connects with Pictou and Sydney, Cape Breton, the centres of the two great coal-fields, and, in passing over the isthmus to connect with the main Canadian system, the line traverses the Cumberland mining district. There is a line of railway from Halifax to Chester, Lunenburg, Shelburne, and Yarmouth, also from Truro to Windsor, and down the Annapolis valley to Digby and Yarmouth, and a branch connects the valley with the Atlantic coast at Lunenburg. There is a short spur from the Springhill coal-mines to their shipping port (Parrsboro) on the Basin of Minas, one connecting Oxford Junction with Pugwash, River John, and Pictou, and another connecting the Cape Breton coal-mines with Sydney and Louisburg. The

Joggins coal-mines are reached by a spur from the Inter-colonial railway from Maccan near Amherst.

Halifax is in communication with Europe by several lines of steamships. The Allan line is fortnightly from Norfolk and Baltimore, touching at Halifax and St. John's, Newfoundland, to Queenstown and Liverpool. The Furness line runs from Halifax direct to London, the Hansa line to Antwerp and Hamburg, the Allan line to Glasgow. There is also a line to New York and one to Boston, and lines of coasting steamers run to Canso and ports in the gulf and round the coast westwards. Steamers run regularly also to St. John's, Newfoundland, and to Sydney.

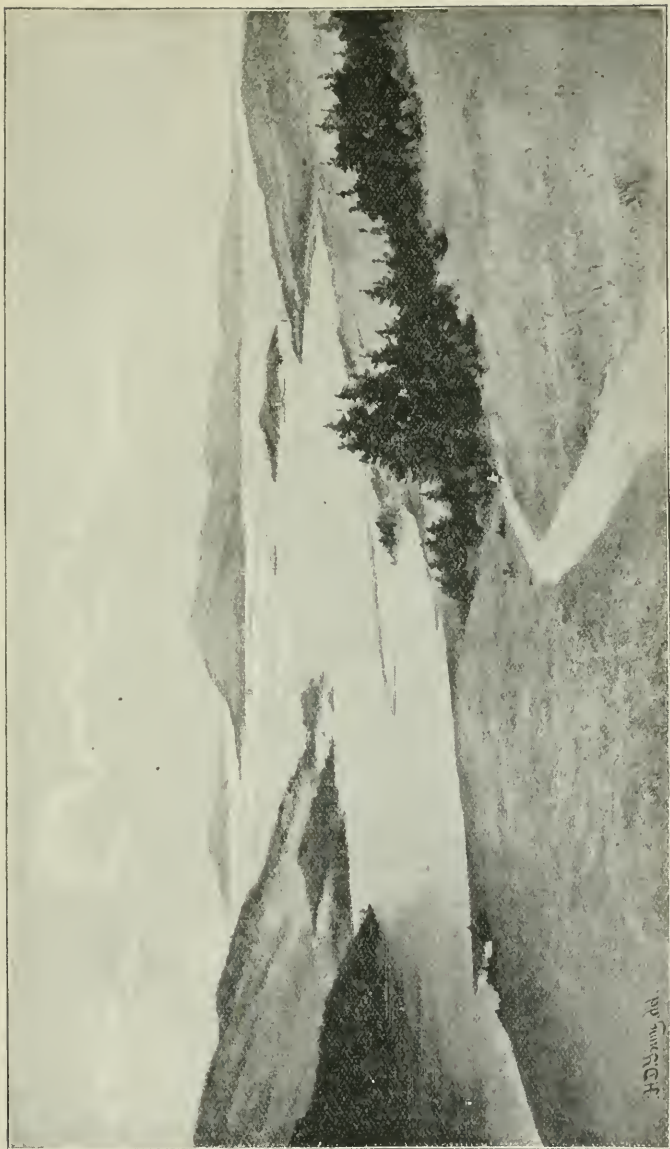
Forests.—Four hundred million feet of lumber were cut in Nova Scotia in 1909. There are 12,109 square miles of good timber land in Nova Scotia. Of these, there are still 1,459,213 acres of Crown Lands in forest culture as yet ungranted. A system of fire protection for the forest was elaborated in 1904 and put into force.

The following table shows the exports of lumber from the ports of Nova Scotia in 1911 :—

	Feet.		Feet.
Halifax . . .	43,000,000	Ingram Decks . . .	9,000,000
Lunenburg . . .	48,269,113	Yarmouth . . .	13,597,452
Bear River . . .	3,500,000	Colchester . . .	70,000,000
Pugwash . . .	19,204,200	Windsor . . .	12,000,000
Liverpool . . .	5,954,000	Hantsport . . .	4,500,000
Maitland . . .	5,147,744	Walton . . .	1,200,000
Pictou . . .	12,227,164	Cheverie . . .	200,000
Sherbrooke . . .	4,500,000	Parrsboro . . .	32,000,000
Weymouth . . .	12,000,000		

Commerce.—The following figures, latest available, give at a glance the value of fishery, mine, and farm products :—

Value of produce of fisheries (1912-13) . . .	\$7,384,055
Number of fishermen (1912-13)	26,538
Value of property (1911)	\$113,051,641
Value of farm products (1911)	\$26,946,768

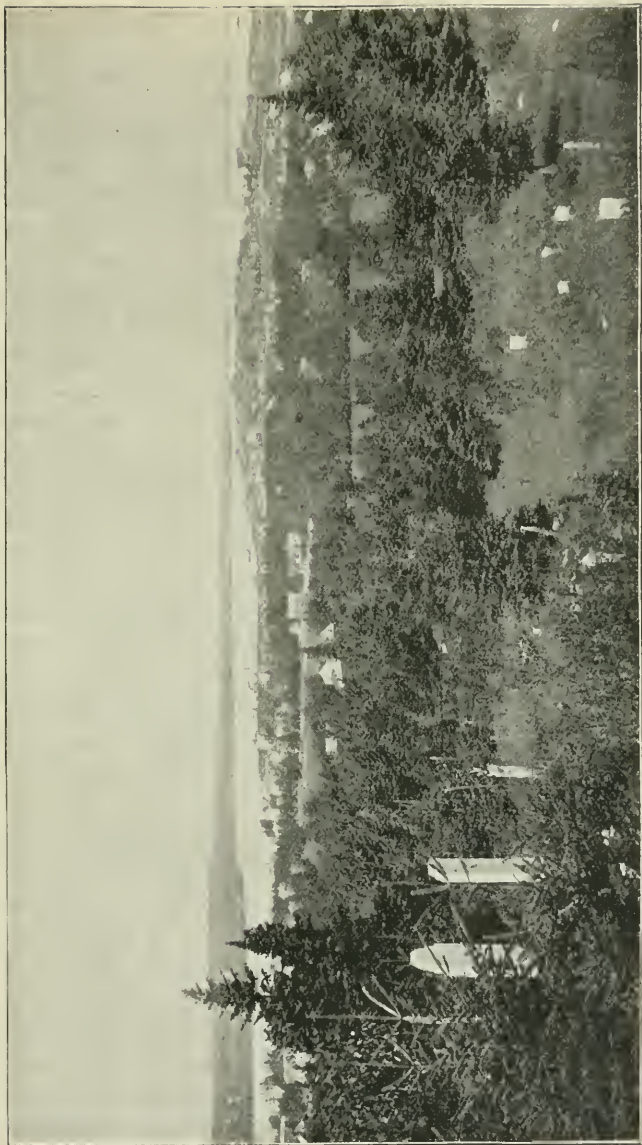


BADDECK, ON THE BRAS D'OR, CAPE BRETON.

Value of mine production (1912)	\$18,922,236
Capital invested in manufactures (1911)	\$79,596,341
Number of employed	28,975
Value of products	\$52,706,184

Cape Breton

The island of Cape Breton is unlike any other part of the Dominion. It has a beauty all its own—a beauty of woods and mountains and sea and lakes in close contrast, for the ocean passing through the narrow inlets flows into the very heart of the island, and searches out the innermost recesses of the two mountain ranges which spread out like the letter V to the north and north-east. The water is deep enough to permit vessels of the largest size to lie close inshore, and there is not sufficient range of tide to expose much beach, so the woods come down to the margin of the Bras d'Or, as this brimming loch is appropriately named. On the west is a wilderness table-land of 1100 square miles and 1200 feet high, and the highlands on the outer side are bluff on the gulf shore and on the inner descend steep down to the Bras d'Or. On the east is a lower range, where an occasional farm may be seen breaking the rounded outlines of the forest-clad hills. At the extreme southern point the Dominion Government has cut a canal only 2400 feet long with one lock, and opened out another passage into the Atlantic, thus dividing the island into two separate parts. The distance from the northern entrance from the sea to the canal is 60 miles, and the Bras d'Or at its widest is 20 miles across. The mountains are not high enough to be gloomy, and they are covered with a mixed forest of deciduous and evergreen trees. Of a summer's day, when the sun shines from a clear blue sky, it lights up the translucent water to the bottom, and the medusæ, or jelly-fish, float in shoals of delicate white, pink,



SYDNEY, CAPE BRETON.

and purple discs, expanding and contracting with regular pulsations in the warm sunlit waters. There is no stir in this golden arm of the sea. The western plateau is an unexplored wilderness, the home of the moose, the caribou, and the bear; occasionally a vessel is seen close inshore, loading gypsum from a white cliff, or the steamer may disturb some bird sitting out on a low branch fishing and studying the clear water for a strike. The brooks and streams falling in are full of trout, and all the fish of the neighbouring coasts are found in the deeper waters. At one point, where the Little Bras d'Or passes into the Great Bras d'Or, all the lake closes in to the Grand Narrows and there it is bridged by the Intercolonial railway. Then it spreads out again in great stretches among the hills—more beautiful, says Charles Dudley Warner, than he had imagined a body of salt water could be. In the fresh early morning when the loons begin to talk about getting up, or in the still evening when the purple of the hills begins to darken, or even in full mid-day when the leaves rustle lightly overhead and the ripples sparkle in the sunshine, the beauty of the Bras d'Or can be expressed only by the opening stanzas of Thomson's "Castle of Indolence" before the Knight of Industry broke in upon the restful paradise.

The Carboniferous rocks of Nova Scotia continue into Cape Breton island and form its centre in which, as in a basin, lie the Bras d'Or lakes. Productive coal-seams crop out on the edges of the island—at the west, on the shore of the gulf along the base of the hills from Port Hood to Margaree—in the south, near Port Hawkesbury at the entrance of the strait of Canso—at the south-east, along the banks of the river Denys; and, on the north-east, near Sydney, where they crop out on the sea-shore. Along the south-east coast, from the Lemnox passage to

Scatari island, a continuation of the Cambrian belt of Nova Scotia borders the low rocky shore. To the north the long projecting plateau extending to the northern capes consists of crystalline rocks classed as Archæan. All round this plateau the coast is bold, rising to 1392 feet at Cape Smoky. On the whole west or inner coast of the island Port Hood is the only fair harbour, but on the Atlantic side are many excellent harbours, foremost among which is that of Sydney, one of the best in the world although blocked by ice in winter. In the sixteenth century, fishermen from all the maritime nations of Europe resorted annually to this coast, and the old names bear witness that they resorted to different harbours. Thus, St. Anne's Bay was called Port Dauphin and was a favourite rendezvous of the French, Sydney harbour was called Baye des Espagnols, and Louisburg, Port aux Anglais. Ingonish or Niganis was, says Champlain, at one time a resort of the Portuguese. Cape Enfumé, Smoky cape or *Baia des fumos*, derives its name from a very curious appearance of smoke ascending from the shore up the face of the cliff which led the old mariners sailing past to suppose the place was inhabited.

The chief town of Cape Breton is Sydney, population 17,723. North Sydney, on the opposite side of the harbour, has a population of 5418, and the population at the neighbouring mines is 7470, in all 30,611 souls. The harbour is very commodious, spreading out into two deep arms. It is a favourite port of the French squadron on the St. Pierre-Miquelon station. Its chief industries are coal-mining, iron and steel manufacture, fisheries and shipping. It is an excellent coaling station, and thither many of the squadrons of the world—British, French, and United States, and others—coal up at the mines themselves situated on the very shores of the Atlantic.

Glace Bay, a few miles distant, with a population of 16,562, is a thriving mining town, and near it is located the celebrated Marconi wireless telegraph station. The site of Louisburg is occupied only by a few fishermen and the ruins of the old fortress city. The harbour is small, but is open all the year. The Sydney-Louisburg railway has been completed to it from the coal mines, and excellent piers erected. During the last 150 years there has been a strange desolation about this really fine harbour, once the centre of the power of France in the west. The fortress was blown up beyond all restoration after its capture. The population of Louisburg counts 1005 souls, and devotes its attention to fishing and shipping interests.

METEOROLOGICAL TABLE

The mean annual temperature and average annual precipitation of moisture for different localities in the whole province may be ascertained from the following records:—

Locality.	Mean Annual Temperature.	Average Annual Precipitation.
Halifax	44·3° Fahr.	56 inches.
Parrsboro	44·4° „	38 „
Pictou	43·2° „	44 „
Port Hastings	43·2° „	49 „
Sable Island	45·5° „	44 „
Sydney	42·4° „	51 „
Truro	42·5° „	45 „
Whitehead	41·8° „	44 „
Yarmouth	40·2° „	50 „

As regards climate, and resources both from the earth and the sea, including products of the soil, mine, forest, and fisheries, Nova Scotia is one of the most favoured in the Dominion.

CHAPTER VII

NEW BRUNSWICK

THE province of New Brunswick is almost square in shape, and three of its sides front on the three great bays of the Atlantic coast of the Dominion. On the north it is bounded by the whole length of the Bay Chaleur and by a part of the province of Quebec. From the head of the bay the line follows the Restigouche river and its tributary the Patapedia as far as lat. 48° , which parallel it follows westwards to the water-parting of the Restigouche and the waters flowing north into the river St. Lawrence by the Rimouski. At that point the western boundary commences. It follows approximately by straight lines the water-parting of the Rimouski and St. John rivers southwards to the south-east corner of the old seigneuries of Temiscouata and Madawaska. Leaving these seigneuries wholly in the province of Quebec, the line follows their southerly limit, and continues on in the same general south-west direction to a point on Lake Beau, where it touches the international boundary. From that point it follows the international boundary southwards to the mouth of the St. Croix river. The greater part of the western boundary is, therefore, formed by the state of Maine, and the rest by the province of Quebec. On the south New Brunswick is bounded by the Bay of

Fundy and by the isthmus at its head—the little river Missiguash being the line of separation from Nova Scotia for almost the whole distance across the isthmus. The eastern boundary is the Gulf of St. Lawrence.

The province extends from $63^{\circ} 55'$ to $67^{\circ} 40'$ west longitude and from $44^{\circ} 35'$ to 48° north latitude, an extreme distance of 200 miles from east to west, and 230 miles from north to south, and its area is 27,911 square miles. Two islands at the entrance of the Bay of Fundy belong to it—Campobello and Grand Manan, both very important to the fishing interests of the province. Campobello is 8 miles long by 3 in width, with very bold shores, and is covered with forests of evergreens. In 1767 it was granted to Admiral Owen, and was held by his heirs for 100 years. There are 1160 inhabitants on the island, mostly fishermen. Grand Manan is 22 miles long by 3 to 6 miles wide, and has good harbours on the east coast. The west and south coasts are perpendicular cliffs 300 to 400 feet high. The surface is level and wooded, and the inhabitants, 2700 in number, live by fishing. Both these islands are the summer resort of many wealthy people from the south, and of artists, who find abundant material for sketches in their bold cliffs and picturesque marine scenery.

The exterior of New Brunswick on the west and south will make an unfavourable impression, for the coast on the Bay of Fundy is rocky and rugged though not high, and the country on the eastern part of Maine and the western part of New Brunswick, where the railways cross the border, is a wilderness of boulders and of rock, where the burnt forest has not found soil wherewith to renew itself. These narrow barriers of barren and rocky soil enclose a broad area of level and fertile country extending away to the eastern and northern shores.

The Bay of Fundy

This broad arm of the North Atlantic reaches eastward towards the Gulf of St. Lawrence, and separates, excepting for a low isthmus only $11\frac{1}{2}$ miles across, the peninsula of Nova Scotia from the province of New Brunswick on the main continent. It is about 180 miles in length. Opposite St. John harbour it is 45 miles wide, and continues about that width until it forks into two great bays—the Minas Basin and Chignecto Bay, which last subdivides into Shepody Bay and Cumberland Basin, the Beaubassin of the French. De Monts, in 1604, named it *La Baye Française*, and so it remained upon the French maps; but the English always called it the Bay of Fundy—the corruption probably of an earlier Portuguese name, *Baya Fonda*, or “the deep bay,” for the Portuguese were the earliest cartographers of this coast.

The tides of the Bay of Fundy are noted for their height. In St. John harbour the spring tides rise 27 feet; at Sackville, 45 feet; at Fort Cumberland, 45 feet; at the mouth of Shubenacadie river in the Minas Basin, 50 feet, rising constantly higher towards the upper reaches of the bay. The cause is apparent on the map. The tidal wave sweeps in from the ocean with a broad front, extending from Cape Sable in Nova Scotia to the Maine coast, and, as the shores of the bay draw together and the depth decreases in the upper reaches, the wave rises in height, and its current becomes swifter. At Cape Sable it runs at the rate of three miles an hour, but rapidly accelerates its speed until, in Chignecto Bay and the Minas Basin, it rushes at the rate of six or seven miles an hour with a bore or crest up the funnel-like estuaries. The water in the upper reaches becomes heavily charged with sediment. The bore arrives suddenly,

the foremost wave curling some 4 to 6 feet high, and it covers almost instantly the broad flats at the head of the bay. The ceaseless scour has, in its lower courses, deepened the bay and swept the shores. On the New Brunswick side the rocks are hard Cambrian, and on the Nova Scotia side a wall of hard trap protects the red sandstone, but farther up the softer Carboniferous and red Triassic rocks are corroded by the swift currents. At



Marshman, Photo.

THE BORE, PETITCODIAC RIVER, MONCTON, NEW BRUNSWICK.

Height, 5 feet 4 inches.

such points as Windsor, or Moncton, or Amherst, the spectator at low tide will see only a vast expanse of smooth red mud, and far away in the middle little rivulets such as the Salmon, the Avon, the Missiguash, the Petitcodiac, trickling in a thin stream of fresh water. Suddenly will arrive a rush of waters, and these little rivers have spread out to a width of two or three miles, and the water brims up in all the little brooklets and ditches. Tide after tide deposits thin layers of red mud

on the flats, and they gradually rise until only the spring tides cover them, then they are dyked and become rich hay meadows which a hundred years of cropping will not exhaust.

The Bay of Fundy, in the months of summer, is very subject to fogs; for the wind at that season frequently blows from the south, and almost any wind with south in it will bring up fog from the Gulf Stream. Otherwise there is no difficulty in navigating it. The coasts are bold; there are no shoals because of the ceaseless scour, and the tides, if they are swift, are always the same. There is excellent shelter for vessels along the New Brunswick coast, and, after the islands off Passamaquoddy Bay are passed, there are no rocks to endanger navigation. Even when the fog is thick on the main bay it does not extend inland, and the whole extent of Passamaquoddy Bay may be clear over an area of 100 square miles of deep and sheltered water. Passamaquoddy Bay contains many harbours, of which the best is that of St. Andrews. Other excellent harbours on the main Bay of Fundy west of St. John are: L'Étang, Lepreau, and Musquash harbours, besides the harbours and shelters of Grand Manan and Campobello islands. On the Nova Scotia side the openings through the barrier of trap are few and narrow, but the harbours of St. John and St. Andrews are open all the year round with easy access and simple navigation to the main Atlantic. There is no other part of the western ocean where the phenomena of the tides afford so interesting a study.

Contour of the Land

The whole southern border of the province fronting on the Bay of Fundy is protected from the scour of the tides

by a narrow belt of ancient and partly metamorphosed Cambrian and Ordovician rocks extending from Shepody Bay in a series of ridges of no great height; Shepody mountain (1050 feet) being the highest point. This belt reaches almost to the south-west corner of the province, and from that point a similar band of hard rocks, largely granite, stretches away at an angle of about 45° , across the province to Bathurst on the Bay Chaleur. Between the base line and this diagonal extends a wide fan-shaped area of level land underlain by rocks of the Carboniferous formation; beyond the diagonal to the north-west is a rolling country of Silurian age. The diagonal stretch of highlands is the water-parting, separating the waters of the Miramichi and the Richibucto, flowing into the Gulf of St. Lawrence from the waters of the upper St. John and the Restigouche. The dividing ridge varies in height from 1000 to 1500 feet, and detached mountains rise throughout this disturbed band to heights from 1500 to 2000 feet, rendering broken and confused the country about the head waters of the Tobique, Upsalquitch and Nipisiguit. Bald Mountain, the highest point, is a mass of granite 2470 feet above the sea, and the height of Blue Mountain is 1600 feet. These ranges of hills are forested to their summits. With the exceptions stated above New Brunswick is a level plain, covered everywhere with forests, and large tracts of it are yet unexplored; a famous hunting country for moose and caribou, bear and lynx, sable, mink, and beaver. Under the operation of good game laws these wild creatures are increasing rather than diminishing in number.

New Brunswick has been well called the best watered country in the world; for it contains an unusual number of rivers terminating at their mouths in estuaries

forming good harbours. These flowing through the interior region of soft rocks have cut broad valleys; so that the country, which is really a plain only from 200 to 400 feet above the sea, seems to be a series of ridges. The valleys are called intervalles, and consist of low alluvial lands flooded at the spring freshets or of terraced land at different elevations above the streams. Such lands are fertile and easily worked, and when not cleared are clothed with a forest of hard wood—the elm and ash growing on the lower levels, which are fertilised by the spring floods. All the islands in the streams are alluvial land of the same quality, consisting of rich loam on a sub-soil of sand or clay. North-westwards of the diagonal range of hills the Silurian plain is 500 to 800 feet above the sea.

Hydrography

As stated above, the province is watered by numerous rivers, and these spread out into a maze of innumerable forks and branches, all of which have valleys of a similar nature more or less wide, so that the aggregate of intervalle land is very large. Those flowing into the Gulf of St. Lawrence terminate in wide lagoons protected by sandy bars and spits; for the coast on that side is low although the water of the gulf is deep.

The chief river of New Brunswick is the St. John—a grand river draining one-half of the province. It rises in the state of Maine, near the sources of the Penobscot and the Chaudière, and flows in a great curve of 450 miles first north, then south-east and south for about 300 miles in New Brunswick. It drains an area of 21,500 square miles. The head waters of the river in the state of Maine flow through a country valuable for its lumber.

The St. John is a lumbering river of the first importance, not only to New Brunswick but to Maine; for all the lumber cut on the upper St. John and its tributaries in that state is floated down to the sea at the city of St. John. For eighty miles of its course the river is the international boundary, and does not become a wholly British stream until a little above Grand Falls. It is navigable for large river steamers for 86 miles as far as Fredericton, and smaller steamers may go up in spring and early summer 126 miles farther to Grand Falls. Above that break it is navigable for a further distance of 65 miles.

The upper stretches of the river flow through a farming country where the Madawaska river falls in, draining Lake Temiscouata—a fertile region settled by Acadians driven out from their homes in the great dispersion, who returned to find them occupied by strangers, and retreated far up into the wilderness where they found an undisturbed retreat wherein to follow their own customs in peace. At Grand Falls the river expands into a broad basin preparatory to forcing its way in a swift current through a narrow rocky channel down an incline of 6 feet to a precipice of 58 feet, over which it falls into a deep chasm 250 feet wide with walls of rock 100 to 250 feet high. Within the chasm the river makes a further fall of 58 feet in rapids and eddies and whirlpools for a distance of a mile. This is the only obstruction to navigation above St. John harbour, and the river resumes its tranquil course through a level and rich farming country with much fertile intervale land, settled after the Revolution by expelled loyalists. It receives many important tributaries in its upper course—the Aroostook from Maine, the Madawaska and St. Francis from Quebec, and the Tobique from near the shores of the Bay Chaleur.

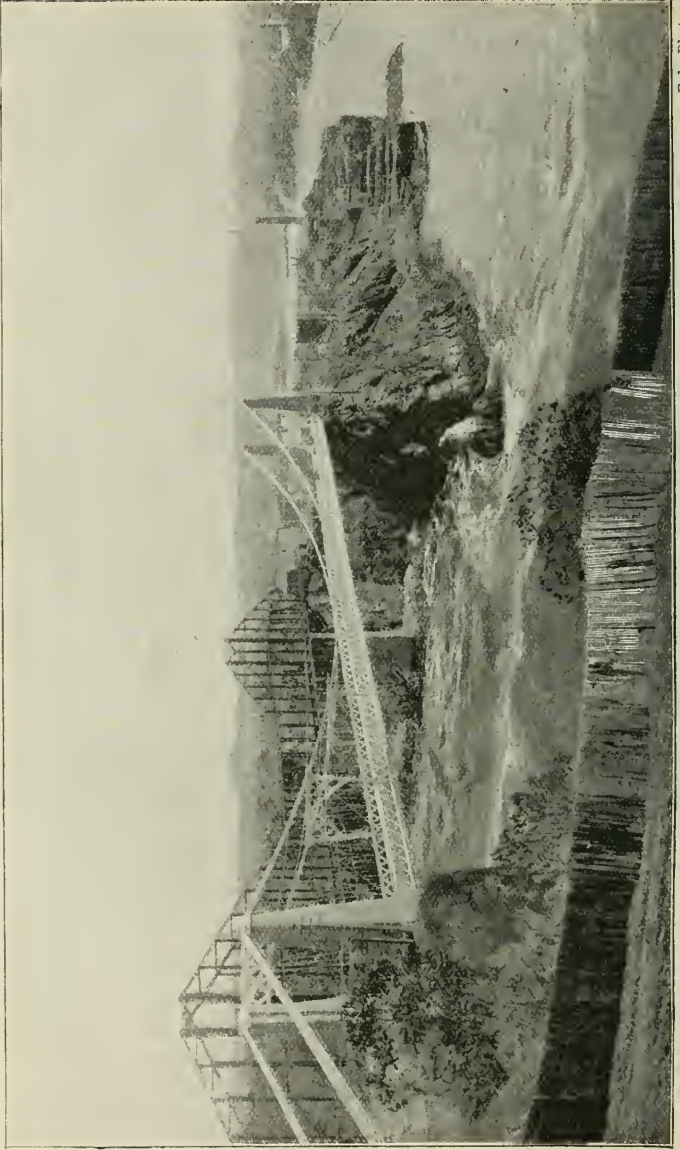
Fredericton—the capital of the province—is 86 miles from the mouth of the river. Opposite to it the Nashwaak river falls in by which the French garrison communicated with Canada by way of Miramichi in the old colony days. The tide rises to a point six miles above the city, and at low water there is a depth of 8 feet that far. For more than 50 miles from its mouth the river is 15 feet deep at low water. At Maugerville, the junction of the Oromocto, was a settlement of English colonists in 1763, the earliest in the province. It was from Massachusetts, and the only one in the present Dominion which sided with the revolting colonists. At Jemseg is the outlet of Grand Lake, an expanse 30 miles long by 3 to 9 miles wide, into which the Salmon river falls. Here was another French fort in old colony days, the scene of many conflicts after 1654 when it was taken by Cromwell's expedition. Up to this point the river flows through a level farming country with wide borders of intervale and many islands. Below Jemseg the banks become hilly and the river seems to be a long succession of lake expanses. South of Jemseg the Washademoak lake and river discharge their waters among a multitude of alluvial islands. As the St. John approaches the sea it passes through ranges of hills parallel to the coast, and extends behind them in long reaches of deep and quiet water through highlands clothed with woods. Near the city of St. John such a reach navigable for large vessels for 20 miles extends to where the Kennebecasis flows in from behind the coast range of hills. At the head of the harbour the river narrows and flows in through a gorge between walls of rock 100 feet high, and here is presented the unique phenomenon of a reversible fall. The river, which at Fredericton is half a mile wide, and in its lower stretches is much wider, is



KENNEBECAS RIVER — NEAR ST. JOHN.

here forced to flow for 400 yards through a gorge only 400 feet across. The tide in St. John Harbour rises 25 feet, and the gorge is so narrow that it can neither admit the tide quickly nor discharge the river promptly; for the tide recedes faster than the narrow outlet can permit the returning water to flow through. At low water the level of the river is 11 to 15 feet above the sea, and at high water the level of the sea is 8 to 12 feet above the river. There are therefore two falls at every tide, one in and one out. Four times in every twenty-four hours there is for ten or fifteen minutes a period of equilibrium when vessels can pass in or out. At other times the passage is dangerous or impossible, according to the state of the tide. The directions for this unique navigation are peculiar enough to be repeated. "The falls are level, or it is still water, at about three and a half hours on the flood and about two and a half on the ebb, so that they are passable four times in twenty-four hours, about ten or fifteen minutes each time. No other rule can be given, as much depends on the floods in the River St. John and the time of high water or full sea, which is often hastened by high southerly winds." The railway crosses the chasm on a cantilever bridge 447 feet long, and near it there is a suspension bridge for ordinary traffic.

The St. Croix river is the western boundary of the province. It is the outlet of extensive chains of lakes and discharges into Passamaquoddy Bay, a magnificent sheet of deep water with good anchorage all over, and protected from the sea by the West Isles. The towns of St. Andrews and St. Stephen are on the New Brunswick side of the river. St. Andrews is indeed a favourite summer resort because of its beautiful scenery, its boating and fishing, and its perfect summer climate:



Erb. Photo.

but its dilapidated wharfs, and its old-fashioned but neglected mansions, tell of brighter prospects and of better days. The St. Croix is navigable for large vessels to the falls, a distance of 25 miles. The town of St. Stephen, 17 miles from St. Andrews, is a stirring, lumbering and manufacturing town.

The Miramichi is the second river in importance in New Brunswick. It is about 220 miles long and flows into the Gulf of St. Lawrence, at right angles to the course of the St. John, for a distance of 125 miles above the forks, and searches out with its affluents all the interior of the country. Near the coast its banks are low and uninteresting, but its upper stretches and tributaries flow through a rolling country. The tide goes up 15 miles beyond the forks and the river is navigable for large vessels for 35 miles as far as Newcastle, at the main forks, and six miles beyond Chatham. These two cities, together with Douglastown, are the Miramichi known to general readers, for there is no city of Miramichi. They were very busy places in the old days of wooden shipbuilding, and they still do a good business in lumber and fishery products. The Miramichi and all the rivers of the province flowing into the clear waters of the gulf and the Bay Chaleur are famous resorts for salmon.

Among the more important rivers on the eastern coast is the Richibucto. It has a good harbour at its mouth, where a town of the same name carries on a good business in fishing, lumbering, and canning lobsters.

The chief rivers falling into the Bay Chaleur are the Nipisiguit and Restigouche, noted salmon streams. The Nipisiguit is a shallow turbulent river flowing on a rocky bed, and with a fall of 140 feet high, and is one of the four streams which combine to form the harbour

of Bathurst. The Restigouche forms in the lower part of its course the boundary between New Brunswick and Quebec, but the upper part is wholly within the former province. The river is 225 miles long and falls into the head of the Bay Chaleur in a wide estuary, and the largest vessels can pass up as far as Campbellton. It has many affluents and drains an area of 6000 square miles. The scenery on its banks is very beautiful, and the country around is covered with a network of streams abounding in fish. Campbellton and Dalhousie at the mouth of the estuary are favourite summer resorts, and, with Bathurst, are the entrances to the wild country in the north and centre of New Brunswick, where large game still have a retreat, and where streams are still full of fish, and the lakes abound with wild-fowl in their season. The Upsalquitch, one of its chief tributaries in the province of New Brunswick, is a notable fishing stream, rising in the high dividing ridge among conical hills 1500 to 2000 feet high. Its source, Upsalquitch Lake, is 750 feet above the sea, and not far from there the river falls over 400 feet in a series of beautiful cascades in a distance of less than two miles. Other important tributaries are the Matapedia and Patapedia from Quebec, and the Kedgwick from the New Brunswick side.

All these rivers, excepting the main river St. John, rise in the centre of the province and their affluents overlap. There are very many other rivers, for New Brunswick is a land of abundant waters, but these are the most important.

New Brunswick as well as Nova Scotia possesses, at the head of the Bay of Fundy, extensive areas of marsh lands. The rivers Petitcodiac, Aulac, and Tantramar are of themselves mere brooks; but when the tide is up

they are broad rivers two or three miles wide. The Petitecodiac flows eastwards behind the coast ridge, and turning suddenly at a place called "the Bend" empties into Shepody Bay. The tidal wave passing from the wide mouth of the bay up the narrow funnel-like estuary attains a height of 50 feet. The advance wave arrives with a bore four to six feet high, and the vessels seemingly asleep on their sides wake up, for the muddy valley suddenly becomes a great arm of the sea.

Geology

New Brunswick presents to the geologist one great obstacle to exploration in the dense forest covering its surface, and the horizontal position of the rocks over a great part of its extent. The main geological features have already incidentally been indicated. The band along the coast of the Bay of Fundy, while consisting mainly of highly disturbed and contorted Cambrian and Ordovician rocks, contains also, near St. John, small areas of much-altered Carboniferous, Huronian, and Laurentian. The city of St. John is built upon indurated Cambrian slates, and these have afforded a series of fossils of great interest to geologists, because of the abundance of types representing the life of this ancient period. Mention has already been made of a band of granite and highly metamorphosed rocks stretching in a chain of hills diagonally across the province, and of a rolling Silurian plain beyond; there remains only to speak more particularly of the great fan-like area of the coal-bearing rocks which occupy the centre of the country. The pivot of the fan is a little west of Oromocto lake—lines drawn from thence north to Bathurst on Bay Chaleur, and east to the head of the Bay of Fundy,

would approximately include an area underlain by horizontal beds of true productive coal-measures. Two seams of bituminous coal have been found, but they are unfortunately thin, although extending over a wide area. A seam of 22 to 30 inches is worked near Grand Lake. It is, near the surface, never deeper than 45 feet, and sometimes brought above the surface by inequalities of



BATHURST, N.B.

ground. An area of over 40 square miles has been proved to exist in one locality. Coal has been found also in widely distant places; but so far, always in thin seams. What may be concealed in the unexplored lands of this extensive forest area it is impossible to foresee, but geologists have, so far, given little hope of the discovery of thicker seams. As before stated, the Carboniferous area of New Brunswick is continuous across the isthmus with that of Nova Scotia, so that from Miscou on the Bay Chaleur, to Sydney on the Atlantic coast of Cape Breton, the whole coast of

the Gulf of St. Lawrence is bordered by coal-bearing rocks.

Minerals

Since the deposits of *albertite* from the oil-shales of Albert County, New Brunswick, have ceased to yield sufficient return to warrant further search for the substance, this province has not developed any notable mining interests. But the shales themselves, in which the *albertite* occurred, have been carefully studied and tested, both in the laboratory and at the reduction works, and the vast accumulations of these shaly strata of Lower Carboniferous age must soon yield a fuel oil which is considered far superior to either coal or wood for steam or other purposes, and the shale deposits will themselves prove of great value to that part of the Dominion.

The Albert Mines of Albert County for many years had yielded *albertite*, a high illuminant, occurring as an inspissated bitumen of great value, naturally distilled from the adjacent shaly strata and segregated in pockets and fissures of the highly inclined, folded and otherwise disturbed measures. These shales have for many years been known to contain hydrocarbons of high value. In 1895, several analyses of shales from the fish-bearing beds at the Albert Mines were made for the writer in the laboratories of Queen's University, Kingston, which gave an average of 39·5 per cent of hydrocarbons or volatile materials—some running as high as 43·7 per cent.

The following results of more recent researches in the field and in the laboratory combined, given in tabular form from various localities, indicate the richness of the discovery. The quantity of crude oil in imperial gallons

per ton, the specific gravity of the oil, and the quantity in pounds per ton of sulphate of ammonia, as a by-product, extracted from the shales, are included.

The following table serves to show the large values of these shales, both in crude oil and in sulphate of ammonia :—

Localities in New Brunswick.	Crude Oil, Imperial Gallons per Ton.	Sp. Gr. of Oil.	Sulphate of Ammonia, lbs. per Ton.
Shale retorted in Scotland from Irvings opening	40	0·92	77
Geo. Irvings, by Dr. Baskerville . . .	39	0·895	76
Baizley's farm, Baltimore . . .	54	0·895	110
E. Stevens, Baltimore . . .	49	0·892	67
Hayward brook, Prosser brook . . .	30	0·895	75
Adams farm, Taylorville . . .	43	0·90	93
A. Taylor's farm, Taylorville, No. 1 . .	48	0·91	98
A. Taylor's farm, No. 2 . . .	37	0·925	110
Sample of 85 lbs., run in 1907, Baltimore	51	0·91	111

Agriculture

The agricultural resources of the province have never been developed, because the energies of the people have always found outlets on the sea or in lumbering and fishing. It contains large tracts of very rich farming lands along the valleys of the rivers and on the marsh lands at the head of the Bay of Fundy. The marshes of the Tantramar alone cover 40 square miles. They are graphically described by Dr. S. E. Dawson :—

Miles on miles they extend level, and grassy, and dim,
Clear, from the long red sweep of flats, to the sky in the distance
Save for the outlying heights, green-rampired Cumberland point ;
Miles on miles outrolled, and the river-channels divide them—
Miles on miles of green, barred by the hurtling grass.

The country about and above Woodstock on the upper St. John is rich farming land, but the finest farms are in

Sussex vale in King's County. The whole central area over the horizontal Carboniferous rocks is suitable for agriculture. The land along the coast of the Bay of Fundy is rocky, and frequent fogs cool the summers and make the winter climate raw; but, in the interior, the climate becomes more continental, and, without being quite as cold as at Quebec in winter, or as warm as at Montreal in summer, the weather is bright and the sky is clear. The snow is always sufficient for the winter roads, the summer rains are abundant for the growing crops, and water is at hand everywhere for cattle. Everything may be grown which will grow in a temperate climate. Wheat has of late years been unprofitable there, as elsewhere in the east, because of the competition of the new western prairie farms, and the farmers have turned their attention to other crops and to dairying. Maize is grown in the interior of the province away from the coast and is used as fodder for cattle. It has been calculated that the province contains 14,008,000 acres of arable land, a great part of which has not yet come under cultivation.

The following table of farm products for the year 1912 will show the quantities grown and the average yield per acre:—

Crops.	Acres.	Bushels.	Bushels per acre.
Wheat	12,400	225,000	18·11
Oats	186,000	5,359,000	28·81
Buckwheat . . .	60,500	1,474,000	24·36
Barley	2,500	69,000	27·42
Potatoes	42,300	7,387,000	174·64
Turnips	8,800	2,506,000	284·75

The total value of the field crops of New Brunswick in 1912 was \$16,300,300.

The total value of farm property and products for 1911 are as follows :—

Farm property	\$84,937,539
„ products	24,966,621

In 1911 there were 1158 factories with a working capital of \$36,125,012, where 24,755 persons were employed, to whom \$8,314,212 were paid in salaries and wages, and the total value of the manufactured products was \$35,422,302.

New Brunswick is a forest province, and excepting over a small area where the land is very rocky, was densely covered with trees. Much of the province has been culled over by lumberers, and the best timber has been cut. In former years, before wooden ships had been displaced by iron steamers, the forests were largely drawn upon for shipbuilding, and the export of lumber is still carried on very extensively. The forest renews itself, and the smaller trees, spared by the axemen, grow faster with more room and light. It is forest fires which are most to be feared. A fire ever to be remembered occurred in 1825 on the lower Miramichi, when 3,000,000 acres of forest were swept away, \$1,000,000 of property destroyed, and 160 lives lost. The town of Newcastle was destroyed, and human beings and domestic cattle took shelter from the heat in the rivers in company with the wild creatures of the woods. The flames advanced on a front of 50 miles, and the north-eastern part of New Brunswick bears evidence still of its desolating effects. This province has a total forest area of 12,000,000 acres, of which 2,400,000 are publicly owned.

Government

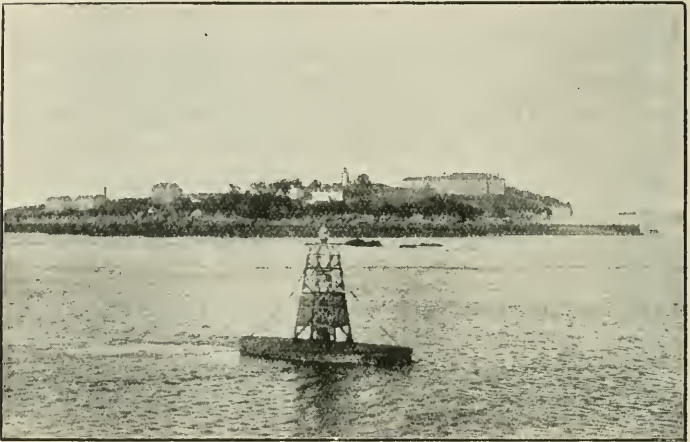
New Brunswick is governed by a lieutenant-governor, appointed by the Dominion Government, and by one chamber of 48 members, called the legislative assembly, elected on a very popular franchise. The executive government consists of 7 members, and is responsible to the assembly in the manner usual in the British colonies.

There is also a system of local municipal government. The unit is called a parish, and annually elects two members to the County Council, which elects a warden. Cities and towns are usually incorporated under special statutes. The seat of government is at Fredericton, a city of 7208 inhabitants, very quiet and very pretty. The University of New Brunswick is at Fredericton. On the opposite side of the river is Gibson, where are large lumber and cotton mills. Fredericton is the central point for sportsmen who desire to enter the wilderness in pursuit of caribou or moose, or to fish in the well-stocked waters of the interior.

Education

The Executive Council of the province, together with the Chancellor of the University and the Superintendent of Education, form a Board of which the Superintendent is secretary and administrative officer. There is a government normal school for training teachers, and a staff of inspectors for supervising the teaching and to see that the laws and regulations are carried out. The schools are free and undenominational, and may be primary, advanced, high, superior, or grammar schools, according to the extent and needs of the district they

are provided for. They are supported by legislative grants supplemented by local taxation voted in district, parish, or county meetings of ratepayers. The schools in the cities are managed by boards of trustees, one-half appointed by the Government and one-half by the City Corporations. The keystone of the system is the University of New Brunswick, founded in 1828, an



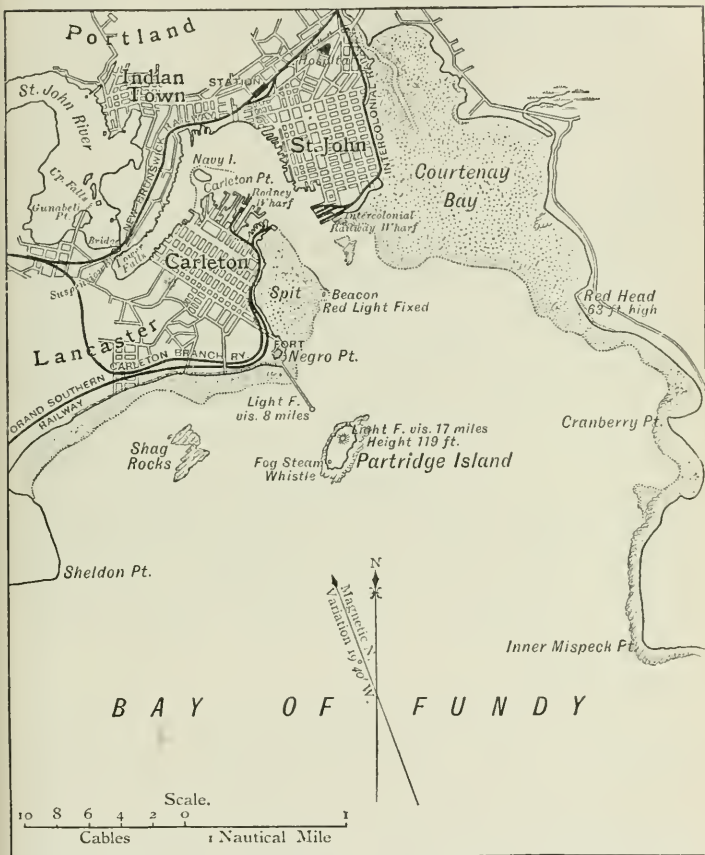
PARTRIDGE ISLAND AND BELL BUOY, ST. JOHN HARBOUR, N.B.

undenominational institution to which a certain number of students from each county are admitted without payment of the usual fees, and which has the power to grant university degrees. There were 2031 teachers and 69,580 pupils enrolled in the public schools of the province in 1912.

Cities

The real centre of provincial life is at St. John, which is situated on a fine harbour at the mouth of the river

St. John, open all the year round, for even if it were cold enough to freeze, no ice can be formed strong



Stanford's Geogr. Estab^t

ST. JOHN, NEW BRUNSWICK.

enough to resist the strength of tides which rise 25 feet. Partridge Island at the mouth of the harbour

protects it from the sea. The population of St. John is 42,511. The pursuits of the people are mainly maritime, and very many residents of the city derive their incomes from the earnings of vessels which are trading in distant seas. A large amount of shipping is owned there, and St. John vessels may be met in every port in the world. The chief industry in former years was shipbuilding. From 1845 to 1895 ships to the value of eighty millions of dollars were built, but the decrease in the shipping interest is now being made up by the introduction of general manufacturing. The city is also a centre of supply for a large extent of country, and does a large business in lumber and products of the fisheries. The exports during the year ending March 31, 1913, amounted to \$34,634,156, and the imports to \$14,445,811. Exports and imports aggregated \$49,079,967. Steamers connect St. John with all ports on the Bay of Fundy, and regular lines are established with England, the West Indies, and the large cities of the United States. Since the extension of the Canadian Pacific railway to St. John its business as a winter port has increased, and there are regular steamships in winter to Liverpool, London, Glasgow, Belfast, Dublin, and Aberdeen.

In 1877 the whole business part, as well as the best residential part of the city, was swept away by a great fire. In nine hours 1612 buildings were reduced to ashes, and vessels in the harbour were burned before they could loose from their moorings. Nine miles of streets were swept clear to the bed rock, and from twenty to thirty million dollars of value was destroyed. The city has been entirely rebuilt.

Dutiable goods to the value of \$5,416,463, and free goods to the value of \$4,428,758 were entered

for consumption at the port of St. John during the fiscal year ended March 31, 1913, making in all \$9,845,221.

There are few large cities in the province. Moncton at the "Bend" of the Petitcodiac is the next in size. It is a railway and manufacturing town with 11,345 inhabitants, and is the headquarters of the Intercolonial railway system. Chatham, with 4666 inhabitants, and Newcastle six miles away, with a population of 2945, are the chief towns on the Miramichi. St. Stephen on the St. Croix is a stirring, progressive town with 2836 people, and Sackville at the head of the bay of Fundy has a population of 2039; Mount Allison College, the chief educational institution of the Methodist Church in the maritime provinces, is situated there, and St. Joseph's College, a Roman Catholic institution, is at Memramcook.

Communications

The aggregate railway mileage of New Brunswick is 1545 miles. Railways extend along the whole outer coast. The Intercolonial railway runs along three sides of the square of the province. The Canadian Pacific railway follows the direct line to St. John and enters the province on the west side, and passes through the state of Maine. Fredericton is connected with the Miramichi by rail and with central Canada by another line through Edmundston on the upper St. John, and by a branch with the Canadian Pacific system. The Intercolonial railway has branches connecting with Richibucto, Buctouche, and Shippigan on the Gulf of St. Lawrence, with Quaco and Hillsborough on the Bay of Fundy, and with Chipman at the head of Grand Lake. St. John is connected on the west with two lines of

road. The Grand Trunk Pacific has a terminal at Moncton.

Resources

The province depends largely upon the products of the forest and the sea. Its fisheries are extensive and productive. The total value of the fisheries of New



FISHCURING PLANT ST. JOHN. N.B.

Brunswick for the year 1912-13 was \$4,264,054—this province ranking third in the Dominion. The chief items were—smelts, \$802,880; salmon, \$238,167; sardines, \$688,220; herrings, \$623,175; lobsters, \$672,375. The sardine fishing is almost peculiar to New Brunswick. The fish are exported fresh to the United States, and on account of the customs laws many canneries are kept going at Eastport, Maine, with sardines caught in New Brunswick waters. Manufacturing industries are extending. The output of manufactured goods for the year 1911 is given at \$35,422,302.

The Bay Chaleur—for so it is always called, though Jacques Cartier in 1534 finding the weather very warm there named it the Baye des Chaleurs—is a deep extension of the Gulf of St. Lawrence, without a rock, reef, or shoal to impede navigation, separating, as far as it goes, the provinces of New Brunswick and Quebec. The Indians called it “the sea of fish.” It is 75 miles long and from 14 to 25 miles wide. It is navigable by the largest ships and has many good harbours. The Restigouche river falls in at the head of the bay and continues it by a deep estuary 2 to 3 miles wide for 17 miles farther. The land rises at a little distance up the river valley, and the scenery on the Restigouche and at the junction of the Metapedia is very fine. On the north side the hills rise from 1000 to 2000 feet; on the south side, although the height does not exceed 815 feet, there are, as elsewhere in the province, detached mountains of considerable height. One of these—the Squaw’s Cap, near the mouth of the Upsalquitch—is 2000 feet high.

Miscou, the extreme point of New Brunswick, upon the bay, is a good harbour with four to six fathoms, but Shippigan Sound not far off is secure for vessels of the largest size. It has been proposed to make Shippigan the terminus of a line of ocean steamers to Canada connecting with the Intercolonial railway. Caraquet and Bathurst both have harbours for vessels of moderate draught, but Dalhousie at the head of the bay has a fine harbour and is the shipping port of the lumber floated down the Restigouche.

Dalhousie is the last port of New Brunswick, and on crossing the Restigouche the province of Quebec begins. The north shore of the bay is bordered by sandstone cliffs and wide beaches of shingle. The high table-land of

Gaspé rises in the rear. The shore is settled by fishermen, for the fishery in the bay is still fair though the great productiveness of former years has been destroyed by recklessness. The sandstone formation is connected with the Carboniferous of New Brunswick, and thin seams of coal have been observed.

Game

The Dominion of Canada abounds in resorts for sportsmen, but none of them are so attractive as the province of New Brunswick. It is a great square and the borders only are settled; the interior is a wilderness penetrated by streams of every size, affording access by canoe and paddle to its wildest recesses. Here in the summer may be seen many a sportsman's camp and many, even with ladies and children, enjoying the healthful life of the woods. The salmon fishing on the Restigouche is reputed the best in Canada. The fish are very large upon it and its chief tributary, the Metapedia. All the tributaries of this fine river are widely known salmon streams. From the head of the Bay Chaleur the sportsman may strike into the very heart of the wilderness about the head waters of the Tobique, the Nipisiguit, and the Miramichi. This region may also be reached from Fredericton on the other side. Here moose and caribou are abundant and of late years have been increasing. Fine specimens of these and other species may be seen in the Provincial Museum in Fredericton. Many sportsmen come every season from every direction, and wealthy people from the large cities have secured leases along the rivers and have built hunting lodges for their holiday convenience.

Climate

As for the climate it is one of exceptional healthfulness. There is not, in fact, any country more free from epidemic diseases or where people live to such a ripe old age. There is but a brief spring; the summers are delightfully warm, although not excessively so; and the winters are cold and bracing, and, especially in the interior, free from sudden changes. The mean temperature of summer is 60 degrees, while the mean temperature of winter is 20 degrees above zero. The climate is specially favourable for the production in their best form of the ordinary crops of the temperate zone. The seasons differ from those of England or Ireland. Summer soon follows winter, and the prolonged autumn constitutes the most delightful months of the year. There is plenty of sunshine at all seasons.

The regular and sufficient rainfall precludes any necessity for irrigation. The mean annual temperature in degrees and average annual rainfall in inches for different stations in New Brunswick are given in the following table:—

Station.	Mean Annual Temperature.	Average Annual Precipitation.
Moncton . . .	43·0° Fahr.	47 inches.
St. John . . .	41·3° „	48 „
St. Stephen . . .	41·6° „	40 „
St. Andrews . . .	41·4° „	37 „
Sussex . . .	40·2° „	43 „
Fredericton . . .	36·2° „	36 „
Chatham . . .	40·3° „	43 „
Dalhousie . . .	36·2° „	36 „
Grand Manan . . .	40·5° „	44 „

W. T. Macoun, Dominion Horticulturist, considers that New Brunswick has the climate to raise the best quality of apples, and he knows no part of Canada that can grow the Mackintosh Red better than New Brunswick. It is estimated that there are at least 5,000,000 acres of land in the province eminently suitable for fruit-growing, and St. John, the chief seaport, is only *six* days from Liverpool.

CHAPTER VIII

PRINCE EDWARD ISLAND

THIS island is the garden province of the Dominion. It is more like an English shire than a Canadian province. Its inhabitants are for the most part farmers, and they have cleared almost the whole island and brought it under cultivation.

Prince Edward Island is situated on the south of the Gulf of St. Lawrence in a great bay formed by the concavity of the coasts of New Brunswick and Nova Scotia, which, from Miscou Head to the North Cape of Cape Breton, curve round it. The island adapts itself to its position by curving to correspond with the encircling shores of the sister provinces and its northern coast-line presents to the gulf a parallel concavity.

The island is 145 miles long from East Point to North Point, but is most irregular in width, varying from 4 to 27 miles across. It is exceedingly irregular also in outline, for the land is penetrated by deep bays and tidal streams to such an extent that it has barely escaped being divided into three parts. From the head of Hillsborough river a portage of one and a half miles would place a boat in Savage harbour on the north shore and cut off the whole eastern end of the island. Farther to the west the distance between the heads of the creeks falling

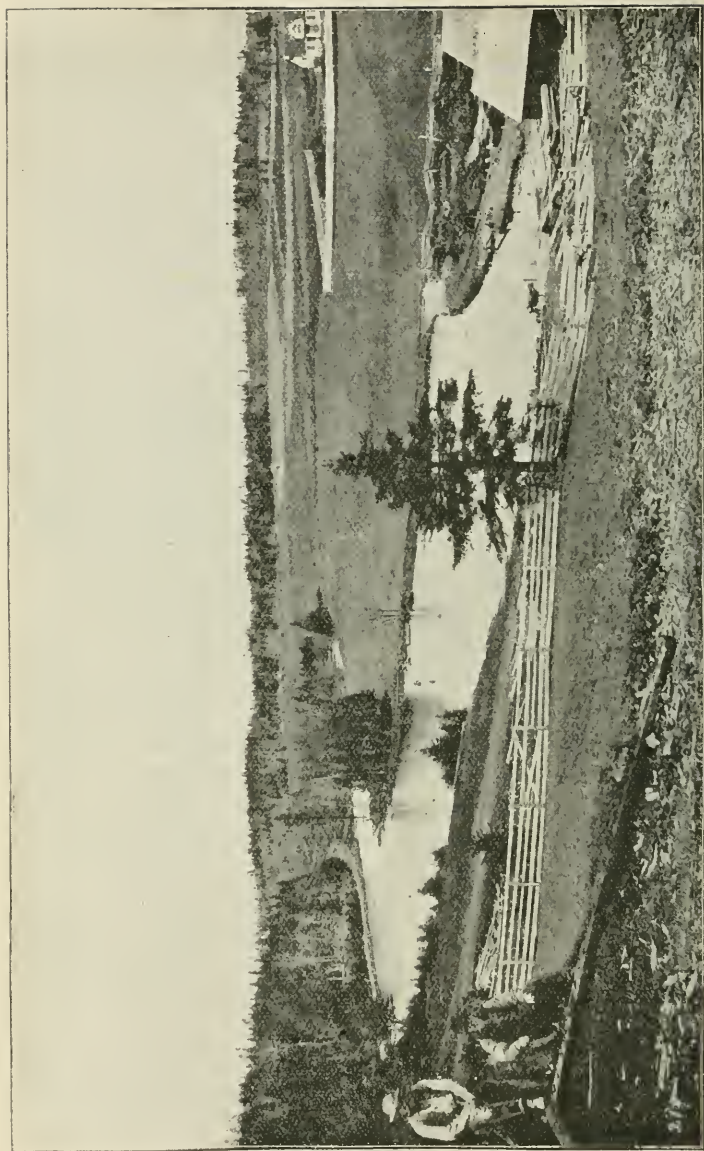
into Bedeque and Malpeque Bays is so short that it measures only two miles on the map, and at high tide it is really much less. This indentation almost separates the western third of the island.

Nothing would be gained in clearness of conception by considering the island in three divisions, for the whole of it is of uniform character in every respect saving that the nearest approach to a highland is in the central part where the land rises on the West river into picturesque wooded hills, but everywhere the country is rolling and almost everywhere it is cultivated. This general uniformity is not monotonous, for there are always differences in the undulations of the surface, differences in the little streams running in the valleys to the sea, and differences in the clumps of trees or patches of woodland which conspire to give variety to what might otherwise be a monotony of pleasing landscape.

The total area is 2184 square miles, and it is inhabited by 93,728 people.

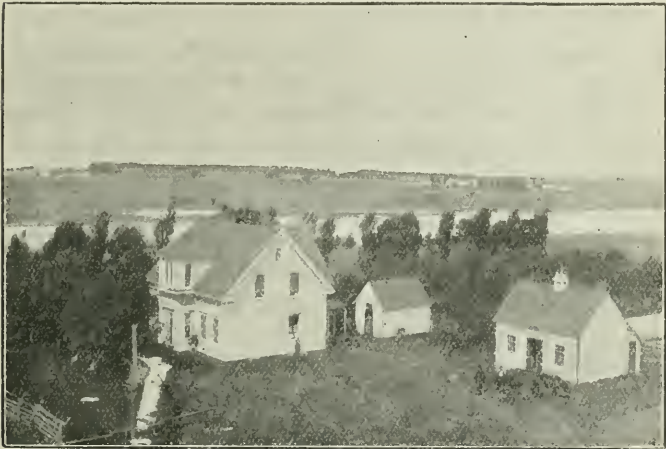
The surface is nowhere higher than 500 feet above the sea. The outcropping geological formation is the Permian and the rock is a bright red sandstone; but exposures are seldom met with, and consist of soft-weathering materials. These rocks are newer than the coal formation, and productive coal-measures may be supposed to exist there also, especially as coal is found on the adjacent Nova Scotia shore. If, however, there be coal it is believed by geologists to be very deep down. Boring operations recently undertaken have reached a depth of 3000 feet and over, but no coal-bearing strata have so far been reached.

The soil of the island is a rich sandy loam, of a deep red colour, and the red soil, contrasting with the vivid green of the meadows, gives a very distinctive



CLARK'S RIVER, PRINCE EDWARD ISLAND.

character to the landscape. It is of all soils that best suited for oats and potatoes, and these are the staple crops of the island. Wheat is still raised, but cannot now be grown at a profit. The soil will, however, produce any crop which can be grown in a temperate climate. The farmers of recent years are commencing to grow maize for fodder; barley is also a favourite crop and is extensively grown.



TURNER'S FARM, VERNON, PRINCE EDWARD ISLAND.

A typical Island scene.

A Provincial Government Experimental Farm has been maintained for nearly half a century in which dairy, stock, and horticultural experiments are made and applied.

There cannot be any general hydrographical system, for the streams flow transversely and the island is narrow. They are all tidal and, the land being low, the tides flow to the heads of the streams. Three beautiful rivers converge in Charlottetown harbour—the Hillsborough, and

the West or Elliott, and the North or York rivers. The Hillsborough rises close to the north shore and flows across the island at its widest part. These rivers are all deep and steamers go up the Hillsborough to its very head.

The climate of the island province is not so extreme as that of some of the interior provinces, but yet it is not a maritime climate; for it is embayed and sheltered from the influence of the outer ocean. There are few fogs and the sky is clearer than on the Atlantic coast, the summer is warmer and the winter is colder than in parts of Nova Scotia. Spring does not come in, as in Quebec and Ontario, with a rush, for it is retarded by the floating ice of the upper waters on its way seawards. The crops do not therefore start as early as in the St. Lawrence valley or even in Manitoba or the far North-west. On the other hand the fall lingers later. The harbours are closed in winter by ice. That of Charlottetown freezes up between December 15 and 21 and opens about April 7. The harbour of Georgetown on the east coast is open longer than any other on the island. The summer climate of the island marks it a paradise for the tourist.

The Strait of Northumberland separates Prince Edward Island from the neighbouring provinces. It is from 9 to 31 miles wide. The projecting capes of Nova Scotia interlock with those of the island, so that viewed from either end the strait seems to be a bay. Jacques Cartier in 1534 coasted along the western coast and crossed over to the Miramichi. He called the opening of the strait the Bay of St. Lunario, and so it remained for sixty years longer, for it was not until the time of Champlain that the island began to be separated on the maps under the name of the island of St. John.

The coast is uniformly low. East Point is a low cliff of red sandstone 30 to 60 feet high, and North Point the other extreme point, is precisely similar. Between these points the concavity of the island forms a bay 91 miles long and 22 miles deep, and in its whole length the north shore is a continuous series of sand beaches and long spits or bars of fine sand, beaten hard by the incessant impact of the waves. The wide bays which on the north penetrate the land are cut off from open water by long narrow sandbanks with occasional openings, through which small vessels may pass. These sandy beaches are favourite resorts for bathing in summer, for they are smooth and compact and the water deepens very gradually. Two of these beaches are each 20 miles long. St. Peter's Bay, Tracadie Bay, Rustico Bay, New London Bay, Richmond or Malpeque Bay, and Casumpeque Bay are the chief of these sand-locked bays. The sand-dunes are highest near New London, where they are 40 feet high; but as a rule they rise to a height of 11 to 20 feet only. Close behind these sandy beaches the forest stands protecting the farm land. The sands are derived from the waste of the soft red sandstone rock, but the oxide of iron is dissolved by the sea, and though the rocks are red the sand is white.

From North Point along the west coast to Cape Egmont there are no harbours. The shore is of red clay or red sandstone—low and with occasional beaches where boats may land in fine weather. Cape Egmont on the south shore is formed of sandstone cliffs 50 feet high. It marks one side of Bedeque Bay at the head of which is a good harbour, that of Summerside, but somewhat intricate to enter. Cape Traverse is the nearest point to the mainland, for there the promontory of Cape Tormentine stretches over from Nova Scotia to a distance of only nine miles

from the island, and here it is that travellers cross in the depth of winter if the harbour of Georgetown is frozen.

The harbour of Charlottetown is one of the best in America and one of the most pleasing to the eye. Any number of vessels of the largest size may find room in it, and the three deep tidal rivers stretch up from it into a charming country of cultivated farm and meadow land with quiet rural scenery diversified by low hills clothed with woods.

On the east coast is the harbour of Georgetown or Cardigan Bay, second only to that of Charlottetown in depth and commodiousness.

Communications

There is an excellent service of steamers connecting Charlottetown and Summerside with Pictou in Nova Scotia and Shediac in New Brunswick respectively, and after these ports are closed a steamer runs to Georgetown. For a few weeks Georgetown may be closed and then travellers must cross in ice-boats from Cape Tormentine to Cape Traverse. This is occasionally very disagreeable when the ice is running with the tides and the weather is thick. The distance is only nine miles, but such modes of transit are not suited to modern ideas of comfort, and a scheme is proposed to tunnel under the strait. If such a feat of engineering skill be ever achieved it will remove the only drawback to a residence on Prince Edward Island. Regular lines of steamers also connect in the open season with Quebec and Montreal, and with Boston and Halifax. A railway, owned and managed by the Dominion Government, runs from end to end through the island with branches. It is 269 miles in length and almost every hamlet on the island is reached by it.

Cities

Charlottetown is the capital of the province. It has a population of 11,198 and is the centre of supply.

Summerside is a town of about 2678 inhabitants, with a considerable trade in exporting the produce of the western part of the island. This part of the coast is noted for its oysters. It is also a favourite summer resort.

Georgetown and Souris are small towns on the eastern shore. Prince Edward Island is a country of farmers and they live all over it. There is very little land not taken up. The towns are necessarily few, for there are no manufactures to attract the people into cities.

Government

Prince Edward Island is governed by a lieutenant-governor appointed by the Dominion Government and a legislative assembly of a peculiar nature. It is composed of 15 councillors elected on a property qualification, and 15 members elected on a popular franchise. The executive government consists of 9 members, and is responsible to the assembly, and must always command a majority therein as in the other provinces. There are no municipal institutions for local government.

It was by an Imperial Order in Council of May 16th, 1871, that Prince Edward Island was admitted into the Confederation.

Education

The supreme authority is the executive council or ministry of the day. The Superintendent of Education acts as secretary of the board and administers the system through school inspectors. There is a normal school for

training teachers, and Prince of Wales college for higher studies. The schools are primary, advanced, and high schools. The expenses are paid by government grants supplemented by local assessments. They are undenominational, but the children read the Bible at the opening of the school. No comments are to be made, and if their guardians object to the reading, children need not be present at it.

Statistics

The total value of farm property on the island in 1911 was \$41,816,072, and field crops as well as other agricultural products amounted, for that year, to the sum of \$11,967,425. Fox ranching is a thriving industry. The manufacturing establishments in 1911 numbered 442, with a capital of \$2,013,365, in which 3762 persons were employed earning \$531,017, and the value of the products was \$3,136,470. Oats were produced to the value of \$3,750,000 in 1914, whilst potatoes gave a return of \$1,508,000, and other roots an additional value of \$700,000. Horses and cattle of the island are valued at \$6,517,292.

The chief exports of the island are agricultural produce and fish products. Lobster canning is carried on to a considerable extent. In 1913 some 29 vessels and 1974 boats were engaged in fishing. The value of fish products exported in 1912-13 was \$1,379,906. In the year 1913 there was a total tonnage of 89,070 tons cleared for sea from the port of Charlottetown.

CHAPTER IX

OLD CANADA—THE ST. LAWRENCE PROVINCES

Land of mighty lake and forest ;
Where the winter's locks are hoarest,
Where the summer's leaf is greenest,
And the winter's bite the keenest ;
Where the autumn's leaf is searest,
And her parting smile the dearest.

ALEX. M'LACHLAN.

THE colony of New France was ceded to Great Britain in 1763, in its full extent, and included the whole basin of the St. Lawrence system of lakes and rivers. In the year 1791 it was divided with the object of forming a new province for the United Empire Loyalists—a body of refugees who, at the recognition of independence of the thirteen revolted colonies, found themselves homeless, their property having been confiscated and they themselves proscribed. The settled part of New France was at that time occupied by French Canadians, who had been continued in the full and undisturbed enjoyment of their religion, language, and laws, so that even the tenure of the land was feudal. It was intended to commence at the western limit of the lands then actually held *en seigneurie*, and to lay the foundations of an English province, where all grants of land should be in free and common soeage, where the common law of England

should be the basis of the organised community, and the English language should be the language of the people. The provinces so separated were called respectively Upper and Lower Canada. In 1841 they were reunited, and these divisions were called Canada West and Canada East. When all the British American provinces were confederated in 1867, these two became the provinces of Ontario and Quebec, and entered into new relations with each other. Thenceforward they ceased to be parts of one province, and each became an integral province of one Dominion.

While these two provinces are thus indissolubly united physically, by the simple fact of forming part of the same great valley, and although, down to the year 1791, they had one history, they are socially very different, on account of the circumstances above stated. It is that very fact which gives special interest to the student of political science; for in Canada questions of the most complicated nature have had to be faced and determined without the possibility of shirking them or putting them off upon a future generation. Plain men have come from their farms and their businesses and have become statesmen by successfully grappling with questions which have agitated older countries for centuries. That a people should be homogeneous over the whole extent of its territory has, no doubt, many advantages and, to an Englishman, it would seem an economy of time and money if all the world were to speak English. Such a world would be in danger of becoming excessively monotonous. On the banks of the St. Lawrence, society has an additional interest in the fact that two of the leading races of Europe are strongly and well represented, and each is striving to do its best for the development and welfare of its country according to its ideals.

Climate

A glance at the map will show that the St. Lawrence flows diagonally north-eastwardly from Niagara to Belleisle, and that, therefore, in the more southern counties of the west the climate is milder. Nevertheless, there is a general description possible which, with the modifications stated in describing each province, may be of use to form a preliminary idea of the conditions of life in old Canada. It is difficult to divide Ontario from Quebec climatologically, because Ontario also stretches north to Hudson Bay and includes a region north of Lake Superior, where the winters are as cold as anywhere in Quebec. The climate of Ottawa, in eastern Ontario, is, if anything, colder in winter than that of Montreal. The range of temperature is almost the same at Sault Ste. Marie as at the city of Quebec. That portion of Ontario known as the "southern peninsula," lying between the great lakes Ontario and Huron, with territory south of the latitude of Boston, enjoys a milder climate than the rest of Eastern Canada, and that portion lying along the shores of Lake Erie and the Niagara river is still more favoured. In order to show the variation, the following table has been compiled from the meteorological returns, and places have been selected on a great curve from Quebec south-west to Niagara and north-west to Sault Ste. Marie. This range will show the climate of New France or Old Canada.

That the climate, since the discovery of the country, has changed very little is clear from the reports of Cartier, Champlain, and the "Jesuit Relations" concerning the crops grown by the Huron-Iroquois Indians. These were not wandering tribes, but had permanent towns. The state-

ment has been made, in places which should be sources of more accurate information, "that corn is more a garden vegetable than a farm product, excepting in southern Ontario." Nothing could be more untrue, for every student knows, that from the discovery of the country, maize has been a staple crop from Montreal to Georgian Bay. It was the staple food of the Huron-Iroquois at Montreal in 1535, and the staple food of the Hurons on Georgian Bay in 1615, and of their kinsmen the Tobacco nation and the Neutral nation. Maize, pumpkins, and beans were grown for food, tobacco for solace, and sun-flowers for ornament. They had no other vegetable food, and they raised large quantities of maize and stored it for winter. There can be no possible mistake about a fact as patent upon the pages of the old writers two hundred years ago as it is in the agricultural returns and the "Trade and Navigation" tables of to-day.

METEOROLOGICAL TABLE FOR ONTARIO AND QUEBEC.

TEMPERATURE IN DEGREES FAHRENHEIT

	Annual mean.	Highest.	Lowest.	Mean in Quarterly Periods.			
				Winter.	Spring.	Summer.	Autumn.
Quebec . . .	36·58	86·0	-34·3	14·80	46·27	60·33	24·93
Montreal . . .	41·03	88·8	-21·6	20·17	52·03	63·73	28·20
Ottawa . . .	40·46	93·0	-19·6	19·57	51·43	62·53	28·30
Toronto . . .	45·03	89·4	- 2·7	28·37	52·53	63·10	36·10
Niagara . . .	46·50	91·0	0·0	30·07	54·03	64·80	37·10
Sault Ste. Marie .	38·82	87·0	-34·0	15·80	47·80	58·77	32·90

METEOROLOGICAL TABLE FOR ONTARIO AND QUEBEC.

TOTAL PRECIPITATION

	Inches of Rain.	Inches of Snow.	Inches of Total Precipitation reduced to terms of Rain.
Quebec . . .	31·74	133·5	45·09
Montreal . . .	33·97	114·5	45·42
Ottawa . . .	25·25	71·3	32·38
Toronto . . .	32·12	52·6	37·38
Niagara . . .	35·75	35·7	39·22
Mean for Ontario . . .	27·83		
„ Quebec . . .	25·43		

A description of the climate of the settled portion of the province of Quebec is equally applicable to the climate of Ontario, north of a line drawn west from Montreal through Ottawa to the Muskoka district on Lake Huron. The climate of the peninsula south of that line is indicated by the figures for Toronto and Niagara in the preceding table. In reading these tables it should be remembered that, if the extremes are given as well as the mean, these extremes do not endure for any length of time. Week after week will pass while the thermometer registers from $+15^{\circ}$ to $+30^{\circ}$. Then a cold wave will sweep eastwards and send the mercury down below zero. Such "cold snaps" may last three days, and there may be three or four of them in a winter. The sky is very blue, and at night the stars look large and the snow creaks under the foot; but these "spells" soon pass away and the temperature returns to 10° or 15° below freezing-point; but, after January, the bright sun thaws enough at mid-day to make the roofs drop a little on the sunny side of the streets and in sheltered positions in the country.

Although in some years there may be two or three days' thaw, the sleep of nature in winter is profound.

No dreams disturb her repose and waken her to premature activity. But when the warm white coverlet begins to disappear she never hesitates or goes back with the provoking indecision of other lands, but spring comes on with a firm and steady foot. The following is from a poem descriptive of April in the country near Ottawa:—

In the warm noon the South wind creeps and cools,
Where the red-budded stems of maples throw
Still tangled etchings on the amber pools,
Quite silent now, forgetful of the slow
Drip of the taps, the troughs, and trampled snow,
The keen March morning, and the silvering rime,
And mirthful labour of the sugar prime.

The first Canadian nobleman (ennobled by Louis XIV) was Pierre Boucher, whose descendants are widely spread throughout Canada to-day. He was governor of Three Rivers in 1653 and defended the infant settlement against the Iroquois at a very critical time. He died at Boucherville, near Montreal, at the age of ninety-seven, a standing testimony to the healthfulness of the climate. Among innumerable other public services to his country this gentleman wrote a *Natural History of New France, commonly called Canada*, and although, at the time he wrote, Montreal was only a perilous outpost in the Indian country, and the forest had not been cleared, his description of the general conditions of life are still to a great extent true. He says:—

“Speaking of New France as a whole, I may say that it is a good country, and one that contains in itself a good portion of all that can be wished for. The soil is very good, it produces wonderfully well, and is not ungrateful; we have had experience of that. The country is covered with dense and very fine forests, that are stocked with numbers of animals of various kinds; and

what is of still greater consequence is that those forests are intersected by large and small rivers of very good water and have in them numbers of springs and fountains; besides which there are large and small lakes, bordered, as well as the rivers, by fine large prairies which produce as good grasses as there are in France. In these lakes and rivers there are great numbers of fish of all kinds, very good and very dainty; waterfowl are also to be met with in great numbers on these lakes and rivers. The country is a very healthy one; animals brought from France thrive very well in it. One sees here many fine plants that are not to be found in France; and there are few plants that are injurious to man. . . . The climate is different in different places; but I may say in general that in the coldest places here in winter, is a more cheerful season than it is in France.”

The translation quoted is by one of Pierre Boucher's descendants. The forest has been cleared over a wide extent, and the descendants of the Iroquois, who howled after scalps round the palisades of Boucher's little fort, are now farmers on the Grand river; but in the north are still the forests where his description would hold in every particular, and the climate is still the same.

Forests

The province of Quebec extends over so wide an area, and the conditions of climate vary so much, that it is not possible to make general statements applicable to the whole province. The northern forest comes down to the water-parting of Hudson Bay, and has been treated of in Chapter III. The forest of southern Labrador consists, for the most part, of northern species, as also the forest on the high plateau of the Gaspé peninsula; but throughout the rich country bordering on the rivers—not only

the level plain of the St. Lawrence and Richelieu, but the Laurentian country to the north up to the water-parting—and over the rolling pasture-lands of the Eastern Townships, a different forest prevails—a forest similar to that already described as existing in the inland counties of the maritime provinces. At page 193 a list of 32 species is given, and it is not necessary to repeat it here. Besides these, the following additional species are stated by Professor Macoun to occur in the forests of Quebec:—

Broad Fruited Maple	<i>Acer dasycarpum.</i>
Red Fruited Thorn	<i>Crataegus coccinea.</i>
Slippery Elm	<i>Ulmus fulva.</i>
Rock Elm	<i>Ulmus racemosa.</i>
Nettle-tree	<i>Celtis occidentalis.</i>
Bitternut	<i>Carya amara.</i>
Shell-bark Hickory	<i>Carya alba.</i>
Blue Beech	<i>Carpinus Caroliniana.</i>
White Oak	<i>Quercus alba.</i>
Cottonwood	<i>Populus monilifera.</i>
Red Cedar	<i>Juniperus Virginiana.</i>

It is these mixed forests which give such a charm to these provinces. When the work of the year is done, when the forest has flowered and fruited and made its growth, it retires to its winter sleep in such a blaze of colour as no painter has ever dared to put upon canvas. Those who have seen it all their lives look upon it with unflinching admiration, and at every succeeding fall they wonder whether the brilliant crimsons or the browns, warmed with red and yellow, or the bright yellows, be the most beautiful or the most effective contrast to the deep green of the pines and spruces. Then the fair blue sky and the sparkling of the flowing water, or the reflections in quiet lakes all through the autumn weather, and the still and mysterious Indian summer at the end, throw over the woods a wonderful charm, and make, as the poet

whose verse heads this chapter has well said, the parting smile of nature as she sinks to rest, the dearest of all her varied aspects.

In like manner, passing westward, the forest of the province of Ontario repeats the species found in Quebec, but, in the peninsula to the south-west inclosed by the lakes, the milder climate favours new species, and we pass into a region of oaks and hickories. The trees superadded to the lists previously given are these, to quote again from Professor Macoun:—

Cucumber tree	<i>Asimina triloba.</i>
Tulip tree	<i>Liriodendron tulipifera.</i>
Kentucky Coffee-tree	<i>Gymnocladus Canadensis.</i>
Judas tree	<i>Cercis Canadensis.</i>
Honey Locust	<i>Gleditschea tricanthos.</i>
Crab Apple	<i>Pyrus coronaria.</i>
Cock-spur Thorn	<i>Crataegus Crus-galli.</i>
Downy-leaved Thorn	<i>Crataegus tomentosa.</i>
June Berry	<i>Amelanchier Canadensis.</i>
Flowering Dog-wood	<i>Cornus florida.</i>
Sour Gum	<i>Nyssa multiflora.</i>
Blue Ash	<i>Fraxinus quadrangulata.</i>
Sassafras	<i>Sassafras officinale.</i>
Button-wood	<i>Platanus occidentalis.</i>
Hog-nut Hickory	<i>Carya porcina.</i>
White-heart Hickory	<i>Carya tomentosa.</i>
Small-fruited Hickory	<i>Carya microcarpa.</i>
Black Walnut	<i>Juglans nigra.</i>
Chestnut	<i>Castanea Americana.</i>
Swamp white Oak	<i>Quercus bicolor.</i>
Scarlet Oak	<i>Quercus coccinea.</i>
Swamp Oak	<i>Quercus palustris.</i>
Black Oak	<i>Quercus tinctoria.</i>

The coniferous trees are not often found in the peninsula. In the north of Ontario, as in Quebec, the “northern” forest comes down to the water-parting of Hudson Bay.

Forest Products

The provinces of Ontario and Quebec still supply the larger proportion of the total forest product of the Dominion, and immense areas of these forests at the north are practically untouched. The best of the more accessible wood on the main streams has been cut; pine is getting scarce and oak is all gone, but the hardwood forests of other species still remain, and the spruce at the north is without limit. The governments of both provinces are beginning to awake to the necessity of taking precautions against forest fires, and of making regulations to prevent the reckless waste which has gone on for many years. Ontario is leading the way in this respect, and the National Algonquin Park is not only a reservation of the primeval forest but a school of forestry. It is situated on the headwaters of the Madawaska, the Bonnechère, the Petewawa, and other streams draining into the Ottawa, and of the Muskoka flowing to Georgian Bay. Very little of the land is arable, but it is admirably suited for the growth of trees. Land unsuited for agriculture is available for arboriculture, and under proper regulations the forest will reproduce itself. Forestry as a science is in its infancy in Canada; still it must not be supposed that the lumbermen denude any district they go over. They cut only the trees above a certain limit as to size, and leave the remainder to grow. Pine, however, does not succeed pine on the same land, nor oak succeed oak. There are some laws dominating the reproduction of forests which have not yet been worked out into a scientific system. The total forest product of the Dominion may be estimated by the exports, and these may be taken as three-fifths of the whole, the other two-fifths being consumed in the country.

The whole subject requires careful examination by impartial scientific experts, for the wildest statements have been made concerning the exhaustion of the forests and the ratio of their reproduction.

Hudson Bay Watershed

Up to recent years there were many differences of opinion as to the resources of the territory belonging to Ontario and to Quebec across the water-parting of Hudson Bay. The parting is low; for at high water Summit Lake discharges both north and south—into Lake Abitibi and into Lake Timiskaming. The main facts seem to be that no white pine is met farther north than six miles below Lake Abitibi, but there is abundance of spruce, poplar, and birch northwards to the bay, of which the spruce is large. At Moose river the spruce is 15 inches in diameter, and the balsam and poplar is of fair size; but there, and all round the shore of James Bay, the trees, while quite suitable for building, do not grow to any great size. As for agriculture, there are gardens at all the Hudson Bay posts in the territory in question, and potatoes and many other vegetables are grown. Cattle are kept in considerable numbers, and feed on the native grass and the hay cut on the meadows. At the post on the East Main river there were fifty head of cattle in 1890. In the basin of James Bay, where the Albany, Moose, Harricanaw, and Nottaway rivers, with their numerous tributaries, flow from the crystalline Archæan axis of primitive rock formations (the home of the pine forest, and forests generally), there are close to 250,000 square miles of arable land fit for cultivation, especially in Ontario, but also in Quebec. Ontario counts 140,000 square miles where settlement has

already grown to respectable proportions in the available sections of the "great Clay Belt." The belt itself or basin includes 16,000,000 acres where the climate is favourable to agriculture, not severe in winter, and temperate as well as bracing in summer. Fine wheat ripened and was cut on the 11th of August 1908 at Lake Abitibi. The writer wrote as follows in 1903 of the resources of this new trans-Laurentian section of Canada:—"The construction of the National Trans-Continental Railway, crossing the cereal-growing district south of Hudson Bay, between the great lakes and the foot of James Bay, will open up for settlement a generally level tract of country, not only well timbered and well-watered, but also producing a dense growth of plants which predicates capabilities of an agricultural nature, dairy, farm, and stock-raising products, which can support a mixed population, including agriculturists, manufacturers, lumber merchants, and all those varied classes of a community dependent on such natural resources as are found within that basin. It is estimated that the marine sediment of the Hudson Bay basin, consisting of clay loam, sandy clays, and various other soils and surface deposits fit for agriculture, is nearly twice the area covered by the agricultural lands in Ontario between Ottawa and Lake St. Clair."

CHAPTER X

QUEBEC—THE ANCIENT PROVINCE

History

CANADA, in the restricted sense of the word denoting New France, represented now by the two St. Lawrence provinces, was discovered by Jacques Cartier, in 1534, for Francis I. of France. He was the first who is recorded to have entered the Gulf of St. Lawrence, and was the discoverer of all the lands bordering on or contained within it. What transpired upon the ocean-coast between that date and the discovery of America has already been discussed in the chapter on Acadia. On his first voyage Cartier went no further than Gaspé. On his second voyage, in 1535, he went up the River St. Lawrence as far as Hochelaga, the site of the present Montreal; he wintered on the St. Charles river, close to the present city of Quebec, and returned to France on the opening of spring. In 1540 Francis I. created François de la Rocque, Sieur de Roberval, his viceroy and lieutenant-general in New France, with many other high titles, and Roberval sent out Cartier in the following year, with five ships, as his lieutenant, intending to follow with the main body of settlers. Cartier built a fort at or near Cape Rouge, a few miles above Quebec, but Roberval did not sail as arranged, and Cartier having sent two ships back to France wintered

again in Canada in 1541-42. Little has been found concerning the events of that winter. He named his fort Charlesbourg Royal, and he would seem to have again visited Hochelaga. On the return of spring he sailed with all his people for France; and, having put into the harbour of St. John's, Newfoundland, on his way home, he found Roberval there with his belated expedition on the way to New France, but having apparently had enough of the country Cartier sailed during the night for home. Roberval continued on his way, and on arriving at Cartier's fort, he enlarged it and changed its name to France Roy. He is reported to have explored the Saguenay, and to have gone up the St. Lawrence at least as far as Hochelaga. Little has remained to record his doings. He passed one winter in Canada, and, in the fragmentary records which survive, it would appear that Cartier was sent out to bring him and the remains of his party back to France. It is, however, certain that both were back in 1544, and from that time no attempt to found a colony was made until 1608.

Although Canada was forgotten by the king and the great noblemen, it does not follow that Cartier's discoveries were not utilised by the merchants and sailors of France. The gulf and river were, during the years of apparent neglect, favourite resorts of the Basque whalers; and there are indications of traders having been not only upon the coasts, but far up the river, although no explicit narrations have been preserved of such voyages. Thus it happens that with Champlain and Lescarbot commence the first definite records of the History of Canada. Tadoussac was the chief place of resort in those early days, and merchants of St. Malo were trading there for furs in 1600, when Canadian history properly begins. Champlain made a voyage as far as Hochelaga in 1603, before he went to Acadia. The merchants of St. Malo and Rouen were then

conducting the fur trade in the river, either individually or by a company of partners, like the North-west Company of 200 years later. The Canadian annals commence with such a company, of which De Monts was the head. After his experiment in Acadia he decided on making a settlement at Quebec, and in 1608 he sent out Champlain as his lieutenant to found the settlement, and Pontgravé to carry on the fur trade.

Quebec was thus a creation of the fur trade. Many of the members of the company were Huguenots, Pontgravé, Chauvin, and De Monts among them; and although Champlain was a Catholic, and always took a deep interest in the conversion of the savages, the merchants cared very little about such matters, being anxious rather for good returns in furs. Protestant and Catholic chaplains accompanied the earlier expeditions, but their polemics scandalised the sailors, and gave little promise of success in converting the Indians. So it came about very soon that only Catholics were allowed to settle permanently in the country.

There has been in Canada no dearth of remarkable men, but of all who have left their traces upon her history none have been endowed with a character so noble, so brave, so loyal, so persevering, as Samuel de Champlain. The amiability and grace of the French character was combined with the sturdier elements requisite in a pioneer leader. He was as much at home smoking the calumet in the wigwam of a sachem on the upper Ottawa as he was in Paris at the court of his patron Henry IV. His cheerfulness never failed him, nor did his faith in his adopted country ever waver. He was patient and kindly without being weak, and religious without being intolerant. It is not the least among the privileges of Canada that her history opens with a personality so sane and so sweet as

still to remain a type and ideal to shine as the guiding star of successive generations of her children.

In 1608, then, Quebec was founded. The first "abitation" was in the lower town, on the site of the present market; but soon after a fort was built on the cliff above, on the site of Dufferin Terrace, not far from the Château Frontenac. Champlain allowed Pontgravé to attend to the fur business of the company, and he set himself to establish a colony for France, and extend discovery to the West, if haply that much-desired passage to the South Sea might only be found. There is not space here to recount the trials of the little settlement—how its founder laboured in the colony; how he pleaded its cause among the great in France; with what tact he conciliated the jarring interests of the merchants of Rouen, St. Malo, and La Rochelle; and, after the English broke up his colony and carried him away a prisoner, with what patient courage he picked up the broken threads of the enterprise, and, after the peace, commenced his work anew.

Champlain has been blamed for having entered into an alliance with the Algonquin tribes, and having thus incurred the deadly hostility of the powerful Iroquois nation. In reality he had of necessity to cast in his lot with the tribes surrounding his colony. In a conflict so deadly there could be no neutrals. The Neutral nation in southern Ontario adopted the very policy which Champlain is blamed for not following, and, after the Hurons were crushed, the Iroquois exterminated them with so ruthless a destruction that their very name disappeared in blood and fire.

Slowly and painfully the little colony grew, and was with difficulty maintaining itself against the Iroquois who, after the assassination of Piskaret, the great war-

chief of the Algonquins, raged up to the very palisades of the fort, when in 1641 there arrived at the little settlement a party of forty men from France, headed by a soldier, or rather a crusader, of commanding and grave aspect—a man who really believed in something, and such persons are always to be taken seriously. With him came Mademoiselle Jeanne Mance and three women companions, two of them wives of soldiers. Such an acquisition to the strength of the colony was indeed welcome.

Now, writing at the beginning of the twentieth century, it behoves one to be circumspect, lest in any way he betray weakness for antiquated ideas of the supernatural. Are they not visions, dreams, figments of exalted religious enthusiasm without objective reality? Possibly; but the present object is not to discuss them, but merely to direct attention to the fact that out of such visions and dreams has been woven the objective reality of the beautiful city of Montreal. These people had not come so far to dwell under the protection of the fort at Quebec; would not, in fact, stay there, but would go when the spring opened to the island of Montreal—that fair but fiend-haunted wilderness infested by devils incarnate in Iroquois war-parties.

It came about in this way; a devout priest (JeanJacques Olier) and a devout receiver of taxes (Jérôme le Royer de la Dauversière), strangers to each other, and living in different cities, each received a divine mission, concerning the reality of which they had no shadow of doubt, so clearly was it marked by miraculous signs, to found an order of priests to preach and minister, an order of nuns to nurse the sick, and an order of nuns to teach—on the island of Montreal and nowhere else upon the habitable globe. They knew nothing of Canadian geography, but

this place they saw in a vision. They met by accident, and each read instantly the other's secret. There is not space to dwell upon these singular occurrences. Those who are able to receive them may read about them in other books, and those who cannot receive them will not care to hear. Suffice it to say, that these two persons, under the inspiration of these and many other such influences, organised a company—the society of Notre Dame de Montreal—obtained a grant *en seigneurie* of the island of Montreal, and Paul de Chomedey—Sieur de Maisonneuve—a soldier of experience in war, had come out to take possession. In vain did the governor of Quebec set forth the danger of their rash undertaking. Maisonneuve replied simply, “It is my duty and my honour to found a colony at Montreal, and I would go if every tree were an Iroquois.” So on May 18, 1642, Montreal was founded, and mass was said on the site of the present Custom-house. All the dreams of its founders came to pass, and remain visible to this day. The seminary of St. Sulpice, founded by Olier, still preaches and ministers in the great parish church of Notre Dame; the successors of Jeanne Mance still nurse the sick at the great Hotel Dieu; and the sister Marguerite Bourgeoys who came shortly after to join them, still teaches the faith of the Roman Catholic church by the mouths of more than a thousand of her successors, not only in the beautiful pile of buildings on the slope of Mount Royal, but in over a hundred establishments to more than 20,000 children throughout the Dominion, and in many cities in the United States. Francis Parkman, a scholar trained in the clear and dry light of Boston culture, asks, “Is this true history or a romance of Christian chivalry?” and answers, “It is both.”

With such a beginning, romance could not fail to

abound in the history of Montreal, and on it fell the brunt of the Iroquois fury. Deeds of devotion and even of self-immolation recur constantly in the history of this little colony, and the halo of a deed worthy of Thermopylæ lingers round the rapids near Carillon on the Ottawa.

The time came, however, when the growing strength of New France not only made headway against the Iroquois, but sought them out in their forest recesses, and destroyed their towns. A life of incessant peril developed a rare succession of partisan leaders and Indian fighters who beat the Indians in their own methods of war. The young men would leave the restrained life of the settlements to follow the wild freedom of Indian life in the forests. In vain were laws enacted against these "coureurs de bois," as they were called; the more adventurous youth found the temptation too strong, and indeed they were of use to the colony. They spread the influence of France to the remotest tribes of the west; they assisted as interpreters, and became the pioneer fur-traders, and they kept the governor informed of every stir on the remotest borders; many married Indian wives and bound the tribes to the French interest. The Count de Frontenac was the leading figure among the governors of those days, and from 1672 to 1698 upheld the prestige of France in the New World. Under his guidance New France passed from the status of a chain of trading and mission posts to that of an organised political community. Although the colony was small, great issues were raised and contended for the mastery. Frontenac represented Louis XIV., and Bishop Laval, the first Bishop of Quebec, represented, fully and worthily, the Church. They were both very able men and embodied types of two oft-conflicting forces in society. The history of Canada in their day is full of interesting disputes, recalling some-

times the times of Pope Gregory VII., and sometimes the "Auchterarder case." The "officialité" of the Bishop and the tribunal of the King's representative were not always in accord, and *appels comme d'abus* disturbed the little society on the St. Lawrence as well as the great world of Paris. Neither the bishop nor governor were endowed with yielding natures, and Frontenac was recalled after the court was wearied with their disputes; but in seven years the colony sank so low that he was sent back to save its falling fortunes. On his return he adopted an actively offensive system of defending the colony. He inaugurated what was called "la petite guerre," to check the advance of the English colonies at the south by harassing them with incursions of Canadian militia and of Indians led by daring and skilful partisan commanders. Such an expedition it was which took Schenectady in a bitter night in February 1690, and massacred many of the inhabitants in their beds, and carried off the rest as prisoners. Another, under Hertel de Rouville, destroyed the village of Salmon Falls, and another harried the town of Casco in Maine. Deerfield in Connecticut, Haverhill in Massachusetts, and other towns were destroyed; generally fired at night and in the winter, by parties of French and Indians on snowshoes. In this way the frontier settlements of the far more populous English colonies were kept in a constant state of alarm. The captives, mostly women and children, were compelled to march to Canada in the swift retreats of the invaders, and the Indians would kill any who could not keep up.

Some really brilliant commanders were produced among the French colonists. All the family of Le Moyne distinguished themselves, but chiefly Le Moyne d'Iberville. He it was who repeatedly conquered

Hudson Bay and Newfoundland, and kept the Atlantic sea-board in terror. He was a captain in the service of the king, and commanded squadrons in the royal navy.

In the meantime great discoveries were being made in the far west. There was no more daring explorer than Champlain himself. He discovered the lake which bears his name. He went up the Ottawa to the river Mattawa and crossed the portage to Lake Nipissing. He went down French river to Georgian Bay in Lake Huron and remained a winter just south of the Muskoka country north of Toronto. He went on a war party through Lake Simcoe and down the Trent to Lake Ontario at the Bay of Quinte and crossed the lake to attack the Iroquois towns in western New York. Nicolet had been sent by him among the Indians to learn their language, and this young and enterprising explorer was able to tell Champlain the year before his death of the Sault Ste. Marie and Lake Michigan. Then came the Iroquois onslaughts. The Huron missions were extinguished in blood, and all the nations of the peninsula were exterminated. The trails were deserted and overgrown. The lurid glare of the flaming towns died down to blood-soaked cinders, and the upper country was closed for many years. In 1663 the régime of the trading companies ended, and under the royal government, succour was sent to the failing colony and discovery recommenced. Talon, the ablest intendant ever in New France, encouraged exploration. In 1660, Groseilliers and Radisson were on Lake Nipigon, and in 1671 Father Albanel was on his way to Hudson Bay by Lake St. John and Lake Mistassini. In 1665 Lake Superior was explored in all its extent, and in 1669 Jolliet and Dollier de Casson were on Lake Erie; for up to that time all exploration had gone by the Ottawa. In 1673 Father Marquette and Louis Jolliet reached the

Mississippi by way of Fox river and the Wisconsin, and paddled down as far as the Arkansas, returning by the Des Plaines and Chicago portage. The same year Fort Frontenac was founded on its present site at Kingston. Then La Salle leased the fort as a centre for western discovery and trade. In 1679 he built the *Griffon* at Cayuga creek on the Niagara river, above the falls, and the pioneer lake craft sailed to the site of Michillimackinac. He went by the St. Joseph and Kankakee rivers to the Illinois, and from that year to 1682, Hennepin, Duluth, and La Salle visited all the region of the upper Mississippi. In the latter year La Salle followed that great river down to its mouth. As the colony gained strength the Canadians pushed westwards farther and farther. They founded Detroit and St. Louis and their forts reached to Hudson Bay. They pushed across the Winnipeg watershed, and founded posts on Lake Winnipeg and the Saskatchewan as far as the Rocky Mountains. All these enterprises emanated from Quebec and Montreal; but the latter city was the centre of the fur trade, and when the narrow streets were filled with *voyageurs* on the arrival of the brigades of canoes with furs, and when the savage allies of the French camped in the meadows near the town, it required all the efforts of the good priests, the *seigneurs* of the island, to keep the people in anything like a tolerably religious frame of mind.

Meanwhile the English colonies at the south were increasing very rapidly, but they had no cohesion. The wars of the New England border, and of the back settlements of New York, never disturbed the Virginians; nor were the New Englanders ever concerned when the frontiers of Virginia were swept with fire and axe. The Canadian French were, by the very fact of that centralisation which was their political weakness, better organised

for war, because their leaders could act with decision and promptness. Town meetings of citizens are useful for making speeches, not for making campaigns; while the military spirit of the French rose high. The expedition under Sir William Phips to take Quebec in 1690 was repulsed, and in 1691 a strong expedition from New York, under Schuyler, was defeated near Montreal. The French had no difficulty in maintaining their position, and even carried on an aggressive policy. There was never lack of bold and skilful leaders among them. It was a native-born Montrealer who settled the mouth of the Mississippi, and another founded the city of Mobile. As the great struggle for supremacy approached, the French established a chain of forts from Canada down the Mississippi valley, and on all the portages leading to its tributaries north of the Ohio.

The history of Canada in those days is full of incident and interest. The exertions and successes of this handful of people in the north against the stronger English colonies at the south are a surprise to the student of history. The Seven Years' War, which broke out in 1755, was undertaken by the English almost solely on behalf of the colonies, now the United States; and twenty years later they turned against the Mother Country, which had saved them by her ships and troops from the far-reaching enterprises of the French from Canada, and placed them in a position of permanent security, at the cost of an increase to the national debt of sixty-four millions of pounds sterling. The struggle was, however, inevitable, and the decaying monarchy of France could not abide the shock. The luxury and extravagance of the horde of speculators which crowded round the intendant Bigot and acted as his jackals, plundered the king and oppressed the people with impartial rascality. It

was one of his creatures, Vergor, who surrendered Beauséjour, and who had charge of the post on the heights at Quebec which Wolfe's troops surprised in the night. One sentence in a letter from Bigot to his protégé when he sent him to Beauséjour tersely expresses the cause of the collapse of the French power in America. "Profit, my dear Vergor, by your position; clip and pare, you have every facility, and soon you will be able to join me in France and buy an estate near me." The English language possesses in its copious treasury no legitimate word to set forth this intensity of decaying public honour, and the low word "boodle" must be used to express that debased ideal of politics which, with the cynicism of Mephistopheles, took the heart out of a people and dropped from the height of Champlain, Maisonneuve, and Daulac, to the coward and sluggard who surrendered Beauséjour and lost the heights of Quebec.

It was in June 1755 that war was declared; but there had been hostilities on the Ohio for a year preceding, and Washington had fired upon a party of Canadians on May 28, 1754, and killed their leader, Jumonville. The French were very indignant, and their histories still apply hard names to the occurrence; but, while it is not necessary to go into this still burning question, it is interesting to note that Washington fired the first shot of the war. On 3rd July he capitulated to a party of Canadians, and for the rest of the year the French held the whole valley.

In 1755 war was formally declared, and the final struggle began. The French, though inferior in numbers and resources, and with very little aid from France, won the first honours. In July, De Beaujeu, with 140 Canadian militiamen, 60 regulars, and 600 Indians, attacked and defeated General Braddock on the Monongahela. It was

a terrible defeat, and had it not been for Washington and his Virginians, who covered the retreat, scarcely a man of the English army would have escaped alive. All the horses, equipment, cannon and baggage of an army of 2000 men were captured, together with the military chest of £25,000. One thousand soldiers were killed, including the general and most of the officers. In the same year Johnson, with colonial troops, defeated Baron Dieskau near Lake George. In 1756 the Marquis de Montcalm arrived in Canada—a soldier whose skill and experience retarded for a few years the fall of the French power. He defeated the English at Oswego, and captured the place, and he invaded the colony of New York by way of Lake Champlain, and captured Fort William Henry at the head of Lake George. The massacre of the garrison by the Indians which occurred there, although against his commands, has been ever since a blot upon his reputation. In 1758, at Ticonderoga, he defeated Abercrombie and an army of 14,000 men, and although the English were successful in some minor engagements, the results of the first three years of the war were disastrous to the English arms.

With the appointment as commander-in-chief of General Amherst in 1758, the fortune of war changed. Amherst did not himself display commanding military genius, but he had with him a number of very capable officers, and, chief among them, Major-General James Wolfe, who led the attack on Louisburg, and captured it after a brave defence. The following year the armies of England began to close in round the hitherto victorious French in Canada, and Montcalm drew in his garrisons for a final stand. It was the end of June before the fleet, under Admiral Saunders, having on board General Wolfe's army, arrived at Quebec, and for more than two months

the town was bombarded, and several unsuccessful attempts were made upon Montcalm's position. At last Wolfe withdrew most of his troops from the north shore, crossed to Point Lévis on the south shore, and began to march up the river, watched by the French from the opposite heights. On the night of the 12th of September, concealed by the darkness, he dropped down the river and effected a landing at a place still known as Wolfe's Cove, and by daybreak his whole army was drawn up on the heights of Quebec.

It is unnecessary to recount in this short sketch the events which succeeded. The details of the battle are well known—the success of the English arms, the heroic death of Wolfe at the moment of victory, and the equally heroic death of the chivalrous Montcalm in the hour of defeat. A single shaft in a conspicuous position in the upper city was erected, when the Earl of Dalhousie was governor, to the memory of both, and the inscription tersely sums up the result :

<p>MORTEM. VIRTUS. COMMUNEM FAMAM. HISTORIA MONUMENTUM. POSTERITAS. DEDIT.</p>
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In Canada, to this day, it is debated whether Montcalm exercised good judgment in accepting battle, seeing that at the approach of winter Wolfe and the fleet would have been compelled to abandon the enterprise. He is blamed for detaching De Lévis, his best officer, and thus weakening his force. To this it may be replied that the defences of the town were destroyed by the bombardment, and that it was in no position to resist attack from the land side, that his force was still superior in numbers to Wolfe's, and that his object was not to give Wolfe time to establish himself. Montcalm was a soldier of great

experience and ability, and doubtless knew all the circumstances better than the critics of to-day.

The fleet sailed away and left General James Murray with a strong garrison in the ruined city, and for the whole winter he was in turn besieged by the active De Lévis who kept the field with troops from Montreal. He was tempted out to meet De Lévis in a battle on the Ste. Foye road, and was defeated, but he held out until the returning spring brought the fleet again with much-needed reinforcements, and a combined movement of all the English armies was made on Montreal. Amherst assembled his troops at Albany and marched to Oswego on Lake Ontario, from whence he moved down the river in a large flotilla collected there in advance,—a perilous passage enough, seeing that he had to run all the rapids with an army of 10,000 men. Colonel Haviland moved down the valley of the Richelieu, the usual route of invasion, and General Murray marched up from Quebec. Amherst disembarked at Lachine, and united his forces on the plateau west of the town. Resistance to such a force was useless, and the French governor, the Marquis de Vaudreuil, capitulated and surrendered to General Amherst the whole of Canada in its utmost extent.

Thus closed the history of the French monarchy in Canada, and opened the history of the United States of America.

The terms of the capitulation were generous, and the treaty of cession confirmed them. After a period of uncertainty the state of the country was settled by a measure called "the Quebec Act," passed by parliament in 1774. That statute confirmed the Canadians in the enjoyment of their religion and their civil laws. The feudal tenure of the land was continued. The religious communities were unmolested, and the Roman Catholic religion received

a quasi-establishment under which it collects tithes from its own people to this day. The Jesuits were not allowed to continue their institution, and about the same time the Jesuit order was suppressed in Europe by Pope Clement XIV. While the members of the order were expelled from all Roman Catholic countries, it is the fact that those who remained in Canada enjoyed their estates under English rule, until the last one died, when the property was taken by Government for the support of education.

Scarcely was the treaty of cession concluded when Pontiac's war broke out, and the whole western border was desolated by fire and axe. It was a deep-laid conspiracy of the western tribes, and all the forts of the frontier but one fell—the most of them by stratagem. Detroit alone held out. After Pontiac's defeat the fur trade opened up again, and the English from Montreal entered into it with vigour; but the West remained uneasy until after the murder of the great war-chief of the Ottawas by an Indian enemy.

At the conclusion of peace in 1763 nearly all the leaders of Canadian society had emigrated to France, even those who, like the Marquis of Vaudreuil, were Canadian born. Nearly all of the class designated by the name "noblesse" left. The parochial clergy remained—the clergy of the seminaries of Quebec and of St. Sulpice at Montreal also remained, and, round this body of faithful clergy, the abandoned and discouraged remnant of some 65,000 to 70,000 French Canadians clustered, and by their ministrations and counsel the national fire was kept alive. The Canadian people indeed needed support; for the English came in from the southern colonies as to a conquered country, and, although under 400 in all, claimed to be alone entitled to political rights, to serve on juries, or have a voice in public matters. They

supposed the penal laws against Roman Catholics were introduced into Canada, and one little knot of grand jurymen even presented the whole native population as papists, and, in the jargon of the period, declared that to permit Roman Catholics to serve on juries, or to hold positions of trust, was "an open violation of our most sacred laws and liberties." In the meantime, in the southern colonies, the seeds of disaffection were being fanned into flame, for the restraining fear of France on the north was at last removed.

The Canadians call this period *le temps de malaise*, but out of it was born in 1774 a measure so just, so wise, so fraught with all that is noble and generous in statesmanship, that it attached at one stroke the affections of the whole French Canadian people to the throne of Great Britain. This measure—the Quebec Act—granted, as above stated, to the Canadians their religion, not only its toleration but its freest exercise, their civil laws, their civil rights, their institutions and their lands; and the amazed people found themselves in a position, civilly, religiously, and socially, vastly superior to that they had been accustomed to under their old monarchs.

The Quebec Act was received with violent indignation by the disappointed little band of English in Quebec, and it raised a storm of invective among the revolutionary leaders at the south, who made it a count in the indictment of the Declaration of Independence; but it was an impregnable wall of defence to the Canadians, and to its terms is due the fact that Canada is still British. At the outbreak of the Revolution the armies of the Continental Congress invaded Canada, occupied Montreal, and besieged Quebec. The investing force was about 3000 men under Montgomery and Arnold, and General Carleton had as a garrison only one company of troops with

the seamen and mariners of a sloop of war and the inhabitants of the town—not exceeding 1000 in all. Montgomery fell in the assault on the night of December 31, 1775, and the siege lagged all through the long winter of 1775-6, to be abandoned at the opening of spring.

In the meantime the Continental Congress was vainly exercising its blandishments upon the French Canadians, and endeavouring to show them under what fearful oppression they were unconsciously groaning. Three commissioners were sent to Montreal. Among them were the astute Benjamin Franklin and Charles Carroll of Carrollton. The latter was a Roman Catholic, and he brought with him his brother, a Jesuit priest, to assist in moving the French clergy. Many interviews were held at the Château de Ramesay in Montreal, but the French were politely immovable. The fact was that the Continental Congress of 1774 had a great literary faculty for composing addresses, and they prepared three—one for circulation in England, where there existed a strong Protestant prejudice against Catholic emancipation; one for circulation in the English colonies, where the Quebec Act was intensely unpopular; and the third for circulation among the French Catholic people of the province of Quebec itself. These appear in the proceedings of Congress, and a sentence or two from each in juxtaposition will explain the present position of French Canada fully, without any added comment. It is no wonder that even the ready and plausible Franklin, who, a few years later, was to outwit the diplomats of England and France, was nonplussed by the production of these three masterpieces of political rhetoric, each so cogent and persuasive to the sufferers for whom it was prepared. At the present date the error of letting them all out at once would be patent, for the press telegrams would publish

them ; but communications in those days were much more difficult. One remark alone suggests itself in this connection, the simple historic statement that, alone among the colonies of the New World, Canada stands proudly pre-eminent, inasmuch as practically no blood was ever shed in the name of religion to sully the white pages of her annals. The only persecutors in Canada were the Iroquois savages, and the only victims were Roman Catholic missionaries.

Extract from the Address of October 21, 1774, to the people of Great Britain

“Nor can we suppress our astonishment that a British Parliament should ever consent to establish in that country (Canada) a religion that has deluged your island with blood and dispersed impiety, bigotry, persecution, murder, and rebellion, through every part of the world.”

Extract from the Address to the people of the English Colonies, October 21, 1774

“In the session of Parliament an Act was passed for changing the government of Quebec, by which act the Roman Catholic religion, instead of being tolerated as stipulated by the treaty of peace, is established, and the people there are deprived of a right to an Assembly. Trials by jury and the English laws in civil cases are abolished, and instead thereof the French laws were established.”

Extract from the Address to the Canadian People, October 26, 1774

“And what is offered you by the late act of Parliament ? Liberty of conscience in your religion ? No. God gave it to you, and the temporal powers with which you have

been and are connected firmly stipulated for your enjoyment of it. . . . We are too well acquainted with the liberality of sentiment which distinguishes your nation to imagine that difference of religion will prejudice you against a hearty amity with us. You know that the transcendent nature of freedom elevates those who unite in her cause above all such low-minded infirmities."

These three addresses were drafted by a committee, and adopted clause by clause in full session of Congress, two of them on October 21, and the third on October 26, 1774. They are very long, and the contents of the rest may be readily guessed. Their importance in this connection is to account for the fact that in all the extensive dominions of the King in the British Empire he has no more loyal subjects than the French people of Canada, and to show that this fact is mainly due to an act of generosity, justice, and kindness granted to a people in the deep discouragement of betrayal and abandonment by their own proper leaders.

With this the history of French Canada may be closed. Under the British Government the people by degrees advanced towards the full development of British political institutions. Only once since 1774 has the soil of the French province been invaded, and then, at the battle of Chateauguay in 1813, it was by a French commander with an army consisting solely of French militia that the enemy were defeated. It is on record in a *Precis*, printed in 1826, by order of the Duke of Wellington, privately for official use, and published many years after, that "not a single Lower Canadian militiaman was known to desert to the enemy during the three years of the war of 1812-14."

In later years 1837-8 a small minority in the neighbourhood of Montreal, dissatisfied with the slow progress of political reform, took up arms against the British Government, but some of the leaders were English, and there was a similar attempt in Upper Canada where the whole population was English. Both movements were promptly suppressed, and the desired changes came about in natural course at the introduction of responsible government. In 1871 and 1885 respectively, French half-breeds of Manitoba and the prairie provinces, led by Riel, rebelled against the Government. Though some small stir followed in Quebec, nevertheless, the rebellions were promptly quelled.

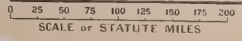
CHAPTER XI

THE PROVINCE OF QUEBEC

THIS province is not only the largest of all the provinces of the Dominion, but from certain view-points it is the pivot province, and also the broad threshold of a young nation where constitutional liberties of a high order are enjoyed by all within its border. No matter how the population of the provinces may wax or wane, Quebec, by the fundamental law, must always have 65 members in the House of Commons. The representation of the other provinces is regulated at each census by the proportion which their population bears to that of the province of Quebec, so that, the delegation from Quebec remaining always the same, the others are adjusted to it. This indicates some peculiar circumstances connected with Quebec requiring a special safeguard, and it is found in the fact that 80 per cent of its inhabitants speak French as their mother tongue. Quebec, moreover, demands the attention of the student because it is the germ of Canada. From the narrow shore under the cliff of Cape Diamond went forth the initial force which penetrated the wilderness from Hudson Bay to the Ohio, and from Labrador to the Saskatchewan. Somewhere on that cliff, unmarked and unknown, is the grave of Samuel de



PARTS OF QUEBEC AND ONTARIO



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Champlain, the founder of New France—one of the noblest, bravest, gentlest men who ever sailed on the ocean or trod a forest trail; for ocean and forest were familiar to him. He was the type of a class of men common in the France of that period. The religious wars in France led to the colonisation of New France, and the City of Quebec (Stadacona) was founded in 1608 by him. There were at least 10,000 settlers who found refuge in Canada or definitely decided to settle in this newly discovered land. These came chiefly from the west of France, Normandy, Picardy, Brittany, Ile de France, along with Champlain's fellow-citizens.

Boundaries

The province of Quebec is bounded on the south by the Gulf of St. Lawrence, the Bay Chaleur, and part of New Brunswick in Canada; by the States of Maine, New Hampshire, Vermont, and part of New York in the United States, also by the Ottawa river and the province of Ontario to the north end of Lake Timiskaming, to the point where the waters of the St. Lawrence basin divide from those flowing into Hudson Bay. On the east it is bounded by the Gulf of St. Lawrence (and includes the Island of Anticosti and the whole group of the Magdalens), by the Strait of Belle-isle, by Newfoundland Labrador (which consists of a narrow undefined strip of land along the Atlantic coast and Strait of Belle-isle from Blanc Sablon eastward and northward), also by Ungava Bay and portions of Hudson Strait. On the west it is bounded by the province of Ontario from Point au Baudet on the St. Lawrence (where Ontario, Quebec, and New York State meet) to the middle of the Ottawa river near Point Fortune at the head of the Lake of Two

Mountains, and by the same province along the Ottawa river in sections to the head of Lake Timiskaming, also along the north and south line drawn from the point where the waters of the St. Lawrence basin divide from those of the Hudson Bay basin to the waters of James Bay, and from this point northward it is bounded on the west by the waters of James Bay and Hudson Bay to Cape Wolstenholme. The province of Quebec is bounded on the north by Hudson Strait, Ungava Bay, and Newfoundland Labrador. The triangular territory between the St. Lawrence and Ottawa rivers, forming part of the province of Quebec, consists of certain seigniories granted under the feudal tenure by the French crown. West of that the country was unsettled, and was set off in 1791 to form a province under English laws.

The former boundary between Quebec and the North-West Territories in south-eastern Canada was marked by a line drawn from the mouth of the Eastmain river on the east coast of James Bay, along the course of that river to the north point of Lake Patamisk; thence the boundary followed the parallel of latitude (about $52^{\circ} 55'$) eastwards to the headwaters of the Hamilton river, which it followed to the westerly boundary of the strip of land or territory under the lawful jurisdiction of the island of Newfoundland in the middle of Bay du Rigolet or Hamilton Inlet. The precise boundary between the province of Quebec and Newfoundland Labrador cannot be more definitely given until the Courts have decided the exact extent of Newfoundland's lawful jurisdiction over the mainland, which point will be readily solved and settled when Newfoundland decides to join the federation of autonomous British provinces in North America, provision for which was made by the Crown in the British North America Act at the time of Confederation.

Provision was made in *The Quebec Boundaries Extension Act*, 1912, for representation of the newly added territory in the House of Commons of Canada, said representation being "determined according to the rules enacted by Section 51 of The British North America Act, 1867," regulating the representation of the provinces other than Quebec; also for the continued trusteeship of the aborigines in the territory on the part of the Government of Canada subject to the control of Parliament.

In 1912 the large triangular addition of 354,961 square miles was made to the province of Quebec, consisting of the most south-easterly portion of the North-West Territories, sometimes called the "North-East Territories," thus giving to the province the whole peninsula of Labrador, with the exception of the territory over which the island of Newfoundland has lawful jurisdiction.

Area and Extent

The province of Quebec stretches, then, from Blanc Sablon, a fishing harbour at the inner end of the strait of Belle-isle, in longitude $59^{\circ} 7'$ west to Lake Timiskaming, in longitude $79^{\circ} 40'$ west, a distance of 1040 miles. From Cape Wolstenholme, on Hudson Strait, the most northerly point of the province of Quebec—about latitude $62^{\circ} 40'$, to a point where the international boundary line between this province and the states of New York and Vermont, marked by the 45th degree of latitude, strikes the state of New Hampshire, the distance is approximately 1265 miles, whilst the distance from Cape Chidley at the opposite extremity of Hudson Strait to the point where the boundary lines between the province of Quebec, the state of New York, and the province of Ontario meet in the middle of the St. Lawrence river

above Lake St. Francis, is 1165 miles. Cape Jones is the most westerly point of the province ($80^{\circ} 8'$ west longitude), and Blanc Sablon, near the Strait of Belleisle ($57^{\circ} 10'$ west longitude), the most easterly. The narrowest portion of the province is marked by a line drawn from Rupert House, a Hudson Bay Company's post at the mouth of the Rupert river, on James Bay in Western Quebec, south-easterly to the most northerly point of the state of Maine (about latitude $47^{\circ} 30'$), and measures 500 miles. Another line, also 500 miles long, joins Rupert House with the most southerly point of the province of Quebec along its boundary with northernmost New York State, near Lake St. Francis on the St. Lawrence. The superficial area of the province is now 706,834 square miles, or 452,375,760 acres. The area added in 1912 was 354,961 square miles or 327,175,040 acres. Its more precise boundary on the south is marked by an irregular line drawn along the valley of the Hamilton river, from the inlet of the same name, by the Grand Falls, Lobstick Lake, Dyke Lake, Petitsikapau Lake, then along the valley of the Ashuanipi to 53° north latitude ($52^{\circ} 55'$) along this line to the northern extremity of Lake Patamisk at the headwaters of the Eastmain river, thence along the valley of this stream to the Hudson Bay Company's fort at its mouth on James Bay. The general alignment of the province is north-east and south-west, in the direction of its great feature, the river St. Lawrence, flowing as it does in a great tectonic valley or trough marking repeated dislocations and earth movements from early geological times.

Until quite recently, in a general way as well as in the historical sense, the province was the hydrographical basin of the river as far as the intersection of the parallel of 45° north latitude, and the river being a northern

river flowing on the southern edge of its basin has only some 50,000 square miles of the area of the province south of it.

But with its extended boundaries Quebec now counts *four* main hydrographical basins, of which the St. Lawrence will ever continue to be the greatest, and next in importance is the James Bay basin. The construction of the National Transcontinental Railway across the province of Quebec, along the Laurentian lowlands, and over the Laurentide Hills to the alluvial and fertile plains of the James Bay basin, will unite two similar areas together, and broaden the zone of settlement several hundred miles. Not only does wheat ripen early in August on Lake Abitibi along the boundary of western Quebec in the James Bay basin but spring sets in much earlier in the valleys of the Kinojevis and other streams flowing into the bay than they do in the forest axis of the Laurentide Hills to the south.

Contour of the Land

Owing to a movement of depression of the whole north-eastern portion of the North American continent in geological time, the highlands of the province of Quebec (those of Gaspé, north shore of the St. Lawrence, the eastern face of the province of Quebec directed Atlanticwards, those of Hudson Strait and Ungava Bay, as well as those of Hudson Bay) and Newfoundland are close to the sea, and the lower parts of the valleys are drowned, forming at times a very irregular coast line. The land is continued under the sea by a broad continental shelf or platform, of which the Newfoundland Banks are the most important part. South of Anticosti

and under Cabot Strait is a deep submerged valley cutting the submerged continental shelf itself, formed at a period of great elevation of this portion of the continent. The great peninsula and peneplain of Labrador, with its body of hard crystalline rocks and schists, slopes towards the central depression now filled by the comparatively shallow mediterranean sea of Hudson Bay. The boldest expression of this Eastern arm of the *Laurentian Protaxis* is in the St. Lawrence valley where high hills and precipitous cliffs face the south, whilst along the Atlantic border and Hudson Strait this feature is also very prominent and directed seaward.

South of the St. Lawrence the Appalachian chain, known in Vermont as the Green Mountains, and in New Hampshire as the White Mountains, crosses the border east of Lake Champlain, and continues in a north-easterly direction to a point about 30 miles south of Quebec city. Thence it follows the general course of the river at a varying distance from the south shore, but nearly always in sight upon the horizon. In the north-east the range is known under the general name of the Notre Dame Mountains. It comes out upon the shore near Metis, and continues along the river to form the tableland of Gaspé. To the south-west of this range is the rolling country of the Eastern Townships, and to the north-west of these is the level plain of the river St. Lawrence.

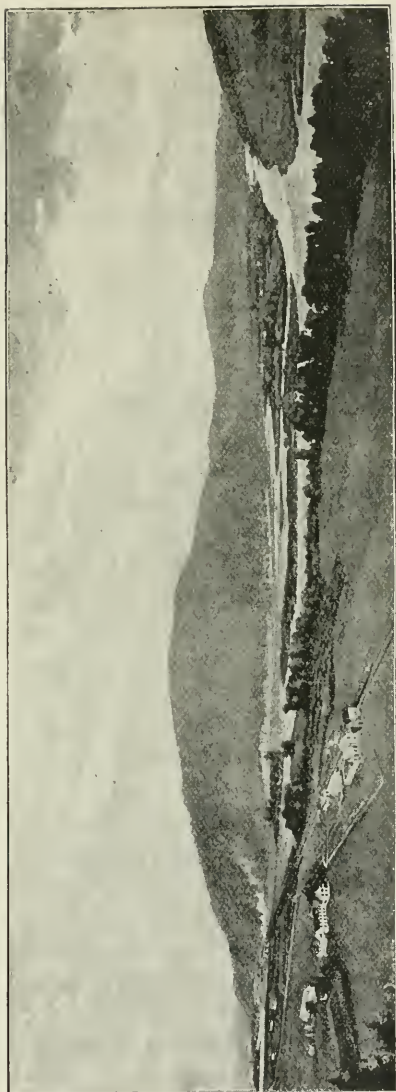
The Appalachian highlands, on passing the border, lose their height, but not their beauty, and cross to the St. Lawrence as a succession of ridges. That portion of Quebec is not a rough mountainous country, but is traversed in a north-easterly direction by numerous parallel ridges and valleys, the western edge being formed by the mountains of the Sutton Mountain anti-cline, east of which is the strongly marked valley of the

Missisquoi river, east of which again is the remarkable belt of serpentine intrusions composing the highest mountains of the district, three of which rise to over 2000 feet. The next important depression is Lake Memphremagog. All through the region of Appalachian folding in south-eastern Quebec (a complicated section of which forms the prominent rock on which Quebec City is built) the same conspicuous north-east and south-west alignment of the topographical features of the country is clearly visible, and geological maps of the district reveal the history of the earth-movements, volcanic activity, and crustal folding. It is a rolling country containing a large amount of rich farming and pasture land, where the valleys and hillsides are covered with fertile, glacial, marine, and alluvial soils. The drowned valleys and sunken (now mostly rising) coasts of Quebec produce fine harbours. Sutton Mountain is nearly 3000 feet high. The mountains on the west side of Lake Memphremagog, although themselves of intrusive origin, are in this range. The higher peaks on the lake are the Bear and Hawk Mountains, the Owl's Head (2400 feet), and Mount Elephantis. Orford Mountain, which is not far away, is the highest peak (2860 feet) among the mountains in that vicinity. In Sherbrooke County also is Bare Mountain, 1520 feet; Carbuncle Mountain, 1270 feet; and Massawippi Mountain in Brome is 1350 feet above the sea. In Wolfe county, Ham Mountain is between 1900 and 2000 feet, and Stoke Mountain in Richmond county is about 1700 feet above the sea. The general elevation of the country is from 500 to 1000 feet above the sea. The lakes in this region are not numerous. Among them are Lake Matapedia 480 feet, Lake Temiscouata 467, and Lake Memphremagog 756 feet above the sea. Lakes Aylmer (795 feet), St. Francis (890 feet), and

Megantic (1092 feet) are the chief remaining lakes of this region.

After the Notre Dame Mountains come out upon the shore of the Lower St. Lawrence they attain their highest elevation in the Shiekshock Mountains, from Matane to Ste. Anne des Monts, a distance of about 65 miles. The range is from 4 to 9 miles wide, and the higher summits rise from 3000 to 4000 feet above the sea, or an average of 2000 feet above the tableland of Gaspé. This range is not a part of the watershed; for the streams rise in lower lands in rear of them, and cut their way through to the St. Lawrence in deep ravines. The central part of Gaspé Peninsula is, on an average, 3000 feet above the sea. In the neighbourhood of the Ste. Anne and Cap Chat rivers many of the main peaks of the "Shiekshock Mountains," or Notre Dame range, have an elevation of more than 3500 feet. Richardson Peak is 3700 feet; Mount Albert, 3560 feet; Barn Mountain, 3400 feet; Tabletop Mountain, 4000 feet. In Rimouski, Mount Camille is 2036 feet; the Bic Highlands, 1236 feet, and the hill 6 miles south-east of Ste. Flavie is 1500 feet. Most of the region is rugged. There is, however, a considerable quantity of arable land under settlement between Metapedia and Metis, along the Intercolonial railway. In Gaspé County, Cape Gaspé itself is 692 feet above the sea, Percée Mountain is 1230 feet, Douglastown Mountain, 1500 feet, whilst the hill opposite Gaspé Basin is 1505 feet, Mount St. Alban, 1170 feet, and the following peaks are 1000 feet altitude each: St. Joseph, Chlorydorme, Fame Point, Little Capis, and Mount Louis. On the lower levels towards the Bay Chaleur the timber is good, and there is a belt, about 10 to 20 miles wide, of fertile farm lands along the shore of the bay between it and the mountains.

On the St. Lawrence side there are small settlements of fishermen clustered in sheltered coves at the mouths of the rivers. The Gaspé Peninsula is separated from the main province by the valley of the Matapedia river, which, taking its rise in Matapedia Lake, not far from the Metis on the St. Lawrence, falls into the Restigouche near the Bay Chaleur. The Intercolonial Railway follows this picturesque valley. Matane County has conspicuous elevations: Mount Logan, 3708 feet; Mount Bayfield, 3471; Mount Matawee, 3365; peak 7 miles south-east of Mount Bayfield, 2669 feet; Big Berry



Notman, Photo.

JUNCTION OF RESTIGOUCHE AND MATAPEDIA

Mountains, 2000 feet; Little Berry Mountains, 1500 feet.

In L'Islet county, the range south-east of L'Islet station, and 5 miles distant, is 1390 feet above tide; the peak 10 miles east of Trois Saumons is 2090 feet; the peak 7 miles south-east of St. Roch des Aulnais is 1666 feet, whilst the peak $6\frac{1}{2}$ miles east of St. Jean Port Joli is 1240 feet above tide. The island of Anticosti, at the entrance to the Gulf of St. Lawrence, forms part of the Silurian limestone plateau which was not affected by the great vicissitudes of the Appalachian region, and whose height varies from 200 to 400 feet above the sea, with precipitous cliffs on all sides formed by wave action. This limestone island with coral beds and a prolific fossil fauna has many points in common with the Island of Gothland in the Baltic and the Grand Manitoulin island in Lake Huron.

The valley of the river St. Lawrence is bounded on the north in its whole length by the Laurentian highlands or Laurentides. They are but a short distance from the shore at Blanc Sablon, and they follow all along the north shore of the gulf, the estuary, and the river St. Lawrence at varying distances, but never very far away, until at the Saguenay they come out upon the shore at Cape Eternity and Cape Trinity. From there they follow the bank of the river very closely to within 20 miles of the city of Quebec. There at Cape Tourmente, opposite the lower end of the island of Orleans, they turn away from the river, but still follow its general course at a greater or less distance. At Montreal they are 30 miles away; and, nearly half-way between Montreal and Ottawa city at Calumet, they strike the Ottawa river, and follow up its northern bank for about 100 miles, as far as Lake des Chats, where they cross the

river into the province of Ontario. As already remarked, the Laurentides appear to have their boldest expression in the southern and north-eastern portions of the province.

The nature of the Laurentian country beyond the valley has been described at length in a previous chapter. The number of its lakes is past all counting, and, as the country is surveyed, more and more are laid down upon the maps. These are the sources of numbers of perennial streams, which flow down into the central valley in rapids and cascades, providing water-power for the lower levels along a line of 1000 miles. In these days of ready transfer of power, such an incalculable reserve of force means a great deal. In the meantime much of it is running to waste.

The great Laurentian tableland of Quebec to the north of the St. Lawrence valley, which extends to Ungava Bay and Hudson Strait, and practically to the Atlantic border, is from 1000 to 5000, and even 6000 feet high, clothed with forest to the latitude of Ungava Bay, and worn by the waste of countless ages into hills with rounded outlines. These rise in places into high mountains. The highest are near the Atlantic coast, in the district of Ungava, where the four Kangardlirarsuk Peaks and Nachvak Mountains both vary from 5000 to 6000 feet high. Nachvak Mountain itself is 3400 feet above the sea, and the mountains on both sides of Nachvak Inlet, immediately overlooking it, rise from 1500 feet to 3400 feet, but, a few miles inland, especially on the south side in Ramah peninsula, they are estimated to attain an altitude of from 5000 to 6000 feet. The north and north-eastern coasts of Quebec, from Cape Wolstenholme on Hudson Strait, round Ungava Bay to Cape Chidley and the north-easterly border of Quebec province, are high and rocky, the elevation of

the land increases in height from the strait of Belle Isle northwards until 70 miles from Cape Chidley, where it attains a height of about 6000 feet. Beyond this the coast diminishes to the Cape (Chidley), where it is 1500 feet above the sea, with the Button Islands also 1500 feet high. Aulatsivik Island, off the Atlantic coast, is 2733 feet high. The Cape Wolstenholme range is 2000 feet elevation. Inland, in the Ashuanipi Lake district, Atikonak Lake is 1700 feet elevation; Dyke Lake, 1675 feet; Kaniapiskau Lake, 1850 feet; and Nichikun Lake, 1760 feet elevation. North of the Mingan Islands the Laurentide hills are on an average 1800 feet elevation, with a marked north-east and south-west trend characterising the great anorthosite mass of intrusive rocks 250 miles long, in that part of the province. The waters of Lake Mistassini are 1200 feet above the sea, whilst those of Lake St. John are only 314 feet above tide, being held in a basin of undisturbed and flat-lying formations like those of the St. Lawrence valley.

In Saguenay county the summit one mile west-north-west of Tadoussac is 1080 feet, and the summit two miles west-south-west of Tadoussac is 1100 feet. The west peak of the range to the north of the Bay of Seven islands is 1307 feet, and the east peak is 1700 feet; Mount St. John is 1416 feet, and the Bradore Hills 1264; whilst the height of land between Atikonak and Romaine rivers is 1750 feet, that between Romaine and St. John rivers 1800 feet, that just west of Attikopi Lake 2400 feet, and the divide between the Matonipi branch of Outarde river and branch of the Maniknagan river 2390 feet above the sea. In Charlevoix county Cape Eternity is 1500 feet, and the north peak of the Murray Mountains is 2300 feet high, the south peak measuring 2050 feet, whilst Les Eboulements Mount is 2551 feet

above the sea, and the church at Les Eboulements has an elevation of 1186 feet. The highest peak of this county is one 2 miles west of Grande Pointe, 2650 feet; whilst the peak 2 miles west of Point à l'Abattis is 2530 feet.

In the Archæan country of Southern Quebec conspicuous hills occur in Montmorency County, north of the provincial capital; Ste. Anne de Beaupré Hills: (north peak 2620 feet, and south peak 2505 feet high); Chateau Richer Hills varying in height, the peak 3 miles north-west of the village being 1405 feet, and the peak 6 miles north-west of the village, 2305 feet above the sea, whilst the peak 2 miles north of the village is 1085 feet high. The range to the east of the Montmorency river (lat. $47^{\circ} 01'$) is 2447 feet, and the summit of the range in latitude $46^{\circ} 59'$ is 2144 feet. In Montmagny county "Mont Ste. Anne" is 2680 feet, and the peak $1\frac{1}{2}$ miles west of Sault aux Cochons is 2365 feet high, the peak $1\frac{1}{2}$ miles north-west of Cape Gubanne 2215 feet, the peak 2 miles north of Cape Gubanne 2070, whilst Cape Tourmente is 1874 feet high, and the peak 1 mile north-north-west of Cape Rouge is 1955 feet altitude. In the Laurentide Hills, north of Quebec city and in its vicinity, the Beauport Hills attain a height of 1950, the middle summit measuring 1895 feet, and the east summit measuring 1800 feet elevation.

North of Montreal, Ste. Marguerite Station, on the line of the Canadian Pacific Railway, is 900 feet above tide, whilst Ste. Agathe station is 1194 feet, and the summit rail at the road-crossing beyond 1250 feet, Nantel Station being 1359 feet above the sea, and the summit ground near the Labarge Mill Station 1403 feet. Val Morin is 1025 feet elevation. The highest peak north of Montreal is Trembling Mountain (2380 feet), rising from Trembling Lake. Here also is one of

those conspicuous masses of norite or labradorite (anorthosite) rock so prevalent in the Canadian Archæan, which have been discussed by Sir William Logan, Dr. Sterry Hunt, Dr. Adams, Dr. Barlow, and others. The slopes of the "Norite Hills" are eminently characteristic. The same Laurentide Hills and their myriads of isolated peaks (for the most part unnamed, like the myriads of lakes which reflect as in so many mirrors the beauty and majesty of their forested or rocky slopes) also extend in south-westernmost Quebec, and are conspicuous in Pontiac County, and within the great bend of the Ottawa river, from its source west to Lake Timiskaming and east to the St. Lawrence at Montreal. They are not elevated as in northern, eastern, and south-eastern Quebec, but present the same bold barrier-like front. The height of land-portage route of Lac des Quinze to Lake Abitibi is 920 feet above tide, and that on the route from Grand Lake Victoria to the Migiskan river is 1000 feet altitude, whereas the summit of the portage between the Keepawa and Douglas lakes is 957 feet elevation.

The most southerly point in the province of Quebec reached by the Laurentide Hills is in Ottawa County, near the federal capital, Mount By range (1085 feet), of which King's Mountain, favourably known, is the highest prominence recorded in the county, measuring 1200 feet above the sea. Kingsmere Lake itself is 725 feet, Meach Lake 580 feet, and M'Gregor Lake 458 feet elevation. From this rapid survey of the various levels of the province, it is evident that throughout its length and breadth there exists a great plateau, with a general south-westerly inclination, dissected radially by streams flowing from a central axis in the neighbourhood of the 53rd parallel of latitude, between the 66th and 70th

longitudes, along the central portion of the old boundary between this province and the North-West Territories. The northern counties of old Quebec, Abitibi, Lake St. John, Chicoutimi, and Saguenay, have the head-waters of many large rivers within their borders.

The southern plain of the St. Lawrence valley extends over an area of at least 10,000 square miles. At the gateway stands the city of Quebec in a spacious amphitheatre formed by the approach of the Laurentides and Appalachian ranges. To the west the valley broadens, level and fertile, to the Frontenac axis and Lake Ontario. The tide reaches to Three Rivers—half-way to Montreal, and nowhere in all the plain is the level higher than 300 feet above the sea, save in the isolated hills of the Monteregian district, to be specially mentioned. Where the basin of the St. Lawrence touches that of the Hudson river on the south the water-parting is but 120 feet high. Lake Champlain, partly in Canada, is itself only 102·3 feet above the sea.

Across this southern plain, at distances varying from 15 to 25 miles, is a line of completely detached hills, all, with two exceptions of igneous rock, rising sharply out of the level fields. They are not very high, 600 to 1150 feet above the plain, but they seem higher by contrast. The most northern is Rigaud mountain at the head of the Lake of Two Mountains. Then follows Mont Calvaire of Laurentian gneiss, where the lake widens. Mount Royal is the next—the forest crown of the city of Montreal. Then follow successively Montarville, Mont St. Hilaire (Belœil), Rougemont, Yamaska, Shefford, and Brome mountains, until the intrusive masses of Lake Memphremagog are reached, which extend south beyond the border. Monnoir or Mount Johnson is a smaller conical peak to the west of the échelon. Any one standing

on Mount Royal, above Montreal, may see on a clear day the Laurentides to the north, and to the south may follow this échelon of detached hills until it leads up to the southern range, where it crosses the border. The plain itself, as before stated, does not rise higher than 300 feet above the sea.

The Gulf of St. Lawrence

This great inland sea is closed in from the Atlantic by the whole length of the islands of Cape Breton and Newfoundland. It washes the shores of four provinces—Quebec, Nova Scotia, New Brunswick, and Prince Edward Island. It has three entrances—one far to the north, the Strait of Belle-isle; one at the south, the Strait of Canso; and in the centre, the main entrance, Cabot Strait, between Cape Breton and Newfoundland. As if to lead up to the grand entrance, a channel over 200 fathoms deep extends from the outer ocean between the St. Pierre bank and the Banquereau. It enters the gulf with a breadth of 40 miles, and continues up the river between Gaspé and Anticosti as far as Bic. The gulf is deep to the very shores, and there are not many expanses of land-locked water presenting so few obstacles to navigation. The land is bold on both sides of the entrance.

The width of Cabot Strait, from Cape North to Cape Ray, is 60 miles. St. Paul's Island, off Cape North, narrows the distance to 40 miles. Cape North is 1100 feet, and the coast of Newfoundland at Cape Ray is 2000 feet high, so both sides of the gateway can be seen from the deck of a passing steamer.

The Gulf of St. Lawrence is 500 miles in its extreme length from north to south, and 243 miles across from Cabot Strait to Gaspé. Its area is over 80,000 square

miles. Although the smooth water of the gulf is sometimes spoken of, it is by no means smooth in a strong wind, even though it is sheltered from the long roll of the Atlantic. The islands it contains are easily recognised, and the gulf and river are lighted almost like a street. The water is deep and the soundings are well marked. On the other hand, the currents are variable, and much affected by the winds and tides. The current which has long been supposed to run in at the Strait of Belle-isle proves to be mainly a tidal current, although there is a preponderance of inward flow. The current of discharge of the river runs near the south shore, and there is a steady current running out of Cabot Strait. Ships sailing inwards follow the northern shore to avoid the river current and obtain the assistance of the tidal stream, which mainly seeks the northern shore.

The navigable season extends from April 15th to the end of December. The lighthouses are extinguished from 10th December to 1st April. Throughout December ice forms in the bays, and though the gulf never freezes, the ice collects in floes with lanes more or less open. In March and April the sealing vessels go amongst the floating ice in pursuit of seals, and, even in May, field-ice, from the breaking up of the rivers in the interior, will sometimes gather, for a few days, in Cabot Strait, but it is rotten with the spring sun, and steamers can pass through. The last field in the gulf to open is the Strait of Belle-isle, where towards the end of June it becomes sufficiently free for ships to navigate. Navigation in the Strait is open to the first of December. In entering the gulf by Belle Isle allowance must be made for the exceptional variation of the compass, as it is 37° at Belle Isle and only 17° at Quebec.

Besides Prince Edward Island, which has been separately treated, the only islands in the gulf are Anticosti and the Magdalen group. There is a long chain of Labrador islands which cluster close against the north shore. Anticosti and some of the Magdalens are alone seen in the direct course in or out by Cabot Strait.

The geography of the gulf is sometimes confused by counting the Magdalens as thirteen small islands. There is a large island, narrow, and concave to the east, about 35 miles long, stretching in the same general direction as the north-east coast, and consisting of what are called Amherst, Grindstone, Allright, Coffin, Goose, and East Islands, but all these are connected by a double row of sandbars enclosing shallow lagoons. It is possible to drive at low tide from one end to the other, for although there are occasional inlets across the bars, they can be forded. The land rises in hills from 200 to 580 feet high, of red Permian sandstone like that of Prince Edward Island, and containing large deposits of gypsum. There is abundance of grass for cattle and sheep, but very little agricultural land. The appearance of the island on a fine day is very pleasing—cliffs of red sandstone, hills of yellow sand, a mantle of bright green grass, and clumps of dark green spruce combining to form a contrast of colour. Entry Island is a red sandstone rock 580 feet high, three miles off the inner south-east point, and Deadman's Island is a trap rock, 170 feet high, 8 miles off the south-west point. It is like a pyramid when seen end on, but its broadside is like a body draped for burial. The funereal nomenclature of this group is heightened by the fact that the islands were granted to Admiral Coffin. Tom Moore's imagination was stirred, on passing Deadman's Island, into bringing the Phantom Ship into the gulf, and other poets have followed him.

To Deadman's Isle in the eye of the blast,
To Deadman's Isle she speeds her fast :
By skeleton shapes her sails are furled,
And the hand that steers her is not of this world !

There are 13,326 inhabitants on the Magdalen Islands (kindly people, for the most part French), who get their living by fishing and sealing. They are never troubled with the Phantom Ship. The islands were known in the early times as *Les Isles Ramées* (the Ramea Island of Hakluyt).

Brion Island—so named by Jacques Cartier after his patron Philippe de Brion-Chabot, admiral of France under Francis I.—is 11 miles from the Great Magdalen. It is 4 miles long and 200 feet high on the north side. The red and gray sandstone so common in the gulf is seen here also. The soil is good, and there are a few settlers on it. Not far away are the Greater and Lesser Bird Rocks rising 105 feet from the sea, and white with sea fowl. It is not possible to land on the Bird Islands excepting in the calmest sea.

In the estuary of the river is Anticosti (referred to already), an island 122 miles long and 30 wide, and 2600 square miles in area. The south coast is low and monotonous; but on the north there are cliffs of white limestone rising to a height of 700 feet. The only harbour is at Ellis Bay, and that has but three fathoms of water. The island is encircled by a dense belt of dwarf spruce. The land is fair, but the crops are exposed to summer frosts, and there is very little good timber upon it. There are salmon in the streams and cod in the waters around, wild ducks and geese frequent its bays and inlets, and it is a famous place for bears, as its name indicates—*Naticostek*, “the hunting ground of the bear.” The island was purchased by the late M. Menier,

the chocolate manufacturer of France, who stocked it as a game preserve with wild creatures of many species, which had been hunted almost to extinction. An excellent monograph or description of the island has been prepared for M. Menier by Dr. Schmitt of Paris, in which topographical, geological, and other physical features of this important portion of the province are recorded. The population permanently residing on the island was 461 in 1911. In 1901 the population was 442.

The New Brunswick shore of the Gulf of St. Lawrence is uniformly low and wooded. The rivers empty into lagoons formed by bars and spits of sand; but there are no shoals or rocks. Shediac has a harbour of 18 feet water. There is also a good harbour at the mouth of the Richibucto. The Miramichi river is the chief place on this coast, and is a great shipping centre for lumber. The inner bay or estuary is 13 miles long by 8 miles wide. There is a depth of 15 feet over the bar at low tide, the water is deeper inside, and any vessel which can cross the bar can go up as far as the forks of the river.

The description of the north shore of the gulf is given in connection with the Peninsula of Labrador.

The River St. Lawrence

Much has been said of this stately river in Dr. S. E. Dawson's classic work, also in a preceding chapter; but, in describing the province of Quebec, it is necessary to revert to it, and to it one must always revert in thinking of Canada; for nowhere is there such another river, with an estuary so bold, with portals so grand, with water so bright, with scenery embracing every element of nobility and picturesqueness, from the solemn

gloom of the Saguenay to the sunny tangle of the Thousand Islands. Romantic memories cling to every islet and headland. Its broad waters were the highway to the great west, and opened up the continent to its very core. What the Nile was to the Egyptians, and more than the Rhine is to the Germans, this king among rivers is to the hearts of those born upon its banks.

The St. Lawrence is not like other great rivers which lose their identity in vast alluvial deltas where land and water are scarce discernible apart. Its banks are clear cut and sharp to the very ocean's rim, and, from the heart of the Atlantic, a broad and deep channel of 200 fathoms leads far up, as if to invite an entrance. Little need be said of the navigation of the river beyond the fact that, among the very few ports with sufficient depth of water to receive the *Great Eastern*, Quebec was one. Above Quebec the average width is two miles, and there the energy of the Canadians has so improved the natural channel that the largest ocean steamer which can cross the bar of New York harbour can steam up to the wharfs of Montreal at the foot of the rapids of Lachine. The St. Lawrence is, as Charlevoix well said, the most navigable of rivers. The strong tides assist vessels in entering or departing when the wind is contrary, for the winds are apt to blow directly up or down the river, being drawn by the highlands on both sides. At Quebec the spring tides rise $18\frac{1}{2}$ feet, so that it seems less a river than an arm of the sea. At Rivière du Sud it is 13 miles wide, at the Saguenay it is 20 miles, at Matane 30 miles, at Seven Islands 81 miles. Only 21 miles below Quebec the water is brackish and at Kamouraska it is fairly salt. In many of the old books and maps the St. Lawrence is called the River Hochelaga, and sometimes the Grand river of Canada.

At Pointe des Monts a stranger first realises that he is in a river, for both sides become visible. The St. Lawrence is 40 miles across at that point and very deep. On the north shore the coast is low and sandy; but 40 miles farther up it rises in places to 1000 feet, and continues high to the mouth of the Manikuagan river, where the mountains again recede. West of Pointe des Monts on the north shore the Godbout and Sheldrake, two noted salmon streams, fall in. Next follow the Manikuagan (224 miles long), and the Rivière des Outardes (234 miles), these are the largest southward flowing streams in this part of the province. They rise in the central water-parting of the peninsula. A shoal 16 miles long off the mouths of these rivers causes vessels to take plenty of room in passing. Farther up is the Bersimis, or Betsiamites, a river 112 miles long, often used as a route to the interior of Labrador. Many rivers, more noted as salmon streams than for anything else, fall in before the mouth of the Saguenay is reached. The Saguenay is, next to the Ottawa, the largest tributary, and in a line from its mouth across the river are Red Island in the centre and Green Island near the south shore, marking a change in the navigation.

The south shore of the St. Lawrence for a long distance from Gaspé is very high and bold, for the mountains rise up from the bank wooded to their summits, and there is little room along the river bank, excepting for small fishing hamlets. At Metis the mountains begin to turn away from the river, and cultivation commences. Little Metis is a favourite summer resort for Canadians. At Rimouski the mail steamers land their mails to be transferred to the Intercolonial Railway. Bic is the next point of note. Bicquette Island lies off the shore, and here the ocean navigation may be said to end, for it is the eastern cruising

ground for pilots, who are usually taken on there, although, in fact, there are no special dangers to navigation below Green Island opposite the Saguenay. The rivers falling in upon the south side are small.

Opposite the mouth of the Saguenay the river navigation commences, for the channel divides. Red Island is the beginning of a series of islands and shoals, such as White Island and Hare Island in mid-channel, although the river is yet 20 miles wide. Vessels usually take the south channel. The river bank is 50 to 100 feet high; the country is level, and there is a continuous line of farms up to Quebec. Cacouna, Rivière du Loup, St. Patrick, and Kamouraska, are favourite summer watering-places.

On the north shore at the mouth of the Saguenay the land again rises. The mountains skirt the shore, and near Murray Bay the scenery is very impressive. At Les Eboulements the mountains rise to 2551 feet, and continue around Bay St. Paul to Cape Tourmente, where they retire from the shore to form an amphitheatre round Quebec city. The northern channel of the river is deep and clear, but the south channel is usually followed, as the anchorage is better.

The south channel passes between Red and Green islands. Between Isle aux Coudres and Pointe St. Roch the channel again divides. Goose Island, Crane Island, and a cluster of other islands, narrow the deep water channel, although the river is 13 miles wide. Here is the Traverse, where the tides attain their greatest velocity, ebbing and flowing at the rate of 8 knots an hour. The tidal wave enters the estuary with a wide front, and off Gaspé runs at the rate of $2\frac{1}{2}$ to 3 knots. After passing the Traverse the beautiful and fertile island of Orleans divides the river into two channels, which unite at its upper end to form the great basin of the harbour of Quebec.

Geology

In describing the contour of the land in the more settled portions of Quebec three divisions were indicated: the southern or St. Lawrence plain, the northern or Laurentian area, and the south-eastern or Appalachian area. The southern plain is underlaid by Ordovician rocks in almost horizontal stratification. The lowest of the series is the Potsdam sandstone, resting directly, though unconformably, upon the contorted Laurentian rocks. It constitutes the first Eparchæan formation in this part of Canada. This is succeeded by beds of impure magnesian limestone, known as the Calciferous or Beekmantown formation. A series of highly fossiliferous limestones follows, representing the Chazy, Black river (and its subdivision of the Lowville), and Trenton formations. These limestones are widely distributed, and from Quebec to Kingston the cities are built of stone from quarries in these formations. The Utica formation which succeeds consists mainly of black bituminous shales, passing gradually into the Lorraine formation, where the shales cease to be bituminous, and mudstones occur. The greater part of the plain country is underlaid by these limestones and shales, the Potsdam and Beekmantown being found upon the margin. Outliers, and small masses of Silurian and Devonian strata, which formerly capped the Ordovician formations in the St. Lawrence valley, occur at St. Helen's Island, near Montreal. The volcanic hills rising above the plain have already been noted.

Archæan.—North of the plain to Hudson Strait and north of a line from Cape Tourmente, 30 miles below Quebec, to Lake des Chats on the Ottawa, the whole country is Laurentian up to and over the water-parting, until the Devonian limestones which slope down to

Hudson Bay are met. The peculiarities of the Laurentian country have already been described and need not be repeated, and, according to Dr. A. P. Low, consist of foliated hornblende and granite-gneiss, such as occur in the fundamental or *Ottawa* gneiss, overlaid by mica gneisses and mica schists belonging to the Grenville series. North of Montreal Island, Dr. Adams finds that the fundamental gneiss consists largely of igneous rocks, banded and foliated owing to the movements and arrangement amongst the constituents caused by pressure. These gneisses are penetrated everywhere by other igneous masses, including the anorthosite rocks, belonging to the gabbro family, with plagioclase predominant. These latter constitute the Norian or Upper Laurentian of Logan, Hunt, and other geologists, but they are known to cut the Grenville series, and are therefore post-Grenvillian eruptives. Nine-tenths of the Quebec peninsula of Labrador consists of Laurentian and Huronian rocks with here and there an outcrop of Keweenawan and Animikie formations. Dr. Bell observed in 1885 green chloritic schists and a compact steatite or pipestone ascribed to the Huronian system on the west side of Cape Wolstenholme. Lower Helderberg limestones occur near Cape Chidley, which, together with the Ordovician of Akpatok Island in Ungava Bay, indicate a paleozoic basin in the bay and strait. It must be observed that large portions of this northern country have not been examined critically, and Huronian rocks, for the most part mineral-bearing, are being found constantly in regions supposed to be solely Laurentian gneisses. Several large areas of intrusive anorthosite rocks exist, one—the most important—near St. Jérôme, north of Montreal, another near Lake St. John, another on the north shore of the river near Isle aux Coudres,

and several smaller areas in Labrador. Near St. Jérôme, north of Montreal, is the extensive and typical Morin anorthosite intrusion in the Archæan, the relations of which have been described by Dr. Adams of McGill University. His writings on the "Monteregian Hills," in the vicinity of Montreal, of which Mount Royal itself is one of the most typical and best known, have revealed a peculiarly interesting petrographical province where *nepheline-syenite*, and *essexite* intrusions with camptonite dykes and sills penetrate the palæozoic formations of the region. Mount Johnson, farther south, is an intrusive plug where magmatic differentiation is well exemplified. At Lake St. John there is an area of upper Ordovician rocks. In the gulf the island of Anticosti is mostly capped by Silurian strata, but has a northern border of upper Ordovician limestones referable to the Richmond formation, and the Magdalen group of islands is of Permian age.

Lake Timiskaming District.—The Quebec side of Lake Timiskaming, recently described by Dr. A. E. Barlow, consists of rocky hills with intervening clay flats around the lake, whilst farther inland large and extensive clay flats occur which have been cleared, and are at present occupied by a contented and prosperous farming community, the soil being good and yielding abundant crops in several townships. The Otter, Cameron, Duford, and Little rivers are the chief streams of this district. Lake Cameron and Sassaganaga are the largest, and, except in a part of Bailey and Laverlochère townships, lakes are of rare occurrence. The banded clays of the Pleistocene resemble those of Sweden. The geological succession is very similar to that of Ontario, and a table of the formations is here given covering both sides of the lake :—

QUEBEC.

Pleistocene.

Clays and sands (glacial banded clays and post-glacial deposits).

Silurian.

Clinton and Niagara.
(Limestones, shales, conglomerate and sandstone.)
Great unconformity.

PRE-CAMBRIAN.

1. *Upper Huronian.*

Quartzite and conglomerate.
No apparent conformity.

2. *Lower Huronian.*

Conglomerate, breccia and slates.
No deposits of economic importance yet found.
Great unconformity.

3. *Keewatin.*

Igneous complex, with some minor beds of altered quartzite, chiefly greenstones, quartz porphyries and porphyrites, much folded and disturbed.

Promising deposits of chalcopyrite, galena, and other sulphides with low values in gold and silver.

IGNEOUS.

1. *Post-Huronian.*

Diabase.

2. *Post-Keewatin.*

Granite (Laurentian).
This granite is intrusive into the Keewatin, but furnishes pebbles to the Lower Huronian conglomerates.

ONTARIO.

Pleistocene.

Clays and sands (glacial and post-glacial).

Silurian.

Clinton and Niagara.
(Limestones, sandstones, and conglomerates.)
Great unconformity.

PRE-CAMBRIAN.

1. *Middle Huronian.*

Lorraine arkose quartzite and conglomerate.
Unconformity (Miller).

2. *Lower Huronian.*

Conglomerates, breccia, quartzite and greywacke slates.
The cobalt-nickel-arsenic silver veins occur in this series.
Great unconformity.

3. *Keewatin.*

Igneous complex, mainly greenstones and quartz porphyries more or less folded and disturbed.

Occasionally some of the silver-bearing veins extend downward into this formation, but as a rule the high grade ores are replaced by chalcopyrite, galena, zinc blende and pyrrhotite in their downward extensions through these rocks.

IGNEOUS.

1. *Post-Huronian.*

Diabase.

2. *Post-Keewatin.*

Lorraine granite (Laurentian).
This granite is intrusive into the Keewatin, but not into the Lower Huronian.

Opasatika Region.—Lake Opasatika and the height of land are reached by way of Lac des Quinzes, up the Ottawa, Barrière Lake, and Lonely river, forming part of the Timiskaming to Abitibi canoe routes. This region forms part of the Laurentian-Keewatin peneplain, characterised by rounded hills, with flat areas between filled with clay. Along the divide between James Bay and the waters of the Ottawa, a number of very prominent Huronian elevations occur: notably—*Shiminis*, immediately east of the interprovincial boundary; the *Swinging hill*, between Opasatika and Island lakes; while the *Kekek* hills form an extended series some 500 to 700 feet above the general level—a conspicuous topographical feature in a comparatively flat country. Lakes abound, and numerous creeks passing through muskegs into rapids and waterfalls, reach Lake Timiskaming waters (Ottawa river expansion) by the Blanche river and Lac des Quinzes. Geologically speaking this country consists of Keewatin schists and greenstone, with granites and gneisses of Laurentian age capped by Lower Huronian conglomerates, greywacke, slate, and quartzite, into which are intruded Post-Huronian diabase, gabbro, and granite-porphry. The rocks of this district are very similar to those of Larder Lake, with this exception, that mica schist is much more abundant as a Keewatin constituent. Gold occurs on Fortune Lake in dolomitised porphyry, traversed by veinlets of dolomite and quartz, containing sulphides of iron and copper in small quantities. Assays of specimens have yielded high values in gold.

Appalachia.—South-east of the southern plain, and beyond the line of fault and dislocation already described as extending from Lake Champlain to Quebec, is the region of hilly Appalachian country extending to Gaspé. This is underlaid by an exceedingly complex series of

rocks of pre-Cambrian, Cambrian, Ordovician, Silurian, and Devonian age, which have been much contorted, folded, and many of the formations completely overturned. The "Quebec Group" of Logan and others, with its *Sillery*, *Levis*, *Lauzon*, and *Quebec* formations around Quebec city, characterised by special faunas of late Cambrian and Ordovician age, is noted for its abundant *graptolitic zones* and the variety and number of other forms in the shaly and limestone strata respectively. The writings of Hall and Lapworth on graptolites from Quebec are classic, and the determination of the geological horizons to which the various faunas were referable not only helped in solving intricate problems in Canada, but also indicated the close and remarkable parallelism which exists between the palæozoic formations of Western Europe and Eastern North America. The Skiddaw and Arenig, the Hartfell and the Llandeilo formations of Britain find their equivalents in Canada, in the St. Lawrence valley. Besides these, the Quebec Group, in its south-westerly extension, has yielded important results and geological facts in the Philipsburg, Bedford, Farnham, and Magog formations, and Dr. Selwyn was the first to recognise the significance of the three volcanic belts of the Sutton Mountain anticline and associated areas in what was held to be an altered Quebec Group series. These formations were the subject of a controversy extending over thirty years by leading geologists both in Europe and North America. These rocks have been very much altered, and among them are many important materials of economic value, including the mines of asbestos, the copper ores, and the quarries of slate, serpentine, and marble of the Eastern Townships. The asbestos deposits of Thetford, Black Lake, and East Broughton, in

the Eastern Townships of Quebec, are the most important in the world. They occur in a peridotite rock altering to serpentine, and the fibre is exceedingly fine and silky, commanding the best markets.

Silurian strata occur in Gaspé, at Port Daniel near Percé, on the Bay Chaleur (Chaleur Group of Billings), and again in the Eastern Townships at Stanstead, Compton, Dudswell, etc. In the centre of the peninsula of Gaspé, around the basin of that name, and coming out in bold cliffs at Cape Gaspé, is an area of Devonian rocks, constituting several geological formations and horizons from the base up; whilst at Escuminac Bay, on the Bay Chaleur side, there are remarkable fish-beds of Upper Devonian age. On St. Helen's island, near Montreal, on the Famine river, on the Etchemin river, and in the Lake Memphramagog basin, rocks of Devonian age occur referable to several distinct formations covering partially the whole of that system. South of this the Silurian rocks of New Brunswick extend into the southern part of Gaspé, while close along the shore of the Bay Chaleur is a band of Carboniferous rock in which, at the extreme edge of the province, a thin seam of coal has been found.

Pleistocene.—The Pleistocene of the province of Quebec consists of glacial and post-glacial deposits of sands, clays, etc., in the form of moraines, eskars, drumlins, terraces, and abandoned strands, characterised by the absence or presence of various organic forms which mark their origin. Alluvial and fluvial, as well as lacustrine deposits, occur throughout the province. The St. Lawrence valley and Labrador peninsula present land ice (till) formations, marine-glacial, and marine beds. The Labradorean ice-mass gave rise to the *Labrador* formation of till (land ice), whilst the *Cacouna* formation is characterised by fossiliferous marine

glacial deposits along the St. Lawrence valley from Cacouna to Montreal. The *Champlain* clays (Leda clays) are marine, and point to the period of submergence when the gulf waters extended far up the Richelieu, Ottawa, Gatineau, and other streams.

Highest Marine Beach.—In the valley of the St. Lawrence, where indications of a regional upwarping are found to be of great regularity, unbroken by dislocations or excessive uplifts of a local nature, the altitudes of the highest marine beach were ascertained at the following localities to be—

	Above Tide.		Above Tide.
Matane . . .	174 feet.	Tadoussac (delta top) . . .	406 feet.
Macnider . . .	243 ,,	St. Alexandre . . .	396 ,,
Little Metis . . .	248 ,,	Murray Bay . . .	433 ,,
Ste. Flavie . . .	272 ,,	St. Jean, Port Joli . . .	513 ,,
Sacré Cœur . . .	294 ,,	Montmagny . . .	543 ,,
Bic . . .	311 ,,	Chateau Richer . . .	591 ,,
St. Simon . . .	337 ,,	St Gervais . . .	623 ,,
Cacouna . . .	354 ,,	St. Gervais (2 miles west)	632 ,,
Rivière du Loup . . .	372 ,,		

At Montreal the upper limit of marine submergence is revealed on Mount Royal, where distinct beaches occur at several places. Sir William Dawson's highest beach at Côte des Neiges was 560 feet above the sea. The 575 foot terrace at Yamaska Mt. (Goldthwait) confirms Dawson's views. The highest marine shore line is seen in the vicinity of Quebec. A profile of the upwarped marine water-plane, drawn from north-east to south-west along the axis of the St. Lawrence valley, puts the top of the bulge not far west of Quebec city. Many beaches occupy lower levels and mark a period of uninterrupted emergence. A 20-foot terrace and sea cliff has been traced for nearly 200 miles, with slight variation, and forms a conspicuous feature worthy of notice.

Evidence of glaciation in the valley of the St.

Lawrence, such as striæ, roches moutonnées and erratics, seem to indicate a general south to north movement of the ice sheet, from a centre of dispersion situated in that Atlantic Peninsula lying between the lower St. Lawrence, the Gulf of St. Lawrence, and the Bay of Fundy.

Population

The population of the province of Quebec is given in the census of 1911 as 2,003,238. It increased by 354,340, or about 21 per cent during the previous decade. The natural increase of the French Canadian people is very rapid, but the mortality is high. They are, however, found in every quarter of the Dominion. The French Canadians are quiet, industrious, and contented. For carpentry, masonry, and the kindred trades they have a natural aptitude. A French Canadian will accomplish as much with an axe as a man of any other race with a full outfit of tools. They form a large proportion of the operatives in the manufactories of the cities. The more educated have a decided taste for literature, art, and politics, and not a few French Canadian politicians display powers of oratory peculiar to the race. The movement to the towns seems to be universal, and Quebec has not escaped it. The extent to which persons of French origin are distributed over the various provinces of the Dominion is furnished by a return according to the latest Census calculations, for the which I am indebted to the department of Trade and Commerce:—

Alberta	19,825	Quebec	1,605,339
British Columbia	8,907	Saskatchewan	23,251
Manitoba	30,944	Yukon	482
New Brunswick	98,611	North-West Territories	226
Nova Scotia	51,746		
Ontario	202,442	Total population of French	
Prince Edward Island	13 117	origin in Canada	2,054,890

The number of persons of origin other than French in the province of Quebec is 397,899. In 1871 the population was 1,191,516; in 1891 it was 1,488,535, whilst in 1901 it was 1,648,898. The province has thus increased 811,722 in forty years or about 68 per cent. Before the addition of Ungava to the province the population had increased from 4.69 to 5.69 per square mile in the last decade. The population is now about 2.8 per square mile. There was a rural gain of 39,951, and an urban increase of 318,863 from 1901 to 1911.

There are *four* civilised "Indian reserves" in the province of Quebec, namely: Caughnawaga, St. Regis, Oka, and Pointe Bleue. They are well worth visiting.

Education

Very difficult problems presented themselves to the statesmen of Canada in connection with education in the province of Quebec; for not only are 85 per cent of the population Roman Catholic, but 80 per cent speak French as their mother tongue. The subject is everywhere else a battleground for opposing theories of Church and State, and, in Quebec, unless the overwhelming majority of French Romanists had manifested the utmost consideration, the Protestant minority of 15 per cent would have found themselves after Confederation in a very uncomfortable position.

By the fundamental law of the Confederation, education is a subject within the exclusive power of the provincial legislatures, but the then existing educational status was guaranteed to the respective minorities, and it was also enacted that the Protestant minority of Quebec should have the same privileges enjoyed by the Roman Catholic minority of Ontario. This was not

satisfactory in every respect to the Protestants of Quebec, for they had been calling for amendments to the existing law. The question was likely to interpose obstacles to the consummation of Confederation, but all objections were removed by a promise made by the leaders of the Roman Catholic majority that the required legislation would be passed at the first meeting of the new provincial legislature—a promise which was faithfully redeemed. These additional conditions are therefore not guaranteed by the fundamental law, but exist under enactment of an overwhelmingly Roman Catholic legislation—a fact worthy of very especial note, and in the highest degree creditable to the majority.

It will not be possible to enter into the details of a system devised to meet difficulties so great. One leading feature is that all the public schools are religious, or to use a common phrase, denominational. There is a superintendent of education for the whole province, a non-political officer, assisted by a council divided into a Roman Catholic and a Protestant committee, each with a secretary who is the chief administrative officer for both classes of schools respectively. These committees meet separately as a rule, though they may, and occasionally do, meet together as the council. Each committee supervises the expenditure of the proportion of public money allotted to it, and each has its own normal school, and appoints its own teachers, and exercises control by the inspectors over its own schools under the general law. The legislative grant for higher education is divided according to population, the Protestants receiving one-seventh; whilst of the grant for normal schools the Protestants receive one-third, and the elementary school grant is divided according to population. This is supplemented by local municipal taxation through local trustees. In

the cities the tax-payers are divided into three panels. The money of Protestants is paid to the local Protestant school board, the money of Roman Catholics to the Roman Catholic board, and the taxes of corporate bodies, most of which are Protestant, are apportioned between them according to population.

Religious teaching is still a strong feature of Roman Catholic schools, but of late years there is a movement, which has met with much success, for more advanced, scientific, and technical schools with a staff made up in part, at least, of lay professors. The instruction in religion and morals given in "Protestant" schools is based on reading from the Old Testament, the Gospels, and the Acts, and the children commit to memory portions of the Gospels and Psalms, together with the Apostles' Creed, the Decalogue, and the Lord's Prayer. If the Protestant Committee wished to secularise their schools there is nothing in the law to prevent them doing it. The religious teaching is deliberately preferred and therefore enjoined. The educational system of the province has been founded upon the wishes and desires of the ecclesiastical authorities of both Roman Catholic and Protestant faiths; and although it may not be so perfect that it meets every case which can arise, it is worthy of study as a contribution to Christian toleration.

Government

The province differs from all its sister provinces, except Nova Scotia, in having a double chamber. The lieutenant-governor is, as in the other provinces, appointed by the Dominion Government. The legislative council, or upper house, consists of twenty-four members appointed for life by the provincial government of the day, and the

popular house, or legislative assembly, consists of seventy-four members elected for five years. The executive government is a cabinet ministry of eight members, responsible to the legislature and holding office so long as they command a majority in the popular chamber. French and English are spoken in the debates, but much more French than English is heard, and all public documents are printed in both languages. The civil law of the province is the civil law of France based on the Roman law, and it is codified in a compact and logical form. It was continued by the Quebec Act of 1774, and can be changed by the legislature of the province alone. The criminal law introduced by the same measure is English, and is uniform over the Dominion, while its principles are English it now rests on Dominion statutes. The municipal system of local government extends over the province, the elementary unit being called a parish in the French districts and a township in the English districts. Under the French régime the country was organised as it was settled into parishes under curés and, as in remote times in Europe, the ecclesiastical preceded the civil organisation. Although of recent years the erection and division of canonical parishes is frequently accompanied or preceded by a corresponding civil change, the ecclesiastical parish and civil municipality are not of necessity identical, but the intervention of the civil power must be invoked to secure civil results.

Law.—The law is administered by judges appointed, as in the other provinces, by the Crown, on the advice of the Dominion ministry. It is needless to add that the proceedings are conducted either in French or English, the lawyers speaking both languages with equal facility, and changing oftentimes abruptly from one to the other as the momentary phases of a trial may require.

The tenure of the land was originally feudal, grants having always been made *en seigneurie* according to the *Coutume de Paris* for the most part. The feudal system had its advantages; for every grant carried conditions of settlement with a penalty of reunion to the Crown domain. Every *seigneur* was interested to secure settlers at nominal rents, and the hardships of the condition of *seignitaires* were superstitions of the English imagination accustomed to another system. Nevertheless the feudal tenure became unsuitable to the social condition of the country, and in 1854 the Government bought out the rights of the seigneurs and changed the tenure to one of free and common socage.

Communications

The population of the province is settled mainly in the south and south-east, or valley of the St. Lawrence and its larger tributaries, the immense territory to the north being undeveloped. As the population advances it is followed up by railways, and, indeed, in very many instances the railways precede the traffic and create it. The total number of miles of track laid in 1910 was 3795, especially in the southern part of the province, but the distribution of the population is such that the people are well provided with railway service. The Grand Trunk, Canadian Pacific, Intercolonial, Canadian Northern, National Trans-Continental and their branches; the Quebec Central, Temiscouata, and other railway lines and their branches, supply a prompt and effective service both in the more settled portions of Quebec and the forested region. Steamers ply on the rivers, and there are excellent connections with all parts of the world. All these communications centre at Montreal

or Quebec, and the channel between Quebec and Montreal has been dredged and carefully buoyed at great expense by the Dominion government. The river channel is now lighted at night, so that ships need not wait for daylight to navigate it.

The Allan, Canadian Pacific, Cunard, Royal, Donaldson, and White Star Dominion lines are all engaged in the Canadian, British, and European continental service for passenger and freight service, besides a large number of other lines for freight business only. Montreal is 900 miles from the Atlantic seaboard, and yet is 300 miles nearer Liverpool than New York City. The continents of Europe and North America get closer together in the northern latitudes; and, although ice is met and occurs along the shorter northern route, under ordinary Canadian precautions, little or no danger exists. To the people of the north icebergs are a terror, and consequently attention and care in navigation is followed. By the recent opening of the Atlantic, Quebec, and Western Railway to Gaspé Basin, the extreme eastern end of the Gaspé Peninsula, in the province of Quebec, has been given the railway communication which has been looked forward to for so many years.

Starting at Matapedia, on the Intercolonial, the Quebec Oriental Railway, formerly the old Baie de Chaleur Railway, and subsequently the Atlantic and Lake Superior Railway, runs to New Carlisle, 98 miles from which point the Atlantic, Quebec, and Western Railway has been built to Gaspé Basin, 104 miles, a total of 202 miles. The whole route from Matapedia to Gaspé is most picturesque, with a charming variety of scenery, embracing the Baie de Chaleur, the Gulf of St. Lawrence, and Gaspé Bay, and the wooded mountainous country reclining back from the shores, which offers great attrac-

tions to tourists where salmon and trout, moose and caribou, as well as a great variety of birds, occur.

With a fast steamship ferry service to the southwestern extremity of Newfoundland, a rapid railway service to the east coast of the island connecting with fast trans-Atlantic steamers (the shortest, quickest, most picturesque, and probably the very safest all-year-round route), a fast all-Red Line would thus be established. The comparatively fogless area to the north-east of Newfoundland commends itself to navigators. Such a line is now under consideration and expects to be realised before many months have elapsed.

The shipping business of the province, inland and ocean, is best seen in the statistics of the port of Montreal where nine-tenths of it is done. The rivers are great highways in summer as well as winter, and steamboats of all sizes ply on the inland waters during the open season, from the large and luxurious steamers on the passenger routes from Quebec to Toronto to the smaller craft upon the smaller rivers. It is an accepted fact in Quebec that a load 40 per cent greater in winter than in summer can be hauled over the ordinary snow and river roads of the colder portions of the country, so that the winter season is an exceptionally favoured one for heavy haulage in forest, mine, or quarry. Some of the finest roads of the province in winter are those of the pine forests in the north country. The province counts 2600 post offices where the estimated number of registered letters amounted in 1913 to 2,728,000; letters posted, 108,975,000; and postcards numbered 7,386,000.

Agriculture

The St. Lawrence provinces of Canada have, from their first discovery, been noted for their agricultural

wealth. Jacques Cartier in 1535 marched to the Indian town which occupied the site of the present city of Montreal, through "the fairest and best countrie that possibly can be seene," "through goodly and large fieldes full of such corn as the countrie yieldeth. It is even as the millet of Bresil, as great and somewhat bigger than small peason, wherewith they live even as we do with ours." In the midst of these fields "is the city of Hochelaga," "tilled round about very fertill." The old English of Hakluyt's translation reproduces the spirit of the narrative better than more modern English. Cartier had never seen maize before, and he walked through fields of it growing on the land now occupied by the busy streets of Montreal. That was 379 years ago, and ever since then seed-time and harvest has never failed in Canada for the growth of maize—a crop which will not ripen in England.

The wise Talon—Intendant in 1665-68 and in 1670-72—saw the capabilities of the country, and wrote of them to the king, pointing out how the surplus wheat, lumber, and fish products might afford a much-needed supply to the French West Indies. At the beginning of the present century the centre of the wheat-producing country of America was in the Richelieu valley. There were large exportations by the Richelieu valley to Vermont and the neighbouring states, as well as from Quebec by sea. But the richest soil will not endure the same crop for a hundred years, and the centre of wheat culture moved steadily westward to the virgin soil of the Red River valley and the boundless prairies of Saskatchewan and Alberta. The valleys of the Richelieu, the Ottawa, and St. Lawrence are now renewing their youth with mixed farming, and, while it is impossible to compete in wheat growing with the new

North-West, the proximity to a market gives the Quebec farmer an advantage in other crops. There are 14,444,175 acres of land occupied in the province, of which 7,439,941 acres, or 51 per cent, are improved. The grain crops for 1913 gave the following returns:—

Crop.	Acres.	Bushels.
Spring Wheat	58,000	1,054,000
Oats	1,303,000	39,025,000
Barley	89,000	2,263,000
Rye	10,000	156,000
Peas	26,000	451,000
Buckwheat	110,000	2,560,000
Mixed Grains.	101,000	2,867,000

Hay is also a staple crop in the province of Quebec, and is extensively exported. All the ordinary crops are produced—wheat, barley, rye, oats, maize, peas, together with pumpkins, melons, tomatoes, potatoes, and other vegetables grown in temperate climates. Fruits, such as apples, plums, cherries, and pears are raised in large quantity. There are 10 experimental fruit stations in the province. The Montreal district is famous for its “fameuse” apples, and melons. In the district of Quebec are also good orchards of apple, plum, and cherry, especially is this the case on the Island of Orleans, at St. Roch des Aulnais, etc. Grapes are grown in the open air near Montreal, and by the census of 1911 the annual production of tobacco grown in the province was over 6,000,000 pounds. Maple sugar was produced in the same year to the extent of 14,300,000 lbs. Much attention is given to stock raising and dairying. The last official returns (1911) report 2142 cheese factories and butter creameries in the province.

While the summer has never failed to ripen the crops

(and nowhere out of the tropics can more than one crop a year be harvested), the winter is not an idle time for Canadian farmers. The snow makes good roads everywhere, and it is the season for hauling wood or produce. The melting snow in the spring aerates the soil, and land ploughed in the fall is pulverised by the relaxing frost. Those who fancy that country life in winter is dreary are mistaken. A native writer describes it as follows:—

“In the country one can go everywhere upon snowshoes, but chiefly is it a delight to walk in the woods in winter. The snow covers the rough places with an even white carpet, and the heaviest wind is shut out by the branching trees. The stillness and solemnity of the woods in winter cannot be described to those who have not experienced it. There is, however, no lack of life there. The field-mice and the hares and the squirrels and the partridges are busy enough, as their tracks on the snow testify. They seem to be always visiting. It is warm for them under the snow, and they enjoy their winter life.

“Then, in the open there is abundant enjoyment for the eye. The light of the winter sun is made the most of. It is not swallowed up by a black and gloomy landscape, but reflected and redoubled from the earth’s snowy raiment into changing gradations of white as the clouds float over the blue sky or the sunset tinges it with faint rosy hues. There are numberless tints of white of indescribable delicacy, always gliding over the snowy fields.”

Forests

The forests of the province have been treated of elsewhere. They have an area of at least 450,000 square miles. There are 6,000,000 acres in private

hands, 45,000,000 acres are under licence to lumbermen, and the balance is in the hands of the legislature. It is, however, of interest to observe that the legislature has set apart the Laurentides National Park "to preserve its forests, fish, and game, to maintain an even water supply, and to encourage the study and culture of forest trees." The park is directly to the north of Quebec city in the counties of Quebec, Montmorenci, and Charlevoix, and is on the head waters of streams flowing into the St. Lawrence, the Saguenay, and Lake St. John. It covers an area of 2640 square miles, or 1,689,400 acres. The lakes and streams abound with trout; partridges are plentiful, and a portion of the park is noted as a hunting ground for caribou. A large forest area north of Montreal, near Trembling Mountain, has also been reserved for the same purposes. Other forest reserves and parks in the province include:—

Laurentian reserve, 900 square miles; Bonaventure and Gaspé reserve, 1733 square miles; Rimouski reserve, 1249 square miles; Peribonka, 3500 square miles; St. Maurice reserve, 27,652 square miles; Ottawa Reserve, 27,652 square miles; Saguenay and Labrador, 109,360 square miles; Gaspé Park, 2500 square miles; besides others, which in all aggregate 180,342 square miles.

In 1911 there were 672,288 cords of pulpwood used in Canada amounting to over 86,000,000 cubic feet. Half of the mills are in the province of Quebec, and it furnishes half the pulpwood, Ontario the third. The total value of the Canadian mill was \$4,338,024.

The recent developments in the applications of wood fibre in the arts have a most important bearing on the industries of the province, for the forests of available pulpwood in northern Quebec are practically inexhaustible,

and the water power is almost unlimited. Large and extensive mills have been erected in different parts of the province to manufacture for export; and as a ton of pulp costs nearly twice as much in the United States as it does in Canada, there is a big demand for the home product.

Manufactures

Whereas in 1906 there were 4965 manufacturing establishments in the province of Quebec, representing a capital outlay of \$255,479,662, in which 108,918 persons were employed, earning \$38,703,763, and producing articles valued at \$219,861,648; the value of the manufactured products of the province of Quebec for the year 1910 was \$350,901,656; whilst in 1900 it was \$158,287,994, showing an increase of over 121 per cent for the past decade.

Minerals

The mineral wealth of Quebec is as yet undeveloped. Gold placer deposits in the Chaudière valley (Beauce) yielded nearly \$2,000,000 in coarse gold in a distance of two miles along the Gilbert river, between the years 1863 and 1878.

From recent investigations by Dr. J. A. Dresser in the Eastern Townships, copper, talc, platinum, antimony, and chromite, besides asbestos, occur in the "Serpentine Belt of Southern Quebec." The discovery of asbestos in commercial quantities in this district dates from 1877, and operations are carried on at Thetford, Black Lake, and Danville. Fifteen mines were in actual operation at the close of the summer season of 1908.

whilst a number of properties are under development. This substance yielded 136,195 tons in 1913, valued at \$3,825,959.

MINERAL PRODUCTION OF QUEBEC FOR THE YEARS 1912 AND 1913.

Product.	Production in 1913.		Value in 1912.
	Quantities.	Value.	
Asbestos Tons.	136,195	\$3,825,959	\$3,059,084
Asbestic "	28,371	20,245	23,358
Copper and sulphur ore . . "	89,345	866,774	631,963
Gold Oz.	738	14,794	19,924
Silver "	36,392	21,791	14,591
Ochre Tons.	5,987	40,868	32,010
Mica "	...	117,038	99,463
Phosphate Tons.	360	3,506	1,640
Graphite Lbs.	206,000	9,620	50,680
Mineral water . . . Gals.	77,313	31,728	39,854
Titaniferous ores . . . Tons.	4,981	9,824	4,024
Slates Squares.	1,337	6,286	8,939
Cement Barrels.	2,881,480	3,361,292	3,098,350
Magnesite Tons.	...	...	9,645
Marble "	...	120,541	252,041
Granite "	...	482,338	358,749
Lime Bushels.	1,656,610	452,330	455,570
Limestone "	...	1,570,455	1,363,555
Bricks per M.	156,358	1,272,092	1,284,232
Tiles, drain, and sewer pipe, pottery, etc. . . .	...	326,165	203,100
Kaolin Tons.	253	4,354	520
Feldspar "	74	1,554	2,200
Peat . . . . "	...	...	2,000
Sand "	...	343,750	170,600
Quartz "	900	2,363	...
Zinc and lead . . . Tons.	335	7,370	...
Sandstone "	...	5,072	...
Phonolite and Flagstone. .	...	...	1,018
Total . . . .	...	\$12,918,109	\$11,187,110

Statistics for 1913, by Mons. T. Denis, geologist, show that Quebec's mineral resources gave employment to 9140 men, whose wages amounted to \$4,450,410.

The total value of the geological resources of mine and quarry for each of the past ten years in the province of Quebec is as follows:—

Year.	Value.	Year.	Value.
1904 . . .	\$3,023,568	1909 . . .	\$5,552,062
1905 . . .	3,750,300	1910 . . .	7,323,281
1906 . . .	5,019,932	1911 . . .	8,679,786
1907 . . .	5,391,368	1912 . . .	11,187,110
1908 . . .	5,458,998	1913 . . .	12,918,109
Total production for ten years . . .			\$68,304,514

Iron ore deposits are known throughout Ungava or northern Quebec:—(1) along the Kaniapiskau, about 40 miles above the mouth of the Larch river; (2) near the mouth (north) of Payne river, west of Akpatok Island in Ungava Bay; (3) on Dyke Lake (1675 feet above tide), being the head-waters of the Hamilton river; (4) at Moars Bay, north of the Hudson Bay Company's fort at the mouth of the Eastmain river; (5) Eastmain river, at a point about 100 miles above its mouth; (6) James Bay, east shore, about 40 miles north of Moars Bay; (7) Long Island, some 20 miles north-east of Cape Jones at the entrance to James Bay; (8) Nastapoka Islands, near the mouth of Nastapoka river; (9) Islands, some 20 miles to the south-east of Portland Promontory.

Copper, iron, and gold are worked, but not to any great extent in recent years. Mica and graphite are abundant, and apatite exists in large quantity, but the export has ceased.

Fisheries

The total value of Quebec fisheries for the year ending 31st March 1913 was \$1,988,241. The fishing outfit was valued at \$1,440,114, and the total

number of persons employed was 11,386. Amongst the principal items the following are noted:—

Cod, fresh and dried	Valued at \$862,283
Mackerel, salted	„ 62,952
Lobsters, shell and canned	„ 363,227
Salmon, fresh, canned and salted	„ 103,042

The inland fisheries of the province, which include salmon, trout, whitefish, bass, pickerel, pike, sturgeon, eels, perch, maskinongé, herring, shad, and other kinds of fish, for the year 1912-13 was valued at \$115,850. The Eastern Townships' division supplied fish during 1911-12 amounting in value to \$34,429. Official reports state: "there is considerable illegal fishing indulged in night and day, on every day of the week, Sunday included, and with all kinds of nets;" and "the law is completely ignored" in divers parts of the province. This is a condition of affairs of incalculable harm to the fisheries of the province.

Subdivisions of the Province

In order to give a more detailed account of a province, which in area is twice as large as France, it will be convenient to subdivide it into districts, and the most convenient division is the following:—

(1) Southern or Quebec Labrador; (2) The Saguenay region; (3) The Ottawa and St. Maurice region, north of the river; (4) The Gaspé district; and (5) The Eastern Townships, south of the river; (6) Quebec and the surrounding district; (7) Montreal and the surrounding district; which are in the southern plain.

1. **South-Eastern Quebec.**—The peninsula of Labrador is treated separately in a subsequent section; whilst the object of the present is to describe that southern

portion of the peninsula forming the belt of country rising to the central tableland. This is highest at its southern side, and the rivers flow down the comparatively narrow southern watershed in violent rapids and cascades. The general height of the tableland is 1500 to 2000 feet, but on the southern side it frequently rises to 2240 to 2500 feet, and the rivers have cut deep chasms through the rock in their precipitous course. On the coast-line, wherever trees may find soil to grow, they are of stunted growth, but at a little distance back there is a continuous forest, of which black spruce is by far the most abundant tree. The others are aspen poplar, Banksian pine, balsam poplar, cedar, white spruce, paper birch, larch, tamarack, and juniper. The trees, however, do not reach any great size. The edge of the central tableland on its southern side runs in the general direction of the shore of the gulf and estuary at a distance varying from 50 to 150 miles. The ascent to the high land of the interior is difficult, for the country is rough and tangled. The Montagnais "Indians" descend from the interior chiefly by the St. Augustine river on the east and the Bersimis on the west; but, at best, the task is laborious, and the mosquitoes and other flies are, when in season, quite phenomenal in activity.

The Strait of Belle-isle, the northern entrance to the Gulf of St. Lawrence, is 35 miles long, with a width of 10 to 15 miles. The water is deep—50 fathoms on an average—and the strait is clear of rock or shoal. Recent surveys have shown that there is not, as has been supposed, a constant current setting inwards, but that the Arctic current passes the strait to flow down the outer coast of Newfoundland. The current has been shown to be mainly a tidal one, and to be affected by the prevailing wind. Nevertheless, although the current flows sometimes out

and sometimes inwards, there is a preponderance in the direction inwards, and this would seem to be proved by the fact that icebergs have been seen off Natashkwan Point. The strait is within the jurisdiction of Newfoundland, but the lighthouses are maintained by the Marine service of Canada.

The boundary of Quebec is at Blanc Sablon harbour, at the inner end of the strait. It would seem to have been a resort for fishermen in very early times. A little river at the head of the bay has formed a beach of white sand, which, on a coast of rock, is unusual enough to give a name to the bay. It is 800 miles distant from Quebec city. The port is much frequented in the fishing season, and there are, besides, several permanent establishments with about 200 residents. The boundary is drawn just west of the port, which thus belongs to Newfoundland. Greenly Island, at its entrance, is still, as described by Cartier, "the island of birds, in which there is great store of godetz and crows, with red beakes and red feete, they make their nestes in holes under the ground even as conies." These are the Arctic puffins, and they are as numerous now as in 1534. This northern arm of the gulf was frequented in early times, and known as La Grande Baye. It is remarkable that although Pedro Reinel, in 1505, showed the strait by unclosed lines, and although several later maps indicate its existence in the same way, Newfoundland was thought a part of the main continent until Jacques Cartier's second voyage, when he sailed out by Cabot Strait.

Bradore Bay, the next harbour, was known to the French first as *La Baye des Espagnols*, and afterwards M. de Courtemanche, who obtained a grant of it in 1702, called it Phelyppeaux Bay. It was an early resort of Basque whalers from San Sebastian in Spain, for there

was no whaling ground in those days like the Grand Bay.

Eskimo Bay, the next great bay, was called Old Fort Bay in early times, and in it is an island still called Old Fort Island. This was the harbour of Brest, and Cartier sailed to it as to a known port, and farther on he found a vessel from Rochelle looking for it. It must not be supposed, however, that it was anything but a resort of fishermen in the summer season.

The coast between Blanc Sablon and Cape Whittle is very rocky and bold, and deeply indented with harbours; but it is skirted by a maze of rocky islets among which no vessel of any size may safely venture without a pilot who knows the coast. It is entirely bare of trees—stunted spruce and birch may be found at the heads of the inlets, but only moss on the rocky coast. Jacques Cartier's remark that he did not see a cart-load of earth on the coast is not too strong. The mainland is generally high. The hills about Bradore are 1264 feet, and the average height of the land is about 500 feet. The Eskimo, St. Augustine, and Mekattina are large and powerful rivers tumbling down in falls and rapids from the inner tableland.

The coast from Cape Whittle to Pointe des Monts turns sharply to the westward, and the land gradually falls, but it is still sheltered by a maze of rocky and barren islets of all sizes. The chief rivers are the Olomanoshibo, the Natashkwan, the Romaine, the St. John, the Mingan, the Magpie, the Moisie, the Pentecost. At Natashkwan the river makes a long and sandy promontory, and there, as well as on many other places along the coast, the sand is so full of iron that ships' compasses are affected. Natashkwan had a population of 400 in 1911; and Magpie, from Moisie to

Mingan, 1600. Mount St. John is the highest point on this part of the coast, and it is an isolated peak 1416 feet high. As the coast passes west there are low cliffs on the shore, but inland the land is high. The harbours are few and suitable only for small vessels. Mingan, however, has a very good harbour, and at Seven Islands there is an excellent harbour for large ships. From Seven Islands to Pointe des Monts the coast is quite low and the high land distant. At this Point there was a population in the year 1911 of 1205 souls.

As the shore proceeds west from Cape Whittle it becomes more wooded, but the timber is spruce, and birch of small size. The climate moderates, and cultivation of the soil is carried on to some slight extent. All the rivers are famous for salmon, and they are all leased by wealthy people who go down in the fishing season. The number of settlers is small; there are Hudson Bay Company's posts at different points, and a few scattered families along the coasts, at the sealing, salmon, and fur-trading posts. As far as St. Augustine they speak French, but east of that point English begins to prevail. At Eskimo Point is one of the largest settlements on the coast. It numbers 838 souls, who are supported by fishing and sealing. St. Geneviève Bay near there was called by Cartier "St. Lawrence Bay," and from it the name gradually spread over the whole gulf. Egg Island is noted as the place where Sir Hovenden Walker's great expedition for the conquest of Canada was wrecked in 1711, when eight transports and eleven hundred lives were lost.

Climate.—The climate is severe; although, as the coast is continually trending to the southwards, it gradually decreases in severity from Blanc Sablon to Pointe des Monts. There are no meteorological stations along the coast for

a very long distance from Blanc Sablon. In sheltered spots along the coast, turnips, cabbages, and potatoes grow, though not to a large size, but the settlers keep cattle; for, a coarse though sweet grass grows abundantly in places where the land is level, and this grass will grow quite early in the spring and attains some length before the snow disappears. Although the climate is severe, it is more from deficient heat in summer than excessive cold in winter. Mr. Stearns, who resided at Eskimo Bay in winter, did not observe the thermometer go lower than -27° , and he adds that on the majority of winter days the mercury hardly reached zero. The winter he passed on the coast was said by the residents to have been unusually mild. There is no meteorological station nearer than Belle-isle which is north of Blanc Sablon.

MEAN TEMPERATURE AT BELLE-ISLE

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
-6.1	6.6	14.3	26.3	35.5	40.8	55.9	55.1	48.3	38.7	29.1	13.1

The mean annual temperature for the Strait is $29^{\circ}61$.

The highest point recorded was 70° in August. The readings throughout the summer were usually 55° to 60° . The lowest point in winter was -21° , but all through January the mercury only once rose to $+8^{\circ}$.

In summer the coast is frequented by many fishing and trading vessels. Sometimes at Bonne Esperance Bay there are as many as 100 schooners at anchor at one time. The residents on the coast live by the fisheries in summer. In winter they trap and hunt, and in spring they hunt seals on the ice. The furs of this portion of the province are of excellent quality, and include those of the black, silver, cross and yellow fox, beaver, marten, mink and bear. Caribou are plentiful in the interior, and the bays and islands are the breeding-ground of

ducks and geese innumerable, while the seas abound with fish. The climate does not seem to incommode the inhabitants, who, with all their hardships, obtain a far better livelihood than the poor of great cities, and they are really attached to their free and adventurous life. There is a mail once a month in winter as far as Blanc Sablon. Travel in winter is by dogs over the snow and ice when the inlets freeze, for there are no roads.

2. **The Saguenay Region.**—The savages who greeted Jacques Cartier told him there were three kingdoms in the country—Saguenay, Canada, and Hochelaga, and in fact the Saguenay region has always been kept, as it were, apart from the rest of Canada. Under the French régime it was *Le Domaine du Roi, Traité de Tadoussac, Postes du Roi*, and was leased to contractors or companies. Under the English régime it was known as the King's Posts, and leased to the Hudson Bay Company. Tadoussac, at the mouth of the river, was a trading post before either Port Royal or Quebec was founded. Even before A.D. 1600, when Pontgravé and Chauvin traded there, the Basques frequented the river for the whale fishery, and, at l'Echafaud aux Basques, a little beyond the mouth of the Saguenay, remains have been found of their utensils for rendering blubber. The name Tadoussac signifies *knolls*, the French equivalent being *mamelons*, from the shape of the neighbouring hills.

The river Saguenay is remarkable for its immense volume and great depth. Inside the bar the depth is from 100 to 145 fathoms. There is not a rock or shoal, and it is navigable for the largest ship afloat to Point Roches, 57 miles from the mouth of the river. Small vessels may go up to Chicoutimi, 6 miles farther. The lower Saguenay is the sternest and gloomiest stream in



TADOUSSAC, SHOWING THE MOUTH OF THE SAGUENAY RIVER.

Notman, Photo.

the world. It is more like a profound mountain loch, with a width of from three-fourths of a mile to two miles of water, black with the shadow of savage cliffs rising sheer 1000 to 1800 feet from the sullen surface. The cliffs are bare; for fire has swept away such forest as the scanty soil would permit to grow and left only the charred spikes. Wooded valleys run up between the



Notmum, Photo.

CAPES TRINITY AND ETERNITY, RIVER SAGUENAY.

hills along the little tributaries, but they also are dark and gloomy. The savage grandeur of the scenery culminates at Capes Trinity and Eternity, the southern and northern headlands of Eternity cove. Gloomy and grim as fate, these terrible cliffs frown over the black abyss of water; and the report of a gun, which is generally fired from the tourist steamers in summer, reverberates in numberless explosions from cliff to cliff round the bay, and far up and down the black river.

From Ha Ha, or Grand Bay, a valley of good land

opens up westwards by Lake Kenogami, and the country around Chicoutimi is fertile. It is a prosperous little town with a college and a bishop's see, and is a good point for shipping lumber. Above Chicoutimi is Le Grand Remoux, a series of rapids which stop further navigation.

The Saguenay is the discharge of Lake St. John, an almost circular basin 28 miles by 20, with an area of 365 square miles. It is 314 feet above the sea, and the river passes out in two tremendous rapids—La Grande, and La Petite Décharge. From the point where they unite it is possible for a skilful boatman to go down the river in a canoe without a portage to a point 12 miles above Chicoutimi. The river runs its rapid course between hills 300 to 500 feet high, clothed with maple and birch and other deciduous trees; nor is there anything of the gloom of the lower river.

Lake St. John is a shallow lake surrounded by high hills, protecting it from the raw east winds. The country around is fertile and settled by a contented population of farmers. Many considerable rivers empty into the lake. The longest, the Ashuapmucuan (where we watch the deer), is considered as the upper course of the Saguenay. The other rivers are the Mistassini, the Peribonka (water flowing through sand), the Metabetchouan (coming out as a rapid), the Ouatchuan (see the falls), and several others of minor importance. These two last streams descend in cascades from the mountains. The fall of the Ouatchuan is visible from the lake as one mass of white foam against the hillside 236 feet high. In the spring, when the snow melts and all these rivers rise in flood, the Saguenay is not able to discharge all the water, and the lake rises 20 to 27 feet.

Far up in the interior, 270 miles north-west of Lake

St. John and 110 miles beyond the height of land, is the great Lake Mistassini, the largest lake in Quebec. The water-parting at this point is 1200 feet above the sea, and if the ascent is laborious the portage across is only half a mile. Mistassini is practically two parallel lakes divided by a range of islands in the centre—the western is 90 miles long, and 13 to 17 miles wide; the eastern is 60 miles long and 5 to 10 miles wide. It is reached by the rivers flowing into Lake St. John, and drains by Rupert river into James Bay. The adventurous Jesuit, Father Albanel, passed to Hudson Bay by this route in 1672. Lake Mistassini is 300 to 400 feet deep. The soil around the lake is good enough, but the summer is too short for crops. The lake is on the height of land, and the trees do not attain full size. It is full of fish—lake trout, river trout, whitefish, pike, and pickerel—and these are the main support of the Indians. Ducks and geese abound in their season, but the caribou have been hunted to extinction.

3. The Ottawa and St. Maurice Districts.—On the north shore of the St. Lawrence the settlements have not penetrated any distance into the Laurentian plateau. Except along the National Transcontinental Railway, and in a few mining and lumber camps, the enormous territory between the head-waters of the Saguenay and Ottawa is still a wilderness. In the summer season the innumerable lakes are visited by anglers, and far up the lumbermen in winter carry on their operations by felling the trees for floating down when the snow melts and the rivers rise in spring. The country has all the wild charm characteristic of Laurentian country. It is covered with forest, but the streams penetrate everywhere, and the lakes expand into still pools. The great rivers interlock at their heads so that it is easy to go up by the Saguenay

waters from Lake St. John and portage into the Migiskan, the St. Maurice, the Gatineau, or the Ottawa. From this treasury of sparkling waters flow innumerable streams, each with its rapids and falls. Only a few can be mentioned. Visitors from Quebec may see the falls of St. Anne, or Sault à la Puce, or St. Féréol. Close to Quebec are the beautiful falls of the Montmorenci, 224 feet high. West of Quebec are the Jacques Cartier and the St. Anne, and the Batiscan, all charming streams of sunny pools and impetuous rapids. At Three Rivers the St. Maurice falls in—an important river 300 miles long. About 25 miles from the town it throws itself into a chasm by a fall of 150 feet—the Shawenegan Falls.

Many other rivers fall in to the westward—the Loup, the Maskinongé, the Assomption, the Achigan, all lumbering streams. North of Montreal the rivers turn towards the west and flow into the Ottawa. Settlements extend 100 miles north of Montreal into the Laurentides, for there is good land in the valleys of the streams and lakes. A railway now leads up to Trembling Lake, and the cottages of summer visitors are seen on the lakes beside the pioneer farm-houses. In the pure clear air of these highlands, as at Ste. Agathe and other localities, is a veritable sanatorium for weak lungs.

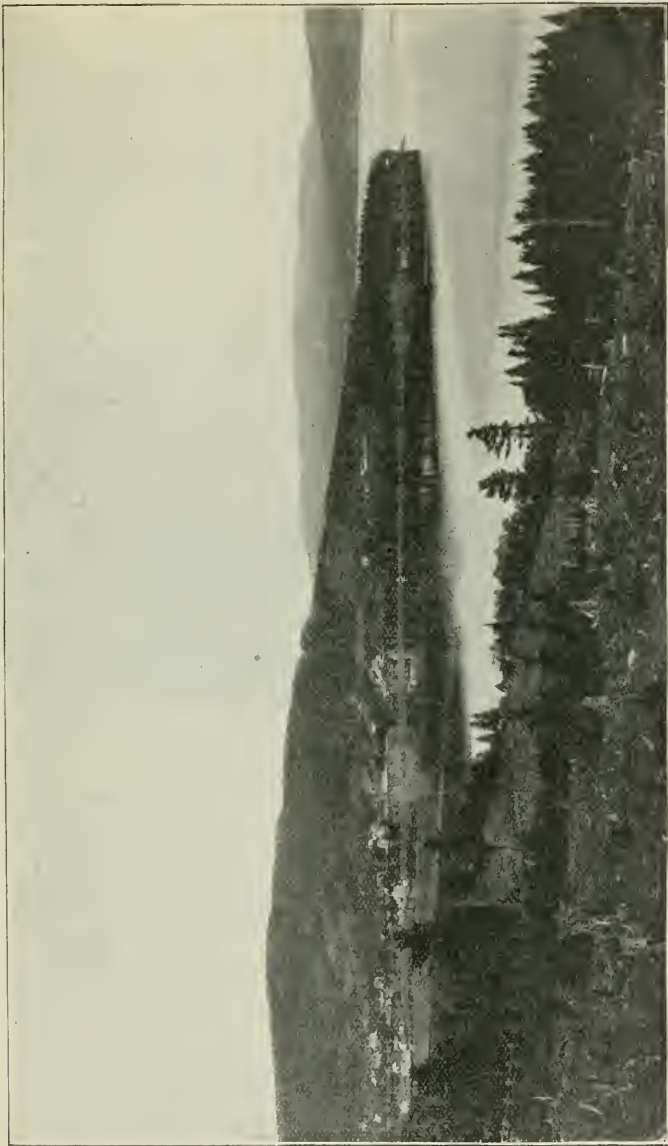
The Ottawa River.—This is the largest tributary to the St. Lawrence. It is 780 miles long and drains an area of 80,000 square miles. It rises in small lakes very near the intersection of 48° N. lat. and 76° W. long., and before it enters Lake Timiskaming it flows to almost all points of the compass in succession through lakes and rapids, and receives the waters of more than twenty large tributaries and innumerable small ones. The Grand Lake Victoria, a large lake 700 feet above

the sea and of very irregular form, is in its course, but it takes its final direction on leaving Lake Timiskaming (deep water), and that lake is practically the head of the river. As its name purports, it is very deep. It is 585 feet above the sea, 1 to 5 miles wide, and 75 miles in length. It is 233 miles above Ottawa city, and may be reached by railway. The land round the head of the lake is settled by farmers. The scenery on the lake is very fine. All over this region are forests of red pine, white pine, maple, elm, ash, birch, spruce, poplar, and cedar. The Ottawa is not by nature a very navigable river, but there are steamboats on the lake and on all the quiet reaches between the interruptions to navigation. There is abundant and sufficient water-supply, however, for canal and lock purposes, and the Georgian Bay Canal route has been surveyed and examined, all along the Ottawa river as far as Mattawa, and found most favourable for uninterrupted navigation from the great lakes to the sea by way of Lake Nipissing, and Ottawa city. The Canadian Pacific railway runs along its bank as far as the lake. From the foot of Lake Timiskaming the Ottawa is a series of rapids to the junction of the Mattawa, 508 feet above the sea. After a stretch of quiet water the Roche Capitaine and the Des Joachims succeed, and, with a total drop of 148 feet, the Ottawa enters into a gorge of high rocky walls on the north, and steep sloping banks on the south, known as the Deep river. It is here a mile wide, and so deep that rafts with 100 fathoms of chain cannot anchor in it. The river then divides at Fort William, an old Hudson Bay Company's post, and encloses a large island—Allumette Island—after which it flows through rapids into Lake Coulonge. After another quiet reach, another series of rapids follow, and the river drops through 135

feet to Portage du Fort at the head of Lac des Chats. This lake is 50 miles long, and at its foot the river flows in a crescent of 30 independent *chutes* 50 feet high into Lake Deschenes (25 miles long). From that lake the river drops 40 feet by the Chaudière falls at Ottawa city 121 feet above the sea. From Ottawa the river is navigable to Montreal by means of the Grenville canal, by which the rapids of the Long Sault and Chute à Blondeau are overcome.

The chief tributaries of the Ottawa within the province of Quebec, on the north-east, commencing from the head of the river, are the Kipawa, falling in with a cascade 120 feet high; the Dumoine; the Black river, 120 miles long; the Coulonge; the Gatineau, 420 miles long, draining a basin of 12,000 square miles; the Lièvre, 170 miles long, draining 4000 square miles; the Petite Nation; the Rouge, 120 miles long; and the Rivière du Nord. On the south-west, or Ontario side, it receives the Montreal river, an old canoe route to Hudson Bay; the Mattawa, the old canoe route to the upper lakes; the Petawawa, 140 miles long; the Bonnechère; the Madawaska, 240 miles long; the Mississippi; the Rideau, the old military route by canal to Kingston and Lake Ontario; and the South Nation. Most of these are important lumbering streams.

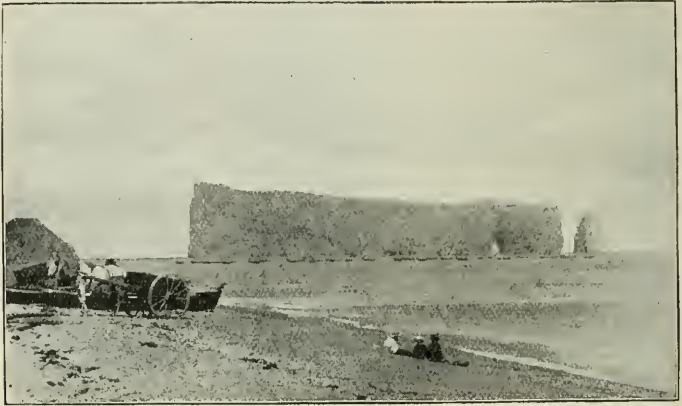
4. The Gaspé District.—The peninsula of Gaspé has been partially described in previous remarks upon the contour of the land and the general geology of the province. The interior is unsettled and partly unsurveyed. There are neat little villages of fishermen in sheltered coves at the mouths of rivers along the shore of the St. Lawrence, but there is no harbour until Gaspé Bay is reached. This magnificent bay is $7\frac{1}{2}$ miles wide, and extends 20 miles inwards to a



Notman, Photo.

HEAD OF GASPÉ BASIN.

land-locked basin where vessels may lie as secure as in a dock. The bay affords excellent anchorage, and the harbour is one of the best on the Atlantic coast, with room and depth of water for any number of vessels. The harbour branches into two arms, and the York and Dartmouth rivers fall in respectively at the head of each. These streams are famous salmon rivers. The scenery



Notman, Photo

PERCÉ ROCK, BAY CHALEUR.

all round Gaspé is very beautiful and bold, especially near Cape Gaspé, a cliff of Devonian limestone, 692 feet high. At Douglastown and at several other points on the bay are settlements of people dependent directly or indirectly upon the fisheries.

Following the coast round into the Bay Chaleur is Cape Percé and Bonaventure Island. Close to the village of Percé is a precipitous island rock rising sheer 288 feet out of the water. It is 1400 feet long and 300 feet wide, and is pierced through by an opening 30 feet wide and 60 feet high, like an archway, through which at

high tide fishing-beats may sail. Its top is inaccessible and is white with sea-fowl—gulls and cormorants. There were two arches sixty-five years ago, but the outer one fell and left the buttress, which is still standing. Back of Percé village is Mount St. Anne, 1230 feet high. It is a conspicuous object from the sea, the cliffs of red sandstone rising through the green of the encircling trees. Here are large fishing establishments, and, in fact, all along the coast are the establishments of the great Jersey fishing houses, and the settlers are largely Jersey people. Port Daniel and Paspébiac are also fishing villages with good roadsteads. At Carleton at the head of the bay is a good roadstead. The rivers Cascapédia, Bonaventure, and Matapédia are noted salmon rivers, and in fact all the rivers of Gaspé are leased for salmon-fishing. The whole region is of special interest to geologists, and has been made classic by the writings of Sir Wm. Logan, Elkanah Billings, and Prof. J. M. Clarke.

The Bay Chaleur was settled first by refugee Acadians, and many United Empire Loyalists got grants there after the United States Revolution. The cod-fishing in the bay was very productive in former days, but has fallen off. The old Indian name was "the sea of fish," and large numbers of salmon and lobsters are still taken along the coast. For many years the district of Gaspé suffered for want of easy communication with the outside world. Railway lines now afford excellent communication along both sides of the Bay Chaleur, to Percé and the Grand river on the north side, and to Bathurst and Shippigan on the south side. With characteristic enterprise railways have thus been made efficient in opening this country to the travelling public, which a few years ago was accessible to tourists only by means of steamers to the Gulf ports.



Notman, Photo.

5. **The Eastern Townships.**—This is a political rather than a natural division of the province, for it includes the level country south of Montreal along the international boundary, as well as the rolling and hilly country to the east, already described in the remarks upon the Notre Dame Mountains. It has already been stated that after the cession of Canada to the

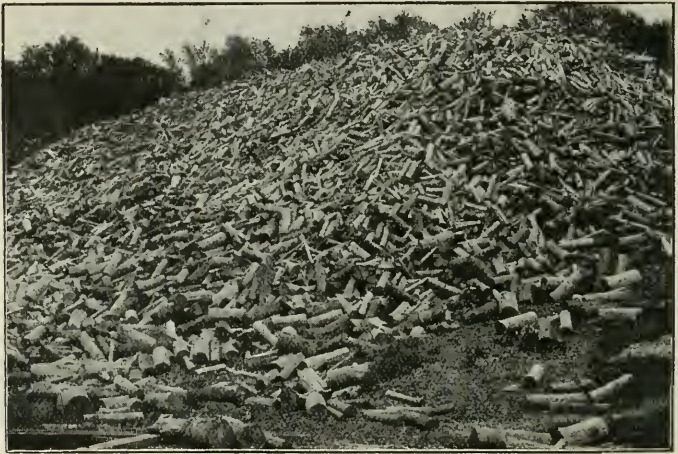


VIEW OF RICHMOND, EASTERN TOWNSHIPS, QUEBEC.

From Upper Melbourne, looking East.

British Crown the French laws were continued, and that in 1791 an English province, now Ontario, was set off to the west of the existing settlements. The French had settled along the rivers only—the banks of the St. Lawrence, the Richelieu, and the Yamaska were continuously settled in several ranges deep, but beyond this “bordage” of cultivated land was a wilderness. Extensive tracts of this wild country were granted to families of Loyalist refugees from the revolted colonies, and grants were made in free and common socage, after-

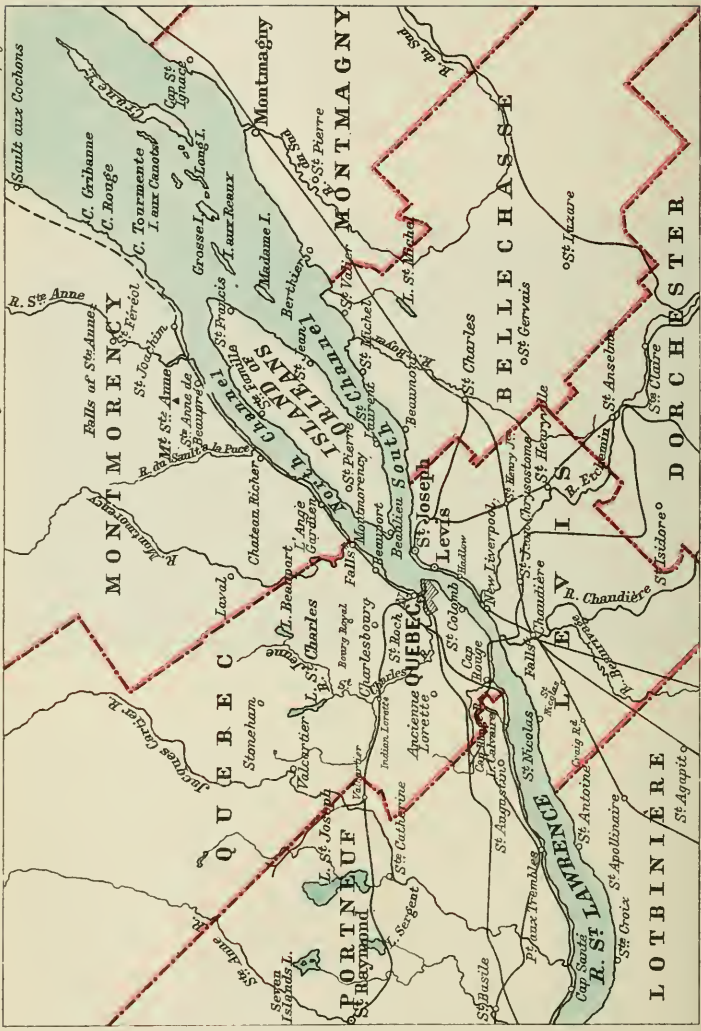
wards confirmed under Imperial statutes passed in 1825 and 1827. The question is a complicated one and not easy of explanation in small compass, but the idea was that the Eastern Townships, like Ontario, were to be English. The abolition of the feudal tenure assimilated the tenure of all land in the province, but of late years, as the virgin lands of the north-west were opened up,



PULP LOGS, WINDSOR MILLS, EASTERN TOWNSHIPS.

and as manufactures were established, the English youth left the farm lands of the Eastern Townships, and moved to the cities or took up prairie farms in the new West. It has therefore happened that by a strange transfer of population the Eastern Townships are to-day much less English than they were fifty years ago, for, as the English moved away to more thoroughly British provinces, the French bought their farms. The French Canadians are less disposed to leave their favoured and native province than the English, they dislike to move away from their

THE ENVIRONS OF QUEBEC

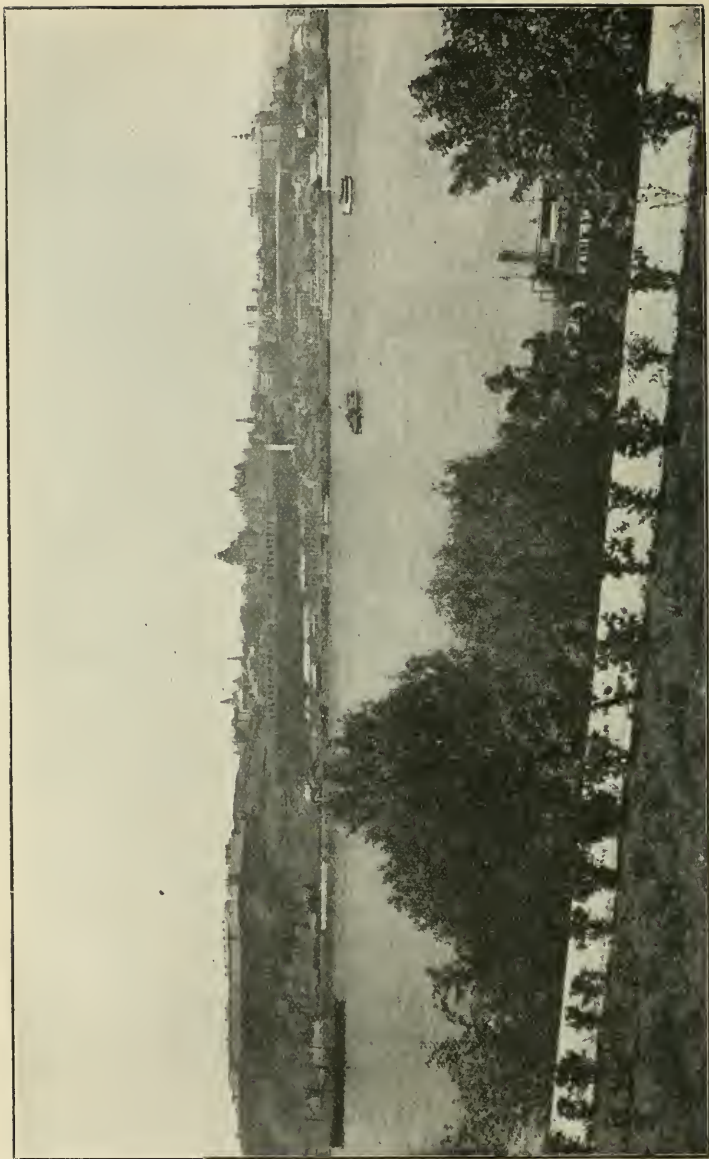


churches, their laws, and the sound of their own language. In this way it happened that as the west became English, the east became and is becoming more French.

The Eastern Townships is an agricultural country, and contains some of the best farming and grazing land in the Dominion. It is watered chiefly by the Yamaska and St. Francis, and by a number of smaller streams. The latter river flows from Lake St. Francis through a course of 130 miles to fall into the St. Lawrence at Lake St. Peter, not far from the mouth of the Yamaska. Lake Memphremagog discharges by the river Magog into the St. Francis, and at their junction is the city of Sherbrooke, the Queen City of the Eastern Townships, also its metropolis, with a population of 16,405. It is an industrial as well as a railway centre, the Canadian Pacific, Grand Trunk, Boston and Maine and the Quebec Central railways affording transportation facilities in every direction. It has also eight banking institutions, and numerous public buildings, besides a public park and fine squares. There are excellent water-power facilities for industrial purposes, as the Magog is a very rapid river. In the eastern and hilly part of this district are the Danville slate quarries, the asbestos, and copper deposits previously mentioned.

6. Quebec and the Quebec District.—Quebec City itself is for all the world like a mediæval French City with its grey walls and shining tin roofs, its precipitous streets and sleepy squares, its narrow alleys and peaceful convents, its towering chateau on the heights, and the long low warehouses in the lower town—a city of the New World with all the charm of the Old. It is one of the most fascinating cities of the North American continent.

The smaller towns and cities clustered along the St.



Lawrence river have a charm all their own. The French Canadian settlers, habitants, and fisher-folk speak a language more like that of the days of Louis the Magnificent in France, than like the French of Paris to-day; and many still till the soil with the same fashion of implements that they brought over from Europe in the seventeenth century.

Quebec (strait or narrows) is the happily descriptive name given by the aborigines to the place where the northern and southern highlands draw together—where the great basin of the St. Lawrence is narrowest, and where the river itself, at Cape Rouge (pronounced Carouge) only seven miles above the city, is narrower than in any other part of its whole course.

“That wondrous strait where close th’ opposing hills
To build the stately portal of the west.
There! at the foot of that stupendous rock,
Which towers above a basin sheltered round
By mountains slowly stooping from their heights,
In terraces of verdure to the deep
And ever-tranquil water.”

The situation of the city is unequalled. Many have attempted to describe it, but none have done better than Charles Marshall. The following is a condensation of his description:—

Unexampled for picturesqueness and magnificence of position on the American continent, and for the romance of her historic associations, Quebec sits on her impregnable heights a queen among the cities of the new world.

At her feet flows the noble St. Lawrence, the fit highway into a great empire, here narrowed to a couple of miles’ breadth. From the compression of the great river at this spot the city derives its name. On the east of the city, along a richly fertile valley, flows the beautiful St. Charles, to join its waters with those of the great river. The mingled waters divide to enclasp the fair and fertile Isle of Orleans.

The city, as seen from a distance, rises stately and solemn.

Clustering houses climb the rocky heights. Great piles of stone churches, colleges, and public buildings, crowned with gleaming minarets, rise above the mass of dwellings. Above all rise the long dark lines of one of the world's famous citadels, the Gibraltar of America.

Quebec was founded in 1608 by Samuel de Champlain, the real father of Canada, for his was the first permanent settlement of Europeans in the provinces of Old Canada.



CHATEAU FRONTENAC, QUEBEC.

From Laval University.

It was the wisdom of a man full of experience both as a soldier and sailor that chose the site, for there is none like it on the continent. In 1908 a fit celebration, commemorating the 300th anniversary of the founding of Quebec was held, in which His Royal Highness the Prince of Wales (now his most Gracious Majesty King George V.), the late Field-Marshal Lord Roberts, and Earl Grey; Vice-President Fairbanks from the United States, besides other representatives from France, England, and the United States, took part. The pageants of history

proved exceedingly interesting and instructive, recalling landmarks in the growth of a young nation. At Quebec, a distance of 846 miles from the open ocean at Belle-isle, is a basin large enough to hold a navy, and deep enough for the largest liners; for, after narrowing at Cape Rouge, the river widens at the city. The mountains around the city form a vast amphitheatre.

Quebec is still the centre of the French life of Canada. Montreal is more cosmopolitan, for there the proportion of two races is not so marked, and there is an eddy of language, race, and religion; but Quebec is overwhelmingly French and Roman Catholic, and in the parishes dependent upon it, around the city and lower down the river, the old French Canadian life still survives.

The city of Quebec has not quite kept pace with the growth of the country. The population at the census of 1911 was 78,710, an increase of 14 per cent during the previous ten years. Several causes have contributed to this. The adoption of iron in place of wood for ship-building destroyed a very large industry. Changes in the timber trade also seriously affected the city. In former years nearly the whole export trade in timber went by Quebec; now comparatively little goes that way. Formerly the timber went down the river in rafts to Quebec; now the business is done directly from the mills, and the lumber is sent to the nearest shipping port by rail. The trade used to be chiefly done with Great Britain; now the lumber is largely sent by rail across the border to the United States. Even the lumber for Great Britain is not always loaded at Quebec. It may be loaded at Montreal or even Three Rivers. Quebec, as a shipping port, appears to have been injured by the rather unreasonable exactions of societies of ship-labourers, who have unwittingly conspired with the

general tendency of trade to send the ocean vessels westward to the port nearest to the point of production. Therefore, as the channel of the river was deepened, the trade moved past Quebec to Montreal, and the rapid growth of Montreal as a manufacturing and railroad centre made it, rather than Quebec, the chief distributing point. Causes such as these have tended to depress the trade of Quebec, besides the fact that the most enterprising merchants always centred at Montreal. In former years the garrison contributed a great deal to the life and gaiety of the city, and kept it in touch with English society. That phase has passed away, and, with the change in trade, the English merchants moved westwards, and do the business of the country from Montreal and Toronto. Laval University has also established itself (a branch) in Montreal, and opened a new Science Faculty.

Quebec still has the trade of the lower St. Lawrence, and, of recent years, some important manufacturing industries have settled there. The Ross Rifle factory is located here, not far from Wolfe's Cove; whilst the tanning business and the manufacture of boots and shoes have been largely developed. A large cotton factory has been established at the falls of the Montmorenci, where cotton cloth is made solely for export to the east. There is at Quebec a ready command of labour, and the French Canadian "habitants" are cheerful, contented, and skilful work-people. The trade of the Lake St. John district and the Saguenay valley must always centre at Quebec, and these districts are developing fast. The chief towns below Quebec are on the south shore where the greater part of the fertile land is situated. New Liverpool is almost a suburb of Quebec. It is at the mouth of the Chaudière, a river 110 miles long, draining an area of 2500 square miles. It rises in Lake Megantic on the

frontier, and a short portage connects it with the Kennebec. Gold has been found in considerable quantity in the gravel of this river. A few miles from Quebec it falls in a picturesque cascade 130 feet in height. At Victoria Cove, opposite the mouth of the Chaudière, is the new cantilever bridge spanning the St. Lawrence, in course of construction for the National Transcontinental Railway. At St. Thomas, the Rivière du Sud discharges, after winding through a fertile and level country. At the mouth of the Rivière du Loup is Fraserville, the largest town below Quebec, and growing fast by the establishment of manufactures. Here also is a very pretty fall.

Along the north shore is a continuous series of cascades, as river after river contributes its quota to the St. Lawrence. The Montmorenci Falls are a cloud of foam arching over a precipice 265 feet high. The falls of St. Anne de Beaupré and of St. Féréol are a series of cataracts, one of which is 130 feet high. It will be impossible to refer in detail to the numberless points of picturesque interest around Quebec. Thoreau (*Yankee in Canada*, p. 54) remarks :

It was evident that this was the country for waterfalls; that every stream that empties into the St. Lawrence, for some hundreds of miles, must have a great fall or cascade on it, and in its passage through the mountains was, for a short distance, a small Saguenay with its upright walls.

Below Quebec the valley of the river on the south side as far as Kamouraska is fertile and rich. It is the heart of the old French colony, where the manners and the language of old France are best preserved from admixture with English. In large portions of this country English is seldom heard. A stranger would suppose he was in the centre of Normandy. On the

river bank is a long continuous village ; for the concessions were deep with only a narrow front on the river, because in the early days the rivers were the only highways. It has been said, with little truth, that the French of Canada is a *patois*. It is as much of a *patois* as the French of Normandy is a *patois*, and no more. It is the French which was spoken in that part of France before the Revolution, and kept up by the clergy, who were always an instructed class, and retained their influence over the people. English is not spoken in the same way over all the United Kingdom, nor does one speak of a Dublin or an Aberdeen *patois*, or for that matter, of a London *patois*. Canada was settled from Normandy, Brittany, and Saintonge long previous to the French Revolution, and after the conquest there was little communication with France. Revolutionary principles and actions opened a wide gulf between the monarchical and Roman Catholic colony and the French Republic, consequently many old French words continued in use ; and a comparatively strong anti-modern-French feeling still prevails. The physical and social conditions of a new country introduced some new words, and some words have been adopted from the English. The pronunciation of the vowels among the country people is broader than now at Paris, and the changes in recent years in the spoken language of the capital have had little effect in Canada, but cultivated French or English people speak their language very much alike wherever they are. The literature of French Canada is very extensive, and has a place of honour in France. The power of literary expression of the French of Canada is very remarkable. It may or may not be common elsewhere for statesmen to speak fairly well in a language not their own, but in Canada there are statesmen born in the French country

and educated in the French-Canadian colleges, who can not only arouse the enthusiasm of their own people, but while speaking, will suddenly turn, and, with faultless and ready eloquence, display a command over the English tongue which is possessed by very few of the English themselves.

The city of Quebec is the centre of French Canada, as before remarked, and Laval University is the heart of the city of Quebec. It perpetuates the name and the memory of François de Laval-Montmorency, the first bishop of Quebec, who, turning his back upon the advantages of an almost princely lineage, spent his life in an outpost in the western wilderness, and built the foundations of the Roman Church deep and solid in the new world. The University buildings at once arrest the attention of a traveller, for they are most prominent objects on the high cliff dominating the lower city. The University has also a large branch at Montreal with faculties in both cities of Theology, Medicine, Law, Literature, and Science. There is a large teaching staff and an ever-increasing body of students. The University is founded on a special charter of Queen Victoria, and a special Bull of Pope Pius IX. There are many French-Canadian colleges throughout the province affiliated with the University. In this institution the activity of the great bishop still works for his people. He founded the Seminary of Quebec, and in 1852 the Seminary (*Petit Séminaire*) founded the University.

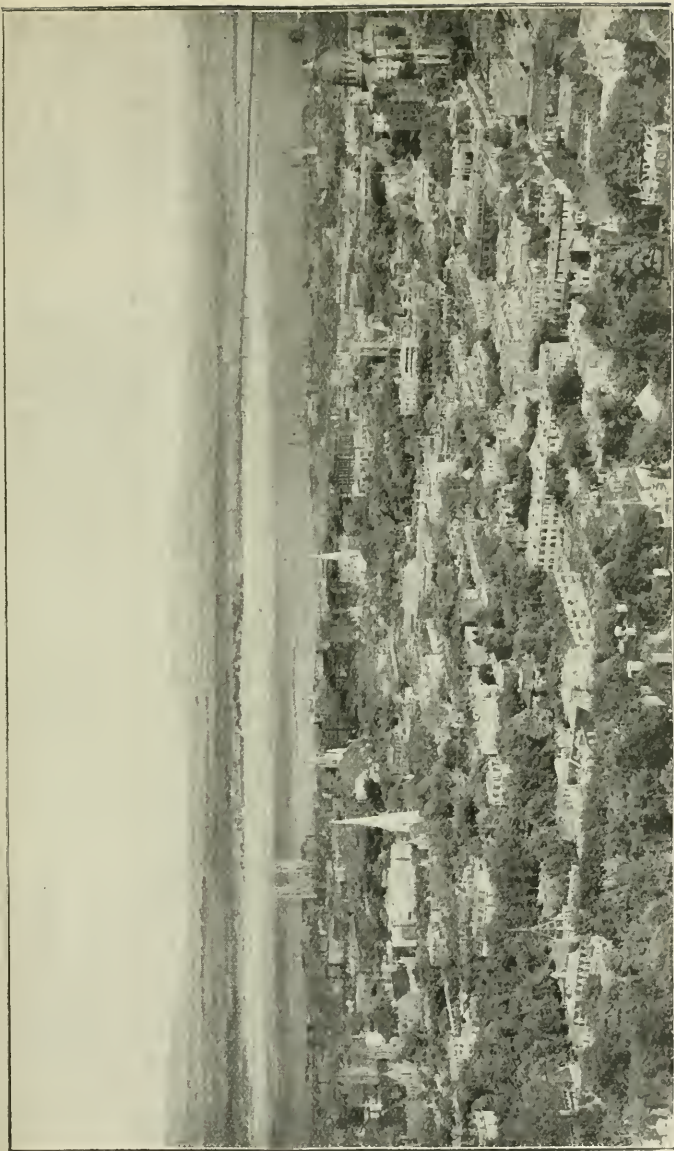
Quebec, being the seat of government for the province, has very large and handsome legislative buildings. As the chief fortress of Canada, the city is crowned by a series of works most formidable in appearance, and armed with cannon most formidable in number. In their day these works have arrested the tide of invasion, and their

day may not even yet be over. Still they are picturesque and noble stretching along the heights, and the heights may at any time be adapted to the latest methods of defence. From the heights of the citadel may be distinguished, on the south side of the river, a number of forts designed according to modern principles for the defence of the city and river.

Quebec in old days was far more important as a shipping port than now. Before the railway age arrived to disturb the natural channels of trade, and before iron shipbuilding superseded the wooden vessels, it was one of the great ports of the world. The first vessel which crossed the Atlantic Ocean propelled by steam was the *Royal William*, launched at Quebec in 1831. She crossed to London in 1833. The port possesses a graving dock at Lévis, 495 feet long and 100 feet wide, with $25\frac{1}{2}$ feet depth of water on the sill at high tide. Another important work is the Louise Basin, 40 acres in extent, with a tidal dock of 20 acres.

Trade.—The exports of Quebec in the year ending March 31, 1913, were in value \$8,592,177, and the imports amounted to \$14,778,587.

7. Montreal and the Surrounding Territory.—Few cities in the world are so advantageously situated as Montreal. It is at the head of ocean navigation on the St. Lawrence, and at the confluence of its greatest tributary, the Ottawa. It is the point where the great river approaches nearest to the Atlantic Ocean on the New England coast, and it is near the intersection of a great north and south valley where the Hudson and Richelieu waters are separated by a water-parting only 120 feet high and 20 miles wide. It is the centre of one of the most fertile valleys in the world, and, though a thousand miles from the open ocean, it is not quite 12 feet above the



Nothman, Photo.

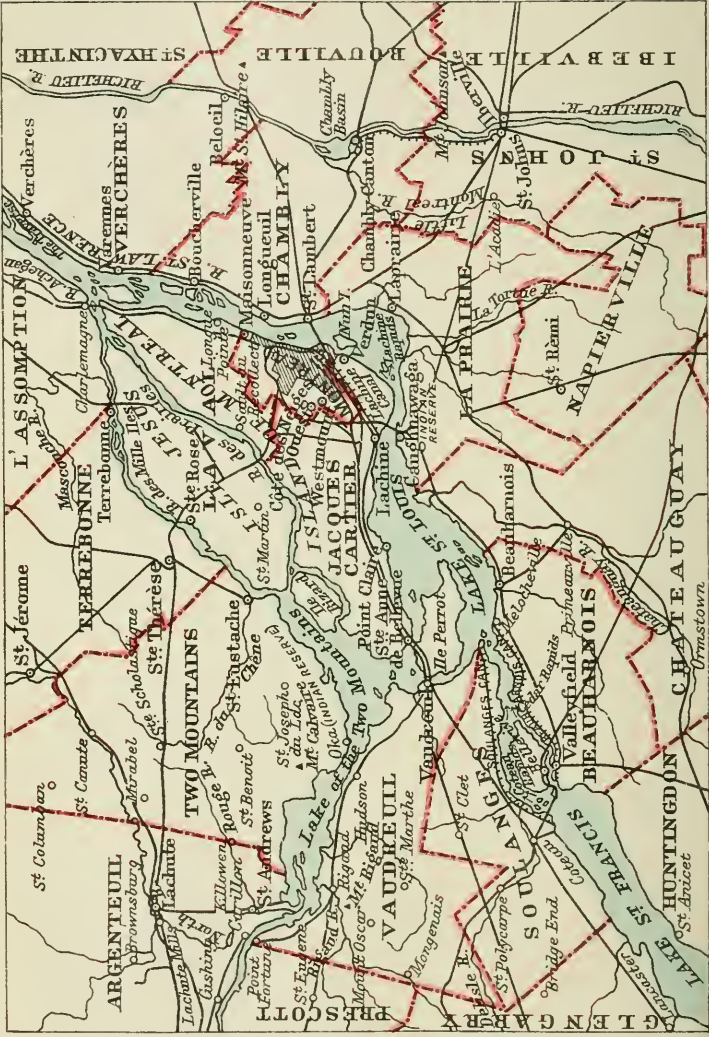
MONTREAL.

level of the tide. It is the foot of the most extensive system of inland navigation in the world, and it has of late years become as important a centre of railways as it always was of waterways. All of the converging valleys bring business to the city, forming a steady volume of local traffic, undisturbed by the fluctuations of foreign markets.

West of Montreal is the valley of the Ottawa, and that river flowing from the west strikes the St. Lawrence flowing from the south-west at a very acute angle, and an archipelago of islands is formed at their confluence, of which the Island of Montreal is the centre and chief. The impact of the Ottawa water presses the water of the St. Lawrence to the southern shore, so that, strictly speaking, the islands are in the mouth of the Ottawa; for, opposite to the city of Montreal the line of separation between the dark water of the Ottawa and the clear blue of the St. Lawrence may be plainly seen, and the rivers do not commingle until tide water is reached. The Ottawa in its lowest reach expands into the beautiful "Lake of the Two Mountains." Rigaud Mountain, an archæan mass, with a remarkable boulder deposit over its surface, at the head of the lake, and Mount Calvaire (an island of Laurentian rising in the midst of the newer Ordovician plain) marks the foot of the lake where it turns to the north-east to follow the general course of the St. Lawrence valley. The St. Lawrence expands into Lake St. Louis just above Montreal. It draws together to a little less than a mile in width before throwing itself over the Lachine rapids, and immediately expands again to form a broad bay, five miles wide, at Laprairie, and then flows past the front of the city with the width of a mile and a half to two miles.

The Ottawa river flows out of the Lake of Two

THE ENVIRONS OF MONTREAL



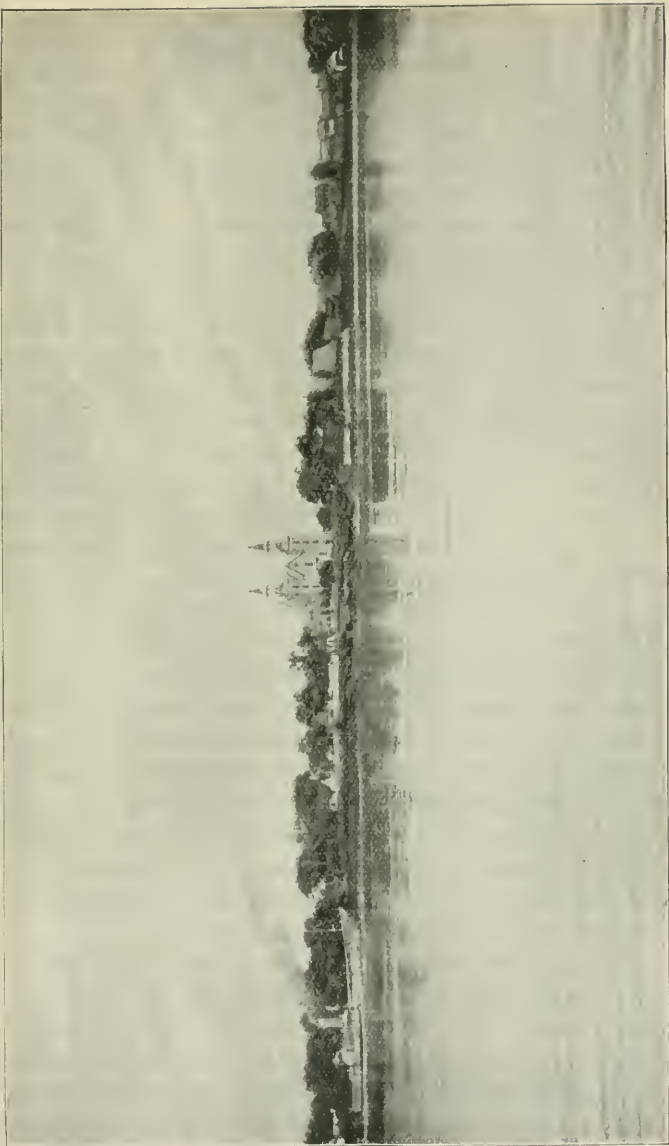
Mountains in four channels, two north and two west of Montreal. The most westerly is not navigable, and flows between the mainland and Isle Perrot ; the main channel flows between Isle Perrot and the Island of Montreal. Here are the celebrated St. Anne's Rapids of Moore's Canadian boat song. A single lock enables vessels to pass. In rear of the island of Montreal the Ottawa is called the Rivière des Prairies, and separates it from Isle Bizard and Isle Jésus, and north again of these latter islands the most northerly mouth of the Ottawa separates them from the mainland. This branch is known under various names : Rivière Jésus, Rivière St. Jean, or Rivière Terrebonne, or sometimes simply as the Ottawa. The largest body of Ottawa water flows in front of Montreal, but rafts of timber for Quebec pass down in rear by the Rivière des Prairies, where the rapids are easier to run. All these streams unite at the lower end of the Island of Montreal in a maze of wooded islands which completely obscures the confluence. Mount Royal rises in rear of the city about 700 feet—a veritable mountain—because it is the point of vantage overlooking the level and fertile plain—a royal eminence from which the very garden of the St. Lawrence spreads to all points of the compass, robed in summer with every colour in which bountiful Nature adorns her most favoured localities, until the horizon is closed by the blue hills of the distant ranges bordering the valley.

Below Montreal, to the north-east, the St. Lawrence river flows in a broad stream through a wide and fertile valley. On both sides of the river stretches a continuous line of farms and villages, and about every nine miles, from parish to parish, there is a group of ecclesiastical buildings, a church and a presbytère, and often a convent school, or some monastic building, showing that the country

is French and Roman Catholic. The banks of the river are from 40 to 100 feet high, cut by the river into the plain. Sorel, at the mouth of the Richelieu, is 45 miles from Montreal. The Yamaska and St. Francis fall in very near, and the river expands into Lake St. Peter, the shallowest part of its course. Through the flats of the lake a broad and deep channel for ships has been dredged, and here the river meets the tide. The present valley of the St. Lawrence from Lake Ontario to Lake St. Peter, and beyond is a comparatively recent (geologically speaking) channel, and like all other young rivers, is marked by alternate rapids and smooth water, also by overflowing its banks in the springtime.

Le Nord.—North of the level country near Montreal, in the blue hills seen from the mountain, is a region generally called "Le Nord." It is in the counties of Joliette, Montcalm, Terrebonne, Labelle, and Wright, chiefly colonised from the older settlements. While the valleys are being cleared for farms, the mountains and lakes are becoming the resort of pleasure-seekers from the cities. The whole region is ideal Laurentian country; for it is in the heart of the Laurentides. The lakes are beyond counting, and they abound in trout. The country is all wooded with mixed deciduous and coniferous forest, and is threaded by numerous streams. There are some stirring little manufacturing villages in this region of abounding water-power, and they bring to Montreal a constant and steady trade.

The South.—South of Montreal is the Richelieu valley. The river of that name is the only important tributary falling into the St. Lawrence from the south. It discharges Lake Champlain, and Lake George in the United States by a stream 81 miles long, from Rouse's Point on the frontier to Sorel on the St. Lawrence. It is navigable by large



VARENNES, NEAR MONTREAL, A TYPICAL SCENE ON THE UPPER ST. LAWRENCE.

river steamers from Sorel to Chambly, with the assistance of only one lock $\frac{1}{5}$ th of a mile long at St. Ours. At Chambly is the mouth of a canal of 9 locks, with a depth of 7 feet, built to overcome a series of rapids interrupting navigation for 12 miles. By this canal a rise of 75 feet is accomplished, and from St. Johns there is uninterrupted navigation to the head of the lake at Whitehall, in New York. Thence there is a canal to the Hudson, and by this route much heavy freight, such as coal, raw sugar, and lumber is exchanged. The Richelieu valley at the beginning of the century was the granary, not only of Canada, but of the neighbouring states of the Union. The banks are low, and the plain is as level as a table. The soil is rich, and although it has been impaired for wheat by overcropping in a long series of years, it is now a most productive country for mixed farming. The valley of this river is the old highway of invasion, and in early times the Richelieu was called *Rivière des Iroquois*, because of the irruptions of the Mohawks by that route. The French and English armies traversed it incessantly in attack and defence during the Colonial wars, and upon its banks some of the manor houses of the old French "seigneuries" still survive. It was originally settled by men of the Carignan-Salières regiment, who came out with the Marquis de Tracy in 1665, and the names along the banks are those of officers of the regiment who received the first grants, such as M. de Sorel, M. de St. Ours, M. de Chambly.

To the south-west of Montreal the St. Lawrence valley extends up to the great lakes, and, although from Lake Ontario to Point au Baudet is politically part of Ontario, it is convenient to consider it in connection with the canals which terminate at Montreal. The St. Lawrence leaves Lake Ontario under its own proper name

and passes through a wilderness of rocky, wooded islets, known as the Thousand Islands (though more than a thousand have been counted), where, after a sharp turn, the Laurentian rocks make a long reach southward to connect with the Adirondack mountains by way of the Frontenac axis, an excellent outlier of the Laurentian system in the state of New York. Through 40 miles of beautiful scenery the river flows among parks and country houses and villas and wild rocky islets, some just large enough to hold a clump of trees. At Prescott commence the rapids of the St. Lawrence and the magnificent series of canals built to overcome them. These are used only in ascending the river. The largest passenger steamers shoot all the rapids in descending, and this experience, so novel and unique, is one of the attractions of Canadian travel.

The river St. Lawrence, with the system of canals established on its course above Montreal, and the lakes Ontario, Erie, St. Clair, Huron, and Superior, with connecting canals, afford a course of water communication extending from the Strait of Belle-isle on the Atlantic coast to Port Arthur or Fort William on Lake Superior, a distance of 2233 statute miles. The difference of level between Three Rivers, tide level, and Lake Superior, is 600 feet. From Belle-isle to Montreal the distance is 1003 statute miles. In 1851 the depth of the St. Lawrence channel between Quebec and Montreal (160 miles) at low water, was 10 feet 6 inches, and in 1869 this depth was increased to 20 feet. In 1882 it reached 25 feet, and in 1888 the depth of $27\frac{1}{2}$ feet at low water was attained by dredging operations. The channel has now a depth of 30 feet at extreme low water, and a minimum width of 450 feet, extending to 600 feet at points of curvatures, and is well buoyed and

lighted. A 35-foot deep channel was commenced in 1907. Navigation, closed by a bridge of ice during winter months at Montreal and points below, opens about the end of April. Efforts are being made towards effecting open winter navigation of the St. Lawrence between Quebec and Montreal or Three Rivers. Professor Barnes of McGill University has no doubt as to the feasibility of the scheme.

The total cost to Canada of the canals along the route from Montreal to Lake Superior to March 31, 1912, is given as follows:—

Original canal construction	\$46,776,018
Enlargement of canals	55,090,811
Total cost	<u>\$101,866,829</u>

East of Prescott, the first in the descent is the Galops rapid, avoided by a canal $7\frac{3}{4}$ miles long. Then follows the Rapide Plat, 4 miles, with its canal. A canal, the Farran Point Canal, only $\frac{3}{4}$ ths of a mile long, follows, and then succeeds the rapid of the Long Sault, $11\frac{1}{2}$ miles in length, which is overcome by the Cornwall Canal. There are long reaches of quiet water between these rapids. The Long Sault is the most picturesque and the most exciting of the upper group. Opposite Cornwall the line of 45° strikes the river, and the banks on both sides become British. At the point of contact is St. Regis, an Iroquois reserve; Cornwall is a manufacturing town with large cotton mills and a large paper mill. There the river widens into Lake St. Francis, and for 38 miles is a quiet stretch between monotonous low banks of farming lands. From Cornwall the southern side of the river belongs to the province of Quebec, but Ontario continues on the north side until the village of Coteau du Lac indicates by its name that the boundary

between the English and French provinces has been passed. At Coteau Landing the St. Lawrence gathers up its strength for another plunge, and the Coteau Rapids, the Cedars, and the Cascades follow each other in quick succession. The run down these rapids is very exciting, for the water is much broken. All three are avoided by the Soulanges and Beauharnois canals, the latter the only one on the south side of the river.

When the policy of deepening and enlarging the canals was adopted, the cost of making a new canal opposite Beauharnois was found to be not much in excess of enlarging the old one, and a new canal is now built on the north side of the river. As the Cascades terminate, the most westerly branch of the Ottawa falls in, and the river expands into Lake St. Louis for 15 miles, and receives the main body of the Ottawa, then it contracts again to fall 45 feet through the Lachine Rapids, which are overcome by the Lachine Canal, $8\frac{1}{2}$ miles long. This is the last in the series, and at its mouth in the harbour of Montreal the Lake Ontario and upper St. Lawrence river steamers may run alongside the largest ocean vessels.

On the St. Lawrence canals 4,302,427 tons were moved in 1913 as follows:—Agricultural products, 1,545,775 tons; animal products, 8269 tons; manufactures, 460,161 tons; forest products, 660,226 tons; and mine products, 1,627,996 tons. The total traffic of the Canadian canals for 1913 amounted to 52,053,913 tons, a steady increase of 23,292,856 tons since 1910. No tolls are charged on any of the Dominion canals, either for domestic or foreign vessels.

This very interesting stretch of inland navigation is unequalled, not only because of the immense volume of the descending river, but because of the magnitude and

costliness of the canals and the large size of the vessels which may pass through them. The following table will be of use to show at a glance the main facts regarding them. Sea-level is taken from the head of the tide in Lake St. Peter. Lake Ontario is 246 feet above that level. At Lake St. Francis, the foot of the first group of rapids, the river has fallen to 142 feet. At Lake St. Louis, the termination of the second group, it has fallen to 58 feet, and the harbour of Montreal is 11.75 feet above tide-water. The total cost of the canal system from Lachine on the St. Lawrence to Ottawa city, on the Ottawa river, is as follows:—Original construction, \$580,286.61; enlargement, \$5,154,798.44; total cost, \$5,735,085.05.

TABLE OF DISTANCES AND LEVELS FROM POINT TO POINT FROM HEAD OF TIDE AT THREE RIVERS, ON LAKE ST. PETER, TAKEN AS 0.

To	Distance in Miles.	Rise in Feet.	Obstructions.	Canal.	Length of Canal in Miles.
Montreal . . .	86.00	11.75			
Lake St. Louis . .	8.50	44.75	Lachine Rapids	Lachine	8.50
Cornwall on Lake St. Francis	59.25	133.50	Cascades Cedars Coteau	Beauharnois	11.25
Prescott on St. Lawrence river	51.25	45.75	Long Sault	Cornwall	11.50
	205.00	235.75	Rapide Plat Galops Rapids	Farran Point Rapide Plat Galops	0.75 4.00 7.60
					43.60

The total distance from head of tide to Prescott is 205 miles, of which 43.6 miles in the aggregate is broken water overcome by canals, Montreal being at the foot and Prescott at the head. The difference in level is 235.75 feet, of which 206.5 is overcome by six canals with an aggregate of twenty-seven locks.

The province of Quebec has elevators at Coteau, Montreal, and Quebec City, with a capacity of some 10,000,000 bushels; whilst the total storage capacity of the 2,356 grain elevators of Canada in 1912-13 was 127,224,550 bushels, marking an increase from a total of 323 elevators and warehouses with a capacity of 18,329,350 bushels in 1900-01.

The City of Montreal

This beautiful city is the commercial capital of the Dominion, for there are the head offices of the greatest financial institutions and the greatest railways, and there is the point of contact between the ocean and the great central plain of the continent. From 1841 (the date of the union between Upper and Lower Canada) to 1849 it was the political capital; but the atmosphere of politics was not congenial to the inhabitants, for in the latter year some excitable hot-heads set fire to the parliament buildings, with a vague idea that they might, perchance, burn a Bill to which they took great exception. The legislature objected to being burned out for trivial causes and removed to Quebec and Toronto alternately, and, after seven years of wandering, definitely settled, in 1866, at Ottawa. In that way Montreal lost the seat of government and the Bill was not burned after all.

In the historical sketch preceding this chapter, the city is shown to have been the result of an outburst of religious enthusiasm. Though no other site on the continent excels it as a centre for trade, it was not a trader who founded it; though no other place equalled it as a central point for geographical exploration, it was not an explorer who founded it. A brave but humble-minded and religious soldier and two meek and timid women are

the hero and heroines of the early city. It was the city of a dream—a bright flower of the Christian faith. The world soon invaded this ideal home of devotion, and the geographical position of Montreal soon gave it the control of the fur trade—the one great commercial interest of early days. In the narrow streets of the old town black-robed ecclesiastics and silent nuns in sober uniform glided about on their errands of charity and mercy, but the soldiers and noblesse were gay with the Paris fashions of the last ship of the season, the *coureurs de bois* swaggered in half-civilised dress; and on the outskirts of the town the aborigines camped, from the farthest regions of the west, decked in all their savage finery of paint and feathers.

Those days passed away, and there came to Montreal, under the English régime, another set of men, mostly from Scotland and many from the Highlands. These were the enterprising and daring fur traders of the North-west. They united with their French predecessors and availed themselves of their knowledge, but they overpassed their discoveries, and chief among them was Alexander Mackenzie, a quiet Scotch youth who came out to Montreal as a clerk in Gregory's counting-house, and who carried the British flag to the Polar Ocean and the great South Sea. That age also passed away, and the era of steam opened first on the St. Lawrence, for the first river steamboat (after Robert Fulton's experiment in 1807) was built in 1809 by the Molsons at Montreal. Then came the era of canals, and the steamboats gradually swarmed from Montreal over the western waters; for Montreal held the key of the whole valley. In 1856 the first line of ocean steamers was established by the skill and energy of the Allans. Then followed the railway age. The Grand Trunk Railway paralleled

the water-courses and spread to all the larger cities ; but, in 1885, the destiny of the city was accomplished, for the Canadian Pacific railway in that year completed its stupendous task, and Montreal once more held the keys of the gateway from the Atlantic to the great central plain and over the passes of the Rocky Mountains to the Pacific Ocean, the *Mar del Zur* of the dreams of the Elizabethan mariners, linking the new West with the far East. Champlain sought for the passage in his adventurous voyage up the Ottawa, Jolliet and Marquette sought it in their lonely wanderings, La Salle thought he had found it, La Verendrye followed the path as far as the mountains, Alexander Mackenzie lifted the veil of the west and north, and, in less than one hundred years later, the North-west passage was achieved by land in the great railway system which gave the shortest passage from ocean to ocean.

The city is built upon natural terraces rising from the river. It is underlaid chiefly by the Trenton and Chazy limestone, and through the level beds of this formation the mass of eruptive rock which forms Mount Royal in rear of the city has forced its way, lifting up the limestones immediately surrounding. Extensive quarries of limestone are found near the city, and the substantial way in which the buildings, not only public buildings but private residences, are built is due to the accessibility of these quarries. The terraces are ancient sea margins formed by the clay and sand of the Pleistocene age. One well-marked terrace is at Dorchester Street, another is at Sherbrooke Street. This last is 120 feet above the sea. Other sea margins may be traced on the flanks of the mountain at heights of 220, 386, and 440 feet, and the crest of the mountain itself is 700 feet above the sea.

The population of the city is given as 470,480 in the census of 1911 ; whilst Maisonneuve, close beside Montreal, had a population of 18,684. Westmount is the name given to the thriving west-end municipality with a population of 14,579. It is an up-to-date modern city with open lawns and numerous squares, much after the character of an English or Ontario town.

Montreal is one of the best built cities in America, and one of the most convenient for residence. It is clean and well drained ; electric cars perform a rapid and efficient service, not only through the city and suburbs, but to all parts of the island, and there are good theatres and frequent musical entertainments and other amusements. Being a university city, there is an element of science and literature in its society, and there is an Art Gallery, which, if not equal to those of the great United States cities, is at least a creditable beginning. In the summer the wharfs and canal basin are crowded with inland steamers from ports on Lake Superior to ports on the lower St. Lawrence, and with sea-going steamers from the Atlantic provinces. Beside them in the harbour lie ocean liners from London, Liverpool, Glasgow, Havre, Copenhagen, Stockholm, Hamburg, Antwerp, and many other European ports. A large fruit trade brings vessels from the Mediterranean and the West Indies. The great sugar refineries bring vessels with raw sugar from the East and the West Indies, and from the Brazils, and the large cotton mills, tobacco factories, rolling mills, and manufactures of all kinds draw raw material from all parts of the world. This shipping finds its return freight in the produce of the farm, forest, and factory. Railway trains run along the wharfs at night, for the port is lighted by electricity, and the vessels may unload by day and night and thus have quick despatch.

Then Montreal is a great terminal centre of railways. It is the terminal point of the Central Vermont, the Delaware and Hudson, and the Adirondack and New York railways to the cities of New York and Boston. The Intercolonial railway has also its terminal in Montreal, linking Halifax, Moncton, Levis (opposite Quebec city), with the Canadian metropolis. Montreal is still, as it always was, the great natural highway to the far west. Trains leave daily for Winnipeg and the Pacific coast, direct to Vancouver without change of cars, and to all points in the maritime provinces, as well as to all points in the west, north, and south. The central offices of the Canadian Pacific railway and the Grand Trunk railway are at Montreal. There are services several times daily for the great cities of the United States and of the Dominion, and there are convenient services for all the neighbouring country. Work on the Mount Royal tunnel, for the Canadian Northern railway, was begun June 14, 1912, and was completed November 5, 1913.

The city is well supplied with parks and pleasure-grounds. The whole of Mount Royal is a park with pleasant drives affording magnificent prospects over the central plain. The island of St. Helen's is another park, and the natural beauties of these places have been heightened by the art of the landscape gardener.

The chief cities of the other provinces lean on their respective provinces for support, but Montreal gives and does not receive. The chief part of the taxes of the province of Quebec are raised there, but the provincial government spends nothing on the city. The city has immense hospitals and universities, and, besides, numerous charitable institutions supported solely by the bounty of the citizens.

Montreal is more cosmopolitan than the other cities in Canada. There the French and English races, languages, and religions meet in a swirl in which neither seems to predominate exclusively. The great trading and manufacturing interests are mainly English, but there are also many large French houses and factories. The magnitude of the business and shipping interests of the city is shown in the figures on page 400. It is one of the largest ports in North America for the shipment of grain, ranking with San Francisco, New York, and Boston.

Montreal is also a great centre of education. The McGill University has 93 professors and lecturers and 1059 students. Its buildings are large and fitted with every appliance for teaching, and situated in the midst of spacious grounds. The Montreal branch of Laval University has 70 professors and 733 students. There are large classical colleges under the care of the Seminary of St. Sulpice and the Jesuit Fathers, and theological colleges for Roman Catholics, Anglicans, Presbyterians, Methodists, Baptists, and Congregationalists. All these are housed in handsome buildings of stone.

Then there are the communities of nuns of the Roman Church, the sisters of the congregation of Notre Dame, numbering fully 1000 professed sisters, and teaching over 20,000 girls all over the Dominion and in many cities of the United States. This is the institution founded by sister Marguerite Bourgeoys, gentlest of holy women, in the year 1653. Then the cloistered nuns of the Hotel Dieu—les Sœurs Hospitalières de St. Joseph—founded by Jeanne Mance, whom only the consciousness of a divine mission supported in those early years when she and her assistants cowered behind the plank doors of the first hospital at the sound of the Iroquois war-whoop in the woods around. Now the great hospital on the

mountain-side is the scene of their activities, and volunteers from their ranks manage the lazaretto at Tracadie. There is also the great institution of the Grey Nuns, with 400 sisters, whose branch establishments reach into the Polar circle along the Mackenzie river. This was founded by a Montreal widow in 1755; and there are the Sisters of Providence, with some 500 sisters and with branch houses all over the Dominion. All these are active workers, nursing and carrying on asylums for the blind, aged, and helpless, and all of them originated in Montreal.

The Protestant charities of Montreal are very numerous, though not branching over the country, for the Protestant religions have not the centralised organisation of the Roman Church. The Victoria Hospital is the gift of Lord Strathcona and Lord Mount Stephen to the city; the General Hospital is an institution of the Protestant citizens, supported by their annual contributions and by smaller endowments. Both are noble charities—of citizens of Montreal, not of governments; for the citizens of Montreal are immensely in earnest when they undertake anything; they do nothing in a half-hearted way, whether they found a line of ocean steamers, undertake to build a transcontinental railway, or to burn out a parliament for the sake of killing a bill they object to. There is nothing monotonous in Montreal or dull about its citizens, and this was the character of the people always in French as in English days. Iberville and Biencourt, the two greatest in a family of captains; Du l'Hut and Lacorne de St. Luc, chief among Indian fighters; La Salle and Mackenzie, among explorers; the old North-westerners as fur traders; the Allans as steamship owners; George Stephen and Donald A. Smith as railway men; Bethune and Dawson as educationalists—

there never was a time when Montreal had not men to bear up her fortunes through all vicissitudes.

Montreal is also a city of churches. The Protestant churches are numerous: all are substantially built, and many of them beautiful; whilst the Roman churches are the largest on the continent. The parish church of Notre Dame will hold 10,000 people. It is 225 feet long, 134 feet wide, and its main towers are 227 feet high. The Cathedral (St. James the minor) is a reproduction of St. Peter's at Rome, on half its scale. It is 333 feet long and 222 feet wide.

The St. Lawrence is spanned by two important bridges at Montreal. The Victoria bridge of the Grand Trunk railway was for many years well known as the greatest tubular bridge in the world. It was 9184 feet long, and the tubes had a span of 242 feet each, except the centre tube, which was 330 feet. It cost \$6,300,000, and took six years to build. It was formally opened in 1860 by the Prince of Wales, and was considered to be the eighth wonder of the world. Since then engineering science has advanced beyond the tubular principle, and to replace that once famous Victoria tubular bridge built by Stephenson between Point St. Charles and St. Lambert village, a distance of two and three-quarters of a mile, the Grand Trunk Railway Company has constructed a wider, lighter, open lattice-work steel bridge upon the original piers, the task taking two years to complete, but without interruption to freight or passenger traffic. The name of the present structure is the "Victoria Jubilee Bridge." The new bridge has double tracks for steam and electric cars, and facilities for vehicles and foot passengers. The spans, as the old piers are used, are of necessity the same. Not far off above is the Canadian Pacific bridge, a trestle bridge on the latest



HARBOUR OF MONTREAL.

plan, which cost \$1,000,000 and took only one year to build.

The Port of Montreal

Montreal was always an ocean port, but not for the largest vessels. The St. Lawrence river in widening to form Lake St. Peter loses very much in depth, and unless steps had been taken to deepen the channel of the river, the great increase in the size of sea-going vessels would have relegated Montreal hopelessly to the position of an inland town; for no vessel drawing more than 11 feet could pass up to Montreal. The legislature undertook in 1841 to deepen the channel, but abandoned it, and it was then that the character of the people once more asserted itself. They undertook the work in 1850 at the charge of the port, and by the year 1853 the channel was deepened to 15 feet 3 inches, and the first ocean steamer arrived at Montreal. Since then the work has been vigorously pressed, but as fast as the channel was deepened the size of the ocean steamers increased. The citizens were not discouraged. They deepened the water to 16 feet, then to 20 feet, then to 25 feet, then to its present depth of 33 feet now being deepened to 35 feet, so that now any ocean steamer which can enter the harbours of New York and Boston can steam up to the wharfs of Montreal. Then it was found that the dues charged upon the trade of the port for this service were a burden on the whole trade of the country, and, in the year 1888, the Dominion Government assumed the debt, and placed the port of Montreal on an equality with other ocean ports. The minimum width of the channel is 300 feet, and at curves where more room is necessary it widens to 550 feet. It is buoyed throughout and lighted like a street.

The harbour of Montreal is not disfigured by ugly buildings on the water's edge. The whole river front is public property, and a broad street faced with quays of stone extends along the river. The quays are supported by a *revêtement* wall of stone, and ramps lead down to the wharfs below. The St. Lawrence, like all young rivers flowing towards the north, is liable to flood in the spring if the ice breaks up on its upper waters before the river is clear below the city. Then the river struggles mightily, the water backs and rises, and the pressure increases until at last what is called a "shove" occurs. So suddenly does it come, and so quickly is it over, that many old residents of the city have never seen it. The river throws off its icy encumbrance, bursting up the level ice and piling it in immense heaps. The whole mass for miles and miles is for a few minutes in motion, and then the river appears in broad channels and expanses, having thrown up against the banks or over the shallows huge masses of ice-blocks piled one upon another. These are soon pierced by the strong rays of the spring sun and crumble in long needles of crystal, and are undermined by the swift current which bears all away to the sea. While the river is gathering force and backing for an effort the water rises, and once in every ten or fifteen years flows over the *revêtement* wall and floods the city. Although this has seldom occurred, it has caused heavy loss when it has happened, and hence a breastwork high above the utmost reach of the river is built along the edge of the quay to higher land above the city and prevents a recurrence of these inundations. Many seasons pass when the ice moves away quietly, but when it holds firmly below the city, and the lake and river ice comes down from above and is packed by the current against the firm ice, the loose floes dip under

and gradually choke the channel; it is then the river rises to its work, and the very remarkable phenomenon called a "shove" is witnessed.

As the trade of the port increased, and large steamships completely displaced the sailing vessels of former days, great changes were made in the harbour, and the works are still in progress. An immense guard pier has been constructed from the outer end of the embankment of the Victoria bridge down stream for a length of one mile and a third. In this way the upper portion of the harbour became an immense slack water basin, and, as the whole discharge of the Lachine Canal falls in at the upper end, the water in the basin will be changed at least twice a day. In this way the harbour front will be protected from the current, and in spring from the scour of the ice and from "shoves" in time of flood. Within this basin are four pier wharfs from 1000 to 1550 feet long. The lower part of the harbour is an extension of the present shore wharf to Hochelaga, and at the lower end four pier wharfs 500 to 850 feet project into the river at an acute angle. The result of these changes has supplied additional wharfage accommodation amounting to about *eight* miles.

The total value of goods in transit through Montreal for transhipment to foreign countries, as determined by the Customs Department at the port of Montreal, reached \$21,506,953 for the fiscal year ending March 31, 1912.

The total value of exports at the port of Montreal for the year ending March 31, 1912 was \$65,934,756, and of imports \$135,019,357, of which \$70,788,508 were dutiable goods.

It would give an imperfect idea of the city to omit mention of its great manufacturing industries. The change of trade policy in England broke up the old

channels of business, and for a few years the city staggered under the blow. In 1854 commenced the manufacturing era; there was, no doubt, some manufacturing done before, but with the great sugar refinery of the Redpaths a new departure was inaugurated. Manufactures of cotton, tobacco, boots and shoes, clothing, silk, iron, and many other things, followed in quick succession. The national policy of Sir John A. Macdonald built up industries in Montreal as well as in other parts of Canada, and protected trade with the neighbouring Republic and other countries with high tariff.

Other Cities.—Besides Montreal and Quebec, which are described elsewhere, the chief towns in the province are: (1) Hull, on the Ottawa river opposite the federal capital, a manufacturing town with large paper and lumbering and pulp mills, and a population of 18,222; (2) Sherbrooke, at the junction of the Magog and St. Francis river, with a population of 16,405, also a manufacturing town with woollen and cotton mills; (3) St. Hyacinthe, on the Yamaska, population 9797, a manufacturing town; (4) Sorel, population 8420, at the mouth of the Richelieu river, a centre for industries connected with building and repairing river steamers; (5) Valleyfield, on the Beauharnois canal, with cotton and paper mills; (6) Levis, opposite Quebec city, with a population of 7452; (7) Chicoutimi, population 5880. There are also a number of suburban municipalities round Montreal, into which various manufacturing industries are overflowing, including Lachine, population 10,699; Verdun, 11,629 inhabitants, and Maisonneuve, 18,222 at the last census of 1911.

In 1905 there were in all 6584 establishments of manufactures, etc., in the province of Quebec, with a capital of \$326,946,925; where 158,207 persons were

employed, earning \$69,432,967, and producing for that year articles valued at \$350,901,656.

Exports.—The total value of exports of Canadian produce by the principal ports of Quebec during the fiscal year ended March 31, 1913, is gathered from the following statement:—

Port.	Value.	Port.	Value.
Abercorn . . .	\$1,758,643	Quebec . . .	\$8,069,656
Coaticook . . .	11,941,142	St. Armand . . .	2,675,865
Athelstan . . .	4,152,857	St. Johns . . .	11,806,176
Montreal . . .	73,157,247		

Total value of exports from leading Quebec ports, \$116,561,586.

Imports.—The total value of dutiable and free goods entered for consumption at the ports of Quebec, Montreal, and St. Johns (Iberville) during the fiscal year ended March 31, 1913, was as follows:—

Port.	Dutiable Goods.	Free Goods.	Total.
Montreal	\$98,027,491	\$47,602,300	\$145,629,791
Quebec	6,959,917	7,759,630	14,719,547
St. Johns	1,064,723	2,824,077	3,888,800
Total	\$106,052,131	\$58,186,007	\$164,238,138

The Labrador Peninsula

Labrador was the name formerly applied to that great peninsula forming the extreme north-easterly portion of the mainland of North America, lying between the Atlantic Ocean and Hudson Bay. Up to the year 1912 it formed part of the province of Quebec and part of

the North-West Territories of Canada, the latter comprising 354,961 square miles, which by Act of Parliament, as stated before, was transferred to the province of Quebec. Besides this greater portion of the peninsula appertaining to the Dominion of Canada, there is a narrow, undefined (except in its southern expression) strip of coast line on the Atlantic from Blanc Sablon near the most easterly outlet of the Gulf of St. Lawrence to Cape Chidley at the south-eastern extremity of Hudson Strait, which strip is under the jurisdiction of the British Crown Colony of Newfoundland. Some authorities maintain that Newfoundland Labrador is a zone of territory of considerable importance and breadth; others hold that the strip is a narrow one confined to the sea coast and does not extend far inland.

The islands off the Eastmain coast, including the Belchers (north and south), Baker's Dozen, King George, Two Brothers, and Ottawa Islands, as well as those nearer the coast, have all been reserved by the Government of Canada, and were not included in the transfer of the great mainland peninsula, but still appertain to the North-West Territories.

There are nearly 75,000 square miles of territory still unexplored in northernmost Quebec, or Labrador peninsula as it was wont to be called. It is becoming a favourite ground for explorers and prospectors, and now that its whole area is within an organised province, surveys undertaken by federal as well as provincial authorities will soon reduce the amount of unknown area.

Labrador peninsula as such, according to Low, measures 1070 miles from Cape Wolstenholme in a straight line to the mouth of the Saguenay river; and from Cape Jones in Hudson Bay to the Strait of Belle-isle is 1065 miles in a line nearly east and west.

The peninsula of Labrador may be described as a tableland having a general elevation of 1500 to 2000 feet above the sea. The interior plateau over an area of 200,000 square miles is a rolling country, in which the differences of level seldom exceed from 300 to 500 feet, and the higher elevations do not exceed 2500 feet above the sea. On the Atlantic coast the plateau rises abruptly from the sea in stupendous cliffs, increasing in height towards the north to a point 70 miles south of Cape Chidley, whence the height decreases, until at the point of the cape it falls to 1500 feet. The shore of Ungava Bay is comparatively low, but from Cape Hope's Advance to Cape Wolstenholme the coast again rises, and continues for 270 miles lofty and bold, 500 to 2000 feet high all along the south of Hudson Strait. On the eastern shore of Hudson Bay the coast is low, excepting between Portland promontory and Cape Jones, where a range of mountains 1000 to 2000 feet high approaches close to the shore for 350 miles. On the south the plateau is bold, and drops in steep terraces down to the level of the river and Gulf of St. Lawrence.

Summit Lake discharges to the north by the Koksoak river, 600 miles long, flowing into Ungava Bay in Hudson Strait, and to the south by the Manikuagan river, 325 miles long, flowing into the St. Lawrence. The lake is 1940 feet above the sea, and is upon the 53rd parallel of latitude. Within a few miles of Summit Lake are the head-waters of Big river, flowing in a course of 550 miles westward into Hudson Bay. The fourth great river of Labrador flows eastward—the Hamilton river, 600 miles long—and its chief source is in Ashuanipi Lake between the parallels of 52° and 53° , and on the meridian of $66^{\circ} 30'$. The four greatest rivers flowing north, south, east, and west, thus have

their sources within a very limited area on the central plateau. The highest point of the plateau is 2400 feet above the sea, on the water-parting of the Big river of Hudson Bay, and the Manikuagan at Lake Attikopi, in longitude 70° and latitude $52^{\circ} 40'$.

The surface of this enormous plateau consists largely of marshes and bare rock, cut up by lakes innumerable and traversed by a maze of streams which flow almost on the surface. The country seems unfinished, as if it had been left as a specimen to show what other countries may have been at the termination of the glacial epoch, when the rivers had not worn down their beds, and valleys and basins had not been formed. So the rivers are here at this late age still like strings of lakes, and the lakes often discharge in two or more directions. The rivers divide and unite again as they flow over the level tableland in a way confusing to the explorer. Fully one-fourth of the area of the peninsula is occupied by rivers and lakes mostly shallow—many not over 20 feet and few over 50 feet in depth. Between Lake St. John and the height of land, the valley of the Chamuchuan and its tributaries has many falls and rapids, the lower stretches of which from Bear portage down have marine clays and sands along its banks rising to a height of over 100 feet above the stream; while the upper section flows over a generally level plateau. The Laurentian highlands cross the valley at the Pimouka rapids. The height of land between the Rivière du Chef and the Nottaway is a plateau some 1200 feet altitude, with small hills rising above the general level. Beyond lies Grand Lake Mistassini and its numerous islands surrounded by a generally well-wooded region. Porcupine and White Bear mountains in its vicinity are excellent view-points.

The largest lake in the province of Quebec is Mistassini, which is, however, deep. It is 100 miles long, but, being very narrow, it covers an area of only 500 square miles. Among the larger lakes are Nichikun (1760 feet above the sea) at the head of Big river; Lake Kaniapiskau (1850 feet) on the head-waters of the Koksoak river—this lake is over 50 miles long; Lake Mishikamau (1650 feet) on the head-waters of the Hamilton river, a deep lake 80 miles long by 20 miles wide. The Ashuanipi and Atikonak, two main tributaries of the Upper Hamilton, take their rise in lakes of the same names (1700 feet). From this latter lake the portage to the Romaine river, flowing into the St. Lawrence, is only half a mile across.

The rivers are, however, for the most part difficult to ascend, for, as they approach the edge of the plateau, they hurry down in swift continuous rapids and precipitous falls, so that while it seems easy upon the map to pass in any direction through the peninsula, it is in practice extremely laborious to portage or to work up the rivers to reach the interior level. The surface of the country is strewn with boulders, and these are for the most part angular, and have not been rounded by travel, while the rivers, in descending to the lower levels through the mountains which fringe the plateau, have cut narrow gorges or cañons requiring great effort to ascend. The southern rivers especially flow in deep valleys 500 to 1000 feet below the fringing highlands. On a portion of the western side, however, the watershed inclines with a gentle slope to James Bay, so that the country is most accessible from that side.

Until recently, the interior of Labrador was a great unknown land. McLean, an officer of the Hudson Bay Company, was the first white man to enter it, and in

1838 and 1839 he crossed from north to south from his station on Ungava Bay to the posts on the Hamilton Inlet. Some of the Oblate missionaries had followed the Montagnais natives from the Gulf of St. Lawrence to their winter retreats on the Hamilton river and its branches, and they established a mission on the North-west river, whence Father Lacasse had gone in 1875



FOURS RAPIDS, RUPERT RIVER.

to Ungava Bay. The Hudson Bay Company had a few posts in the interior on the main routes; Messrs. Richardson and McOuat had examined the country around Lake Mistassini, and Dr. Robert Bell had explored and reported on the coast region in its whole circuit from James Bay round by Hudson Strait and the Strait of Belle-isle; Professor Hind had gone up some of the southern rivers to the tableland; but it remained for Messrs. Low and Eaton in their explorations during 1892-94 to open up the heart of this formidable wilder-

ness. They entered by the south-west, by Lake St. John, the head of the Saguenay, passed up the Chamuchuan (Ashuapmuchuan), and crossed to Lake Mistassini. From thence they explored the Eastmain and Rupert rivers to James Bay. Returning the following year they went up the Eastmain river and the Big river to its source, crossed the water-parting of the northern watershed, and followed down the Koksoak river from its source to its mouth in Ungava Bay. At Fort Chimo they found the Hudson Bay Company's supply vessel, which took them round the east coast to Rigolet, the Company's post on Hamilton Inlet. They thence explored the Hamilton river to its source, and the highest part of the central plateau, then turning southwards they crossed the southern water-parting and followed down the Romaine and St. John rivers to the Gulf of St. Lawrence. Thus, in a series of most arduous explorations, an area of 289,000 square miles of the peninsula was examined, for much of which even native guides could not be found. Maps showing the results of their labours were compiled by Mr. Eaton, and were published by the Geological Survey of Canada.

The explorations of Messrs. Low and Eaton show that while Labrador is, in reality and in many of its wilds and barrens, a very uninviting country, Professor Hind's oft-quoted words, that "language fails to depict the awful desolation of the tableland of the Labrador peninsula," are too strong. Although large game has become scarce in the south, the myriads of lakes and streams are alive during the summer with wild ducks and geese. The explorers found also that fish, whitefish, lake trout, and brook trout were very abundant in all the inland waters. The country is, however, the very home of mosquitoes and black flies; for everything in

it—land, water, climate—tends to produce an environment in which these irritating insects increase and multiply. It is by no means everywhere a treeless waste; but the forest is continuous south of 53° and north of that latitude, while the summits and northern slopes of the hills are bare over large areas, in the valleys of the streams and lakes, and at the heads of the inlets, and in sheltered places, white, black, and balsam spruce, as well as birch and poplar, are abundant. In the valley of the Hamilton river the spruce attains 24 inches in diameter at a height of 3 feet from the ground. Dr. Grenfell reports trees at the head of Sandwich Bay from which 60 feet spars might be made. North of latitude 54° the timber is not large enough to be of much commercial value, and the tree limit is reached at latitude 58° , or about the southern coast of Ungava Bay. The northern part of the peninsula, where the trees are scant, is covered with reindeer moss. At the south this is replaced by sphagnum. A large portion of the forest region has been swept by fires started by the carelessness of people, who take no precautions with their camp fires. The "Mayflower" (*Epigea repens*) abounds everywhere.

Dr. A. S. Johnson, who visited Labrador during the summer of 1905, and accompanied the Canadian Government Solar Eclipse Expedition sent to Northwest river, made a careful study of the country and especially of the district visited. His writings point to future commercial and industrial development, and contain discussions of possibilities in various directions, including mining, lumbering, and fisheries. He prophesies that the silence of centuries will be broken by the pick and hammer and spade of the prospector, by the throb of the lumber mill, the whirl of the pulp mill and the factory, whilst up its myriad beautiful fiords, bays, and rivers,

the teeming life they contain will yield an abundant and highly remunerative harvest.

Geologically, Labrador is an immense area of Archæan rocks. Nine-tenths of the whole peninsula consist of Laurentian gneisses with intrusions of granite, basalt, and syenite. Masses of anorthosite occur north-east of Lake St. John, on Lake Michikamau, west of Grand Falls,



MOUTH OF WIACHUAN RIVER, RICHMOND GULF.

also north of Alexis river, and one large mass in the southern part of the territory crossed by the Natashkwan, Romaine, St. John, Magpie, Moisie, and Ste. Marguerite rivers. Huronian rocks occur to a somewhat large extent along the Eastmain river, and on some lakes south-west of Lake Mistassini. Small areas are reported along the coasts of Hudson Bay and the Atlantic Ocean. Rocks of Keweenawan or Animikie age are reported in large areas along the Koksoak and Kaniapiskau rivers, and on the upper waters of the Hamilton river, also on

Lake Mistassini, at Nastapoka Sound and Richmond Gulf, on James Bay, at Cape Smith and in the interior, also along the south shore of Hudson Strait, at Cartwright and the coast to Hamilton Inlet. Enormous quantities of bedded iron ore specular, carbonate, and red hæmatite, occurring in mountain masses, were observed in the Keweenawan or Animikie deposits along the Koksoak river and on the upper waters of the Hamilton. These ores are, unfortunately, too inaccessible at present to be utilised. Dr. A. P. Low is the only geologist who has seriously attacked the problem of preparing a geological map of this great peninsula, and his various explorations together with their detailed descriptions, as well as his synthetic report and maps, furnish the best information available for reference. Professor Reginald A. Daly's work in the summer of 1900 has also furnished valuable information of a geological and physiographical nature. Sulphide of iron in Rowsell's harbour about latitude $58^{\circ} 30'$, the large sand delta between Sandwich and Eskimo bays reported to have yielded gold in paying quantities during 1907 and 1908, antimony about Eagle river, mica along Paradise river, copper on Mugford island, garnet, labradorite on an island near Nain, gold at Hebron and similar indications elsewhere, point to the existence of mineral-bearing formations in Labrador. Much of the surface of the Archæan throughout north-eastern Quebec is driftless and bare. The great Labradorean ice-sheet, like other ice-sheets at different periods during the last great refrigeration, having taken up within its plastic mass all the loose materials that lay over its broad areas, made a clean sweep of them, and furnished the now more genial latitudes and settled districts of New Jersey, New York, Ohio, Pennsylvania, southern Ontario, and the Laurentian lowlands of Quebec as well

as Maine, New Hampshire, and Vermont with abundance of drift constituting fertile soils.

The evidence furnished by numerous raised beaches and glacial deposits indicates that Labrador peninsula is still rising out of the ocean, the northern portion more rapidly than the southern. Glaciers still exist in the northern extremity of the Torngak mountains near Cape



RAPIDS ON CLEARWATER RIVER.

Chidley. Labradorite of the precious variety occurs in very large masses on an island near Hopedale on the Atlantic coast, and Low and Eaton found it also in great abundance on Lake Michikamau. It is a beautiful mineral, and glistens with opalescent colours from bright blue to bronze green and yellow. It is sometimes used in jewellery. For ten miles along the lake large crystals were found.

Of the four divisions previously referred to, the western watershed is the largest, and many large rivers

flow through it to fall into Hudson Bay. The Big river is 550 miles long, the Eastmain and Great Whale rivers are 250 miles long, little Whale river and Clearwater river discharge a group of large lakes, but the region around the last two is practically unknown. The watershed from James Bay slopes very gradually up to the dividing ridge, and is an exception in that respect to the rest of the peninsula.



CLEARWATER LAKE, LABRADOR.

The northern watershed is chiefly drained by the Koksoak river and its affluents, which rise in groups of small lakes at the apex of the central triangle and flow into Ungava Bay. Next after the Hamilton it is the most important stream in the peninsula, and drains an area of 60,000 square miles. The George is a very large river, and falls also into Ungava Bay after a course of about 300 miles. Whale river in the same division is 150 miles in length. The coast of Hudson Strait, which forms the base of the northern watershed, has been described in the chapter on Hudson Bay.

There remains to be noticed north-easterly Quebec and

Newfoundland Labrador (that portion of the peninsula along the coast politically a dependency of Newfoundland). Blanc Sablon, at the inner end of the Strait of Belle-isle, is the point of separation from Quebec. Thence a line is drawn due north to the 52nd degree of latitude. There the line stops, and the governor's commission goes on to say that from the point of intersection of that line



STILLWATER RIVER, LABRADOR.

with the parallel of 52° the *coast* of Labrador and all its islands to Cape Chidley shall be under the government of Newfoundland. How far inland from the coast-line the jurisdiction of Newfoundland extends has not been authoritatively decided, but will no doubt be satisfactorily settled. Behind the mountains of the coast range, up to the height of land, the country is unexplored, excepting the valley of the Hamilton river. There are three principal mountain ranges that appear to have risen as a result of pressures in a north-easterly and south-westerly direction on the north coast: (1) The *Torngaks*

(devils) lying between Saeglek Bay and Cape Chidley; (2) the *Kaumagets* (shining-topped), between Saeglek and Okkak; (3) the *Kiglapeits* (dog-toothed) mountains between Okkak and Nain. The most northerly afford the highest and wildest scenery along the whole coast of Eastern North America.

The Torngak mountains include many peaks of the Matterhorn type, and their summits were never submerged beneath the great continental ice-cap. They attain a maximum height of 6000 feet at least, though they have often been described as reaching 10,000 feet. They rise direct from the sea-level as a plateau. Dr. Grenfell ascribes to the highest peaks of the Kaumaget range, imposing as they appear, not more than 3500 feet elevation.

This coast presents to the Atlantic a formidable line of steep-to cliffs of Laurentian gneisses, schists, and granites, with occasional Huronian rock, deeply indented by fiords, and studded along all its length by innumerable islands. These are all rocky, and many of them are high. Along continuous stretches of hundreds of miles these islands afford an inside sheltered channel. Only at one spot of this whole rugged and barren coast is there a stretch of sandy beach. A veritable archipelago of islands fringes the Labrador coasts, between Cape Whittle and Blanc Sablon in the Gulf of St. Lawrence, that is over 100 miles; between Boulter's Rock and Holton, over 100 miles; between Cape Harrison and Port Manners, about 150 miles; between the Kiglapeits and Saeglek bays, about 50 miles; and between Eclipse Harbour and Cape Chidley, another stretch of 50 miles more. When good surveys have been made and charts published, these islands will afford excellent cruising waters in a region where the

extraordinary beauty of the northern cliffs and romantic fiords can be enjoyed under the shelter of islands and the increasing number of visitors to Labrador will enable it to compete with the coast of Northern Europe. There is at least *one* harbour from the ocean in every 10 miles of the coast from Belle-isle to Chidley. There are also a few off-lying reefs, the most dangerous being in the vicinity of the Hog's Back, a series of small bare tops of a submerged mountain range which rise just above the surface of the ocean off the mouth of the Komaktorvik in about lat. $59^{\circ} 30'$. These are still uncharted, and form an obstruction to navigation except for small vessels between Nachvak and Cape Chidley. Grenfell's Tickle is a sheltered channel used as a short cut into Ungava Bay, obviating the necessity of entering Hudson Strait.

The ocean face of rock rises from 500 to 1000 feet, increasing in height northwards to 1500 feet at Nain, and continuing to rise from Okkak to Nachvak Bay to a height of 3000 feet. As already described, this mountain range in the rear comes down north of that point, close to the coast, and the land rises to 5000 feet and 6000 feet, until within 70 miles from Cape Chidley, when it sinks to a continuous height of 1500 feet. The mountain chain of the interior, as it approaches the coast at the north, contracts to 25 miles from a width of 50 miles, and is the highest land not only in Quebec, but also in British North America east of the Rocky Mountains. The peaks of these northern mountains are not glaciated, but angular and ragged, not rounded by attrition, but split by sudden changes of temperature and frost. Professor Hind's description is very graphic: "The Atlantic coast is the edge of a vast solitude of rocky hills, split and blasted

by frosts and beaten by waves. Headlands grim and naked tower over the waters—often fantastic and picturesque in shape, while miles on miles of rocky precipices, or tame monotonous slopes, alternate with stony valleys, winding away along the blue hills of the interior.”

With the notable exception of the Hamilton river, the streams on the eastern slope are very short. They



NACHVAK INLET, NORTHERN LABRADOR.

empty at the heads of deep fiords where the flowing water and the beating surf have completed the work of the glaciers of a former age, and have cut deep grooves in the rocky rampart. During the short summer the wind is most frequently from the west, and the sea is then calm, but easterly winds throw against the coast a tremendous sea. Navigation here is not so much impeded by fog as on the southern and south-eastern coast of Newfoundland. Navigation opens on the southern shore at the end of June, or early in July, but north of Nain the coast is seldom clear of field-ice before the end

of July, and all the year round bergs are passing down southwards. In July and August the stream of icebergs is most continuous, but all through the summer they are floating down the Arctic current. The whole overflow of the Arctic basin is thrown against this coast, for the currents east and west of Greenland set upon it. According to Dr. Barnes, during the winter months the surface temperature of the Labrador current often falls to the freezing-point of salt water, about 28° F., but it is more often at 29° or 30° F. As the spring advances the line of low temperature advances farther north, until in July or August the temperature on the Grand Banks towards the Straits of Belle-isle reaches 40° or 45° F., and gradually falls northwards to 29° F. in Hudson Strait. The surface temperature varies considerably, depending on the proximity of ice or land.

In April, May, and June are to be found the greatest number of icebergs and the largest extent of field-ice. They have been seen as far south as the 39th degree of latitude and as far east as longitude $38^{\circ} 30'$ west. In general, it may be stated that floating ice may be met with anywhere in the North Atlantic Ocean, northwards of the 40th degree of latitude, at any season of the year.

Sandwich Bay is one of the more important inlets. It is 25 miles long and 6 miles wide. It contains several good harbours, and here, at a place which still bears his name, the adventurous Major Cartwright established his trading post at the end of the eighteenth century. The most important, however, is Hamilton Inlet. This extends 35 miles inland where it narrows to one-third of a mile, and then expands into Lake Melville, 18 miles wide, and reaching 90 miles farther inland to where the Grand or Hamilton river discharges its waters. The whole distance from the headland at the mouth of the

inlet to the Hamilton river is 150 miles, and the average width is 14 miles. At the narrows is Rigolet, the chief post of the Hudson Bay Company in the district. The country round is bold and rocky, especially on the south shore where the Mealy mountains rise abruptly 800 to 1200 feet from the waters of the inlet.

Only one river is worthy of mention on this coast, the great Hamilton river, which practically drains nearly the whole of easternmost Quebec. Its tributaries rise in large lakes on the interior plateau, and its head-waters interlock with the sources of the Koksoak and George rivers which discharge into Hudson Strait. From its farthest source to its mouth the distance is about 600 miles. Like all the rivers of the peninsula it flows on the interior plateau in an even bed, on the surface and not in a deeply cut valley; but in its lower course below the falls it flows in a precipitous rocky valley deep below the surface of the surrounding country. The great falls are 215 miles from the mouth of the river, and commence where it first sweeps down from the central plateau. In a distance of 12 miles the river falls from a lake (1660 feet) to the mouth of a gorge only 900 feet above the sea—a drop of 760 feet. Four miles above the great cataract the rapids commence, and, within that distance, the river rushes swiftly down until it reaches the head of a precipitous gorge, at right angles to its general course, into which it plunges with a final fall of 302 feet.

Through this deep and gloomy cañon the river sweeps in foaming rapids in a zigzag course of about 10 miles, and then passes into a narrow valley with steep sides deeply incised into the tableland, down which it flows swiftly for 50 miles to quiet water at Winokapau Lake. From the lake it passes in rapids, and falls down the remaining height in its course of over 120 miles, and

flows into the sea-level at the head of Melville Lake. The ascent of the river is very arduous, owing to the swift current and the precipitous sides of the valley in which it flows. In some places the whole valley is less than half a mile wide, and perpendicular walls of rock rise from 400 to 600 feet sheer from the river, which in the course of ages has cut its way back from the inlet.

These falls were first seen by Mr. M'Lean in 1839. Father Babel, who spent some seasons with the "Indians" on the Hamilton, about 1870, visited them. In the summer of 1891 two parties from the United States succeeded in reaching them, and described them in communications to the periodical press. In 1893-94 Low and Eaton wintered on the Northwest river, and in the following season explored the Upper Hamilton; and the fullest description of the Grand Falls is to be found in Mr. Low's report published in 1897. Recent surveys by H. G. Bryant (1912) along the St. Augustine river, from the sea to its source (141 miles) revealed a central plateau "as of surpassing beauty" with long and difficult portages along the river course.

Climate, Forests, etc.

In attempting to describe and understand the meteorology of Labrador three facts must be taken into consideration: Firstly, the great extent of latitude the country covers; secondly, the presence of the polar current; and, thirdly, its proximity to Hudson Bay. In a series of experiments made by Dr. Grenfell in conjunction with Prof. Adolph Neilson, the temperature of the sea surface seldom rose in summer above 43° Fahr. except in the bays and inlets, though at the wider ends of some of these, especially in Hamilton and Sandwich bays, the

water temperature rose to 60° Fahr. On the outer coast the temperature in winter seldom, if ever, falls below 40° below zero; whereas on the high plateaus about the grand falls lower temperatures are experienced as in Central and North-west Canada. Similar differences obtain in summer, so that with every mile from the coast the opportunity for vegetable growth increases. The liability to frosts in summer, which is a feature of life on the outside, becomes a negligible factor of danger. The summer season is short and the total amount of sunshine limited, chiefly owing to the latitude of the peninsula, which has a diurnal rotation similar to that of Great Britain. At the mill, situated at the mouth of the Hamilton river, oats and barley are cultivated. According to Low, spruces, especially *Picea nigra*, and birches grow as far north as Hebron, and thence in a diagonal direction to Ungava Bay. Larch (*Larix Americana*) are next to the spruces in abundance, whilst balsams and poplars are not of commercial value. These trees and other plants of this portion of the peninsula have assumed a xerophilous form, owing to the coldness and acidity of the soil, which form protects them against dryness. This, and not the extreme cold, is the real cause of the stunted nature of the flora.

. According to Low, the forests of Labrador may be said to be continuous, except on the hill-tops, as far north as latitude 54°; nevertheless, when latitude 55° is reached half the country is treeless, and those trees which exist are greatly diminished in size. There are few places in the world which can compete with the wild berry crops of Labrador. In his writings Seton Thompson records blackberry (*Empetrum nigrum*), red cranberry, the wineberry of the sagas (*Vaccinium vitis-idea*), blueberry (two varieties: *Vaccinium Pennsylvanicum*

and *V. uliginosum*), bearberry (*Arctostaphylos alpina*), cloudberry (*Rubus chamamorus*), Arctic raspberry (*Rubus arcticus*), besides the white teaberry and red marshberry. The cranberry is beginning to be exported in large quantities both for food and for its red juice for dyeing purposes. *Russulae* and *Boleti* among humbler plants grow on the rocks as far north as Cape Chidley, and form an excellent article of food for winter use when dried and preserved during the summer season. An Iceland moss (*Cetraria*), reindeer moss (*Cladonia*), and rock-tripe (*Umbilicaria*), the plant on which Sir John Franklin and his party subsisted for nearly three months, are fodder plants for the caribou.

Lord Strathcona relates that the flower and vegetable gardens about Hudson Bay posts in Labrador were beautiful and brilliant, recalling those of Britain or settled portions of Upper and Lower Canada.

The climate and soil of northern Quebec or Labrador peninsula proper do not admit of agriculture north of 51° . There is but little soil over the surface of this ancient tableland; neither is there grass for cattle, and its place is supplied by reindeer-moss and lichens. Edible berries, such as gooseberries, cranberries, raspberries, currants, whortleberries, cloudberry, grow everywhere in great abundance. Potatoes will grow at the head of Hamilton Inlet and at Nain. The Moravian missionaries cultivate during the short summer a few garden vegetables by covering them at night. The average annual temperature here is 22.5° Fahr.—that is 9.5° below freezing-point—while farther south at Hopedale it is 27° or 5° below.* In the north, on Hudson Strait, the climate is Arctic, and on the unsheltered plateau it is very cold. In Ungava Bay the summer temperature rises to 90° Fahr. at noon, and drops to freezing after sundown.

Along the Atlantic coast easterly gales are in winter very severe, sending against the shore a heavy swell which sometimes breaks over islands 30 feet high. The fishermen retire, after the fishing is over, up the valleys into sheltered spots, and carry on fur-hunting during the long winter. It is not that the winter temperature is so low compared with other places where agriculture is possible—for at Rigolet, on Hamilton Inlet, the mercury never falls below -40° Fahr.—but it is the shortness of the summer and the frequent summer frosts which prevent the cultivation of vegetables.

In the wooded tracts of the southerly inlets and valleys, from early June to the end of August, the climatic conditions of that portion of the Labrador peninsula are much like those of the Adirondacks, or the verdure-clad hills, lakes, and islands of the Muskoka region of Ontario and the Laurentide Hills region of old Canada. Except where the eternal dampness of the sea is felt among the coastal highlands, the Labrador climate is much the same as in other parts of eastern Canada.

The fishermen of the Atlantic coast profess to prefer the winter season, when they retreat up the valleys for perhaps 50 miles or more. They find abundance of food-fishes—trout, whitefish, ouananiche, or land-locked salmon—and may catch them easily through holes in the ice. Innumerable geese breed in the north, and these, shot by the residents in the fall, are hung up to freeze. On the coast eider-ducks, loons, divers, widgeon, teal and other water-fowl are very abundant, and a supply of those suitable for food may be preserved by frost all through the winter. Partridges are very plentiful in the interior, and on the coast the choicest of the food-fishes of the sea come to the feet of the inhabitants. Caribou are scarce in the south, but the Iceland moss is the support of herds

of reindeer in the far north. The winter residents also hunt and trap for their skins foxes, otter, beaver, mink, marten, and lynx; so that Mr. Low concludes that the lot of the residents at Labrador is more enviable than that of the poor of large cities. These northern climes are, however, unsuited for the "submerged tenth" of civilisation. Nature is stern in the north, and quickly eliminates the idle and thoughtless. The permanent residents are frugal, moral, good-natured, and intelligent. They are tall and strong physically, and their appearance testifies that the climate is healthy. The Labrador coast proves an important dependency of Newfoundland, for more than one-fourth of the total fishery product of the colony is derived from it, and the proportion is annually increasing. In the fishing season, from 30,000 to 40,000 fishing-folk, men and women, leave Newfoundland for the harbours of the coast of Labrador. The favourite inlets are crowded with fishing craft, not only from Newfoundland but from Canada and the United States. There are numerous stations along the coast for buying fish, and temporary settlements are made, where the fish caught are cured and dried and shipped, for the most part to the ports of final consumption in the West Indies, Brazil, or western Europe.

The cod of this coast are very large and fine; for along it, about 15 miles outside the islands, extends a narrow bank exceeding 7000 square miles in area, over which the Arctic current sweeps its treasures of "living slime"—the food of fish. In June the capelin arrive, blackening the water by their numbers and throw themselves on the shore in myriads followed by the voracious cod. The cod will not take bait while the capelin are running, but are caught in enormous seines. Later in the season, after the capelin disappear, they are taken by the

hook. The stations do not extend beyond Nain, but the fishing vessels follow the fish when they strike in all along the coast as the ice clears away through the summer. Besides cod, herring and salmon are taken in their season, and in spring the seal fishery affords employment.

In the fall the large floating population go back to their homes, and the winter residents gather at the chief harbours. Postal communication is kept up even during the winter season by courier to Battle Harbour. Beyond that, there is no communication in winter, the inlets are all frozen over, and the field-ice sets in upon the coast, blocking it from November until July. Practically all the population of the coast east of Blanc Sablon is English-speaking, and the French language is seldom heard there.

It is impossible to write or speak of Labrador without a tribute of respect to the Moravian Brethren. They came upon this desolate coast about 1764 and made their first settlement at Nain, from which they have extended their work among the Eskimo. Their settlements are Hopedale—the most southern,—Zoar, Nain, Okkak, Hebron, and Ramah on Nachvak Inlet—the most northern. The Eskimo of the coast are collected round their stations. They had been embittered against the whites by centuries of injury—the very name of Labrador records the humiliating fact that it was as man-stealers that Europeans first appeared upon those coasts. The Moravians at first found it difficult to approach the Eskimo, who did not believe that a white man could be anything but an evil being. Now there are very few heathen among them on the whole peninsula, and they have become a harmless and industrious people, working at their business of fishing and hunting, and grouping

themselves around the Moravian Brethren, who teach them, up to their needs and capacity, the arts of civilisation. They are very different from the native tribes or aborigines of British North America. They are cheerful and good-natured in disposition and industrious in habit. They are very fond of music, and Captain John Davis relates how they would gather round to listen to it. That was 300 years ago, and they have still the same love of music. Dr. Grenfell of the Medical Mission reports that when he arrived on the coast in his mission ship, a number of them came aboard and squatted round in the hold, while one of their number played excellently on the ship's harmonium, and others performed on two concertinas and two cornets, and the rest sang, in parts, hymns in their own language to English tunes. They will play on the violin in first and second parts, and have a natural appreciation of harmony. They are not increasing, for, under the influence of European food and clothing, their natural hardihood is weakened. Mr. Low confirms the reports of some other explorers that the Eskimo are not short in stature. They are from 5 ft. 6 in. to 6 ft. tall, but their breadth and the clothing they wear detract from their height. They can all read and write in their own language.

The native tribes of Labrador are of Algonquin stock, and are Montagnais south of Hamilton Inlet and Nascopies at the north. They have all been Christianised by the Anglican missionaries from Hudson Bay and the Roman Catholic missionaries from the St. Lawrence. The Christian natives nearly all read and write in the syllabic characters invented for them by the missionaries, and it is not unusual to find at the portages letters written with charcoal on birch bark, fastened up for the information of travellers.

Further remarks on the northern and western shores of Labrador will be found in the chapter on Hudson Bay. The volumes published by Messrs. Packard and Stearns, and by Professor Hind and Dr. Grenfell, besides those of the officers of the Geological Survey of Canada, are of much value in obtaining reliable information on the great peninsula of Labrador.

History

That the Northmen must have visited Labrador in their voyages to Vinland in the tenth and eleventh centuries cannot well be doubted; but there is nothing recorded to suggest that they ever attempted to settle on that very uninviting coast. They are generally believed to have given the name Helluland to the country—a name singularly inapplicable; for though Labrador is a country of stone and rock, it most certainly is not “a land of stony flatness”—*terram saxæ planitici*; for that is Rafn’s translation of “Helluland,” the descriptive name which Leif Ericson gave to the territory he saw. The coast is not such as to suggest any idea of flatness at first sight. “From recent researches in history,” writes J. D. Rogers, “it is quite clear that Labrador, Newfoundland, and some parts of the American continent, were visited by a party of colonists between A.D. 1000 and A.D. 1006, and were described with unerring fidelity. Eric’s son Leiv, Leiv’s brother, Karlsevne, Bjarni, Thorvald, Thorvard, Freydis, and Thorhalle are so many names of seafaring folk who found the new world, and who described it as Helluland (Slabland), Markland (Woodland), Kjalarnes (Keel-ness), Straumfjord (Streamfjord), and Hopi—where they met the Skrælings (Eskimos), primæval forests, bears, deer, and localities where the

scenery was softer. The Norse discovery of Newfoundland and America was the false dawn, and many events were destined to happen before the real dawn appeared." After the Northmen, the first Europeans to reach the north-east coast were the Cabots. They, in their second voyage in 1498, sailed along it northwards in the hope of finding a passage to Cathay. Their expedition must have reached Hudson Strait; and from indications on Ruysch's map, elsewhere referred to, they must have attempted unsuccessfully to enter the strait before turning southwards. There is nothing positive in the records or maps to show that Cortereal, who followed soon after the Cabots, was ever on the coast of Labrador, either on his first or second voyage. The Cantino map of 1502 shows the east coast of Newfoundland, and Cape Farewell in Greenland, but no land between; and the indications on that map are that he struck directly from Cape Farewell to the Newfoundland coast, as Leif Ericson probably did. The Labrador coast is in fact barred from the east until late in the year by a continuous stream of ice, sweeping down with the Greenland current, as explained in previous sections, and it is not probable that either voyager entered the pack. There is, however, in Kunstmann's Atlas a reproduction of a Portuguese chart, dated 1502-4, showing an island marked Terra Corterialis, and a small piece of coast behind it marked Regalis Domus. These lines are repeated in the Ptolemy of 1511, and suggest that some Portuguese sailor may have penetrated into the Strait of Belle-isle; but they are not found on any other map, and Newfoundland was delineated as part of the mainland until Jacques Cartier's time. There is always, however, a deep bay (La Grande Baie) marking the place of the Strait of Belle-isle.

Seeing that Labrador is so near Europe, a singular

amount of mythology has gathered around its scanty history. There are, for instance, the Basque stories, and, among what are called the "traditions of the coast," is the story that Cabot found a Basque vessel there. This is an evident transference of an experience of Cartier. Then there is the story, based on a few incidental words in Peter Martyr's letter, that the natives met by Cabot on the coast called the cod by the Basque name *baccalaos*—a word no more Basque than Spanish or Portuguese. It is also asserted in a general way, without citation of any evidence, that the north-east coast was well known to the Basque whalers before Cabot or Columbus discovered America.

It is beyond doubt true that the Basques, both of France and Spain, were very early upon the coast, but there is no evidence that they preceded the Bretons in 1504. They carried on the whale fishery at the time America was discovered, and they followed the whales far out to sea; but the assertion that they were on the American coast as early as 1450, and that Cabot and Cortereal met their ships there, is without foundation. It is hard to prove a negative, but it is destructive to history to make positive statements without adducing a single historical fact in support of them. St. Sebastian was the great centre of Basque shipping, and both Kohl and Estancelin quote Navarrete, to the effect that he had searched the annals of St. Sebastian and of the province of Guipuzcoa, and that they showed that the Basque whale fishery on the coasts of Newfoundland did not commence before the return of Stephen Gomez' expedition. Beyond question, Cabot or Cortereal did not encounter Basque vessels on the American coast, and no name or date has been cited to show the contrary.

Then there are myths connected with the French

claims on Hudson Bay. For instance, that in 1656 the sovereign council of Quebec sent Jean Bourdon to Hudson Bay by sea, and that he went there and took possession in the name of the king of France. This is effectually disproved by the Jesuit *Relation* of 1658, which records the arrival of Bourdon's vessel at Quebec in 1657, and states that he did not go beyond latitude 55° , where he was stopped by ice, and that he therefore returned, having lost some of his people killed by the Eskimo. The year is generally erroneously given as 1656. Again it is asserted that Père Dablon and the Sieur de Vallière went overland to Hudson Bay in 1661; but in the Jesuit *Relation* of that year a full account is given of this expedition in a letter from Père Dablon, dated from Lake Nikabau, a little south of the height of land, the utmost point they reached. They did not therefore cross the height of land. It is, moreover, clear in the *Relation* of 1662 that Father Albanel was sent to make a "discovery" of the bay, to learn its situation and distance, and that his was the first expedition to succeed in reaching it from Canada.

Then, in 1841, the Literary and Historical Society of Quebec published a memoir by a resident on the Labrador coast, giving what the author called the "traditions of the coast." This memoir is a treasury of mythology, and the statements made have been copied into most of the later books; and here it may be remarked that a coast without permanent inhabitants can have no traditions, and that settlers in after years, in a wild country without books or records, are not in a position to know more of its previous history than any one else. Most of the statements made in this memoir have been incidentally treated elsewhere; it is only necessary now to refer to those concerning the port of Brest. It is stated that

Brest was founded a hundred years before Quebec, about A.D. 1508, and that it contained 200 houses and 1000 permanent inhabitants all the year round, a number probably trebled in summer; that in 1630 a grant was made of Bradore Bay *en seigneurie* to a Count de Courtemanche, who had married a daughter of King Henry IV., and that the town then fell into decay. Louis Roberts's *Dictionary of Commerce*, published in 1600, is cited to the effect that Brest was the chief town of New France, the residence of a governor, almoner, and other high officials, with many other particulars showing the importance of the town.

The real facts concerning Brest are that it was a harbour well known to the fishermen. Jacques Cartier was there in 1534, but mentions no town, nor fort, nor governor. He calls it the "Island of Brest" and the "port of Brest." Jean Alphonse in his *Routier*, about 1542, mentions Blanc Sablon, but not Brest. If it had been a settlement he could hardly have failed to notice it as the only settlement on the coast. Champlain does not once mention the place, though it, like many other harbours without inhabitants, is on his map, and he wrote from 1600 to 1632. The port was in Esquimaux Bay, not in Bradore Bay, and on the old French maps Esquimaux Bay is often called Vieux Fort, and Old Fort Island of our maps was called Vieux Fort. It is at the mouth of the bay, but Stearns saw no remains of a fort, nor even of buildings upon it. He resided on the bay for a year, and the settlers told him that they had seen remains of houses on the south shore near the mouth of the bay; but he did not find any remains there. The name indicates that there must have been an establishment, probably a summer fishing station there. The particulars of the grant of Bradore are in the public

records at Quebec, and it is beyond question that there was no Count de Courtemanche. The only grant was made in 1702 to Augustin Le Gardeur de Courtemanche, who was born in Quebec in 1663, and married the widow of Pierre Martel. Her maiden name was Marie Charest, and she was the daughter of a tanner at Levis, opposite Quebec. He married her in second nuptials in 1697, and in 1704 he made a voyage to Labrador, and, in a report to the Governor, he described the coast from the Kegashka to a point beyond the strait. He mentions Esquimaux Bay, but not Brest, which ought to have been there if it were a town; and he describes Bradore Bay, then called Baye des Espagnols, where he found the vestiges of an establishment for rendering blubber. He found no inhabitants on the coast. In 1712 his grant was renewed and its extent curtailed. He built a fort there, and he called the bay Phelyppeaux Bay, from the name of the minister, and the fort, Pontchartrain, from the minister's territorial title. Phelyppeaux was Minister of Marine from 1699 to 1715. The first grant on the coast was made in 1661 of the Seigniorship of Mingan to François Bissot, and the grant to Courtemanche, whose wife was Bissot's grandchild, was the second. After that many grants were made for limited periods from Cape Whittle eastwards far beyond the Strait of Belle-isle, and on the opposite coast of Newfoundland. These were worked by the grantees, who were mostly Quebec merchants, and a brisk business was carried on. It was under the English régime that the coast fell into the hands of a monopoly, and was eventually almost abandoned to the Hudson Bay Company. The correct title of Louis Roberts's work referred to in the memoir is given in Lowndes as *The Merchants' Map of Commerce*, and the first edition was published, not in 1600, but in 1638.

With respect to north-east America the work is full of errors. The town of Brest is given as the capital of Terra Corterialis; the chief town of the region of Norumbega bears the same name; the chief towns of Nova Francia are Canada and Sanguinai. All these towns are equally mythical.

Returning once more to history, the name Labrador presents much difficulty. It was not given by Cortereal. He stole a number of natives from Newfoundland; and from the descriptions given by Cantino and Pasqualigo, who saw some of them in Lisbon, they could not have been Eskimo. In the letters written at the time, both the writers record the fact that the king of Portugal was impressed by the suitability of these natives for labourers or slaves, and this is the most rational explanation of the name. It is on the earliest maps, though not on Cantino's, as Terra Laboratoris, De Lavrador, and Labrador. The last is the Spanish spelling of the same word, and means labourer, so that Labrador might be freely translated as "Slave Coast." A map dated 1534—the "Wolfenbuttel map"—contains the only attempt at an etymology, in a note to the effect that the country was discovered by the English, and a labourer (Labrador) from the Azores among the crew saw it first. The "tradition of the coast," however, modifies this theory by reporting that "one Labrador, a Basque whaler from Navarre in Spain, did penetrate through the Strait of Belle-isle as far as Labrador Bay some time about the middle of the fifteenth century, and eventually the whole coast took its name from that bay and harbour." The fact is, that Bradore Bay is a name which dates only from the English occupation, and is not found on the early maps or in the French authors. In the *Geographical Journal* for February, 1897, a Portuguese writer states that private documents

have recently been found to indicate that in 1492 the king of Portugal sent one Joaõ Fernandes Lavrador to discover lands across the ocean. The documents are not appended to the paper.

The early English voyages of discovery were to the coasts north of Labrador. The English were searching for the North-West passage, and sought for it more to the north. Frobisher saw the entrance of Hudson Strait. Davis, in 1587, crossed the mouth of the strait, and sailed down the coast of Labrador to latitude 52° , having landed at Davis Inlet and Hamilton Inlet before returning to England. Weymouth, in 1602, sailed for some distance into the strait, and afterwards coasted along Labrador. The state of English knowledge is shown by the Hakluyt map of 1600, and was limited to the existence of a strait, but the Portuguese maps of an earlier date not only show all the coast of Labrador named, but even indicate a knowledge of Hudson Bay, which Hudson did not enter until 1610. When the Portuguese ceased to frequent the north-east coast, and the French and English began to make maps, all these names disappeared.

When at the peace of 1763 Canada was ceded to Great Britain, the whole of Labrador, as far up the gulf as the St. John river, as well as the Island of Anticosti and the Magdalen Islands, was annexed to the Government of Newfoundland. This became a grievance to the proprietors on the coast, because the grants had been made under French law, and much confusion arose because of the introduction of English law; so that, by the statute commonly called the Quebec Act of 1774, Canada was extended to its ancient limits. In the meantime, English merchants at Quebec bought out the old French grants and worked the fisheries for a while; but eventually the whole region passed under lease, first

to the North-West Company, and then to the Hudson Bay Company, whose trading posts still exist at convenient points along the coast. In 1809 the boundaries of the province of Quebec were again contracted to the River St. John, and Southern Labrador reverted to Newfoundland; but finally, in 1825, the boundary of Quebec was extended to Blanc Sablon at the Strait of Belle-isle, its present limit.



DR. GRENFELL'S HERD OF REINDEER, LABRADOR.

North of the Strait of Belle-isle the coast was uninhabited when, in 1771, the Moravian Brethren founded at Nain the first of their missions to the Eskimos. The eccentric Major Cartwright settled soon after at Sandwich Bay, where he carried on, for many years, trade with the Eskimos. Settlers from England were established on Hamilton Inlet in 1777, and found there the remains of the French stations. A few years later the Quebec merchants established posts there. At Eclipse Harbour, close on latitude 60° , the United States Govern-

ment expedition of 1862 was stationed to observe the eclipse of that year. The chief settlements north of Hamilton Inlet are at the Moravian, Deep Sea Mission, and Hudson Bay Company stations and posts. Cartwright, Rigolet, Hopedale, Zoar, Nain, Okkak, Hebron, Ramah, and Nachvak are among the principal settlements of the coast.

Dr. Grenfell, the active physician, missionary, and friend of seamen, fisherfolk, and all the inhabitants of the great peninsula along the Atlantic border, has repeatedly expressed his belief in the splendid possibilities of Labrador. Pulpwood, furs, and fish were staple products of great value, whilst the country could support from *three to four* million deer with an annual export meat-trade of 4000 to 5000 deer. The herd of 250 reindeer from northern Europe introduced into Labrador had rapidly increased to 850. Seal-hunting, at present remunerative, would, however, be completely ruined if recent methods of wholesale slaughter and destruction were not limited by beneficial legislation properly enforced.

CHAPTER XII

PROVINCE OF ONTARIO

Boundaries

THE province of Ontario is bounded on the east by the province of Quebec, James Bay, and Hudson Bay; on the north, partly by the province of Quebec along the Ottawa river, and by James Bay, Hudson Bay, and part of the province of Manitoba; on the south by the international boundary. Its western boundary is the international boundary, as it follows through the centre of the Great Lakes, along the watercourses to the north-west angle of the Lake of the Woods and the province of Manitoba. The north-west boundary of Ontario runs in a straight line from the north-east corner of Manitoba province (previous to 1912) to the most easterly point of Island lake, in approximate latitude $53^{\circ} 30'$ and longitude $93^{\circ} 40'$ west; thence north-easterly in a right line to the point where the 89th meridian of west longitude intersects the southern shore of Hudson Bay.

The area of the province of Ontario up to 1911, at the time of the last census, was 260,862 square miles, or 166,951,636 acres; but in 1912 it was increased by Act of the Federal Parliament by 146,400 square miles,

or 93,696,000 acres, making a total area of 407,262 square miles, or 260,647,636 acres. As defined in 1912, Ontario stretches fully 1000 miles in a north-westerly direction from the St. Lawrence river at Brockville to the north-west angle of the province formed by the intersection of the two former main Manitoba boundary lines near the head-waters of the Severn river west of Sandy lake. It is very irregular in outline (shaped somewhat like a foot) having a comparatively short north-east and south-west base from Cornwall along the St. Lawrence river to Windsor on the Detroit river close to Lake Erie, measuring 500 miles, whilst its boundaries with Quebec are marked by the Ottawa river up as far as the north end of Lake Timiskaming, and thence along the meridian of that point to James Bay. This province now reckons 600 miles of sea-board (salt water) along Hudson and James Bays, and over 1600 miles of continuous fresh-water shore-lines along the Great Lakes, bays, and rivers to the south. A line drawn across the province of Ontario from Cape Henrietta Maria on Hudson Bay to the mouth of the Rainy river, where it enters the Lake of the Woods, measures nearly 700 miles; whilst a line drawn across the province over the waters of Lake Nipissing is barely 100 miles long. The extreme limits of the province lie approximately between 42° and $56^{\circ} 50'$ north latitude; and between 74° and 95° west longitude. Pelée Island, in Lake Erie, is the most southerly spot of Ontario, and is well south of the latitude of Boston and about on the same latitude as Valladolid, Barcelona, Rome, Constantinople, and Tiflis, whilst the northernmost point of Ontario proper, in the district of Patricia, is practically in the latitude of Edinburgh, Copenhagen, and Moscow, and all the other capitals and large cities of England, France, the Netherlands, Germany,

Switzerland, Austria, Servia, Roumania, Bulgaria, Montenegro, and Russia are between these latitudes.

The addition to the province of Ontario comprising an area of 146,400 square miles, formerly part of Rupert's Land, and more recently part and parcel of the North-West Territories, lying to the south and west of Hudson and James Bays, forms an irregular five-sided



GORGE AT NARROWS, SUTTON LAKE.

figure bounded on the south by the waters of the Albany and English rivers; on the west by Manitoba, and on the north by Manitoba and Hudson Bay, and on the east by Hudson Bay and James Bay. The greater portion of this area is drained by the Severn and its tributaries, the Sachigo and Fawn rivers, the Winisk river, Ekwan and Kapiskau rivers, all of which flow into the bay. Along the southern boundary of this area the Albany and English rivers, with Lac Seul and Lac St. Joseph as expansions, drain but a comparatively narrow zone of territory to the north. Lansdowne, Trout, Sandy

and Winisk and Sutton lakes are the best-known lakes of the region. Evenly bedded rock-formations of Paleozoic age form a broad plane of marine sediments in this newly acquired territory, and dip gently towards the waters of the bay. These differ essentially from the older, harder, more rugged and disturbed crystalline rock-formations lying beneath them or occupying the remainder of this area constituting the district of Patricia.

Contour of the Land

Throughout its whole extent Ontario is an undulating plain, without any prominent elevated ranges to mark its surface, and sloping down gradually to the great waters at the north, east, south, and west. None of the water-partings which control the courses of the rivers are high. The northern shores of Lakes Huron and Superior are high and bold, but the shores of Lakes Erie and Ontario are low. The highest land in the district of Patricia is about 1500 feet above tide (Tyrrell), and the highest mountain in Ontario is Tip Top Hill, in the Thunder Bay district, whose elevation is 2120 feet above tide. The land, indeed, rises to an average of 1200 feet above the sea, but the rise is so gradual as to be imperceptible to the eye, excepting along the line of the western escarpment, where a height of 1600 feet is attained at the summit of the Blue Mountains between Lake Huron and the Georgian Bay, forming the promontory of Bruce.

Hydrography

The great lakes of the province have been dealt with in a previous chapter; but, besides these there are

countless lakes and streams throughout the whole province that are fed by regular and sufficient precipitation. The water-parting of Hudson Bay enters the province on the east from Quebec about 40 miles north of Lake Timiskaming, and passes north of Lake Huron and Lake Superior in a sinuous course at an average distance of 60 miles. At a point near Jackfish Bay the water-parting comes close down to the shore and then suddenly turns north to sweep round the heads of the feeders of Lake Nipigon, then, turning south, in a bend equally abrupt and equally sinuous, it crosses the international boundary at Pigeon river on the Grand Portage about 60 miles from the lake shore. It must, however, be observed that near the bend, where the water-parting finally turns south, there is a divide running to the north between Lake Seul and Lake St. Joseph. West of the watershed from that point, and west of that divide, the water does indeed eventually reach Hudson Bay, but first flows into the sub-basin of Lake Winnipeg. Lake St. Joseph drains eastward by the Albany river, and Lonely Lake (Lac Seul) drains westward into English river, which falls into the Winnipeg river almost precisely at the extreme north-western point of the boundary of the province. The northern watershed slopes gradually down to James Bay and Hudson Bay, and, as the shore is approached, the Archæan rocks are covered by flat-lying limestones of Ordovician, Silurian, and Devonian age.

The water-parting of Hudson Bay approaches so closely to the lakes that the rivers, though numerous, are all short. There are also many lakes, but none are important save Lake Nipigon, which is 70 miles long by 40 miles wide, and has an area of 1450 square miles. It is very deep, and is studded with many beautiful and picturesque islands. It is 852 feet above the sea, and

drains into Lake Superior by the Nipigon river, about 30 miles in length.

Numerous large and important rivers of northern Ontario, including those of the new district of Patricia, drain into Hudson Bay. At Hannah Bay, the most southerly extremity of James Bay, the lower Harricanaw river (whose head-waters are close to those of the Ottawa) and some of its tributaries discharge their waters into the bay. The Moose river and its tributaries, the Abitibi, Mattagami, Opatatika, Kapuskasing, Missinaibi, and others, the head-waters of which cross the Canadian Pacific railway tracks between Biskotasing and Chapleau north of Lake Superior on their way northward, discharge their at first clear and rapid, then more sluggish and turbid, waters into the bay at Moose Factory. At Fort Albany, farther up the coast of James Bay, the Albany river, and its branches the Kenogami, Little Current, Ogoki, and many other streams rising in lakes in the Archæan country, together with the waters of Lake St. Joseph, drain into Hudson Bay.

In the district of Patricia the principal rivers are the Albany and Churchill rivers, along its southern boundary; also the upper waters of the Oiseau, Bloodvein, and Berens rivers draining west into Lake Winnipeg; the Kapiskau, north and almost parallel to the Albany for its whole length; the Attawapiskat, rising in Lansdowne lake, and the Ekwan, both of which enter the bay on the lee side of Akimiski island; the Winisk, rising in Winisk lake, and draining it as well as a string of others into the bay at Wabuk Point; also the Severn river, and its branches the Fawn and Sachigo, draining Trout and Sandy lakes in the Archæan area to the west.

Coming now to that part of the province enclosed between the Ottawa on the east and the Great Lakes on

the west, that portion most thickly populated, we find it is divided into two parts by what is called the Niagara escarpment, marked conspicuously throughout the province, but notably at the point where it crosses the international boundary, by the Falls of Niagara. The river has cut its way back through the limestones, and flows after its fall for several miles through a cañon 200 feet deep. The escarpment commences in Canada at Queenston Heights, and follows westwardly along the southern shore of Lake Ontario at no great distance in the rear of St. Catharines and Hamilton. Having reached the head of the lake, it turns sharply to the north-west and passes through the heart of the western peninsula to Georgian Bay, near Owen Sound at its western corner. Thus the most southerly peninsula of Ontario is divided into an eastern plain between the Niagara escarpment and the Ottawa river, having an approximate area of about 16,000 square miles, and a higher western plain with an area of about 10,000 square miles sloping gently down to Lakes Erie and Huron from the summit of the escarpment.

Considering first the eastern or lower plain, it may be divided into five drainage basins. First, the Ottawa basin. The chief rivers falling into the Ottawa on its southern or Ontario side are the South Nation, Rideau, Madawaska, Bonnechère, Petawawa, Mattawa, and Montreal rivers. Many of them are large rivers and reach far into the centre of this plain. Those falling in east of Ottawa city rise very close to the St. Lawrence. One of the branches of the South Nation river, which falls into the Ottawa half-way between Montreal and the city of Ottawa, rises in the townships of Matilda and Edwardsburg only a mile and a half from the bank of the St. Lawrence, and the water-parting there is only thirty feet above the latter river. The Ottawa basin forms therefore

an important division of the lower plain, while the basin of the St. Lawrence proper is of little comparative importance.

The second division of the eastern plain is a narrow strip of country draining into the main St. Lawrence and extending along the river as far as the Frontenac axis where the Laurentian rocks cross the river. This is physically an unimportant division, for the watershed is so narrow that it can form no river of any size; all the important streams drain away to the Ottawa at the north.

The third or central division is the basin of the Trent, called the Otonabee in its upper reaches. This river has a winding course of about 170 miles, and drains a country full of lakes of the most irregular shapes. Balsam, Scugog, Chemung, Sturgeon, Stony and Rice lakes are large lakes, but the number of smaller ones is beyond count. The valley of the Trent is wide, and its course most eccentric. It doubles, by six very sharp turns, the direct distance between its source and its mouth, and the Bay of Quinté, into which it falls, zigzags in similar sharp angles before joining the main lake. The basin of the Trent spreads very widely, for Scugog lake, its main feeder on the south, is only 17 miles from the shore of Lake Ontario. The height above the sea of the chief sources of the river are—

	Feet.
Balsam Lake	838
Cameron Lake	815
Scugog Lake	820
Sturgeon Lake	793
Pigeon, Buckhorn, and Chemung Lakes	805
Stony and Salmon Trout Lakes	758
Rice Lake	596

The amount of water-power in this basin is evident by the drop from the upper lakes to Rice lake, and thence to Lake Ontario 245·02 feet above the sea. This

subdivision is drained also by the Moira river and two small streams, the Salmon river and the Napanee, but all fall into the Bay of Quinté, and they may be conveniently grouped into one subdivision.

The fourth division of the eastern plain is the basin of Georgian Bay, and its southern arm Nottawasaga Bay. This basin touches the Ottawa basin on the east, and the Trent and Ontario basins on the south. Its chief feature is Lake Simcoe (area 271.2 square miles), the most western lake of any importance in the peninsula. There are several large rivers in this division. At the north is French river draining Lake Nipissing; the Maganatawan drains a number of small lakes, the Muskoka river drains the Muskoka lakes, and the Severn drains Lake Simcoe. On the south the Holland river rises at the Toronto portage, and on the west the Nottawasaga river flows along the base of the escarpment and empties into the bay of the same name. It flows in a broad valley about twelve miles from the foot of the cliffs, and some of its feeders rise even west of the escarpment and cut through it in deep ravines. Lake Simcoe is 720 feet above the sea, and lies in a depression which barely misses being a continuation of the Trent valley. It drains into Lake Huron, but the water-parting between it and the Trent is very narrow. A series of works is being constructed to connect Georgian Bay with the Bay of Quinté through the Trent valley, and numerous locks have been built to overcome obstructions, including two remarkable lift-locks, one at Peterborough (see p. 35) and the other at Kirkfield.

The distance between the Bay of Quinté and Georgian Bay is 200 miles, of which less than 20 miles will require canals; the rest of the proposed route will be by stretches of water communication improved in various

ways. The works now in progress will open up 160 miles of direct and the same extent of lateral navigation.

The fifth division of the lower plain may be called the Ontario division, as its streams fall directly into Lake Ontario. It extends from the Trent division on the east to the Niagara escarpment on the west, and is bounded on the north by the basin of Georgian Bay. The only streams of note are the Humber and the Credit. The Humber falls into the lake at Toronto. The old portage route to the north was by the Humber and across to the Holland into Lake Simcoe, and thence by the Severn into Georgian Bay. The water-parting of the Humber and Holland is 904 feet, and of the Nottawasaga and Humber 950 feet above the sea, from which it will appear that this plain scarcely attains at its highest point a height of 1200 feet above the sea, or 900 feet above Lake Ontario. Much drift material and glacial accumulations account for the higher levels.

The Niagara escarpment, as before explained, forms the edge of a higher plain, and its drainage has reference solely to Lakes Erie and Huron, which are respectively 571.59 and 579.90 feet above the sea. It is distinctly marked in its whole course across the country, and presents a face more or less steep to the east. At places the weathering of the limestone cliffs and the wearing away of the softer rocks beneath have produced scenes of wild and picturesque beauty. This upper plain attains at one place an extreme height of 1524 feet above the sea, and on its southernmost side rise the streams which water the garden of western Canada. The escarpment continues to the north to form the long promontory of Bruce, and then passing along the southern shore of the Manitoulin Islands, crosses over into Michigan at the Strait of Mackinaw.

The area of the upper plain is about 10,000 square miles, and it may be divided into four basins. First, the basin of the Grand river; this stream rises in the highest part of the western slope of the escarpment, and its descent is so steep in the first part of its course that it was called by the French *La Rivière Rapide*. On its



Cannon, Photo.

GORGE AT ELORA, ON THE GRAND RIVER.

banks are many manufacturing towns of importance, and from Elora it drops 600 feet to Lake Erie. Below Brantford it is a tranquil stream flowing out by a large estuary into Lake Erie at Port Maitland, about 30 miles west of the discharge of the lake.

The river Thames, which is the chief physical feature of the second basin, rises also on the western flank of the escarpment, but more to the south, and is a quiet

stream meandering through a beautiful park-like country in a general course at right angles to the Grand river and falling into Lake St. Clair at the western end of Lake Erie. These two streams drain the centre of the upper plain.

The valley of the Thames is broad, and there is much rich intervale land wooded with willows and elms; sheep and cattle graze on the sloping hill-sides, and clumps of oak and elm and maple are interspersed with meadows, and give the general impression of an English landscape.

On the south of these two basins is the third subdivision—a narrow strip running along the shore of the lake, drained by short streams and brooks falling directly into Lake Erie. The fourth is the Huron basin—a triangular tract north of the Thames basin and between the northern part of the escarpment and the lake—drained by the Maitland river falling into Lake Huron at Goderich, and by the Saugeen falling in at Southampton. This upper plain of the province of Ontario is very important from its great fertility and from the density of its population, and while these divisions and subdivisions of the peninsula may seem very small, every physical fact regarding so important a part of the province is of interest.

Geology

The crust of the earth as revealed in the geology of Ontario belongs to *three* great divisions or systems: (1) the Archæan complex of crystalline and associated rocks; (2) the Palæozoic; (3) the Pleistocene or Quaternary. In the first and oldest are to be found the gold, silver, copper, nickel, cobalt, iron, and other valuable ores of the province; in the Palæozoic strata, the salt, gypsum, petroleum, natural gas, sandstones, dolomites, limestones and

shales of great economic value; whilst the Pleistocene clays, sands, and gravels are utilised in many of the arts and industries of the day, besides constituting the soil.

Estimates made of the areas covered by the Archæan and the Palæozoic formations of Ontario ascribe 290,000 square miles, or 185,600,000 acres to the former, and 117,000 square miles, or 74,800,000 acres to the Palæo-



ABITIBI DISTRICT: LINE OF THE TRANSCONTINENTAL RAILWAY.

zoics of the Hudson Bay, Great Lakes, and Ottawa basins, these measuring 85,000, 27,500, and 4750 square miles respectively.

In tabular form the areas of the province covered by the Archæan and the Palæozoic formations give the following statement:—

	Square Miles.	Acres.
Archæan Rocks . . .	290,000	185,600,000
Palæozoic Strata (<i>circa</i>) . . .	117,000	74,800,000

The Archæan forms a single and continuous mass of crystalline and mineral-bearing rocks stretching from the

city of Kingston to Island lake and from Lake Abitibi to the Lake of the Woods; whereas the Palæozoic formations of Ontario occur in three isolated districts as follows:—

	Square Miles.	Acres.
Palæozoic of Hudson Bay Basin . . .	85,000	54,400,000
„ Great Lakes „ . . .	27,500	17,600,000
„ Ottawa Region . . .	4,750	3,040,000
	<hr/>	<hr/>
Total . . .	117,250	75,040,000

In the chapter on the province of Quebec it has been shown that the Archæan rocks cross the Ottawa river at the Lac Deschênes, where it is the cause of numerous cascades. From that point they sweep down to the St. Lawrence river along the Frontenac axis, where the more prominent and rounded bosses of crystalline rock project above the flowing waters and form the beautiful archipelago of the Thousand Islands. In this way they cut off to the east a triangular area, the Ottawa Palæozoic basin, of about 4750 square miles in extent, of Palæozoic rocks between the two great rivers. This area, as has been seen, is very level and drains mostly to the Ottawa. The only elevation to break the level surface is Rigaud mountain on the lower Ottawa, an Archæan mass rising 538 feet above the plain, on which are remarkable accumulations of boulders described by Sir William Logan. The geology of this basin is simple, with the Potsdam, Beekmantown, Chazy, Pamela, Lowville, Black river, Trenton, Utica, Lorraine, and Richmond formations constituting a thickness of from 1800 to 2000 feet exclusive of the Pleistocene clays and gravels. There are numerous faults and dislocations throughout this area, some of which mark at least 1400 feet displacement.

Archæan.—If a line be drawn due west from the Thousand Islands to Matchedash Bay in the Georgian

Bay of Lake Huron, then north-west and westerly north of the Manitoulin Island, and by way of Sault Ste. Marie along the north shore of Lake Superior and the international boundary as far as the north-west angle of the Lake of the Woods, it will mark the southern limit of the Archæan in southernmost Ontario; north of that line the territory is a region of Archæan and crystalline rocks, with an occasional outlier of newer sedimentary formations, until the Palæozoic basin of Hudson Bay is met, forming a great plain of marine sediments not unlike that of the more settled portions of older Ontario, but covering fully three times the area of the latter.

The Archæan, wherever met, is a complex of crystalline rocks, often difficult of interpretation, and presenting different phases in different parts of the earth's crust, owing to profound erosion, intense metamorphism, and the disturbed condition as well as mode of occurrence of its different members. Two main divisions of this great complex were defined by Logan: (1) the *Laurentian*; (2) the *Huronian*, with subdivisions in both. The Huronian constitutes the more important, from an economic standpoint, and for sixty-five years efforts have been made to discover, determine, and map geologically this metalliferous series throughout Ontario, Quebec, and other provinces. After Logan, with Hunt and Murray as associates, came the Dawsons, Selwyn, Lawson, Adams, Barlow, Coleman, Coste, Miller, and many other familiar names in the literature of Canadian geology. The precise relations of the various members of the Archæan have been made known by different writers from their investigations in various portions of Ontario; and pronouncements by North American geologists from Canada and the United States have been made from time to time, including those from federal and state, as well as provincial geological surveys on

both sides of the line, also by an "International Committee of Geologists" who visited critical areas and discussed Archæan problems together. The term "Algonkian" has been given to certain Ontario rocks of pre-Cambrian age, which, however, when mapped, were found to coincide with the Huronian system of Canadian geologists. The term "pre-Cambrian" itself, as applied to formations of Ontario and elsewhere, is useful though vague, for, in portions of Canada it includes at least 42,000 feet of pre-*Olenellus* strata, besides an enormous mass of crystallines truly Archæan. The researches of Daly, Lawson, Van Hise, Bailey Willis, and Walcott in pre-Cambrian strata are throwing much light upon new systems in the Proterozoic.

The most philosophical and practical statement which obtains is that of Lawson, in which he describes the Archæan of the Lake of the Woods and Rainy Lake region as consisting of *two* principal parts: (1) An *upper* division of sediments and volcanic rocks, which, though often highly metamorphosed, were originally not essentially different from sedimentary and volcanic rocks that have accumulated at the earth's surface in later geological periods. These are his "*Ontarian System*." (2) A *lower* division of granitoid gneisses (commonly called Laurentian, which had been universally regarded as metamorphic sediments, the oldest rocks in the Archæan, and the basement upon which all other known sedimentary rocks rested), which are batholithic intrusions that had invaded the Ontarian system from below as igneous magmas, and in so doing had displaced the original basement, or floor upon which those rocks were laid down.

The Ontarian system includes *two* series:—(1) The *Coutchiching*, a great volume of altered sediments free from volcanic admixture, and overlying these; (2) the

Keewatin, consisting chiefly of volcanic accumulations, but including also sedimentary strata.

Lawson further indicates the relations of the *Keewatin* and *Coutchiching* of Rice Bay in pointing out that the former occupies an anticlinal dome completely surrounded by the Keewatin, and that the Coutchiching of the Bear's passage is similarly anticlinally below the Keewatin, and in its extension to the west south-west this belt has in general the structure of an anticline, or series of anticlines, dipping away from dome-like intrusions of granite gneiss and flanked on both sides by Keewatin belts which have a synclinal structure. The *Shoal lake conglomerate* is described as occupying a well-defined trough with a belt of Keewatin a mile wide on the south side of it at the east end of the lake, which conglomerate is the basal formation of a series of rocks which is neither Keewatin nor Coutchiching, but later than both, and to which he gives the provisional name of *Seine* series. This Seine series is a new and distinct member of the Archæan complex. Iron ore bodies—such as that worked near Sabawe lake—are the probable result of concentration of the iron ores produced by oxidation in the weathered zone of the Keewatin in pre-*Seine* or early *Seine* time. This contact should be carefully mapped, and would afford a valuable aid in search for iron. The Steeprock series, which has been an interrogation mark in the Archæan geology of Canada for 20 years, has been found to consist chiefly of a basal conglomerate and some 600 to 700 feet of fossiliferous limestones with some volcanics, post-Keewatin in age, resting unconformably upon the Keewatin, as well as upon the granite gneiss, and is also deeply folded within, and well down in, the Archæan, and apparently below the *Seine* series. The fossils found in 1911 by Lawson, and described by Walcott

(and believed by him to be related to both sponges and *Archæocyathinæ*) are probably the oldest well-defined organic remains now known to science.

The Montreal river district, as described by Collins, consists of a complex of ancient crystalline rocks, with greenschists and granites, or granite gneisses, which underlie everything else. The greenschists—themselves a complex assemblage of various highly metamorphic intrusives—occur as elongated areas surrounded by the granites and gneisses which are younger and intrusive. The surface of this crystalline basement constitutes a greatly eroded peneplain. Upon it rests a mantle of well-preserved, nearly flat-lying sedimentary formations, composed chiefly of the fragmental materials that resulted from its denudation. Both basement and mantle are intruded by younger quartz and olivine diabases. All these are of pre-Cambrian age. Subsequent erosion has developed upon them the present characteristic peneplanated surface, upon which lies a thin, discontinuous film of glacial materials. Thus the region is marked by *Keewatin* rocks consisting of sheared acidic and basic eruptives, iron ore, metamorphic hornblende, and biotite gneisses; *Laurentian* batholithic intrusions of hornblende and biotite granites, etc.; unconformably overlaid by *Huronian* conglomerates, greywacke, slate, arkose, and quartzite, with rhyolitic lavas and agglomerate associated, besides quartzite, quartz conglomerate, arkose and arenaceous limestone. *Post-Huronian* intrusives are also found forming sills and dykes of quartz diabase, with later dykes of olivine diabase.

The Onaping lake area also presents a pre-Cambrian geological sub-province, which covers not only the Sudbury and Nipissing districts of Ontario to the south, but also extends eastward into Quebec. This sub-

province is stamped by a profound erosion interval which separates a peneplanated basement consisting of a schist complex intruded by granite batholiths from an overlying cover of gently folded Huronian sediments and associated diabase intrusions. Gold, silver, and cobalt, and iron ore occur in these pre-Cambrian rocks, which include the Keewatin, Laurentian, Huronian, and Keweenawan (?). The term *Laurentian* usually applied to the batholithic intrusions of the Archæan, consisting of hornblende granite gneiss and biotite gneisses, may include different intrusions widely spaced in time.

The valuable nickel and copper-bearing sulphides of Sudbury occur in huge, irregular masses at the outer margin of a norite intrusion between a newer series of tuffs and sediments on the one hand, and an older complex of Laurentian, Huronian, and Keewatin rocks, where magmatic differentiation is a marked feature. Dr. Barlow's monograph on the nickel deposits of Sudbury is a classic.

In the Haliburton-Bancroft area, along the southern edge of the Archæan outcrop, is the finest section of the *Grenville series* known in Canada, where progressive metamorphism of its strata by intrusions of granitic batholiths gives rise to various types of amphibolite, etc. The corundum deposits of Craigmont, to which the world looks for its supply, occur in nepheline and other alkaline syenites, while sodalite of a fine depth of colour forms a conspicuous and highly decorative marble quarried near Bancroft. Mica deposits occur at Mumford, graphite at Wilberforce, whilst marble quarries have been opened at Bronson.

The Lake Timiskaming and Cobalt region, Larder lake, Montreal river, Elk river, Gowganda, Miller lake, Maple Mount, Silver lake, and Porcupine areas of

Ontario, have all recently proved to contain mineral deposits which economic geologists have shown to be of great value. The Huronian is widespread, with conglomerate, greywacke, slate, and quartzite often complexly alternating and replacing one another. As in the cobalt district especially, the relation of the quartz-dabase and silver-cobalt vein deposits is intimate, the veins holding smaltite, niccolite, silver, and bismuth, etc., being always close to the diabase; the ores of silver, cobalt, and nickel have been eliminated from the diabase magma in the form of a highly aqueous solution. The quartz which forms part of the gangue probably originated in the same manner, but there is reason to believe that the calcite, which is commonly a more abundant gangue mineral, was dissolved from other rocks, probably the Keewatin, in which the vein-filling solutions had access. The following summary of the geology of the Larder lake district, by Morley Wilson, can be taken as typical of a vast area of the Archæan complex for a considerable radius in all directions from Lake Timiskaming, and, in a general way, affords a very distinct record of geological events. At the base of the whole region is a complex group largely igneous, comprising the Laurentian and Keewatin, the members of which, although of different age, are all distinguished by their greatly disturbed and metamorphosed character. Resting unconformably on the uneven surface of this ancient complex is a series of but slightly disturbed Huronian sediments—conglomerate, greywacke, and arkose. These sediments—with the exception of a few local intrusives, which are post-Huronian in age—comprise the youngest rocks in the region; any sediments that may have been deposited between that time and the deposition of the glacial drift, having since been entirely removed by erosion.

In the Porcupine district of Ontario, gold has recently been discovered in paying quantities, and is associated with galena blende and copper ores in the townships of Tisdale, Whitney, Mountjoy, Ogden, Deloro, and Shaw, and on Kamiskotia and Night Hawk lakes. Rocks of Keewatin age, consisting of greenstones, quartz-porphyrines, and schists, more highly altered than in the Cobalt area, occur together with some slates, greywackes, and conglomerates that have been subjected to intense dynamic metamorphism, and are of Huronian age. The Alexo pentlandite (nickel) deposit from the post-middle Huronian diabase of Frederick House lake district in the "Clay Belt," and on the Timiskaming and Northern Ontario railway, is an interesting discovery in a serpentine area.

The goldfields of Lake of the Woods, Manitou, Dryden, and Sturgeon lake have received fresh impetus since the discovery of the Porcupine gold district, and the iron pyrite deposits of Vermilion lake, close to the line of National Transcontinental railway near Lake Minnitaki, are reported to provide shipments on a considerable scale.

The Sturgeon lake (elevation, 1328 feet) gold area presents an extremely complex igneous series of extrusions and intrusions, where very few sediments occur in the form of greywacke, arkose, and dolomite, the igneous rocks are granites and their metamorphic equivalents, gneisses, aplites, quartz-porphyrines, rhyolites, hornblende-syenites, diorites, diabases, basalts, gabbros and porphyrites.

The Keewatin iron formation of Moose Mountain, with its locally concentrated and massive magnetite ore, occurs in a series of schists intruded by granitoid gneisses; whilst the iron range on beautiful and peerless Lake Timagami, with its banded jaspillite, quartz, magnetite

and hematite, also occurs in a typical area of Keewatin rocks.

Lake Nipigon district.—From recent surveys and explorations along the National Transcontinental railway, between Lake Nipigon and Lac Seul, the surface of the country is an Archæan peneplain with low relief and moderate altitude. Lake Caribou, to the east, stands 1149 feet above sea-level, whilst Dog lake on the west is 1168 feet, and Sturgeon lake 1382 feet above tide, one of the many tributaries of the Ogoki river representing the highest water level. Hills seldom reach 250 feet in height. From the top of such a hill, the entire horizon line appears an unbroken level, and the whole area enclosed within it undulating and forested. The Lake Nipigon district, however, has rugged characters, owing to erosion of diabases overlying granites and gneisses, showing cliffs and precipitous hills 150 to 300 feet high, and deep-set lakes and streams; whereas in the Sturgeon and Savant lake regions, the steep-tilted green-schist formation has developed a very irregular surface forming alternations of high parallel ridges and valleys, the latter often containing long and narrow lakes. This district is well watered, and forms one of the most admirable canoe routes through lakes and streams of picturesque beauty. Gold and iron, copper, lead and zinc, have been recorded, and the soil of the region steadily improves as one proceeds westward, especially on Dog river and Sturgeon lake. Iron ore deposits in the form of magnetite occurring in schist bodies peculiar to the iron formation are described by Collins from several locations along the line of the National Transcontinental railway on the Sturgeon river and westward. This iron formation was traced on Lake Kashaweogama on the frontage between Island and Cliff lakes, at Iron lake, on the frontage

to Savant lake, as well as west of this lake, and in the schist area enclosing Lake Minnitaki. Analysis of the ore gave 53.5 per cent of metallic iron. Hidden gold was also found at the St. Anthony reef in the Sturgeon lake mining district, and east of Couture lake, free gold; and copper ores also occur in the schists of Dog river and on Minnitaki and English river. Placer gold was also found by Collins in the Lac Seul sands, which are abundant and consist of quartz, garnet, magnetite, and greenstone grains, indicating disintegrated Keewatin material. The Lac Seul to Cat lake area, with the general elevation of lakes and land ranging from 1172 feet (Wenasaga lake) to 1325 feet (height of land), belongs wholly to the Archæan, with gneisses and schists, also granites predominant, forming a modified peneplain over the western or Keewatin arm of the great V-shaped Archæan protaxis. There are very few land elevations more than 50 feet above the general level, and the monadnock, west of Cat lake, 90 feet above the lake level, is a rare exception.

In the Silver Mountain area near Port Arthur, between Rabbit Mountain south of the Kaministikwia river on the east, and Whitefish lake (elevation 1330 feet), along the western branch of the Canadian Northern railway, silver occurs as argentite and native silver, with zinc blende, galena and pyrite in a gangue of calcite, quartz, fluorite, barite, and witherite. The fissure veins of the black slate belt near the diabase contact, or in the sill itself, are good values, thence followed downwards to the slates where the best values are found. Keweenawan diabase occurs in the form of a trappean overflow and is found capping a grey quartzite series, the black slate silver-bearing formation, and an iron-bearing formation below the black slate—the last three being referable to the Animikie series—as yet unplaced in the succession of sedimentaries. On

Silver Islet silver occurs in the grey argillites near diabase intrusions. Arsenical ores also occur here. A comparison of the Cobalt and Port Arthur silver districts shows that, whereas native silver, bismuth, niccolite, chloanthite, smaltite, erythrite, annabergite, cobaltite, and dyscrasite predominate in the Cobalt area, the Port Arthur silver district, 500 miles distant, also in the Huronian system, is characterised by argentite, sphalerite, graphite, macfarlanite, huntelite, and animikite, as prominent, with the following ores in common: galena, mispickel, tetrahedrite, besides native silver, bismuth, graphite, niccolite, erythrite, annabergite, argentite, and sphalerite. The total production of the Port Arthur district to 1903, when the last returns were made and the mines closed, was \$4,699,731.

In Central Ontario Dr. Adams, together with Dr. Barlow, record granitoid gneisses, diorites, and gabbros, all more or less clearly foliated, which they ascribe to the Laurentian proper; and associated with these gneisses is the Hastings series consisting of thinly bedded limestones and dolomites cut through by great intrusions of gabbro, diorite and granite, held by them to be newer. Dr. Barlow graphically describes the fundamental gneiss of the *Laurentian* as follows: "It may possibly represent, in great part, the first-formed crust of the earth, which, necessarily thin and fragile, and so liable to frequent upswellings of the molten mass beneath, has undergone successive fusions and recementations before reaching its present condition. As at present mapped, it is regarded as a complex of irruptive plutonic rocks, representing repeated and intricate intrusions of basic and acidic material." Dr. Barlow, on field as well as petrographical characters, divides the Laurentian of the Nipissing and Timiskaming districts into two groups:

(1) *An Acidic Group*, consisting of those foliated rocks similar in composition to granites, etc., to which they correspond, their differentiation being determined solely by their foliated texture, which, usually pronounced, is sometimes obscure, and occasionally altogether absent. (2) *A Basic Group*. These rocks occur interbanded with the more acidic gneisses and represent either basic segregated portions of the granite magmas or foliated basic irruptives allied to diorites, diabases, etc., and caught up in it.

Huronian.—In the Nipissing and Lake Timiskaming regions Barlow found the Huronian system to be widely distributed, especially in the north-western part. They consist of the basal series made up of “breccia-conglomerate, containing pebbles and fragments often angular though usually subangular or rounded in outline, of granitite, diabase, diorite, etc., embedded in a matrix composed of the same materials in a finer state of division, while the more minute interstices are filled up with scales and flakes of chlorite and sericite.” The fragmental rock passes into a greywacke which in turn merges above into an exceedingly compact and fine grained rock of similar composition which gradually assumes a banded and slaty character. Superimposed upon these slates or shales, directly, is found a quartzite grit made up chiefly of granitic quartz and felspar, resembling arkose.

The Grenville series of the Archæan of the Ottawa valley and the Hastings series of Hastings County have been correlated by some geologists with the Huronian system. Throughout Kenora, Nipigon, Nipissing, Thunder Bay, Timiskaming, Algoma, Rainy river, and Sudbury districts, as well as in the new district of Patricia, the Archæan formations predominate. The districts of Algoma and Nipissing form classic ground for the student of Huronian geology.

Post-Archæan : Palæozoic, etc.—The importance of the Archæan formations of Ontario, and of other parts of the Dominion as well, from economic and other viewpoints, cannot be overestimated. The profound erosion which the Archæan or primitive crust of the earth has undergone, has led to a reassortment and distribution of the detritus, as flat-lying formations in vast or more limited sheets of sand, clay, and lime strata of varying thickness, in a succession depending upon the submergence or emergence of the land and consequent encroachment of the waters of the great ocean basins upon the land in the form of bays, gulfs, seas, upon scarps, and other geographic (Palæogeographic) features, where various primitive types of life flourished and died, and in some cases left their impressions and skeletal remains, which serve in determining the period when those formations were laid down. The quartz, felspar, mica, hornblende, lime, and other leading mineral constituents of the granites and gneisses and associated crystalline rocks of the Archæan in Ontario and vicinity have served, in eroded and detrital form, to build up the superstructure of the bedded or sedimentary (aqueous) rocks and formations of the province in the Hudson Bay, the great lakes, and Ottawa basins.

Sedimentaries ranging from the Steeprock, Animikie, and Keweenawan on the one hand and the Potsdam on the other to the Chemung formation: that is, from the pre-Cambrian, through the Ordovician and Silurian systems to the summit of the Devonian, including several thousand feet of strata, in which salt, gypsum, lime, petroleum, natural gas, and other useful materials occur, were laid down in Ontario over the crystalline complex, the basal beds of which filled up all the irregularities of the surface of the unequally eroded Archæan peneplain, and

after much erosion present a mantle or covering of fine accumulations consisting of sandstones, limestones, and shales in cycles of more or less regular sequence. These accumulations vary in thickness, some formations finding their highest development in the province, others weakly represent various phases and conditions of the times such as climate, currents, depth of submergence, streams, crustal movements, and materials available for deposition.

First Eparchæan Formation.—The encroachment of the first marine waters upon the solidified crust of the earth, and the reassortment of the detrital materials it found, or made by dissolution, wave action, and other mechanical forces at play then as to-day, led to the building up of what may be termed the first Eparchæan formation—the first sedimentary formation capping the crystalline complex. Such a formation is the Potsdam sandstone of Ontario, both of the Ottawa and the great lakes (Kingston-Sarnia) region on both sides of the Frontenac axis. In its development over the crystalline complex of the Ottawa basin, organic forms peculiar to the second fauna of Barrande—Ordovician in age—occur near the contact of this formation with the Archæan. This phenomenon in Canada finds a contrast in the development of the similar formation in New York State to the south, and in Pennsylvania still farther south, where the basal sandstones of Pennsylvania hold a Lower Cambrian (*Olenellus*) fauna, and the basal sandstones of the Saratoga region present a Middle Cambrian facies, whilst in northern New York State—at the typical locality—Potsdam—the sandstones have an Upper Cambrian character. It will thus be seen that the first Eparchæan formation capping the crystalline complex was a shore deposit indicating the work of accumulation of an advancing sea from the south northward covering, a

portion of two geological systems or periods at least over the areas specified.

Hence it follows that "the Eparchæan interval" of Van Hise and other writers is a term whose value varies in different districts, depending upon the facts obtained in each case, its significance in the Ottawa Valley being far greater than in the Toronto, Peterborough, Manitoulin, and Sault Ste. Marie districts. The first Eparchæan formation of the Ottawa basin is a basal conglomerate and sandstone formation called "Potsdam," in which, however, Ordovician forms of life occur. In the Great Lakes basin of the Palæozoics of Ontario between Kingston, Sarnia, and Sault Ste. Marie, the first Eparchæan formation differs in different localities. At and near Kingston the westward extension of the Potsdam proper is seen overlying the Archæan; at other localities near by an impure limestone and arkose bed with sandy and shaly materials constitutes the first Eparchæan formation. In Hastings County it is at times a saccharoidal sandstone and arkose series, or a limestone, which is in direct contact with the Archæan, whereas throughout the remainder of this part of the province, where the Palæozoics are from 1000 to 3000 feet thick and more, the first Eparchæan formation is a calcareous sandrock or sandstone varying in age, as the deep wells have shown, but for the most part rather older than the Black river and Lowville formations. At Sault Ste. Marie and in the vicinity of the Grand Manitoulin Island the first Eparchæan formation is an impure sandstone formation presumably of Chazy age. Near Pembroke, Ontario, at the base of the Palæozoic column, a sandstone is found with *Lingula Lyelli*, Billings, characterising the Chazy formation.

Great Lakes Palæozoic Basin.—The Palæozoic forma-

tions of the Great Lakes region of Ontario include, besides the Animikie, Keweenawan or Nipigon formations overlying the Archæan, referred by some geologists to the Eo-Cambrian, the Potsdam sandstone formation, a small outcrop of which occurs in the vicinity of Kingston. Profound erosion after the Potsdam period and before the close of the Chazy period removed a great deal of palæozoic materials from the basin, and later deposits were laid down in a comparatively shallow and warm as well as clear water sea which prevailed until the close of the Trenton period, when cold and muddy waters invaded the region and laid down the Utica shales of Whitby and Collingwood, which are also found beneath the Lorraine and Richmond formations of the Toronto and Lake Huron (Manitoulin Island) regions. The Ordovician of the region between Kingston, Lake Simcoe, and Oakville, includes the Potsdam, and newer formations allied to the Stones River Group, but which have generally been referred to the Birdseye (Lowville) and Black River, Trenton, Utica, and Lorraine formations of geologists made up of limestones, dolomites, and shales. These formations were all laid down in quiet seas and are very little disturbed or altered to the present day.

An attempt is being made to reclassify the Ordovician sediments of southern Ontario and group them according to faunistic distinctions including the Potsdam, the Theresa (a phase of the Beekmantown or "Calciferous" of authors), the Chazy, Pamela, Lowville, Black River, Trenton, and Utica formations, the latter of which has received for its basal beds or transition series the name of Collingwood formation. The Silurian of this region consists of sandstones, shales, and limestones of the Medina, Clinton, and Niagara formations and their subdivisions. These three are well exposed in the Niagara gorge, where the softer

beds at the foot of the falls are eroded away, and blocks of the limestone above tumble down. The Guelph dolomites, Salina group, Bertie and Anderdon limestone formations are well developed in the Huron-Erie peninsula where beds of salt of enormous extent (several hundred feet), as well as gypsum, occur in this system. The Devonian is represented by the Oriskany sandstone, Onondaga (Corniferous limestone), Marcellus shale, Hamilton shale, Genesee shale, Portage sandstone and impure Chemung shales and limestones.

The higher Devonian strata exposed on Lake Huron, or buried beneath the drift, contain plant beds, spores, etc., with very thin coaly or carbonaceous accumulations which predicate the in-coming of the coal formations, some of which occur in the neighbouring state of Michigan. There are no Carboniferous or coal-bearing rocks proper in the palæozoics of Ontario.

The Ottawa Basin.—In the Ottawa palæozoic basin, the sedimentary formations of the Ordovician of Eastern Canada and New York State are some 1500 feet in thickness. They are much faulted about Ottawa and elsewhere with vertical displacements of 1000 feet and over. The building up of the Monteregeian Hills no doubt accounts for the breaking up and sinking of the Archæan crust as well as of the overlying palæozoics after the close of the Devonian. The commanding bluff—Parliament Hill—at Ottawa, on which the Government buildings are erected, is some 500 feet lower than it should be normally. The Potsdam sandstone is the basal formation of this basin, and is decidedly Ordovician in age, followed by impure sandrock and magnesian limestone of the Beekmantown formation (Calciferous of authors), followed upwards by the Chazy and its three subdivisions of sandstones, shales, and limestones. These

in turn are capped by the impure limestones of the Birdseye (Lowville) and Black River formation, the Trenton limestone, the Utica shales (bituminous), the Lorraine shales and Medina mudstones, the latter of Eo-Silurian age. Several cubic miles of palæozoic sediments have been removed by erosion since Silurian times in the Ottawa Basin.

The Hudson Bay Basin.—The Ontario palæozoics of the Hudson Bay region may be generally defined as appertaining to a special province—the Hudsonian—with strong affinities in its faunas with those of Central North America and Central Europe. The Ordovician of the district of Patricia is Trentonian in age and more closely related to the uppermost Ordovician of Manitoba than to the Trenton of New York State or of the Great Lakes or Ottawa basins. It forms an isosceles triangle comprising an area of some 3000 square miles. The Silurian of the Ekwan, Winisk, and other typical localities has affinities to Niagara, Guelph, and higher strata, whilst the Devonian is mostly of Meso-Devonian times, with a phase of the Hamilton formation present on the Albany river.

In the Ekwan river district Cambrian rocks occur at the Sutton lake, recalling in character the *Animikie* of Lake Superior, or the Manitounuck and Nastapoka formations of the east main coast of Hudson Bay. Silurian strata ranging in age from the Niagara through the Guelph and Lower Helderberg (Chaleur group) occur on the Ekwan river, and the fauna which they yielded enabled Dr. Whiteaves to describe a large series of interesting types from the warm and clear water seas of the period. Marine pleistocene shells also occur in the clays, and consist of types still living in the open sea.

General Notes.—The Winisk and Attawapiskat river

districts, which the construction of the National Trans-continental railway will soon make more readily accessible, have the triple character of—(1) a high and elevated Archæan peneplâin (Wimbobika Lake, 1300 feet; Wapikopa Lake, 750 feet), ranging from 700 feet to 1000 feet above sea-level; (2) a boulder clay area 159 miles across; and (3) a limestone area with similar surface features as (2). In the region of imperfect drainage great muskeg or swamp areas, acting as storage reservoirs of water, are the sources of supply as well as origin of rivers, so that even in the driest season, the volume of drainage is large. The Archæan is represented by Keewatin, Laurentian, and possibly Huronian rocks, whilst the limestones are coral-bearing and of Silurian age. Marine clays and glacial clays abound in the district, and *morainic ridges* of boulders and gravel influence the course of the Winisk and other streams, especially in their upper parts. The Winisk has cut into the Silurian limestones to a depth of 50 feet and more, the cañon filling up at high water.

The country south-west of James Bay, drained by the Kapiskau, Atikameg, Otadaonanis, and Moose rivers is a very level plain, underlaid by flat-lying Devonian limestone and marine clays, as flat as can be, not the slightest elevation being apparent. For 175 miles up the Kapiskau river this is the case, but the next 25 or 30 miles up stream exhibit flat-topped hills rising some 75 feet above the general level. Farther up-stream the country becomes flat once more, the stream sluggish with lake-like expansions. One of these lakes, a mile long with tall scouring rushes (*Equisctum*) obstructing the channel into the river gives the name to the river, Kapiskau signifying "obstructed"—no channel or passage being visible from the lake into the river, and

the canoe has to be forced through the rushes across the lake.

Within the Moose river basin the Archæan consists chiefly of pink granites, syenites and gneisses, cut by diabase dykes, and, with the exception of the agricultural areas where Pleistocene clays and loams occur, the topography is rough and broken. North of the height of land, lakes are fewer than to the south, and swamp areas more extensive. There are many valuable water powers awaiting development. The Palæozoic areas of the Moose basin are chiefly Silurian and Devonian limestones, shales and sandstones, with occasional Archæan inliers. Iron (limonite) occurs about the edges of the limestones in pockets, basins, and irregular channels, whilst beds of low-grade lignite occur in the drift. The soil of this drift-covered region is a good clay loam, which when drained will be well suited to agriculture. Along the southern fringe of the palæozoic of this basin, areas of pulpwood occur, but the timber diminishes as James Bay is approached.

In the country drained by the Moose river and its tributaries appertaining to northern Algoma, Sudbury, and Nipissing, the approximate boundary between the Archæan and palæozoic is at the following points:—

Localities.	Contact.
On the Kiosko river . . .	16 miles above forks of East branch French river.
East branch French river . . .	Between Gilbert portage and Kowosh falls.
West branch French river . . .	30 miles above forks of French river.
Little Abitibi river . . .	18 miles above junction with Abitibi river.
Abitibi river . . .	Near Sextant portage above Long Rapids.
Mattagami river . . .	9 miles below Smoky Falls near Gorge.
Opasatika river . . .	1½ miles below Breakneck Falls, above Squasicke Creek.
Missinaibi river . . .	About 10 miles above Old Brunswick House.

There are features in the Huronian of Ontario which have led Canadian geologists to conclude that the accumulations of boulders found in various portions of the Cobalt and other areas of Huronian age in the south-eastern portion of the province are truly glacial in origin, though appertaining to such a remote period in the history of this planet.

Pleistocene or Quaternary Deposits. — The newest deposits covering the surface of the province (not reckoning a few driftless areas), are the result of accumulations due to glacial agencies as well as to marine and fresh-water sedimentation, acting upon materials derived from the decomposition and erosion of the palæozoic and Archæan formations previous to and during the Ice Period, the period of submergence which followed, and the present period of emergence or elevation in which we live. The glacial moraines, kames, eskars, drumlins, etc., which were left behind on the recession of the continental ice-sheet, of its local glaciers, of its lobes which advanced and retreated, as well as the sands, clays, and gravels of the lake region, and of the Hudson Bay basin, presenting varied types of pleistocene deposits of glacial, interglacial, marine, fresh-water, and estuarine characters, constitute the *soils* and loams of Ontario farms and agricultural districts, the land upon which so many industries of the country depend, and in which the present drainage system is effected, and by which also it is greatly influenced. The history of the great lakes marks a phase in the pleistocene history of the province, and a study of their abandoned strands is replete with interest, and problems of a practical nature, of value alike to the railway, stream, sanitary, and civil engineer, as well as to the student of nature for its own sake, crop out at every point. Glacial as well as water-laid moraines, shore features and their

altitude, water-planes and their level or rising features indicating differential uplift, together with the ancient river channels and drainage of the lakes at different periods, also form part of the pleistocene history of the province. The strong terminal moraines of the Lake Ontario lobe of the Ice-sheet, the recessional moraines of the continental Ice-sheet through southernmost Ontario lake peninsula described by F. B. Taylor, as well as the studies of Professor A. P. Coleman, George Jennings Hinde, and Sir Sandford Fleming, have added much to our knowledge of the Quaternary deposits of the province. Tyrrell has described the *Keewatin* glacier, which was a great glacier flowing outward from a gathering ground north or north-west of Dubawnt lake during early glacial times, but subsequently changed its gathering ground and moved southward to the country between Dubawnt and Yathkyed lakes. From these centres the ice flowed westward to near the base of the Rocky Mountains, and southward for more than 1600 miles through what is now the District of Patricia and Central Ontario, as far south as Iowa and Illinois, whilst the great Labradorean glacier, having its centre of dispersion in the great peninsula of Labrador, flowed south-westwardly and covered south-easternmost Ontario with its mantle of drift. Rivers draining into James Bay from the south-west, carry a large proportion of detrital matter in suspension in their waters and discharge them into the bay, which in certain favoured spots is fast filling up and making land. The *Labrador formation* or mantle of till from the Labrador glacier, the *Rupert formation* or mantle of till and its modifications from the Keewatin glacier, the *Erie clay*, the *Artemisia gravel*, the *Algoma sand*, the *Saugeen* (often banded) clay (which represents the seasonal accumulations during the melting and freezing seasons accompanying the process, as in Sweden), and the

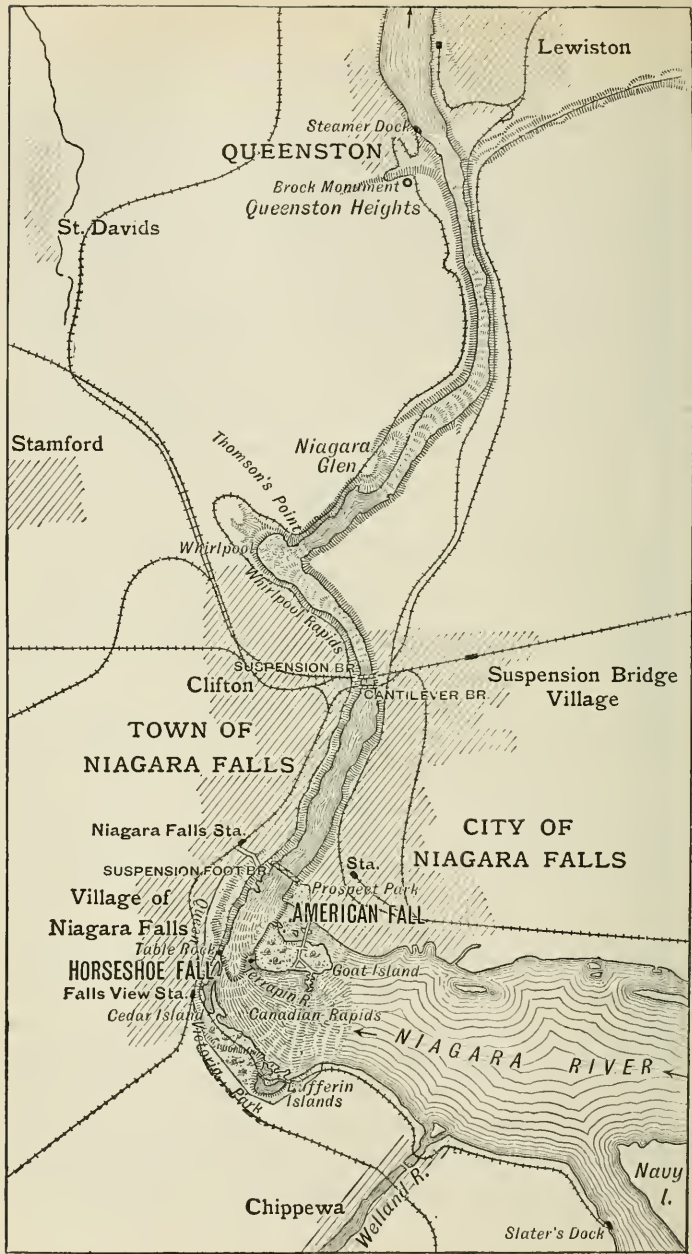
Toronto formation, constitute some of the better-known deposits of Quaternary age in Ontario, in which strata glacial and interglacial and later faunas and floras have been discovered and described, including remains of extinct elephants, caribou, various kinds of insects, besides numerous remains of molluscs. The Pleistocene of the Ottawa Valley has been described by Sir William Dawson, Sir William Logan, and others; but there still remains much to be done in this last chapter in the geological history of the province, in which human remains are also found which prove of special interest.

The Lakes

The distinguishing characteristic of Ontario is the important physical fact that its great peninsula is practically surrounded by water—not only the southern peninsula and the upper plain, but the whole peninsula from the Ottawa river as a base to its apex on the Detroit river. Georgian Bay reaches far down towards Lake Ontario, and in the belt of Laurentian country from Lake Nipissing to the Thousand Islands, though the lakes are small they are beyond all count. The aggregate area of the great lakes alone is 98,500 square miles including Lake Michigan, which, though in the United States, is sufficiently near to have an effect on the climate of Ontario. The greater peninsula of Ontario is what is generally meant in conversation by “Ontario.” The outlying territories dependent on the province are the districts of Sudbury, Nipissing, Algoma, Thunder Bay, Rainy river, Timiskaming (parts of Ontario in its broader sense), but the population and strength of the province is in the peninsula, and lies south of a line drawn along the 46th degree of latitude. On a previous page (p. 32) is given a table of the dimensions of the greater lakes.

The north shore of Lake Ontario is comparatively low, rising only from 50 to 150 feet above the surface of the lake. The most remarkable features of the lake are (1) the high rocky peninsula of Prince Edward separated by the Bay of Quinté from the mainland, where the Murray canal, $5\frac{1}{6}$ miles long, without locks, cuts across the neck of the peninsula; (2) the Niagara escarpment and gorge at the west end of the lake; and (3) the Scarborough Heights near Toronto. There are many excellent harbours along the lake: Kingston, Cobourg, Port Hope, Whitby, Toronto, Hamilton, and Port Dalhousie at the mouth of the Welland canal are a few of them. The lake is deep and navigable over its whole extent. It is 193 miles long by 53 miles in average breadth, and its area is 7260 square miles. Many cities of importance are on its shores, for it lies between the most populous province of Canada and the important state of New York. Its clear waters are studded with the white sails of lake craft. Passenger steamers ply in abundance to the many cities which surround it, and long tows of barges bring down to the sea the agricultural treasures of the west. The rivers which fall into the lake are not important. The largest is the Trent. The main feeder of the lake is the Niagara river which, in its short course from Lake Erie, drops 326 feet not only over the Niagara Falls but in rapids above and below.

The Niagara Falls have been the theme of so many descriptions, not only in guide-books but by writers of great literary eminence, that it is difficult to write about them, and the more they are known and the longer one tarries within the sound of the falling waters the less one is inclined to attempt to describe them. The enormous volume impresses the mind only by degrees; for at first sight it is not realised, and the steady un-



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Statute Miles

London: Stanford's Geog. Estab^t

intermitting flow of the cataracts slowly impresses the nerves by its solemn and monotonous roar. Beautiful parks and grounds, cared for by public officers, skirt the banks of the falls and rapids, both in Ontario and in the state of New York. On the Canadian side the park is longer, for the river makes a deep curve; but an electric railway runs through its whole length and a visitor may stop anywhere his fancy dictates. There is extensive electrical power development at Niagara, but local governments at Albany and Toronto, together with international associations and committees, have done much to preserve the scenic grandeur of the mighty cataract.

The Niagara river did not form part of the main route to the west in the earliest days of the colony. That was by the Ottawa and French rivers to the Strait of Mackinaw; so that Lakes Huron, Michigan, and to a great extent, even Superior, were well known before Lake Erie. Nor was this strange, for not only were the hostile Iroquois avoided by the Ottawa route but the circumnavigation of the peninsula was also avoided, and on Champlain's map of 1632 Lake Erie is shown only as a long river. About the position of Niagara a fall is indicated. In the *Relation* of 1641 Lake Erie is mentioned and the river is called Onguiaahra. No fall is alluded to; but, in 1648, Father Ragueneot mentions a fall of a "frightful height"; and in Sanson's map of 1656 the lake is plainly shown and the river is called Ongiara. The simple word "sault" indicates the knowledge of an existing fall, but the information is evidently from Indian reports, and even on Galinée's map of 1669 the fall is laid down as "reported by the Indians to be 200 feet high." La Salle heard the roar of the water as he passed the Niagara river on his way to the head of

the lake in 1669. There he met Jolliet on his way down from the upper lakes, but he too had avoided the Niagara river for fear of the Senecas, and had gone up the Grand river and made a portage across to some point near Hamilton. La Salle remained behind, but Dollier and Galinée, two Sulpician priests in his party, took the trail to Grand river and wintered on Lake Erie. It was in 1678 that La Salle, Tonty, La Motte, and Hennepin saw the falls, and the first description on record is in Hennepin's *Travels* in 1683, where is also given a very fair drawing of them. The Frenchmen built a fort at Niagara, to the great annoyance of the Iroquois, and then made a portage to Cayuga Creek above the falls where La Salle built the *Griffon*, the first vessel on the upper lakes.

The Falls of Niagara are formed by the precipitation of the whole drainage of the four upper lakes from the upper to the lower plain, over the escarpment so frequently referred to in the previous pages. The edge of the escarpment is at Queenston Heights seven miles lower down, but, in the course of ages, the river has cut its way back, and the falls are continuously receding in the same way. The upper 85 feet of the precipice is limestone, and the lower 80 feet is of shale, so that the cataract erodes the softer shale and undermines the limestone above. This is best seen on the Canadian side, at Table Rock, where the limestone projects over the abyss. Not many years ago this ledge was much wider, but an immense mass of it broke off and fell into the caldron below.

The Niagara river flows from Lake Erie with a swift current, but moderates as it divides and expands to enclose Goat Island. Below the island it unites in a broad stream $2\frac{1}{2}$ miles in width. About half-way between the lakes the rapids commence, and gather momentum

as they speed down an incline of 55 feet in three-fourths of a mile. At the edge of the fall is Goat Island dividing it into two unequal parts. The crest line of the American Fall is 1080 feet, and is almost straight. The Canadian or Horseshoe Fall, which carries seven-tenths of the water, makes a grand curve and falls as into a huge caldron.



GENERAL VIEW OF NIAGARA FALLS.

Notman, Photo.

The crest of water, as it curves in a clear green sheet over the edge, is 3010 feet. It breaks into white foaming masses as it plunges into the misty abyss. It is calculated that 7000 tons of water fall every second. The height of the fall on the Canadian side is 158 feet, and on the United States side 167 feet. Several bridges span the river below the falls, among which is a suspension bridge and a cantilever bridge, 825 and 900 feet long respectively.

Below the falls the river runs with great rapidity between steep cliffs. A few miles below are the lower rapids and the tortured river, compressed into a width of 300 feet between cliffs of rock 200 feet high, forms a whirlpool where the currents not only swirl round horizontally but from below in confused waves. At Lewiston and Queenston the river resumes its tranquillity, and steamers from Lake Ontario steam up to the wharves. The total fall from Lake Erie is 326 feet in a distance of 33 miles from lake to lake. The upper rapids account approximately for 55 feet, the cataract for 160 feet, and the remaining 111 feet is in the declivity of the lower rapids.

Lake Erie is another busy lake, the centre of the traffic of many cities. Its shores are for the most part low (although there are in places long stretches of clay banks 50 to 100 feet high) and its waters are comparatively shallow. While the other great lakes are so deep that their bottoms are lower than the ocean surface, Lake Erie has an average depth of only 85 feet. The shallowest part is at the western end—west of Pelée Island. In the centre and east, the depth varies from 80 to 210 feet. The navigation is more dangerous on that account, and there are not so many good harbours. On the Canadian side the chief are Port Colborne at the entrance of the Welland Canal, Port Maitland at the mouth of the Grand river, Rondeau harbour, and Port Dover. In this lake, as also in Ontario, there is a bay at the eastern end cut off by Long Point, a low marshy spit 18 miles long, once a peninsula but now an island, the waves having cut a canal at the neck. It is the resting-place in the migrations of innumerable ducks and geese. Near the western end of the lake is Point Pelée, and south of it Pelée Island, well known for its vineyards.

The lake is 239 miles long by 59 miles wide, and covers an area of 10,000 square miles.

The Detroit river, about 32 miles long with a depth of 17 feet, leads into Lake St. Clair, a small and shallow lake 360 square miles in area, and with an average depth of only 15 feet. The St. Clair river connects it with Lake Huron. The lake is about 25 miles wide, and the St. Clair river is 30 miles long. The steamboat channel in the lake is a canal across the flats $26\frac{1}{2}$ miles long by 300 feet wide and with 16 feet of water, kept to its proper depth by dredging. The shores are low. The river Thames is the only feeder of importance falling into the lake. The large city of Detroit in Michigan was an old centre of the fur trade; opposite to it is the Canadian town of Windsor, and not far away on the Detroit river is Amherstburg, famed in the war of 1812-14 as the only point of Canadian territory held by the United States at the close of the war.

The Detroit river is crowded with shipping and crossed by many ferries. The railway cars are no longer ferried over on large barges, but a tunnel has been constructed into the United States, so the continuity of travel is not broken.

Lake Huron, the *Mer Douce* of Champlain, the great route to the west by the Ottawa, was the first of the great lakes known to the French. It is 270 miles long, with a breadth of 101 miles, and covers an area of 23,200 square miles. It is deep over its whole extent. In many places the depth is over 600 feet. The great island-studded expanse of Georgian Bay is almost a lake of itself. It receives the French river, the Severn, the Nottawasaga, and other rivers of importance, and is separated from the main lake by the great Bruce promontory terminating in Cabot Head and by

the long chain of the Manitoulin islands. The water of this great lake is singularly clear, and on summer days it is difficult to distinguish between the blue sky and the blue water, and a canoe will seem to float in the air. The southern part of the coast is low, but, near Goderich, the land rises into bold breezy bluffs and continues high to Cabot Head, terminating in limestone cliffs 324 feet high above the lake. Goderich and Kincardine are the chief ports on the main lake, but the great stream of Canadian traffic from the Sault Ste. Marie and the Straits of Mackinaw passes into Georgian Bay to the crowded ports of Collingwood, Parry Sound, and Owen Sound—the terminal point of railways which carry the freight directly east and south to Toronto or Montreal, and avoid the long detour by Lake Erie. There are many harbours on the Georgian Bay. Before the convention for national disarmament on the lakes, Penetanguishene was the naval station for the upper lakes. The north shore is sometimes bold, and rises up into cliffs of the formation called Huronian, from its great development in this portion of the Lake Huron basin.

Lake Superior—602 feet above the sea—is the last of the great series of St. Lawrence lakes, and is also the largest. It is 420 miles long, with a width of 162 miles, and extends over 31,800 square miles. It is the largest sheet of fresh water on the globe—a serious and stern inland sea encircled by steep rocky cliffs 300 to 1500 feet high, of Archæan age, interrupted by immense masses of granite and basalt. The water is very clear and very deep, averaging 900 feet, and the lake is subject to storms of great violence. Port Arthur and Fort William are the chief Canadian ports on the lake. Near them the gigantic ridge of Thunder Cape

rises clear from the water, a mass of basalt 1300 feet high with an outline like a lion *couchant*.

“Storm-beaten cliff, thou mighty cape of thunder ;
 Rock Titan of the north, whose feet the waves beat under ;
 Cloud-reared, mist-veiled, to all the world a wonder,
 Shut out in thy wild solitude asunder,
 O Thunder Cape, thou mighty cape of storms.”

Thunder Bay is 25 miles long by 16 wide, and is surrounded by cliffs about 1000 feet high. Not far



THUNDER CAPE, NEAR PORT ARTHUR, LAKE SUPERIOR.

off is Pie Island, rising 950 feet from the lake, capped by a mass of eruptive rock, and near it is the little Silver islet, celebrated for having contributed from three to four millions of dollars' worth of silver to the currency before the great fall in price. The St. Louis river falls in at the head of the lake—not a very important stream, but interesting as the source of the St. Lawrence. The Kaministikwia is a large river, the old portage route to the west, and Fort William was the entrance where the fur traders held high carnival at their reunions in the good old days

of the fur trade, when the western plains were brown with bison.

Fort William is in a beautiful valley at the foot of McKay Mountain, and has a good sheltered harbour. The business of the Canadian Pacific, Canadian Northern, and Grand Trunk Pacific passes through Fort William,



GRAIN ELEVATORS AT FORT WILLIAM, ONTARIO.

and there the railway companies have immense elevators for grain, some recently constructed estimated to have the largest capacity of any elevators in the world. The new Canadian Pacific railway coal-handling plant is the greatest of its kind, and unloads a boat carrying 10,000 tons of coal in ten hours.

Port Arthur and Fort William are twin cities at the point where rail and water meet, and have become hives of activity in the shipment of grain eastward and of industrial products westward. Their combined popula-

tion is now estimated at, at least, 30,000. In 1910 these two cities had an elevator capacity of 21,740,700 bushels, whilst four new grain elevators built by the Grand Trunk Pacific Railway Company at Fort William have a total capacity of 40,000,000 bushels. Lake Nipigon is the most important feeder of the main lake. It is a great lake 1450 miles in area, very deep, and a favourite resort of fishermen in summer. Off the mouth of Michipicoten river, formerly one of the main canoe routes by the Missinaibi and Moose rivers to Hudson Bay, is Michipicoten Island, another mass of eruptive rock.

Lake Superior discharges its waters into Lake Huron by the St. Mary river, which, at one point in its course, falls in rapids 22 feet in a distance of three-fourths of a mile. This is the Sault Ste. Marie, or locally the "Soo," one of the great cardinal points of the continent. There is a canal on the United States as well as on the Canadian side. When the Canadian north-west began to open up, Canada felt the need of a canal of her own, and the Government completed the Canadian "Soo" Canal in September 1895 at a cost of \$4,923,330. It is in one lock 900 feet long by 60 feet wide, and with 20 feet 3 inches of water on the sills at lowest known level. It is larger than its neighbour, and will take larger vessels than can now navigate the lakes. The total length of the canal is 7472 feet, and its width at the surface is 150 feet, and 141 feet 8 inches at the bottom. Three steamships with an aggregate length of 936 feet, and a registered tonnage of 4987 tons, were passed through at one locking. The canals are free, and of nearly equal capacity. In 1911 there were 6802 vessels, with a net registered tonnage of 19,361,220 tons, passed through the Canadian Canal, carrying

30,951,709 tons of freight; whilst 11,870 vessels, with a net registered tonnage of 22,321,519 tons, passed through the United States Canal, carrying 22,523,851 tons of freight. The tonnage passing through is *three* times greater than that through the Suez Canal. Navigation on the great lakes opens about the middle of April and continues until the middle of December.

These great inland waters present very different aspects. Clear and bright, in fine weather, the blue sky is reflected from their transparent depths; but in days of storm, when the sky is black with clouds, they are very serious waters to navigate. The waves have not the long swell of the ocean, and are less regular in their movement. During a storm of several days the waves will attain an amplitude of 15 to 18 feet. The surface of the lakes is much affected by winds of long duration, and a long continued gale will raise the level of the leeward end of a lake as much as .7 feet. In that way storm beaches are formed on the shore. The level of the lakes is subject to fluctuations not yet accounted for, and recurring in cycles of years.

The great lakes do not freeze in winter, save in the shallow places along the shores, for the cold is not of sufficiently long continuance to cool the whole body of water to the freezing-point, and the amount of heat absorbed from the sun in the summer season is exceedingly high. As fast as the surface layer is cooled it sinks and is replaced by warmer water of less density from below. The currents through the lakes vary from 4 to 12 miles a day; but during a long prevailing wind the rate may be increased to 2 or even 4 miles an hour.

The system of canals by which these great inland waters are opened up to navigation has been already described, and it has been shown how the difference of

level between Montreal and Lake Ontario is overcome by a series of nine canals, with an aggregate length of 42 miles, and overcoming a total drop of 205 feet. Between Lakes Ontario and Erie the difference of level has been shown to be 326 feet, and of this 167 feet is at Niagara Falls. The Welland canal overcomes this drop by twenty-seven locks in a course of 28 miles. It extends from Port Dalhousie on Lake Ontario to Port Colborne on Lake Erie, and the aggregate rise is 333 feet. This canal, once passed, the whole of Lakes Erie, Huron, and Michigan are accessible, without further obstruction.

The parallel of 46° passes through two very important points—the head of tide water on the St. Lawrence and the key of the whole centre of the continent—that remarkable conjunction of the outlets of the upper lakes at the Strait of Mackinaw and St. Mary. Montreal, a few miles above tide water, in the old fur-trading days was the eastern end of a navigation which led straight, by way of the Ottawa and Lake Nipissing, to that central point of the continent. The route was due west, never deviating more than a few miles from the parallel of 46° . Lake Huron is 581 feet above the tide; the foot of the Chaudière Falls at Ottawa is 118 feet above the tide. It is now proposed to open up this old canoe route by the construction of the Georgian Bay Ship Canal with sections as follows: from French river harbour through the French and Pickereel rivers and Lake Nipissing to the height of land some 80 miles distant; thence through the divide by a canal $3\frac{1}{3}$ miles long, through Trent lake, Turtle lake, Little Mattawan river to Sandy Bay at the east end of Talon lake, 21 miles; thence by canal 3 miles to Mattawa river, along Mattawa river to the old Hudson Bay Company's post at Mattawa; thence $\frac{3}{4}$ mile to the Ottawa river, along the Ottawa river past Ottawa

and the Chaudière Falls to Oka, 293 miles; thence either by the St. Lawrence or the Rivière des Prairies, 25 miles, to Montreal, making a total distance of 440 miles. The proposed route of the Georgian Bay Ship Canal was in Pleistocene times the natural water-way between the Great Lakes and the Ottawa and St. Lawrence valleys by way of the French river, Lake Nipissing, and the Mattawa; and the beaches and strands formed by the old water-levels have guided the aborigines and voyageurs, and pointed the natural course to the modern engineer.

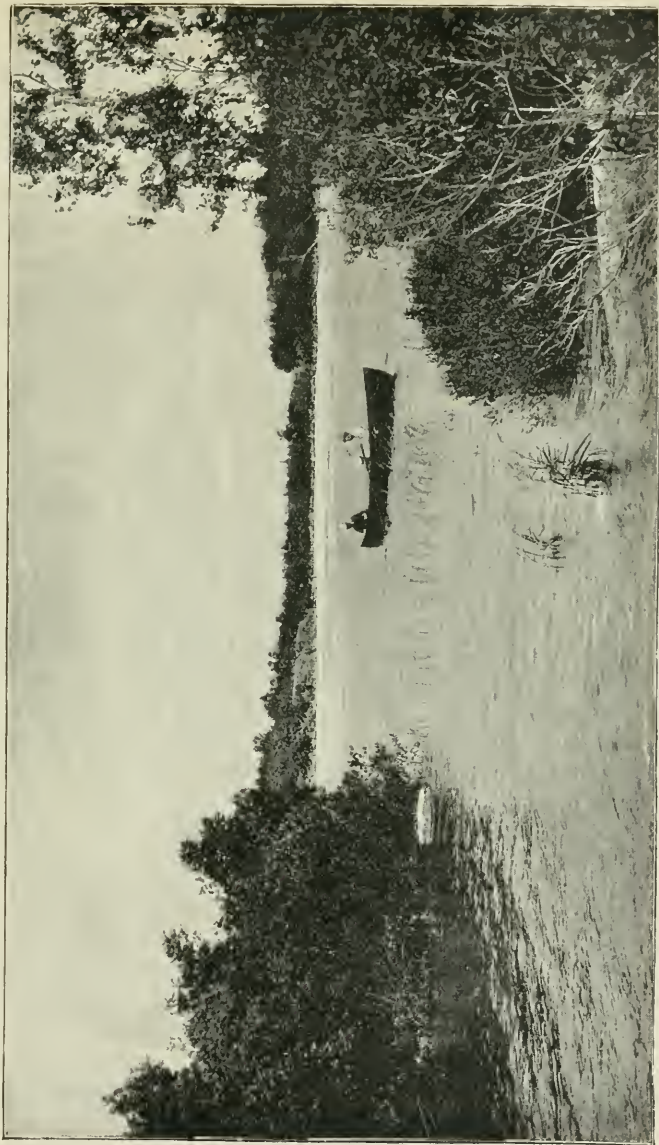
Natural Beauty

It must not be supposed that because the more settled portion of Ontario is a level country that it is wanting in natural beauty. On the contrary, it has beauties all its own. Gazing across these blue inland seas in summer, and hearing the lap of the ripple at his feet, one might imagine oneself transported to the Mediterranean. The Lake of the Thousand Isles has been long celebrated. It is 40 miles long by 4 to 7 miles wide, and contains about 1700 islands and islets. Georgian Bay, on Lake Huron, studded with islets and shut in from the main swell of the lake by the Manitoulin islands, is a paradise of loveliness:

"That bay of wizard beauty, where
The frequent islets seem to float, so like—
In calms—the upper and the nether blue."

It is reported, on the authority of David Thompson, that Lieut. Collins, of the survey party, counted 47,500 islands and islets in the bay. Many of them are of very small size. Another estimate places the number at about 30,000.

All the Laurentian country, from the Ottawa to the



AMONG THE THOUSAND ISLANDS.

Trent and Lake Simcoe, is a wilderness of lake and forest. Much of this region is included in the Algonquin National Park, Muskoka, and Parry Sound districts, and is still in its pristine wildness.

The Algonquin National Park lies along the Parry Sound (Grand Trunk) railway, east of the Georgian Bay, and is an area of fully one million acres of crown lands, which has been reserved in perpetuity by the authorities as a forest, fish, and game park, under the name "Algonquin National Park." Its numerous enchanting lakes and streams abound in trout, bass, and other members of the finny tribe, while the forests are alive with moose, deer, beaver, and other of the larger animals, and hundreds of wild fowl and birds, enjoying an earthly paradise without fear or trembling of being killed by man. The preservation of the forests in their natural condition at the height of land between the Ottawa river and St. Lawrence (Lake Ontario) watershed is doing much to conserve the magnificent water-powers of the streams flowing from this park southward in many directions through the settled portions of southern Ontario. The Muskoka region is within a few hours of Toronto, and is a favourite summer camping ground. There are also good hotels through it. The region contains from 800 to 1000 lakes studded with islands and connected by a network of streams. With canoe and paddle one may go all over it, and thousands of people resort to it not only from the cities of Canada but also from the United States. On the southern border was the home of the Huron nation when the Iroquois warriors extinguished it in blood. Two great routes led to Lake Ontario; one by the Severn, Lake Simcoe, and the Trent into the Bay of Quinté, and the other by the Holland and Humber to Toronto. Lake Simcoe (on the old maps,

Lake Toronto) is one of the most beautiful places in the Dominion, and is the entrance to the Muskoka region. Champlain came down with the great Huron war-party by that route, and although the waters of the lake are now ploughed with steamers, and canals are being built along the Trent, the great features of the country remain unchanged.

Champlain belongs to the whole of Canada ; for he was as familiar with Ontario as with Quebec, and he visited almost every harbour on the Atlantic coast of Acadia. Few Canadians in these days of railways have seen more of Canada than he saw from his canoe. During the winter he spent with the Hurons he visited the Tobacco Nation and another nation farther west. He must have entered upon the upper western plain of Ontario and looked down on the beautiful country to the west and south sloping down to Lakes Erie and Huron, and covered, as Charlevoix says, by "the noblest forest of the whole world." Charlevoix saw it from the other side and pronounced it "the finest country in the universe." In Champlain's time it was well settled with aborigines, and trails led in all directions through forests of oak and elm and hickory and walnut. The native towns and villages were surrounded with fields of maize and pumpkins and sunflowers and tobacco. Champlain saw the country in all its primitive beauty.

He says of it :—

"Ceste terre est comme une isle, que la grande rivière Saint Laurent enceint, passant par plusieurs lacs de grande estendue." "Le pays est fort plaisant, estant chargé de grandes et hautes forests, remplies de bois de pareilles espèces que ceux que nous avons en France."

Much of the forest is now cleared, but there is enough woodland left to give the whole country the appearance of a park. On the upper course of the Grand river and

along the edge of the Niagara escarpment the scenery is very beautiful, and on the cliffs looking over Lake Huron one might fancy oneself on the chalk downs overlooking the English Channel. Timagami, or lake of the "Deep Waters," with its many arms and beautiful as well as multitudinous, well-forested islands, and shores, haunted



FALLS ON BLACKWATER RIVER, NIPIGON DISTRICT

by innumerable wild-fowl, forms another of those natural beauty-spots which by a wise provision of the Ontario government has been set aside as one of nature's gardens, where the slaughtering hand of man is stayed. It is here that the eye of the observer of nature and searcher into her laws may study her moods to advantage, and try to unravel her mysteries. In the life-histories of the various types of life dwelling in peace and unmolested in the *Timagami Forest Reserve*, will be found a treasury of information and a wealth of science of the most fascinat-

ing character. The Kawartha lakes of Ontario, the Ottawa river from its source at Lake Kapemitchigama to its mouth near Ste. Anne's, the Moon river district, Timiskaming and Kipawa, Nipigon river, Kenora and the Lake of the Woods, the Hudson Bay and James Bay region, as well as the district of Patricia, offer magnificent scenery combined with a healthful climate, the winter season vieing with the warmer days in its attractiveness and delights.

Population

Ontario is the most populous province of the Dominion. Out of a total population of 7,205,364 given in the revised census of 1911, Ontario has 2,523,274. The population in 1901 was 2,182,947, making an increase of 340,327, notwithstanding the large emigration to the north-west provinces. The rural population in 1901 was 1,246,969, and in 1911 it was 1,194,785; whereas the urban population in 1901 was 935,978, it was 1,328,489 in 1911. In 1871 the population of Ontario was 1,620,851, making an increase of 55.67 per cent in forty years. The population of the province is almost all in the older part, in the peninsula bounded by the lakes and the Ottawa river. As originally planned, Ontario is still an English province. This province, formerly called Upper Canada, was partially explored by Champlain in 1615, but French settlements did not follow as in Quebec, owing to the war-like attitude of the Iroquois. The true founders of Ontario are those United Empire Loyalists who emigrated from the United States after the civil war which led to their secession; but according to the 1911 census, there are no less than 202,442 persons of French origin now in Ontario. What is called the "new Ontario" has many

thriving cities and towns in the mining and railway centres of this part of the province.

Government

The capital of Ontario is Toronto, on Lake Ontario, the second city of the Dominion. Its population is given in 1911 as 376,538, but it is increasing rapidly. It is admirably situated for lake navigation, and is the next most important manufacturing centre to Montreal. It is a well-governed city, well kept, with imposing public buildings, comfortable private residences, numerous parks, as fine as those of any other city in the Empire. Hamilton is a busy hive of industry at the western extremity of Lake Ontario, with a population of 81,969, whilst Ottawa, the federal capital, in the county of Carleton, in the south-eastern extremity of the province, has a population of 87,062. The provincial government consists of a lieutenant-governor, nominated by the Dominion Government and a legislative assembly of 106 members elected on a manhood suffrage. The province started at Confederation with one chamber only. The executive government is, as in all other provinces, a committee of the privy council having seats in the legislature, and holding office as long as they command a majority therein.

Ontario led the way in the important matter of local self-government, and first organised a municipal system which, while it relieved the legislature of the minor details of government, formed in every municipality a local school for training the people in the exercise of their political duties. It was from Ontario that the municipal system spread to Quebec at the Union in 1841, and quite recently to most of the other provinces.

Education

The educational system of Ontario is eclectic, and based on principles adopted after a careful examination of the systems of other countries. It was welded into



MARKET DAY AT HAMILTON, ONTARIO.

an organic whole and moulded to the requirements of the province mainly by the Rev. Dr. Ryerson, a man of unusual ability, born in Ontario, the son of an exiled Loyalist of the colony of New Jersey. It was commenced on the present lines in 1844 on Dr. Ryerson's appointment as chief superintendent of education, and he administered it until 1876, when the office was abolished and its duties were assumed by a member of the government of the day. The Minister of Education, with his

subordinate staff, now administers the education laws as a department of government. In this way unity of action is attained, and he administers it, moreover, through trustees elected by the local ratepayers, by which flexibility and perfect adaptation to local needs is secured. It is a complete system, and extends from the child of four years in a kindergarten to the Bachelor of Arts of the provincial university fully equipped for his career in life. The principles of the system, as it has finally been shaped by the legislature, are deserving of careful study. Education is divided into three divisions, each distinct and complete in itself; and yet the course of study is uniform and consecutive without overlapping.

There are, *first*, elementary or, as they are called, public schools. These are free, and children from eight to fourteen must attend them or some private school of equal grade. They include kindergarten schools in the towns and cities, for children of four years; but children of six years may enter the elementary schools. *Second*, intermediate education is carried on by high schools or collegiate institutes which youths of thirteen years may enter. The fees are very low, and many are free of all charge. Youths who have passed through these schools are prepared for the *third* division—higher education—and may matriculate at the university, where, after a four years' course, the degree of Bachelor of Arts may be attained.

Taking first the autocratic side of the system, the Government, by statutes, orders-in-council, and departmental regulations, examines and certifies teachers, prescribes text-books and courses of study, compels attendance, dictates the essential requisites of school buildings, contributes grants, creates the machinery of local taxation, and appoints inspectors to secure con-

formity with the laws. The democratic side is manifest in the provisions for carrying out all details by boards of trustees elected by the local ratepayers of each school section. The excellent municipal organisation of the province makes this easy. The counties are organised by townships or by incorporated villages or cities; all are municipalities, and these are subdivided for educational purposes into school sections. Every school section has at least one public school, and every county has at least one high school.

Teachers are selected and appointed by the local boards, from among those certificated by Government, in three classes, according to their acquirements and abilities. In every county there is at least one school called a model school, under a highly trained master, where, in addition to ordinary work as a public school, students are prepared for a third-class certificate as teachers. There is a normal school at Toronto and one at Ottawa where teachers are trained for second-class certificates, and a school of pedagogy at Toronto where first-class certificates are granted.

The main portion of the money required is raised by local taxation. Under the statute law this is imposed and collected by the locally elected boards of trustees, who also administer all the finances, build the schoolhouses, and appoint and pay the teachers. In the wealthier cities the schoolhouses are large and handsome. The Government makes a grant to each board based on attendance, and the county council must raise an equal amount. In addition, the township council must contribute at least \$100 annually to each school; and if more is needed, the trustees must raise it from the ratepayers of the school section. It is a principle of the system to keep these three divisions

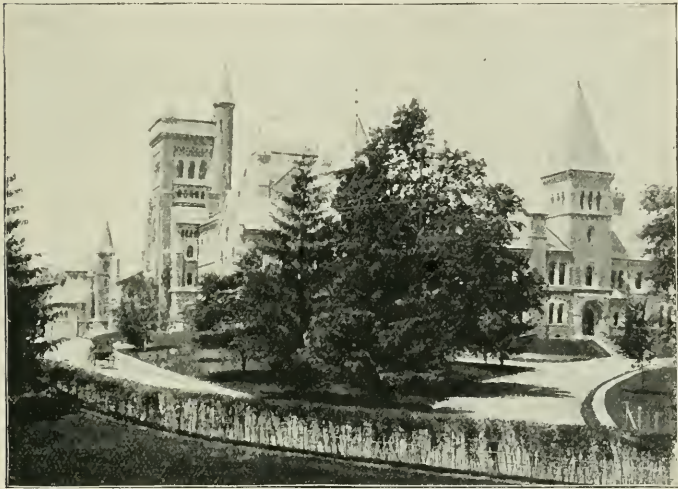
of education separate. There are separate inspectors of public, model, and high schools, and they are managed by different boards of trustees.

In the province of Quebec the schools are frankly denominational, but in Ontario, where the majority is overwhelmingly Protestant and opposed to the least semblance of connection between church and state, the Roman Catholic minority has separate schools. Nor are the public schools of Ontario open to the reproach of being godless; on the contrary, "Christianity is the basis of the whole system of elementary education, and its principles pervade that system," but at the same time "no religious body has any voice in the management of the high or public schools and the university."

Under the Act of Confederation the Roman Catholics of Ontario have separate schools. Government inspectors visit these schools and keep them up to the legal standard, and the teachers must be certificated, but the Government does not concern itself with the religious teaching. The Roman Catholics generally avail themselves of these provisions, and in some localities, where Protestants are in a minority, it is they who have the separate schools. It is, however, the general law that every public and high school shall be opened with the Lord's Prayer, and closed with reading the Bible and with the Lord's Prayer, or a special prayer authorised by the Government, and that the Bible shall be read systematically either in the complete King James's version or out of the authorised volume of selections from it, as the trustees may direct; but no comment may be made. Pupils whose parents have conscientious objections to such religious exercises may retire. All such matters are at the discretion of the trustees.

The crown to this system is the University of Toronto,

endowed, maintained, and controlled by the province. It is undenominational, and has faculties of arts, law, science, and medicine. The faculty of applied science and engineering has seven departments of instruction:—(1) Civil Engineering, (2) Mining, (3) Mechanical Engineering, (4) Architecture, (5) Analytical and Applied



MAIN BUILDING, UNIVERSITY OF TORONTO.

Chemistry, (6) Chemical Engineering, (7) Electrical Engineering—all leading to the degree of Bachelor of Applied Science. It has also a college called University College, and a number of denominational colleges and similar institutions are federated with the University. These grant their own degrees in Divinity, and are represented in the governing body of the University which confers all other degrees. The chief among the federated bodies are: Victoria University (Methodist), Knox College (Presbyterian), St. Michael's College

(Roman Catholic), Wycliffe College (Anglican), Huron College (Anglican), the School of Practical Science, the Ontario Agricultural College, Trinity Medical School, the Women's Medical College, the Toronto College of Music, the College of Pharmacy, and the College of Dental Surgeons. The standard of education in the province is high, and the people of Ontario are justly proud of their educational system. Other universities in the province are: Queen's University, Kingston; Trinity University, Toronto (Anglican); Ottawa University, Ottawa (Oblate Fathers); M'Master University, Toronto (Baptist), and Western University, London.

Agriculture

Ontario is, above all, the province where agriculture has been most scientifically carried on, and, where the climate and conditions are suitable, the greatest results have been achieved. As has been seen, the southern and well-settled portion is a level and well-watered country. There is no possibility of summer drought, and lakes and running streams abound for cattle. The soil varies from sandy loam to clay loam in every possible gradation, according to the geological structure of the locality. Wheat is a staple crop in this part of the province, which grows the finest barley on the continent, and raises the finest cattle. All the productions of temperate regions grow throughout its extent and even beyond the watershed of Hudson Bay in the great fertile "Clay Belt" at the north, which is traversed by national and provincial railways. The native "Indian" tribes, who inhabited the province before the whites, grew maize, tobacco, pumpkins, and beans, and were sedentary tribes with settled abodes. The western peninsula is more especi-

ally the garden of the province, and the southernmost counties are the centres of production of the choicest fruits. There the grape grows in the greatest perfection for table use, and for the manufacture of wine. Peaches are cultivated in extensive plantations and sold in immense quantities; and, for home use, the farmers grow apricots, nectarines, and quinces, over an area of several thousand square miles.

All over the province maize is a standard crop, and melons are grown in abundance. Every farmer may have his orchard, and grow fruit for his own use, if not for sale. Canada had been long misrepresented as a region of frost and snow, where it is difficult to wrest a living from an inclement climate. From the census returns of 1911 Ontario farm values are as follows:—

	1911.	1901.
Land	\$723,902,419	\$585,352,294
Buildings	317,876,963	226,575,228
Implements	84,969,426	59,897,513
Live Stock	214,720,404	129,496,261
Total	\$1,341,469,212	\$1,001,321,296

which shows a net gain of \$340,147,916 in *ten* years.

The chief peach district in Ontario is in the southern counties around Niagara, along the shores of Lake Erie, and on the shores of Lake Ontario from Niagara to Toronto. But they may be grown anywhere as far north as the south shore of Georgian Bay. The largest orchards are at Niagara, Grimsby, and St. Catharines; and at Leamington, in south Essex, 35,000 baskets of peaches were shipped in one season. In the same year the peach crop of Niagara was estimated as 300,000 baskets, and the crop was so large that they were sold in the Toronto market at twenty-five cents, or one shilling sterling a basket. In the same year, at Winona in

South Wentworth, 1200 tons of small fruits were shipped, and one firm alone paid \$3000 for baskets. In 1912 there were 7000 cases of Ontario peaches shipped to Great Britain, where they found a ready market and yielded excellent profit.

Grapes have long been a staple crop in Ontario, and are grown all over the southern peninsula of the province, as far north as the south shore of Georgian Bay. On a preceding page is a view of a vineyard near Ottawa, but the most productive region is along the shores of lakes Erie and Ontario, for there the farmers have given greater attention to the cultivation of the vine. This is the natural home of the famous "Concord" grape vine, the hardy variety with which the vineyards of France, Italy, and other countries have been restocked after the ravages caused by the *phylloxera*. The counties of Lincoln, Wentworth, and Welland are mainly identified with grape-growing, with a total annual output of some 20,000 tons. Good grape-land is plentiful. Grapes for the table are mainly raised; about *one-third* of the crop is devoted to the manufacture of wines; the present annual output being 300,000 gallons. Both grape and tobacco culture are extending rapidly in Ontario.

Tobacco is now grown very extensively in Ontario. It was the home of the Tobacco Nation (Nation du Pétun) situated between Toronto and Nottawasaga Bay. There were 20,000,000 pounds of tobacco produced during the year 1911, the yield per acre averaging 1200 pounds. In the year 1912 there were 10,749 acres of land under tobacco culture, the counties of Kent and Essex having 3132 and 6663 acres respectively.

Maize is a sure crop anywhere in southern Ontario, Quebec, and the Maritime provinces. Corn (maize) for

husking covered 320,519 acres in 1910 and produced 24,900,386 bushels, the average yield per acre being 77.7 bushels, the output for the year being valued at \$9,301,245. Corn for silo was cultivated over 326,627 acres, yielding 3,788,364 tons of green corn, the average yield per acre being 11.60 tons and the market value \$7,576,728. There were 298,347 acres of orchard land in 1910, besides 11,390 acres of vineyard and 24,384 acres of small fruits, also 57,982 acres of gardens. The quantity of apples grown is enormous, as well as of small fruits. From one railway station alone, 158,000 quarts of strawberries were shipped. Plums are also a very large crop.

Field Crops.—The following table gives the acreage, production, and market value of the field crops of Ontario for the year 1910:—

Crops.	Acres.	Bushels.	Bushels per acre.	Market Value.
Fall Wheat . . .	743,473	19,837,172	26.7	\$17,172,678
Spring Wheat . . .	129,319	2,489,833	19.3	2,229,999
Barley	626,144	19,103,107	30.5	9,930,410
Oats	2,757,933	102,084,924	37.0	35,698,964
Peas	403,414	6,016,003	14.9	4,856,986
Beans	49,778	892,927	17.9	1,386,798
Rye	95,397	1,620,333	17.0	1,024,787
Buckwheat	194,913	4,693,881	24.1	2,346,387
Corn (for husking)	320,519	24,900,386	77.7	9,301,245
Potatoes	168,454	21,927,804	130	10,798,597
Carrots	3,551	1,049,348	296	131,169
Mangel-wurzels	68,966	34,686,137	503	2,774,891
Turnips	108,360	49,425,472	456	4,942,547
Sugar Beets	26,879	11,238,577	418	1,348,629
Mixed Grains	497,936	18,261,803	36.7	9,187,822
		Tons.	Tons.	
Corn (for silo)	326,627	3,788,364	11.6	7,576,728
Hay and Clover	3,204,021	5,492,653	1.71	54,407,105
Totals—				
1910	9,725,684	...	...	175,115,742
1909	9,578,323	...	...	167,966,577

The extent of stock-raising in Ontario is expressed in the following figures for the year 1910 :—

Value of horses in the province	\$92,757,431
„ cattle „ „	76,872,733
„ all live stock in the province	194,416,037

The total amount of assessed land in the rural parts of the province is given officially at 24,706,699 acres, made up as follows :—

Cleared land	14,323,478 acres.
Swamp land	3,082,671 „
Wood land	5,293,094 „

The total value of all field crops of Ontario for the year 1910 was \$204,002,000 out of a total of \$507,185,500 for the whole Dominion.¹

There were 1102 cheese factories in the province in 1910, in which were used 1,451,244,620 pounds of milk, producing 135,521,390 pounds of cheese, valued at \$14,491,410; whilst 121 creameries made 12,893,650 pounds of butter, valued at \$3,016,135.

Climate

The old settled part of Ontario (Southern Ontario of to-day) lies between 42° and 46° north latitude, and, as before observed, is nearly surrounded by water. The effects of a cold wave from the west are modified by the lakes, while they are more severely felt farther to the south, where they pass entirely over land.

Central Ontario and Northern Ontario (district of Patricia), lie between 46° and 56° latitude, and their surface is much forested and lake covered, whilst enormous areas are in close proximity to, and strongly influenced by, Hudson Bay waters.

¹ For 1914, \$335,000,000 out of a total of \$639,061,300.

The climate of the Central Ontario districts and of the district of Patricia is more boreal, and though very pleasant in summer is more severe in winter as one reaches higher latitudes.

TEMPERATURE.—The following table gives the temperature of the province in each month for five consecutive years, together with the mean annual temperature, also the mean temperature for the six months April to September—practically the growing season—together with the average for the five years, 1906 to 1910, and the twenty-nine years, 1882 to 1910 :—

Month.	1910.	1909.	1908.	1907.	1906.	1906-1910.	1882-1910.
	°	°	°	°	°	°	°
January	21·6	21·6	18·7	16·9	26·6	21·1	17·8
February	16·8	22·1	14·8	13·1	18·4	17·0	17·3
March	35·2	26·9	28·1	31·0	23·4	28·9	26·4
April	46·6	38·6	39·9	36·4	43·3	41·0	41·6
May	51·2	52·0	55·8	47·3	53·5	52·0	53·6
June	62·4	64·2	64·9	63·2	65·0	63·9	63·7
July	68·3	66·6	69·4	67·3	68·2	68·0	68·0
August	65·6	67·0	65·4	63·7	70·0	66·3	64·4
September	57·0	57·9	63·0	59·5	63·3	60·1	59·8
October	49·0	44·8	49·4	44·1	47·6	47·0	47·0
November	33·4	39·0	36·9	34·3	35·0	35·7	35·0
December	17·7	22·9	23·4	26·5	19·9	22·1	23·2
Annual mean	43·7	43·6	44·1	41·9	44·5	43·6	43·2
Mean for 6 months, April to September	58·5	57·7	59·7	56·2	60·5	58·5	58·5

This table, prepared previous to the addition of the new district of Patricia, includes records obtained by the Meteorological Office from Algoma, Nipissing, Thunder Bay, Parry Sound, Muskoka, Renfrew, Frontenac, York, Middlesex, Dufferin, and other stations in Central and Southern Ontario.

The average number of hours of sunshine per year for the last twenty-nine years is 1936·5 hours. The total amount of rainfall for the five months, November 1909 to March 1910, was 6·41 inches, which is practically the average fall for the last twenty-nine years, 1882 to 1910. The rainfall for the growing season, for the six months, April to September of 1910, was 16·23 inches, a normal quantity for the twenty-nine year-period preceding.

Central Ontario

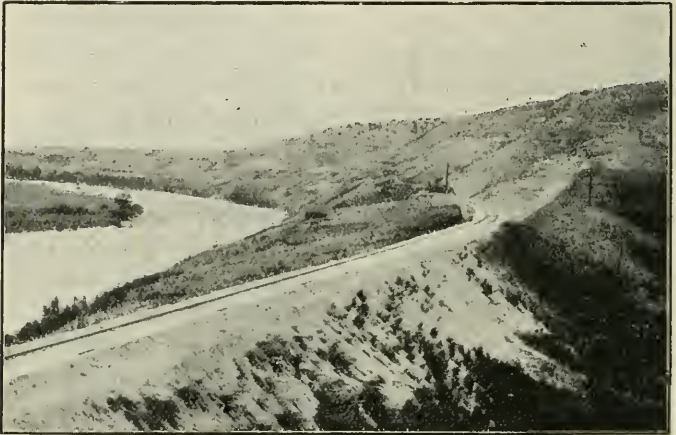
Old Ontario with its narrow confines, thought of as a triangle of smooth and flat country covered by fertile soil, formed the *locus* upon which colonists preferred to settle. The completion of the Canadian Pacific railway in 1885, and the consequent discovery of copper and nickel in the railroad cut at Sudbury, and of minerals elsewhere in the north, led to the settlement of more remote areas within the more rugged country, at times in the very heart of the pine forest. The building of the National Transcontinental railway, besides many branches of the Grand Trunk and Canadian Northern railways, of the Timiskaming and Northern Ontario railway—the latter a purely provincial and colonising, mineral and timber railway—has done much to make known a New Ontario, with metalliferous zones of enormous possibilities, besides wheat-growing areas in the northern clay belt of the Hudson Bay basin, thus widening the zone of habitable country and resourceful regions of the province where towns and villages have arisen within the last fifteen years, and where a thriving population is developing the industries and natural wealth at its very doors.

The provincial authorities in Toronto continue to call the *seven* districts constituting the central part of the province "Northern Ontario," comprising at least *three-fifths* of the area of the province; but, as important mining towns and railway centres rise and develop in this essentially mineral and timber section of the province, and "the Clay Belt" receives its quota of the agricultural population when its possibilities are better or fully realised, then the province is better divided into three parts—(1) *Northern Ontario*, comprising the new district of Patricia; (2) *Central or New Ontario*, including the seven districts of Nipissing, Timiskaming, Sudbury, Algoma, Thunder Bay, Rainy River, and Kenora; (3) *Southern Ontario*, the remainder, or Old Ontario, constituting the most densely peopled portion of the province.

In a partial sense only is Central Ontario thus defined "new," as it has been explored, surveyed, and searched diligently for two generations for its great wealth of fine timber, and its unfathomed resources in minerals of late years. New towns have arisen, new cities built and improved, whilst thriving centres of railway and water-way combined have led to betterment, and the opening up of what had been considered quite untrodden parts of the "banner" province. Thus have the twin cities of Port Arthur and Fort William increased, and Sudbury, North Bay, Cobalt, Kenora, Sault Ste. Marie, Haileybury, Fort Frances, Sturgeon Falls, Englehart, Cochrane, Matheson, Latchford, and Dryden, and many other centres of industry, come to the front.

The upper Ottawa valley is a lumbering region *par excellence*, having all the characteristics of the Laurentian country so frequently described. The seven districts of Central Ontario have the same general features of climate, forest, rock-formation, lake and river systems as the

upper Ottawa valley, and especially is this the case on each side and on the summit of the height of land, which is never very high, and sometimes very far to the south; for, in Ontario, as in the province of Quebec, the boldest expression of the Laurentian or Archaean country is to be found in the south, and once the first few miles of the rugged country are traversed there are but few



RAILWAY LINE EAST OF COCHRANE, LOOKING UPSTREAM.

obstacles northward. This is particularly so on the north side of the Laurentian axis—in the Trans-Laurentia country where the marine and estuarine deposits of Hudson Bay have spread their soft mantle of clays and sands during that great period of submergence which followed the Ice Age (when the continent to New Jersey, Pennsylvania, and Ohio was invaded by an enormous ice mass, which finally separated into several great lobes and spread the present soil-materials over wide areas), helping thus to produce the agricultural areas

of the "Clay Belt" and other sections of the province in Central and Northern Ontario. This country is traversed by the three well-known transcontinental railway lines, the Canadian Pacific railway, the Canadian Northern, and the Grand Trunk Pacific branch from Lake Superior (Fort William) to Winnipeg. The National Transcontinental railway (under a Royal Commission) passes through the 16,000,000 acres of the "Clay Belt," where wheat is harvested early in August and other cereals ripen early. This is a region capable of supporting a population of not less than 10,000,000 people. The Timiskaming and North Ontario railway traverses diagonally and longitudinally the great metal-liferous belt of Huronian rocks where gold, silver, nickel, copper, iron, and other metals are found, and many ores and minerals are known to abound. The Algoma Central railway and other lines also traverse this section of Ontario, and their traffic is already overtaxed.

Railways have also done much to encourage tourists, health-seekers, and the general public to visit the scenic spots of these regions with lines run through them, and they are the summer recreation grounds of the inhabitants of the large cities. In South Nipissing is the Algonquin park, already partially described, a tract of eighteen townships, from whence pot-hunters are rigidly excluded, where the wild animals may roam unmolested, and where visitors may catch fish only with a hook and not more than are necessary for their own food. The park consists of 1300 square miles of land and 160 square miles of water. It is a forest reservation, well wooded with pine, maple, black birch, hemlock, beech, black ash, and basswood.

While the question of boundary was unsettled very little attention was paid to these territories and very

little was known about them. It is not strange in a country like Canada, where land is so abundant, that few cared to press along the northern shores of the upper lakes. It was seen that the shores were bold and rocky, and it was assumed that the back country was the same. When, however, two lines of railway were run through the district, it was seen that there was a large quantity of good land behind the coast barrier. The people of Ontario recognised the fact that they had a territory of many millions of acres; larger than the New England States with New York included, and easily accessible by railway and steamboat, and that much of it was available for settlement. The country is a tableland elevated about 1000 feet above the sea, and exhibits an endless variety of lake, river, and forest country with soil of all kinds. It contains a good deal of broken rocky land in the ridges, but the valleys contain large areas of good land. It is a region of summer rains, and the numberless streams and lakes drain it thoroughly. It is also a land of abundant grass; and cattle, especially sheep, thrive there.

Forests.—Central and Northern Ontario are practically all forested portions of the province, but the area of forest land is estimated at 102,000 square miles. North of the Canadian Pacific railway are about 60,000,000 acres of spruce, jack pine, and poplar. The best forests are those of *red* and *white* pine, which are found growing in large quantities in the Timagami forest reserve, around the shores of Lake Timagami, Lady Evelyn lake, along the Montreal, Sturgeon, and Wapitei rivers and their tributaries; in the Mississaga forest reserve on the river of the same name, and its numerous tributaries; also in the Rainy river district along the Minnesota boundary from Rainy lake to Hunter's Island,

and in isolated areas throughout the district of Sudbury as far north as Fort Mattagami. The total stand or amount of white and red pine still on the Crown or unlicensed lands of Ontario exceeds 12,000,000,000 feet (board measure), whilst pulp wood, on Crown lands, still undisposed, is estimated at 350,000,000 cords. The quantity of pulp wood available in this region is past all calculation, but the forests are by no means all spruce or poplar. Elm, basswood, maple, beech, and oak are plentiful. The largest pulp mill in the world is now established at Sault Ste. Marie. It is situated near the Canadian canal and draws from the Sault 9000 horse-power. The company possesses many square miles of pulp forest, and the mill can turn out between one and two hundred tons of pulp in a day. The former tariff of the United States had been enacted with a view of excluding pulp made in Canada, and drawing on the Canadian forests for the raw material of pulp wood. Half of the wood used by the mills of New York State was drawn from Quebec and Ontario, whilst Maine was drawing largely on the forests of New Brunswick.

Recent adjustments of the tariff are giving Canada and its forests the value they deserve. According to government reports nearly 40 per cent of the total timber cut in the Dominion comes from the forests of Central Ontario. The forests of Ontario are in the midst of lakes and rivers where water-power is abundant and readily harnessed; where also the wild animals of the country, including moose, elk, deer, caribou, beaver, otter, marten, raccoon, foxes, wolves, and bears, and many other fur-bearing quadrupeds, abound, and are to a great extent protected.

The provincial government has established a number

of forest reserves covering an area of 17,860 square miles of timber land, situated for the most part along the highlands, where water supply and forest growth combine to benefit the population in the more settled parts of the lowland country.

By so doing, the intimate relationship between forest land and water supply is recognised, and the dangers of flood as well as of drought are checked. These reserves are *five* in number, and the areas covered by each are as follows:—

	Square Miles.
Timagami Forest Reserve	5,900
Mississaga „ „	3,000
Nipigon „ „	7,300
Quetico „ „	1,560
Eastern „ „	100
	<hr/>
Total	17,860

The Rainy (Réné) river district is a broken country, studded with thousands of lakes and covered with a network of myriads of streams hurrying away to the four points of the compass down the watersheds which converge there. Along the Rainy river, however, the soil is very rich for a distance of 80 miles, and the area of good farming land is calculated at 600,000 acres. There is farming land to be found in the valleys throughout the district, but it is scattered over the country. The chief town of this district is Kenora at the outlet of Lake of the Woods and 133 miles east of Winnipeg, with a population of 6159. It is the centre of enormous water-power. The Lake of the Woods is the great reservoir for a countless number of lakes and streams, and is like an immense mill-pond with a surface of 3000 square miles. There are large lumber mills there (for it is an extensive lumbering district), and also the largest flouring

mill in Canada is located here, with an output of 2000 barrels of flour in a day. The wheat comes from Manitoba and the north-west provinces.

The wild animals which roam the forests and wilds of Northern and Central Ontario include the following:—

Moose (*Alces Americanus*); sparingly scattered to latitude 52° 50'.

Caribou (*Rangifer caribou*); range all over the district.

Bear (*Ursus Americanus*); in goodly numbers.

Wolf (*Canis lupus*); scarce.

Fox (*Vulpes vulgaris*); red, silver, black and cross varieties are numerous.

Lynx (*Lynx Canadensis*); fairly plentiful.

Mink (*Putoris vison*); plentiful.

Otter (*Lutra Canadensis*); plentiful.

Pine Marten (*Mustela Americana*); in goodly numbers.

Beaver (*Castor fiber*); sparingly scattered.

Muskrat (*Fiber zibethicus*); plentiful.

Skunk (*Mephitis mephitica*); common.

Weasels (*Putorius vulgaris*); not rare.

Wolverine (*Gulo luscus*); in goodly numbers.

Rabbit (*Lepus Americanus*); common everywhere.

Raccoon (*Procyon lotor*); occasionally strays to N. lat. 52°.

District of Patricia

The most northerly portion of Ontario is the district of Patricia, formerly part of Keewatin and the North-West Territories. It once formed part of Prince Rupert Land. By an Act of the Parliament of Canada (2 Geo. V., chap. 40, Statutes of Canada 1912), consented to by an Act of the Legislative Assembly of the province of Ontario (2 Geo. V., chap. 3, Ontario Statutes, 1912), 146,400 square miles of country were added to the province of Ontario, to "form and be part of the said province." It was during the term of office of Field-Marshal His Royal Highness the Duke of Connaught and Strathearn as Governor-General of Canada that

these Acts took effect, and the new district was named in honour of his daughter Her Royal Highness Princess Patricia.

Boundaries.—The district of Patricia is bounded on the north by Manitoba and Hudson Bay, on the east by Hudson Bay and James Bay; on the south by the districts of Timiskaming, Algoma, Thunder Bay and Kenora, with the Albany river, lac St. Joseph, lac Seul (1140 feet), and the English river as natural features separating northern Ontario from Central Ontario; and on the west by Manitoba. A journey round the district of Patricia would comprise a circuit of at least 1500 miles. The district actually contains 157,400 square miles according to the calculations of Rogers of the Ontario Bureau of Mines, and it is thus nearly three-fourths the size of France or Germany, and one and one-fifth times that of the British Isles.

Physiography.—The physical features of the district are much the same as those of the northern portion of Central Ontario, especially those of Timiskaming and Algoma, consisting of a broad, generally flat, low-lying and gently sloping zone of country adjoining the waters of James Bay and Hudson Bay. The Sutton Mill trap area is an exceptional phenomenon in this zone of palaeozoic-bedded rock formations, but west of it lies an extensive tract covering about 100,000 square miles of rugged, forested, well-watered, and eroded plateau of ancient crystalline rocks and schists of Keewatin, Laurentian, and Huronian age rising to a height of 1500 feet.

Geology.—The greater part of the district is underlain by rocks of pre-Cambrian age, whereas the coasts of James Bay and Hudson Bay, from the mouth of the Albany river to the most easterly part of Manitoba, the underlying rocks include *Ordovician*, *Silurian*, and

Devonian strata. These rocks consist of sandstones, shales, limestones, and dolomites, which are highly fossiliferous in many localities. Rocks of *Keewatin* (Archæan) age occur in the crystalline complex west of the Palæozoic outcrops, and should furnish mineral deposits, gold, silver, copper, nickel, iron, etc., as in other portions of Central Ontario. The Huronian system, so far as known, is not extensively developed, whilst the Animikie or Nastapoka rock formations are probably represented at Sutton Mill within the Palæozoic area of the Winisk river, twenty-six miles from its mouth, indicating an intrusive character analogous to those of Lake Superior and Cobalt series. Quaternary (Pleistocene) deposits, consisting of glacial, marine, and estuarine, as well as more recent accumulations of drift, are well developed in the district of Patricia. According to Mr. J. B. Tyrrell this district presents many features of paramount interest and value in furnishing evidence for the solution of many fundamental, yet much-discussed problems in glacial geology. Round the headwaters of the Severn river the country presents the aspect of a great uplifted peneplain with a lower general relief than is usually met with in other parts of the Archæan; maximum reliefs are 100 feet above the level of the water, with a few exceptions in the monadnocks of the Cat and Cedar lakes, and on the Severn river watershed, near Windigo lake, etc. A drift hill, near Greenshields lake, rises 300 feet high and is of glacial origin. Similar hills are situated on the divide between the Severn and Albany rivers. Archæan rocks of Keewatin age, for the most part are developed in the upper Severn country, consisting of granites and gneisses in almost unbroken succession.

Lakes.—The principal lakes of the district are:—Sandy, Fawn, Monsomshi, Bolsover, Kapikik, Gull, Beaver,

Oponask, Sachigo, Favourable, Lost, Trout (1295 feet), Red (1200 feet), Williams, Sesiki, Nago, and Black Bear lake.

Soil and Climate.—The district of Patricia considered as a whole is not a good agricultural district, nevertheless agricultural possibilities are known to exist as regards the hardier crops of vegetables and cereals. Considerable areas of good land occur along the Severn river, at Lake St. Joseph, along the Albany river, and in the neighbourhood of the larger lakes. M'Innes says of the climatic conditions, that, though somewhat adverse, they should not by any means be prohibitory to the general cultivation of suitably situated tracts. The common garden vegetables of Ontario have been grown successfully at various Hudson Bay Company's posts, though, occasionally, late summer frosts have cut off all but the hardier kinds.

Timber.—The Lac Seul and Berens river districts afford, in sections, excellent timber, though of small average growth. Banksian pine occupies sandy tracts, and river valleys have poplar, birch, and spruce, in abundance. Red and white pine occur in small groves south of Lac Seul. On the Albany, which is a stream comparable with the Ottawa river, timber is now being cut, and an area of about 14,000 square miles of larch country has recently been destroyed of its larch trees in an area for 60 miles along the Winisk river, and southward to the Albany.

Subjoined is a list of the observed northern limits of a number of forest trees:—

White Elm, <i>Ulmus Americana</i> , Albany river	N. lat. 51° 30'
Black Ash, <i>Fraxinus sambucifolia</i> , Eabemet lake	N. lat. 51° 50'
Mountain Maple, <i>Acer spicatum</i> , between Attawapiskat and Winisk rivers	N. lat. 52° 25'
Mountain Ash, <i>Pyrus Americana</i> , between Attawapiskat and Winisk rivers	N. lat. 53° 38'

Banksian Pine, <i>Pinus Banksiana</i> , Weibikwei lake	. N. lat. 53° 0'
White Cedar, <i>Thuja occidentalis</i> , Weibikwei lake	. N. lat. 53° 5'
Balsam Spruce, <i>Abies balsamea</i> , Winisk river	. N. lat. 54° 15'
Canoe Birch, <i>Betula papyracea</i> , Winisk river	. N. lat. 54° 25'
Aspen Poplar, <i>Populus tremuloides</i> , Winisk river	. N. lat. 54° 45'

The northern limits of balsam, poplar, tamarack, and of black and white spruce lie beyond the mouth of the Winisk river.

Fauna.—Whitefish and sturgeon are the best food-fishes of the district of Patricia, and these occur in most of the lakes. Doré and pike are widely distributed, while the *sucker*—a less desirable fish—is ubiquitous. Lake and brook trout occur sparingly. Of other animals the moose (*Alece Americanus*) occurs as far north as the southern shore of Lake Weibikwei in N. lat. 52° 50'. It is not as plentiful as in the belt of country lying near the Canadian Pacific railway and extending some 150 miles north of it in Central Ontario. Caribou and red deer roam everywhere, whilst bears, wolves, foxes (the three varieties), lynxes, otters, beavers, minks, and rabbits occur and are plentiful or scarce according to trapping activity. Trout lake, on the Severn river, has remarkably clear water which is cold and deep. It is abundantly stocked with trout and large whitefish which form the principal food of the aborigines as well as of the Hudson Bay Company people living around the lake. The Canada goose, black and other ducks, plover, ptarmigan, and other birds occur in different sections of the district.

Porpoises are frequently seen at Ekwan point, seals and walrus occur in the Bay and numerous skeletons of them are often seen lying on the beach north of the Albany river. Whales also occur in Hudson Bay. There is no doubt that the flora and fauna of this portion of Ontario shows evidence of the influence of

higher latitude as the Manitoban frontiers to the north are reached.

Water powers are numerous, and as only a small quantity of lignite coal occurs in the Moose river country, their utilisation will be a great source of energy for heat, light, and power.

The granitic areas are usually considerably raised above the general surface of the plateau, whilst the Huronian areas show more pronounced denudation and greater irregularity of surface features.

Aborigines.—The aborigines of the Winisk and Attawapiskat river districts number about 700, and are Ojibways, mixed with Crees, nomadic trappers who live upon fish and dwell in small log huts or winter in birch bark *teepees*. They are nominally Christians and can read and write the syllabic characters designed and introduced by James Evans, an early Wesleyan missionary among the Crees. These aborigines are of larger frame than the Crees of the coast, and the purest of them dwell for the most part about the heads of rivers, constituting a sort of highland tribe.

Routes.—The principal routes from Hudson Bay to Liverpool are:—Churchill to Liverpool *via* Hudson Strait, 2926 miles; from Nelson to Liverpool, same route, 2966 miles, as compared with the route from Montreal to Liverpool by Belle-isle, 2761 miles, and from Montreal to Liverpool by Cape Race, 2887 miles. The distance from Winnipeg to Montreal *via* Canadian Pacific railway is 1422 miles.

There is an ordinary tide of five feet in Hudson Bay which has been observed off Akimiski Island. All the islands in Hudson and James Bays have been reserved by the Dominion Government, and form part and parcel of the North-West Territories.

Ontario Fisheries

The fisheries of the great inland seas of the province have an important place in its industries. For conservation and preservation as well as for purposes of inspection the province is divided into three fisheries districts: (1) Rainy river, Thunder Bay, Parry Sound, etc.; (2) Lakes Huron, St. Clair, and Erie; (3) Lake Ontario and eastern counties of the St. Lawrence and Ottawa valleys. The returns of production for the year ending March 31, 1912, are, aggregate value, \$2,205,436, an increase of \$179,315 over the figures for the previous year. Details of the catch are as follows:—

Fish.	Quantity.	Value.
	Cwt.	
Trout	69,715	\$697,150
Whitefish	41,630	416,300
Pickerel	20,522	180,016
Pike	33,173	206,774
Sturgeon	1,743	23,395
Eels	1,080	8,626
Perch	9,572	47,860
Tullibee	1,526	9,688
Herring	90,589	457,985
Mixed Fish	30,887	150,942
Caviare	67	6,700
Total value		\$2,205,436

There were in all 3831 persons employed in vessels, tugs, boats, fish-houses, freezers, etc., in connection with the Ontario fisheries during the year ending March 31, 1912. The total value of the plant used was \$1,170,365.

The Ontario hatcheries are the Newcastle, Sandwich, Wiarton, Sarnia, and Quinté hatcheries, whence salmon

trout yearlings, millions of salmon trout fry, black bass fingerlings and parent fish, white fish, pickerel, are distributed to all the lakes, rivers, and streams of the province where they are most likely to survive. Upwards of 200,000,000 were thus distributed in 1911.

A Biological Station has been established by the federal government at Go-Home Bay, in Georgian Bay, where a Toronto University professor and a staff of student workers are engaged in a study of Ontario lake fisheries, and reports on a number of important economic natural history problems are being issued, amongst which Dr. Bensley's *Fish Life of Georgian Bay* is a most valuable contribution.

Mineral Resources

Until recent years Ontario had been known almost solely as a province of surpassing agricultural resources and of forest wealth, but of late years, and especially since the building of railways and the discovery of valuable ores, the settlement of the western and northern districts, the mineral wealth of the country has come prominently forward; and Central Ontario to-day is *first* among the nickel-producing, and *third* among the silver-producing countries of the world, whilst the promise of gold already amounts to a prophecy of great things.

The total value of the mineral production of Ontario for the years 1910 and 1911 was \$43,538,078 and \$42,672,904 respectively,¹ sums representing 40.76 per cent and 41.72 per cent of the entire production of the Dominion. Of silver there were 30,761,690 ounces²

¹ For 1912, \$51,985,876; for 1913, \$58,697,602.

² For 1912, 29,214,025 ounces; for 1913, 28,411,147 ounces.

which came from Ontario. The total shipments of silver ore and concentrates from the Cobalt district and adjacent mines were about 16,234 tons, containing approximately 28,817,198 ounces, in addition to which 3,334,052 ounces were shipped as bullion. The average silver content of the ore and concentrates shipped was thus about 1744 ounces, or \$929.62 per ton as compared with an average of 867 ounces in the year 1910, and 840 ounces in 1909. The 1911 shipments were chiefly high-grade ore averaging over 3400 ounces, and concentrates averaging over 850 ounces. In 1910 the shipments were 28,684 tons of ore containing 23,797,111 ounces of silver, or an average of 830 ounces per ton; 6943 tons of concentrates containing 7,111,579 ounces, or an average of 1024 ounces per ton, and bullion containing 1,003,111 fine ounces. The total exports of silver ore in Canada amounted to 31,216,725 ounces, valued at \$15,807,366; whilst there was also an importation of silver in bars, etc., valued at \$847,645. Of copper ore contents there were 21,402,221 pounds shipped in the year 1911 from Ontario; whilst the same province produced in the same year 17,932,263 pounds, as compared with 19,259,016 pounds in 1910, all from the nickel-copper ores of the Sudbury district. In nickel, the total production of matte in 1911 was 32,607 tons, valued at \$4,945,593 at the smelters, a decrease of 6.9 per cent, or 2426 tons, from the production of the year 1910. The metallic contents were, copper 17,932,263 pounds, and nickel 34,098,744 pounds. The aggregate results of the operations on the Sudbury nickel-copper ores during the past four years were as follows, in tons of 2000 pounds:—

Material.	1908.	1909.	1910.	1911.
Ore mined	409,551	451,892	652,392	612,511
Ore smelted	360,180	462,366	628,947	610,834
Bessemer matte produced	21,197	25,845	35,033	32,607
Copper contents of matte	7,503	7,873	9,630	8,966
Nickel contents of matte	9,572	13,141	18,625	17,049
Spot value of matte shipped	\$2,930,989	\$3,913,017	\$5,380,064	\$4,945,592

The exports in pounds were as follows:—

Countries.	1908.	1909.	1910.	1911.
To Great Britain	2,554,486	3,843,763	5,335,331	5,023,393
To the United States	16,865,407	21,772,635	30,679,451	27,596,578
Total	19,419,893	25,616,398	36,014,782	32,619,971

The production of nickel is one of the most important branches of the mining industry of Ontario, and for that matter, of Canada, as it is now practically established that the mines near Sudbury control the nickel markets of the world. Nickel and copper mining in the Sudbury district of the province of Ontario show a production of about \$67,000,000 worth of the former metal, and \$16,000,000 of the latter produced from 1886 to 1907. In the year 1910, 652,392 tons of nickeliferous pyrrhotite ore were mined, and 628,947 tons smelted, from which were produced 35,033 tons of Bessemer matte, carrying approximately 18,636 tons of nickel and 9630 tons of copper. The net value of the matte was returned as \$5,380,064. The matte which is shipped to the United States and Great Britain for refining, carries from 77 to 82 per cent of nickel and

copper combined. Monel metal is produced from monel matte, which contains 22 per cent copper and 58 per cent nickel. The 1910 output was 9180 tons better than in 1909, and wages paid in both years were \$1,698,152 and \$1,234,904 respectively; the number of men employed was 1882. There were shipped to Great Britain 3,843,763 pounds of nickel in matte in 1909, and 5,335,331 pounds in 1910; whilst there were exported to the United States, 21,772,635 pounds in 1909, and 30,679,451 pounds in 1910.

Copper.—In 1913 there were 25,885,929 pounds of copper produced in the province valued at \$3,952,522, from operations carried on at the Bruce Mines, the Canadian Copper Company, the Creighton, and Crean Hill Mines, and by the Mond Nickel Company at Victoria Mines. The production of copper in 1886 was 165,000 pounds, valued at \$18,150, and from 1889 on, better returns followed.

PRODUCTION OF COPPER IN ONTARIO DURING CERTAIN YEARS.

Year.	Pounds.	Value.	Year.	Pounds.	Value.
1889	1,466,752	\$201,678	1906	10,638,231	\$2,050,838
1891	4,127,697	531,234	1907	14,104,337	2,821,432
1895	4,576,337	492,414	1908	15,005,171	1,981,883
1897	5,500,652	621,023	1909	15,746,699	2,044,237
1898	8,375,223	1,007,539	1910	19,259,016	2,453,213
1899	5,723,324	1,007,877	1911	17,932,263	2,219,297
1900	6,740,058	1,091,215	1912	22,250,601	3,635,971
1901	8,695,831	1,401,507	1913	25,885,929	3,952,522
1905	8,779,259	1,368,686			

Gold.—This much sought-for precious metal occurs in different districts of Central as well as of Southern Ontario, whilst further researches may reveal its occurrence in the district of Patricia. There were nine

properties from which bullion was recovered in 1910, the output of which is given at 3619 ounces (fine), valued at \$68,498. Returns for 1909 gave the year's production as 2185 ounces, valued at \$45,155; whereas for the years 1912 and 1913 the total has risen with extraordinary rapidity to \$1,788,596 and \$4,535,462. In 1909 there were 9 mines on the producing list; in 1913 the list comprised 16 mines, of which 7 were in Porcupine and 9 elsewhere.

Silver.—The yield of the silver mines of the province for the year 1913 was 28,411,147 ounces, valued at \$16,987,309. It was in 1903 that silver was discovered at Cobalt, in the district of Timiskaming in Central Ontario. Owing to the rapid development and nature of the Cobalt silver camp, the production of silver in Canada, in point of value, has taken the second place in the list of mineral productions of the Dominion, being exceeded only by coal. During the first seven years the mines of the Cobalt camp added upwards of 94,000,000 ounces to the world's stock of silver. The number of producing mines was 39, of which 38 were at Cobalt, the remaining one being the Hanson Consolidated, the only mine in the Port Arthur silver region which gave returns in 1910. In the well-established Cobalt camp returns from the best mines are annually printed for the information of shareholders, and were incorporated in the Annual Report of the Ontario Bureau of Mines, 1911, from which the following are interesting figures for the year 1910:—

Name of Mine.	Production in Ounces.	Name of Mine.	Production in Ounces.
Nipissing	5,590,800	Timiskaming	1,994,226
La Rose (including Lawson)	3,484,754	Buffalo	1,629,328
Crown Reserve (in- cluding Silverleaf)	3,255,567	Hudson Bay	985,552
Kerr Lake	2,877,299	Trethewey	846,579
Coniagas	2,621,681	Right of Way	455,986
M'Kinley - Darragh- Savage	2,606,891	Millerett	322,000
		City of Cobalt	305,216

The Ontario ores from the Cobalt camp are treated by the smelting companies at Copper Cliff, Deloro, and St. Catharines, besides three other companies which have recently entered the market at Toronto, Orillia, and Swansea, all within the province. There are also contracts with companies in the United States and Great Britain for treating these silver ores.

PRODUCTION AND VALUE OF SILVER IN ONTARIO, 1905-1913.

Year.	Quantity.	Value.
	Ounces.	
1905	2,451,356	\$1,479,442
1906	5,401,766	3,607,894
1907	9,982,363	6,521,178
1908	19,398,545	10,254,847
1909	24,822,099	12,784,126
1910	30,366,366	16,241,755
1911	30,540,754	16,279,443
1912	29,214,025	17,772,352
1913	28,411,147	16,987,309

The Ontario Bureau of Mines furnishes the following figures on the silver production of the Cobalt mines from 1904 to 1910. Number of producing mines in 1910 was 41; tons of ore shipped, 102,078; tons of concentrates shipped, 10,930; quantity of bullion shipped, 980,633 ounces. Silver contents in the ore, 81,123,857 ounces; concentrates, 11,959,699 ounces; bullion,

980,633 ounces. Average silver contents per ton, 795 ounces; concentrates 1094. The value of silver shipments, ore, \$41,933,986; concentrates, \$5,904,887; bullion, \$527,460; total value of silver production being \$48,366,333. The development of this rich silver camp in Ontario has given Canada *third place* among the silver-producing countries of the world; Mexico ranking *first* with 73,574,220 ounces; the United States *second*, with 56,438,695 ounces; Ontario *third*, with 32,878,590 ounces, and South America *fourth*, with 16,476,928 ounces. The continent of America, including both North and South America, furnishes 82.9 per cent of the total silver production of the world; Australasia, 7.6 per cent; Europe, 6.6 per cent; Asia, 2.4 per cent; and Africa, 0.5 per cent. The gold mines of the Rand, however, give Africa *first* place with an output valued at \$175,000,000 for 1910. The world's output of silver in 1871 was 63,317,014 ounces, whereas in 1911 it was 217,788,714 ounces, having increased nearly $3\frac{1}{2}$ times in 40 years. Much difficulty was at first experienced in treating the cobalt ores; but the key to the solution and extraction of the ores of the Cobalt camp is the *arsenic*, which forms 30 per cent of the ore; silver, 6.084 per cent (1774.5 ounces to the ton); cobalt, 6.76 per cent; nickel, 3.72 per cent. The total dividends and bonuses declared from July 1903 to December 1910 by *seventeen* Silver Cobalt Mining Companies amounted to \$21,802,179.58, of which \$7,275,239.90 were paid during 1910.

Cobalt.—The silver-cobalt-nickel-arsenide of Coleman township, district of Timiskaming in Central Ontario, is the source of the metal *cobalt*, and these ores are now said to be the principal source of the world's consumption of cobalt. In the year 1910, cobalt values amounted to \$51,986, as compared with \$94,609 in 1909, and

\$113,423 in 1908. It has been calculated that the total ore shipments from the Cobalt field in Ontario during the past seven years have contained upwards of 5000 tons (10,000,000 pounds) of metallic cobalt. A cobalt coinage for smaller currency in Canada is suggested.

Iron.—Four mines in Ontario were shipping iron ore in 1910. The Mayo, at Bessemer, in Hastings County; the Moose Mountain, at Sellwood, thirty miles north of Sudbury; the Helen, north of Michipicoten, and the Atikokan, 130 miles north-west of Port Arthur on the Canadian Northern railway. The total shipments for the year amounted to 231,445 tons, valued at \$513,722; whereas in 1909, there were 263,893 tons shipped, valued at \$653,808. In 1909, Ontario produced 407,012 tons of pig-iron, valued at \$6,002,441, and in 1910 there were 447,273 tons produced, valued at \$6,956,923 or \$15.55 per ton. In 1896, Ontario produced 28,302 tons of pig-iron valued at \$368,942; in 1900, it produced 62,387 tons valued at \$938,725 whereas in 1905 a special expansion in the production took place with an output of 256,704 tons of pig-iron valued at \$3,868,197, and the industry has gone on increasing ever since.¹ Iron and steel works are located at Midland, Deseronto, Hamilton, Sault Ste. Marie, Port Arthur, Owen Sound, and Ottawa. Roughly \$630,000 was paid in Federal Government bounties to six iron and steel corporations in Ontario during 1910, and \$200,000 were paid as bounties to three Ontario companies on steel ingots produced in the province during the same year.

Corundum.—This remarkable abrasive mineral, next to the diamond in the scale of hardness, and usually rare throughout the world, occurs in the townships of Faraday

¹ In 1911, 526,635 tons, value \$7,606,939.
 „ 1912, 589,593 „ 8,176,089.
 „ 1913, 648,899 „ 9,338,992.

Dungannon, Monteagle, Carlow, Raglan, and adjacent townships of Hastings and Renfrew counties in southern Ontario and within the Haliburton-Bancroft area, already described in the chapter on geology. Mining operations began in 1900 when 60 tons of grain corundum graded were produced, of which only 3 tons were sold in Canada. In 1909 there were 35,894 tons of corundum-bearing rock treated, from which 1579 tons of grain corundum graded were obtained.

OUTPUT OF GRAIN CORUNDUM FOR ONTARIO, 1904-1910.

Year.	Pounds.	Value.	Average Price.
			cents.
1904	1,986,290	\$109,545	5·51
1905	3,288,267	149,153	4·48
1906	4,548,176	204,973	4·50
1907	3,785,450	177,922	4·70
1908	2,178,790	100,398	4·60
1909	2,981,634	162,492	5·45
1910	3,740,900	198,680	5·31

The metalliferous Huronian formation, so well developed in Ontario, has been the source of the various metals and their ores whose aggregate values amount to \$161,486,051.

TOTAL PRODUCTION OF ONTARIO METALLIFEROUS ORES.

Gold	163,336 oz.	\$2,577,990
Silver	98,872,911 ,,	63,550,476
Platinum and Palladium .	3,364 ,,	62,784
Cobalt	5,215 tons	585,470
Nickel	118,673 ,,	32,611,829
Copper	99,098 ,,	14,374,103
Iron Ore	3,180,656 ,,	6,039,571
Pig-iron	2,656,105 ,,	41,475,418
Lead Ore	3,351 ,,	20,000
Pig-lead	1,143 ,,	96,000
Zinc Ore	7,704 ,,	92,410
Total value		\$161,486,051

Natural Gas.—There are 815 natural gas-producing wells in Ontario, of which 174 were completed in 1910. The principal producing fields are (1) Welland County; (2) Haldimand and Norfolk; and (3) Essex-Kent gas fields. This commodity is used for lighting, heating of houses and manufacturing establishments quite generally throughout the districts where it is available. The value of the production in Ontario for the year 1910 was returned as \$1,491,239; in 1909 the value was given at \$1,145,307. To the consumer the gas was sold at prices ranging from 5 cents to 30 cents per 1000 cubic feet. The Government has very wisely prohibited the waste of natural gas in the province, and its exportation, except under special licence issued by the Governor in Council.

Petroleum.—Ontario is a fair producer of petroleum, and although the production varied little from 1901 to 1907, it has diminished in recent years. The figures for 1910 show an output of 11,054,325 imperial gallons from Ontario wells valued at \$388,550. The petroleum fields of the province are in southernmost Ontario: Lambton, Tilbury and Romney, Bothwell, Leamington, Dutton, Thamesville, Comber and Onondaga (Brant County). There are four oil refineries: the Imperial Oil Company's works at Sarnia; the Canadian Oil Company's works at Petrolea; the British American Oil Company's works at Toronto; and the Empire Refining Company's works at Wallaceburg, where 53,603,778 gallons of crude oil from foreign countries were used in 1910 valued at \$1,639,320, whereas 35,884,103 gallons were imported in 1909 valued at \$1,186,400.

Peat.—The province has numerous peat-bogs awaiting development, in Southern as well as in Central and Northern Ontario. Part of the output of the only peat-

producing plant of the province at Alfred, on the Canadian Pacific railway (between Montreal and Ottawa) was used in the Government's fuel-testing station at Ottawa, also sold locally, and in Ottawa, and found satisfactory, especially for grates, bakeries, and cooking stoves. With the recent investigations on peat in Canada by Nystrom, Anrep and Leverin, a decided impetus to the peat industry of this and every province of the Dominion has been given. In the year 1910 there were 851 tons produced valued at \$2604.

Salt.—This useful mineral (*halite*), a chloride of sodium, was first discovered in Silurian strata, at Goderich, in 1865, while drilling for oil. Since then it has been a staple industry. Salt occurs extensively in the Huron-Erie peninsula, some beds being 60 feet, some 100 feet, and others several hundred feet thick. All the salt produced in Ontario at the works in Windsor, Sarnia, Goderich, Kincardine, Wingham, Stapleton, Elaston, Exeter and Parkhill, is the result of evaporation of a brine (containing 25.68 per cent of salt) obtained by pumping wells in which water is allowed to penetrate to the beds below. The total salt production for the province in 1910 was 84,071 tons, valued at \$414,978; the 1909 value being \$389,573. The total output of salt in Ontario from 1886 to 1911 amounts to upwards of \$6,000,000.

Gypsum.—The output of the gypsum quarries of the province for 1910 was 10,043 tons, valued at \$17,825.

Mica is extensively mined for electrical purposes in Lanark, Leeds, and Frontenac counties; some 320 tons of roughly cobbled mica being produced in 1911, valued at a little over \$43,000.

Cement.—The demand for Portland cement is increasing so rapidly that the industry has made great

strides in the province. Whereas in 1891 there were only about 3000 barrels of cement produced in Ontario, valued at a little over \$5000, there were upwards of 3,000,000 barrels produced in 1911 valued at over \$3,600,000.

Felspar, graphite, marble, quartz, pyrites, granite, sodalite, tale, zinc, as well as clay and its numerous products—brick, terra cotta, roofing tile, and sewer pipe (made from the shales and strata of the Lorraine, Medina, and Hamilton formations in the province), together with limestones and sandstones of excellent quality for building purposes from the Palæozoic formations, are among other geological resources of Ontario which add materially to the wealth and convenience of its inhabitants. The mineral production for 1913 totalled \$58,697,002.

Manufactures, Finance, etc.

Ontario is the greatest manufacturing province of the Dominion, having industries of every description and remarkable natural resources, including almost unlimited water-power. It has a network of railways, the total mileage of which aggregates nearly 10,000 miles, besides natural waterways and extensive canals with excellent inland shipping facilities. The Hydro-Electric Commission of Ontario is extending its electric power service from cities in the southern part of the province to rural districts for labour-saving purposes on the farm. In 1910 there were some 8000 establishments in the province with a capital invested of \$595,394,608, and where 238,817 persons were employed earning \$117,645,784, whilst the value of the articles produced for consumption at home or for export amounted to \$579,810,225.

Among the leading articles manufactured in the province during 1910 are:—

Industries.	Capital.	Wages Paid.	Value of Products.
Agricultural Implements	\$44,201,532	\$5,261,308	\$19,293,088
Automobiles	4,699,256	903,349	6,251,885
Axes and Tools	3,241,627	566,891	1,843,168
Boilers and Engines	8,471,904	1,848,418	4,903,203
Boots and Shoes	9,202,697	2,597,921	14,067,357
Butter and Cheese	3,465,539	681,098	18,148,629
Carriages and Wagons	9,602,753	1,985,575	8,547,502
Do. and materials	3,062,136	664,464	2,872,352
Car Repairs	2,290,354	3,549,759	6,902,607
Cement, Portland	5,992,172	744,992	3,145,934
Clothing	14,343,323	8,753,468	30,246,355
Cottons	7,012,000	872,548	4,134,489
Electrical Apparatus, etc.	10,753,041	2,048,028	7,050,000
Electric Light and Power	57,660,774	1,183,373	5,584,091
Flouring and Grist Mills	22,918,407	2,163,990	52,721,625
Foundry and Machine Shop	36,130,705	9,729,509	29,323,360
Fruit and Vegetable Canning	4,984,233	808,684	5,475,121
Furniture	10,721,185	2,992,218	9,241,001
Hosiery and Knit Goods	3,886,010	2,122,812	10,062,703
Iron and Steel Products	24,354,479	4,224,894	22,024,705
Leather	14,943,882	1,776,763	15,937,825
Liquors	21,298,130	1,515,146	15,784,283
Log Products	39,847,923	1,759,333	36,530,337
Lumber Products	15,160,245	3,746,164	17,776,684
Musical Instruments	5,963,303	1,607,030	5,189,888
Oils	4,031,056	496,630	5,884,457
Paper	3,706,800	531,774	3,002,568
Printing, Publishing, etc.	17,461,194	6,120,145	15,002,332
Rubber and Elastic Goods	4,045,562	649,777	5,437,886
Seed Cleaning, etc.	765,000	116,349	1,484,485
Slaughtering, Meat-Packing	7,497,926	1,252,468	28,115,444
Tobacco	3,664,787	1,466,105	5,974,367
Smelting	7,399,665	1,170,047	12,987,792
Woodpulp	14,080,088	840,963	4,487,827
Woollen Goods	4,854,254	1,174,780	4,017,316
All other Industries	137,000,000	...	121,000,000

There were \$15,784,283 worth of liquors produced in 1910, and \$5,974,367 of tobacco in Ontario.

Materials entering in the manufactures of the province during 1910 were valued at \$297,580,125.

There are *ten* chartered banks of Canada having their headquarters in the province, doing business within its borders, in other provinces of the Dominion, and in foreign countries as well. These banks are—Canadian Bank of Commerce, Bank of Toronto, Dominion Bank, Bank of Hamilton, Bank of Ottawa, Standard Bank of Canada, Sterling Bank of Canada, Home Bank of Canada, Imperial Bank of Canada, and the Metropolitan Bank of Canada. These have an aggregate subscribed capital of \$46,000,000 which is practically all paid up, besides reserve funds totalling over \$40,000,000, and, with only two exceptions, paid from 10 to 13 per cent according to the dividend declared on September 30, 1912. The amount of exchanges of the clearing-houses of chartered banks in four Ontario cities for 1910 is as follows :—

London	\$67,154,567
Ottawa	\$193,714,890
Toronto	\$1,593,954,254
Hamilton	\$101,226,496

The total value of farm property and farm products, according to the 1911 census, was \$1,223,753,540 and \$271,611,509 respectively.

Exports of Canadian produce during 1910 by the principal ports of Ontario are as follows :—

Bridgeburg	\$9,087,268
Fort William	\$11,701,467
Niagara Falls	\$21,810,499
Prescott	\$10,543,756
Sault Ste. Marie	\$7,093,192

Railways, etc.

The railways of Ontario form a network of communications in the more densely populated sections of

the province, linking town and country with the outer world. The Algoma Central and Hudson Bay, Bruce Mines and Algoma, Timiskaming and Northern Ontario, Canadian Northern, Canadian Pacific and leased lines, Grand Trunk Pacific, Grand Trunk (Canada Atlantic division), Lake Erie and Detroit river (Père Marquette), Manitoulin and North Shore (Algoma Eastern), and Canada Southern are some of the principal railway lines in operation, with a mileage nearing 10,000 miles. The Central Ontario railways are pushing northward to Port Nelson and James Bay; and with the privileges granted by an Order-in-Council to the province—a five-mile strip through Manitoban territory, and a ten-mile frontage along the Nelson river and vicinity (which strip and frontage have already been selected and surveyed by Tyrrell for the Government)—Ontario will have a seaport of its own and a direct outlet to the Atlantic Ocean, the distance from Port Nelson to Liverpool being only 2966 miles, but a trifle more than the distance of Liverpool to Montreal, namely 2887 miles. Excellent telegraphic and telephonic communications throughout the densely and even the sparsely settled portions of the province have done much to advance the interests of its citizens. There are few countries in the world where the telephone system is more generally used and its advantages recognised. It was in Brantford, Ontario, that Dr. Graham Bell invented the telephone, and it was in that city that its use was first proved and tested. There are nearly 800 miles of electric railways in Ontario.

The province had 3845 post-offices in 1912, where 240,232,000 letters were posted, besides 33,393,000 post cards, 5,245,000 registered letters and 11,644,000 free letters. There are nearly 5000 miles of colonisation

roads, and these are continually extending. There were 228 electric light companies in 1912 supplying arc and incandescent lamps. The province had 417 public libraries, many of which were generously built by Mr. Andrew Carnegie; 242 travelling libraries, 375 agricultural and 80 horticultural societies. The total value of the exports of the province of Ontario for the year ending March 31, 1912, amounted to \$108,554,834; imports for the same year \$240,262,151.¹ There were goods entered for consumption valued at \$234,952,371, and the duty collected thereon was \$34,326,700.76.

The annual grant of the Federal Government to the province of Ontario for the last few years is \$2,128,772, a trifle over \$59,000,000 having been granted since Confederation in 1867.

Cities

The city of Toronto is the capital of Ontario, and the seat of the provincial government. It covers an area of twenty-nine square miles, and, according to the latest federal census, had a population of 376,538. The assessment of the city for the year 1912 was \$343,598,145. Bank clearings in 1911 amounted to \$1,852,397,605. It is situated on the north-west shore of Lake Ontario on a front of fifteen miles, between the mouths of the rivers Don and Humber, on an excellent harbour protected from the swell of the lake by a long low island. The city is mostly on level ground, but in the rear the land rises in a terrace which was a former lake margin, and the belt of land along the terrace and in the valley and ravine is laid out in beautiful drives and parks. The city is well laid out, with streets at right angles, and is built up with substantial

¹ For 1913-14, exports, \$186,410,843; imports, \$290,647,435.

buildings. The residences are mostly detached with a little ground around them. The residences of the labouring classes show the taste and comfort which is becoming so marked everywhere throughout the cities of Canada.

The first settlement at Toronto was in 1749, when the French built Fort Rouillé, named after the Count de Jouy, Minister of Marine and Colonies. It was intended to check the communication between the Indian tribes of the north and the English traders from Oswego. The meaning of the name has been much disputed. It is argued by many that it means "place of meeting," but scholars in the Indian tongues like the Abbé Cuoq and Bishop Barega give the meaning as "trees in the water," probably from the fact that in approaching Toronto from the lake in a canoe the trees on a long, low spit of land seem to grow out of the lake. This spit of land is six miles long, and incloses a commodious and sheltered harbour. Of recent years the lake has washed a channel through the neck and made an island of what was a peninsula. The name of the landing-place for the portage to Georgian Bay was extended on the old maps over the whole country to which the route led, and so Lake Simcoe was Lake Toronto, and Matchedash Bay was Toronto Bay, and the river Severn which connects them was Toronto river.

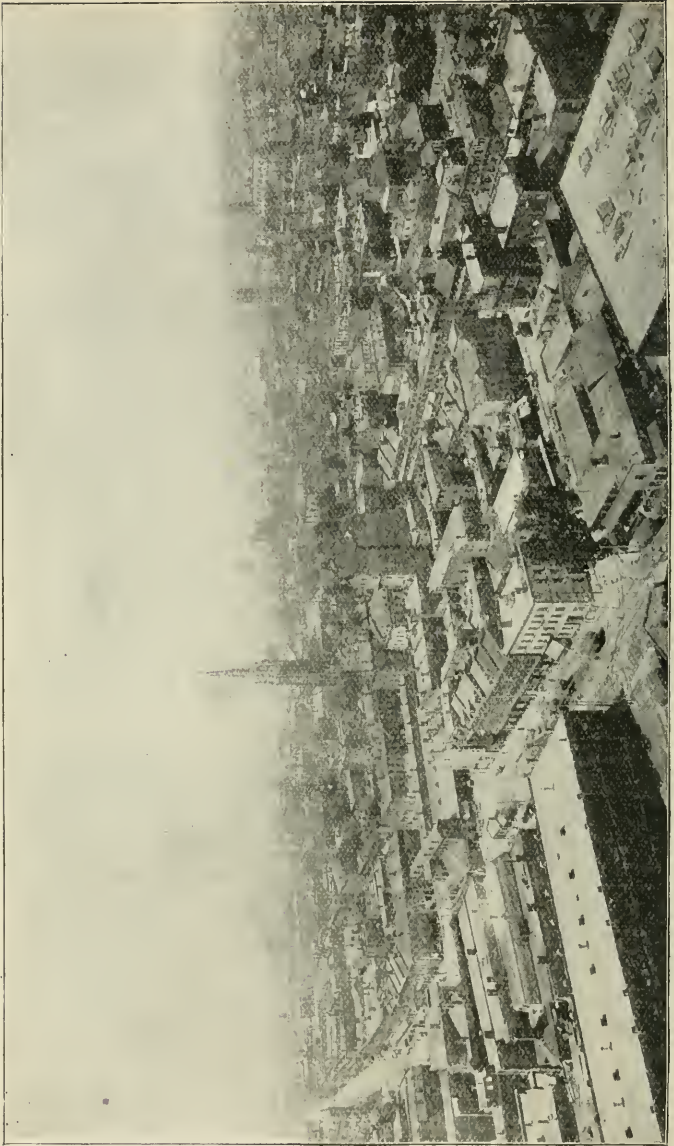
When Governor Simcoe in 1793 fixed on Toronto as the site of the future capital of Upper Canada it was a wilderness. One Mississanga wigwam occupied the site of the city. The fort had been abandoned since the French evacuated it. Simcoe pitched his tent there and lived in it during the first winter. Men of the Queen's Rangers (his old regiment) cleared the site, and in 1797 the legislature removed there from Newark.

The present euphonious name did not please the governor and he called the place York. It was not until 1834 that the name was changed back to Toronto. During the war of 1812-14 the town was twice taken and the public buildings were burned; but it was not occupied for more than a few days at each raid, for the attack was by expeditions over the lake.

Toronto is a leading financial, commercial, and manufacturing centre, and its citizens are very active and enterprising business men. The harbour is always full of steamers and lake craft, and a large number of railways converge upon the esplanade on the lake front; many lines originating in the city itself stretch out in all directions—north, east, and west, and touch the shores of the great lakes at very many points. Few cities anywhere have such a railway service. The country around Toronto is rich in agricultural wealth and of itself would support a large city; but the trade of the city far over-spreads the province and the business enterprise of its people extends over the whole Dominion from ocean to ocean.

The city is a very pleasant place of residence, for it has all the conveniences of the largest American cities. The electric car-service is excellent, and in 1911 carried 169,728,515 persons. The electric light and telephone systems are also most complete. There is no lack of amusements both for outdoor sports (golf, lacrosse, cricket, hockey, boating, ice-boating, a special attraction on Toronto Bay, and swimming) and for indoor recreation, for there are theatres and large music-halls, where the best artists visiting North America never fail to play or sing.

The educational advantages of the city are complete. The schools are of course numerous and good, but the



PART OF TORONTO, LOOKING NORTH-WEST.

institutions of higher learning are also many and important. The University of Toronto is the especial care of the government of the province, and with this central institution twelve colleges are federated. The buildings are considered the finest group of university buildings in the Dominion, if not on the continent. University College has a large teaching staff of professors and lecturers for all its faculties, which are well equipped



KING STREET, TORONTO, LOOKING WEST.

with practical apparatus, museums, etc., and the number of students in attendance in 1911 was over 4000. In the paragraph on Education information will be found concerning the educational institutions of the city. A large and admirably managed free public library adds greatly to the attractions of the city. It is a well-governed city, well kept, with numerous parks, as fine as those of any other city in the Empire.

As the capital of so important a province, Toronto is the centre of its political life, and the legislative and

departmental buildings are very substantial and imposing. The centre of the excellent educational system of the province and the chief Normal school is at Toronto, and there also is the chief Meteorological and Magnetic Observatory of the Dominion.

It is a banking and insurance centre, and the head offices of nine large and successful banking institutions are situated in Toronto. The higher courts of law are here also, and it is the centre of the legal business of the province as well. Another and more pleasing advantage is that it is the centre from which a very large number of attractive summer resorts may be readily reached. The Muskoka region, Georgian Bay and the upper lakes, Niagara Falls and Grimsby Park, the Algonquin National Park, and many resorts along the lake shore are conveniently accessible by the swarm of steamers in the harbour or the frequent trains from the stations.

Ottawa, with a population of 87,062, the capital of the Dominion, is situated on the river of the same name 120 miles west of Montreal at a point where navigation is arrested by the Chaudière Falls. Rideau Hall, in the eastern part of the city, is the official residence of the Governor-General of Canada. The Victoria Memorial Museum contains an Art Gallery, and is the National and Natural History Museum, where the resources of the country are exhibited to advantage. It is the most important centre of the lumber interests in Canada. The enormous power developed by the fall of such a river as the Ottawa is utilised by immense saw-mills, pulp mills, a carbide factory, and other industries including electrical concerns. Hull, on the Quebec side of the river, is a growing city of nearly 20,000 population, with numerous factories and mills, including the International Portland Cement Works. The Parliament and Departmental

buildings (*see Frontispiece*) of the Dominion Government are very handsome and cost \$19,750,000, and, as the seat of Government, the city draws many visitors, especially during the sessions of Parliament. Ottawa has 30 banks, with clearings amounting to \$195,000,000. Ottawa has also a Royal Observatory, Central Experimental Farm,



Patenaude, Photo.

CHAUDIÈRE FALLS, OTTAWA, VIEW FROM PARLIAMENT HILL.

the Royal Mint, the Dominion Archives, Public Library, 15 Government buildings, 61 churches, 62 hotels, 87 wholesale business houses, besides 168 factories which in 1910 gave an output valued at \$37,700,000, and employing 14,000 persons, whose wages totalled \$7,978,000 for that year. There are 46 public schools, where a daily average of 10,965 pupils attend, besides higher institutions of learning, including the University of Ottawa. There are 11 parks, covering 237 acres of land within the city limits, and 2000 acres adjacent to the city. Within

300 miles there is a population aggregating 4,075,000, and numerous lines of railway, transcontinental, inter-provincial, international and local, radiate in every direction, besides steamboat, lake, canal, and river transportation, which afford facilities for further traffic in Ontario and the neighbouring province of Quebec.

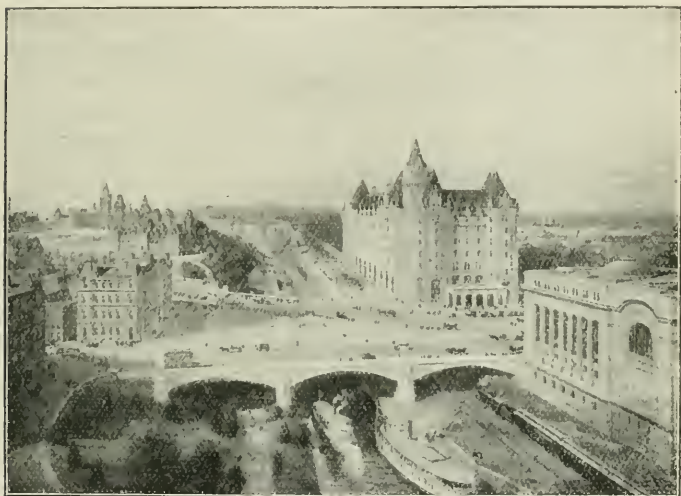


VICTORIA MEMORIAL MUSEUM, OTTAWA.

Ottawa had in 1910 not less than 145 miles of streets, 144 miles of watermains, 103 miles of sewers, and 42 miles of street railway, which latter carried 17,897,498 persons during that year.

Kingston, at the foot of Lake Ontario, is situated on the best harbour on the lake, and is the oldest town in Ontario; for Frontenac built a fort and trading post there in 1673, and it is the only place west of Quebec which has any pretence of being fortified. The Rideau

Canal from Ottawa opens into the lake at Kingston. It was built as a line of interior communication in case of war. The Royal Military College—the West Point or Woolwich Academy of Canada—is situated here, and Queen's University, an institution in the front rank of the universities of Canada, is also at Kingston. The large



OTTAWA, LOOKING UP THE RIVER.

The Houses of Parliament are on the left, and the Chateau Laurier Hotel and Grand Trunk Railway Station on the right.

lake craft tranship their grain by elevators at this point into barges which carry it down to the ocean vessels at Montreal. There are cotton, woollen, and flour mills, also a grain elevator, smelter, locomotive works, and a ship-building plant. The population is given in the census of 1911 as 18,874.

Peterborough is a city of 18,360 inhabitants, situated on the Otonabee river in the Trent valley. Originally a

lumbering town, it has developed into an electrical and manufacturing centre because of the immense water-power generated by a fall of fifty feet in the river. There are 35 factories, including electrical machinery and supplies, mining and mill machinery, agricultural implements, rapid tools, tents, woollen mills, flouring mills, bridge-building works, and railway car factories. It is the headquarters of the Canadian General Electric Company, and of the Quaker Oats Company for all Canada, but it is chiefly celebrated all over the Dominion for making the "Peterborough canoe" the best canoe made anywhere. The city is the centre of a region of innumerable lakes and streams.

Hamilton is an important city situated on Burlington Bay at the head of Lake Ontario and at the foot of the Niagara escarpment. It is a very busy and a very well built city, with numerous large institutions and handsome edifices. Many important manufactures are carried on at Hamilton, and its industries are more diversified than those of other cities in the west, some of which are supplied by natural gas, others by the Hydro-Electric Commission from power generated at Niagara Falls, others from power generated at De Cews' Falls. It has a free public library and museum. The railway connections of Hamilton are very extensive, and being at the extreme head of the lake it is an important point of inland navigation. The population was given in 1911 as 81,969; it has about 400 factories, including steel, cotton, iron, woollen, agricultural machinery, tobacco, electrical wires and cables, boots, furniture, ploughs, stoves, and clothing. The output of 33 of these factories for five years averaged \$26,000,000 per annum.

Brantford is a rapidly growing city, beautifully situated on the Grand river. In 1911 its population

was 23,132, and the annual value of its manufactured products \$15,866,229. It has manufactures of machinery and hardware, of bicycles, carriages, binder-twine, Portland cement, wind-mills, electrical fixtures, rubber, felt, emery wheels, and stoneware, and has also cotton, flour, and woollen mills. The power used is derived from natural gas, water, and electrical energy from Niagara Falls. It is named after Brant, the great and humane Mohawk chief, who was *not* at Wyoming at the so-called "massacre," as he has been represented in certain quarters to have been.

Galt is another city on the Grand river, whose name commemorates John Galt the author of *The Ayrshire Legatees*, and other novels very popular in their day. It has a population of 10,299, and is noted for its manufactures of edge tools, machinery, woollens, brass goods, hats, safes, wheels, and other articles. It has 9 churches, a public library, 4 large parks, and is in the centre of a rich agricultural district, with supplies of lumber and building materials.

Guelph is on the Speed, a tributary of the Grand river, and a fall of 30 feet gives it abundant water-power. The population in 1911 was 15,175. It is the seat of the Ontario Agricultural College and Macdonald Institute for domestic science training, where 1550 students were in attendance in 1911; and it is also the centre of a very rich farming country. There is an experimental farm attached to the college, and the number of students is usually very large. There is a very effective, scientific, and practical teaching staff. Guelph has some 70 factories producing agricultural implements, woollen goods, carpets, sewing-machines, pianos, organs, stoves, ranges, hardware, etc., to the value of about \$8,000,000 annually.

London on the Thames is a city of 46,300 inhabitants, the centre of the richest farming district in the west, and reaches out by many railways over the peninsula. It has many industrial interests, iron foundries, machinery works, breweries, chemical works, musical instruments, and many factories of other kinds. The country around is very beautiful, and it is known as the "Forest city" because of the park-like appearance of the surrounding country. Many large institutions, educational and financial, are situated at this central point. It is the chief distributing point between Toronto and the Detroit river. The bank clearings of 1911 gave \$67,054,567, and the customs receipts amounted to \$1,074,006.

Woodstock on the Thames is another agricultural and manufacturing centre. The country round is exceedingly rich, and it has more than the usual educational advantages, even in Ontario. Organ and piano factories, woollen mills, and many other industries are carried on here. The population in 1911 was 9320.

St. Catharines, in Lincoln County, has a population of 12,484. It is delightfully situated on the Welland Canal, and has numerous railway connections and a number of industries, including five paper mills, canning factories, wine, biscuit, metal works, flour mills, agricultural tools, knives, and threshing machines. There are saline springs in the neighbourhood and a sanatorium for persons suffering from rheumatism, gout, and other disorders. St. Catharines is the seat of Bishop Ridley College (Church of England) for boys, and is in the heart of the fruit belt.

Sarnia (population, 9947) is a growing town on the St. Clair river, celebrated for having one of the greatest tunnels in the world. It is the link connecting the Grand Trunk railway of Canada, at Port Huron, in

Michigan, with its branch to Chicago. The tunnel is under the St. Clair river and is 21 feet in diameter and 6025 feet long. The walls are of cast-iron segments bolted together. The approaches are 5600 feet in length. The cost was \$2,700,000. Salt, timber, natural gas and petroleum are the chief local products which support many industries. The town has two miles of water-front, at any point of which boats can dock safely.

Windsor is immediately opposite the City of Detroit in Michigan, itself a large centre where many Canadians have been successful in business and other pursuits. It is a point of many converging roads, and freight and passenger cars are ferried across to Detroit on immense barges. It is also on the line of all the Canadian steamships on the lakes. Salt and limestone occur in the neighbourhood, and numerous industries have arisen, including large salt works, wire fence, tobacco, cigars, brass goods, paint, varnish, electrical machinery, cereals, and automobile factories. Natural gas is used for lighting and manufacturing purposes. It is a progressive town and had a population of 17,829 in 1911, and an annual output valued at \$3,771,706.

Owen Sound is a town situated at the mouth of the Sydenham river on Georgian Bay. It has a population of 12,558, and numerous industries, counting two Portland cement plants, 5 grain elevators, 2 flour mills, 1 oatmeal mill, and is the best harbour on Lake Huron, with a sound 12 miles long, 5 miles wide, and navigable for the largest vessels. It is the terminus of one of the Canadian Pacific Railway systems. The steamers in connection with that railway leave Owen Sound for Fort William on Lake Superior.

Some of the cities and towns owe their prosperity to

the fact that they are the centres of converging railways such as Stratford (pop. 12,946) and St. Thomas (pop. 14,054); others are centres of rich farming districts, as Chatham with a population of 10,770. Manufactures naturally spring up at such points. Others are terminal points of great railway systems on the lakes, such as Goderich on Lake Huron, Collingwood on Georgian Bay, where there are elevators and facilities for transhipment.

Other thriving towns and their population are as follows:—

	Population.		Population.
Orillia	6,828	Kenora	6,158
Oshawa	7,436	Lindsay	6,964
Berlin	15,196	Smiths Falls	6,370
Belleville	9,876	Sault Ste. Marie	10,984
Brockville	9,374	Niagara Falls	9,248
Cornwall	6,598	North Bay	7,737
Ingersoll	4,763	Sudbury	4,150
Barrie	6,420	Welland	5,318

Fort William and Port Arthur, with a population (1911) of 16,499 and 11,220 respectively, have already been described. Cobalt is a comparatively new mining town of 5638 inhabitants in the heart of the silver district. Cochrane is at the junction of the Timiskaming and Northern Ontario railway with the National Transcontinental railway 253 miles north of North Bay, and 480 miles from Toronto. It has electric light and power and is in the centre of a fertile agricultural district. It has a population of 2500 according to the latest returns.

Many other cities and towns might be mentioned if space permitted. They are abundantly furnished with the conveniences met with in modern cities, such as electric cars, electric light, telephones, schools, churches, and places of amusement, and they are all well administered under the municipal laws of Ontario.

In the old days, before the railway system obtained its present large development, ports such as Cobourg, Port Hope, Whitby, and similar places on the shores of Lake Ontario, were leading towns, but now the railways are passing through the heart of the country, and the inland towns are becoming more important centres of business. Toronto, Ottawa, and Hamilton are great railway centres as well as important points of inland navigation, and are growing very rapidly, but some of the lake ports are losing their comparative importance.

CHAPTER XIII

CENTRAL CANADA AND TERRITORIES

History.—The history of Central Canada is the history of its explorers, adventurers, and voyageurs, who sought the great waterway to the Indies, or searched for new lands and countries; it is also the history of the great fur companies whose influence spread over so vast a portion of the North American continent, and whose activities and achievements have furnished, are now furnishing, and will continue to furnish, chapters of marvellous interest in the annals of British America. It is the history of the North-West Territories and of Prince Rupert's Land; the history of Manitoba, Saskatchewan, and Alberta, of the three prairie provinces, and adjacent territories where tens of thousands, nay, hundreds of thousands are entering, making those productive regions yield wheat and plenty out of the abundance of their wealth and stored riches; doing more, establishing thrift and honest labour in lands where "peace, decency, and order" dwell, where homes, free and bright, in a clear, cheery, and bracing atmosphere, are made; to the up-building of a British nation linked to an Empire that stands for all that is best in the highest expression of modern civilisation.

In 1728 Pierre Gaultier de Varennes de la Verendrye,

while in charge of a fur-trading post on the northern shore of Lake Nipigon, was told by an Indian of a great lake at the west discharging westwards by a large river into a sea which ebbed and flowed. Never had the French given up the idea of a water-route to the Pacific. It was constantly in their minds, and at that very time they were seeking it through the country of the Sioux. La Verendrye was no ordinary man. Born at Three Rivers, he passed over into France in his early manhood, and, entering the army, was severely wounded at Malplaquet. He returned to Canada and joined the number of those hardy and fearless men who found congenial homes in the pathless forests and far-reaching rivers of Canada, who endured toil and privation with light hearts and tireless bodies, and for whom the wildest tribes in the west had no terrors. The idea seized him that the river of the western ocean was more to the north than had been supposed. He came east and succeeded in interesting the governor, Beauharnois, and obtained an exclusive licence for the fur trade in the territory to be explored. Being poor, he obtained means by associating others in his enterprise, and in 1731 he started from Montreal for the Grand Portage, on Lake Superior, with a large party. Some vague knowledge already existed of the lake wilderness west of the post on the Kaministikwia, and Lake Winnipeg even appears on the maps of the time as a small lake; but that was the utmost limit of knowledge, and La Verendrye led his party into what was at the time an unknown wilderness. In the succeeding nine years, undeterred by the loss of one of his sons and twenty of his companions, he succeeded in building a number of trading posts—Fort St. Pierre, at the outlet of Rainy Lake, Fort St. Charles, on the west shore of Lake of the Woods, Fort Maurepas, at the mouth of the

Winnipeg river, Fort Rouge, on the site of Portage la Prairie (the portage to Lake Manitoba), Fort Bourbon, on Cedar Lake, the inlet of the Saskatchewan, and Fort Dauphin, on Mossy river, where Lake Dauphin discharges into Lake Manitoba. Other lesser posts there were, but these were the strategic points of the whole of Manitoba, and in 1740, before the English had crossed the Alleghany Mountains, or the Hudson Bay traders began to ascend the rivers from the bay, our prairie province was the field of a valuable fur business centring at Montreal.

The Souris river was an important stream in those days, for it led to the portage for the upper Missouri, and the French built a fort at its junction with the Assiniboine. La Verendrye pushed up the Souris, ever in search of the great river of the west. He struck across to the Missouri, and came upon the Mandan tribe—an interesting tribe of aborigines, whose faces are perpetuated in George Catlin's pictures, and who in after years were supposed by Celtic enthusiasts to speak Welsh and to be descendants from Prince Madoc's party of emigrants in the twelfth century. They were very kind to La Verendrye. He, however, went no farther, and one of his sons, whom he left behind, also failed to proceed farther. In 1742 two of his sons, with only two companions, started over the same ground, and pushed their adventurous way across the broken and arid region of Montana until they saw the lofty snow-capped peaks of the Big Horn range of the Rocky Mountains. Canadians from Three Rivers were the first white men to see the Rocky Mountains at the north—but the great river of the western ocean was yet hidden.

La Verendrye, the father, died in 1749, and his two sons continued the trade and discovery of the North-West; but the evil days of New France were approaching, La Jon-

quière was governor, and Bigot, the evil genius of Canada, had arrived. The licence of the brothers was cancelled, and their forts and property and business became the prey of a syndicate of the clique of the favourites of the new governor and intendant. Acting for them, Legardeur de Saint Pierre took up the places and enterprises of the Verendrye brothers. He sent an expedition of ten men three hundred leagues up the Saskatchewan (probably the south branch), and they built, in 1751, Fort La Jonquière, at the foot of the Rocky Mountains. It was soon abandoned, but again the Rocky Mountains were seen by French Canadian voyageurs before Daniel Boone had crossed the mountains into Kentucky, and before the Hudson Bay traders had established a post beyond tide-water. The Seven Years' War ensued, and the two brothers La Verendrye, though ruined in fortune, served their king in defence of their country. One of them died in 1755, and the other perished by shipwreck in the *Auguste* on the coast of Cape Breton, with a number of distinguished Canadians who were returning to France. Thus closed in injustice, disappointment, and disaster the first chapter of North-Western history.

The fur trade of the French was broken up by the war, and the consequent uncertainty and confusion of the cession; and, before the country could again become quiet, Pontiac's war broke out, and the whole west was aflame with fire and massacre. Peace was made in the fall of 1765, and in 1766 two Montrealers are reported as trading on the Saskatchewan. Others followed, both English and French, until the Hudson Bay Company began to wake up, and in 1774 built Fort Cumberland on the same river commanding the route to the Athabaska. In 1787 the chief Montreal merchants combined and formed the North-West Company, managed by

such men as Frobisher, McTavish, McGillivray, Gregory, and McLeod, and they availed themselves of the skill and knowledge of the French voyageurs and traders. They pushed their posts into the farthest regions of the North-West, and one of their partners, Alexander Mackenzie, went down the river which bears his name to its mouth, and, the following year, was the first white man to cross the Rocky Mountains and reach the Pacific on the north. Sir Alexander Mackenzie and the Honourable Edward Ellice formed in 1796 the X. Y. Company, but united again in 1804 with the North-West Company. Farther and farther these daring men extended their operations. They had posts at Pembina, in the present Minnesota, and as far south as Grand Forks, in Dakota. On the north their posts extended down the Mackenzie river, and on the west they crossed the Rocky Mountains and followed the Columbia river almost to its mouth. Then the Hudson Bay Company, fully aroused to the danger of having the Indians coming to their posts to trade intercepted on the way, began to occupy the country; and, in the rivalry which followed, the Indians were being fast corrupted by the competition of 'the rival companies for their furs. The Hudson Bay Company's business was done by way of York Fort on Hudson Bay, and the North-West Company's by way of Montreal and the Grand Portage at the head of Lake Superior.

While the rivalry between the two companies was fast approaching a crisis the Earl of Selkirk arrived in Canada. He was a very capable and thoughtful nobleman, with advanced views on colonisation. At Montreal he was in the centre of the fur trade, and there he acquired such a knowledge of the Far West that he resolved to found a settlement in the very heart of the continent. Returning to England, he purchased a con-

trolling interest in the stock of the Hudson Bay Company, and, despite the protests of the more practical shareholders, he purchased from the company an immense tract of territory which he called Assiniboia, and proceeded to send out settlers. The tract acquired reached from about Big Island, on Lake Winnipeg, far south, into the present Minnesota and Dakota, to the water-parting of the basin of the Red river. On the



OLD FORT GARRY.

Type of an important Hudson Bay Company's post. It stood on the site where the modern city of Winnipeg, Manitoba, now stands.

west the line reached the confluence of the Qu'Appelle and Assiniboine, and on the east it reached Lake of the Woods, with a long projection along the water-route to the height of land over Lake Superior. The area of this mid-continental empire was 116,000 miles, and it comprised what are now known to be the choicest farming lands in the world—the very garden of the North-West. In 1812-13 he sent out the first party of settlers by way of Hudson Bay, under Captain Miles Macdonald as Governor of the Hudson Bay Company and of the Selkirk Colony. He proceeded to enforce what he con-

ceived to be the territorial rights of the company against the North-West Company's employees. It is unnecessary to discuss the merits of the controversy. It culminated in a private war which lasted several years, in the course of which the colonists were driven away and posts on both sides were captured and destroyed. At last, in a battle between the Hudson Bay Company's people and the North-Westerns, Governor Semple, a military officer then in command of the colony, was killed, together with some twenty of his people, and the colony a second time scattered. In 1817 Lord Selkirk succeeded in establishing a final colony on the Red River, and the whole matter went before the courts, and became the subject of a war of pamphlets. Meantime there was private war at all the forts and carrying-places throughout the great western territories.

At last, in 1821, both companies were nearly bankrupt. The long struggle had exhausted the resources of both; for, however congenial a life of turmoil may have been to the half-breeds and the traders on the wild western plains, the men who, at Montreal and London, managed the finances of the companies, saw the folly of the struggle, and both companies united under the charter of the Hudson Bay Company. The policy changed; the North-West became a sealed book, and the little settlement on Red river seemed to lose reality even to the Canadians themselves. Gradually the company withdrew its operations from Montreal, and conducted its business, unobserved, by the remote route of Hudson Bay. In the year 1846 a detachment of the 6th Royals, under Lieut.-Colonel Crofton, was sent to the Red river, but they went by Hudson Bay. They returned in 1848, and for a few years a small force of pensioners was maintained at Fort Garry, but they went

and returned by way of Hudson Bay. All knowledge of the fertile region of Assiniboia faded away and a dark veil of wistful obscurity was drawn over the land, and the country now covered with teeming corn-fields was thought of only as a region of illimitable snow and intolerable frost. So closed the second chapter of North-West history in the domination of a handful of powerful fur-traders over an empire—a domination which must be admitted to have been beneficial, for the time of the Dominion of Canada had not yet come.

This territory covered by the Hudson Bay Company's operations was considered under two heads: *First*, Rupert's Land, granted under the charter to Prince Rupert and his associates; and, *second*, the Indian territories, occupied with exclusive right of trade under licences from the Crown for periods of 21 years. In the year 1858 the Canadian Government, in an address to the Queen, impugned the validity of the charter, and deprecated a renewal of the licence. Seven years were spent in a three-cornered correspondence and negotiation between the Imperial Government, the Hudson Bay Company, and the Canadian Government, and in the British North America Act provision was made for admitting these territories into the Dominion. It was recognised by the Canadian people generally that they were necessary to the continuous existence of the confederation of the provinces then in course of formation, and, after much further negotiation, the Company in 1869 surrendered to the Crown, for the consideration of certain territorial reserves, and the sum of £300,000 sterling, to be paid by Canada, the whole of their right and title to the territories in question for transfer to Canada.

While the final steps for transfer were in progress, the Canadian Government appointed a governor and sent

parties of surveyors to survey lands. No opposition was anticipated; but in this all parties were mistaken, for the Canadian officials were met at the frontier by an armed party of half-breed residents and warned not to proceed farther.

These transactions are so recent that it is inconvenient to discuss the merits of the dispute, or to enter upon the details of the events. An organisation had been formed among the half-breeds with the intention of exacting terms of some kind from the Canadian Government before yielding peaceable surrender of the territory. The movement developed into an insurrection, and an armed force under the command of Louis Riel seized Fort Garry, issued proclamations as a provisional government, summoned a convention, and passed what they called a Bill of Rights. Then followed the imprisonment of settlers adverse to the provisional government, the hoisting of a new flag—a white flag with a fleur-de-lys and shamrock; the confirmation of Louis Riel as president, and, last of all, the crime of condemning Thomas Scott to death for rebellion against the provisional government, and of shooting him in cold blood.

In these and similar proceedings passed the winter of 1869-70, but, as the spring opened and the country became again accessible from Canada, calmer counsels began to prevail and wiser heads began to resume influence. The Imperial Government had accepted the transfer from the Hudson Bay Company and felt bound to hand it over to Canada. The Imperial troops had not at that time been withdrawn, and an expeditionary force was despatched under Colonel Wolseley (the late Field-Marshal Lord Wolseley) consisting of 250 men of the Imperial army and 750 men of the Militia of Canada. No resistance was offered, the men concerned in the

rebellion had disappeared, civil government was established, the two battalions of Canadian troops remained over the winter, but the Imperial troops returned at once. Thus the transfer was complete, and the whole North-West to the Rocky Mountains and the Polar Ocean became part of the Dominion of Canada.

On 5th July, 1871, British Columbia entered the union, and the chief condition was that Canada should build a railway to connect the new province with the railway system of Canada. This was a stupendous task for three millions and a half of people; but the national spirit of Canadians was aroused and they were determined to carry it through. Surveys were instituted to discover the best route, and more especially to discover a practicable pass over the Rocky Mountains. This would necessarily take some time, and in the meanwhile the Government adopted the policy of having the Pacific Railway built by a company and not by the Dominion. In 1873 the first Pacific charter was granted; but before anything was done the Government was defeated at the polls, consequently the charter fell through, and the new Government decided to construct the railway as a public work. The surveys were pressed forward, and after a long and careful examination the line of road was located by way of Edmonton and the Yellowhead Pass to Burrard Inlet. In 1878 the Government again changed hands, and the original policy was reverted to—the present company obtained the charter in October, 1880, the existing location was adopted, and the 1st of May, 1891, was fixed as the limit of time for completion of the whole line. The history of the railway is as interesting as a romance. There is only space to say that on June 28, 1886, the first train ran through from Montreal to Burrard Inlet—five years before the expiration of the stipulated time. The

company was a most exceptional combination of skill, energy, and courage, and the more that is known of the difficulties of the undertaking the more wonderful does the result appear to be.

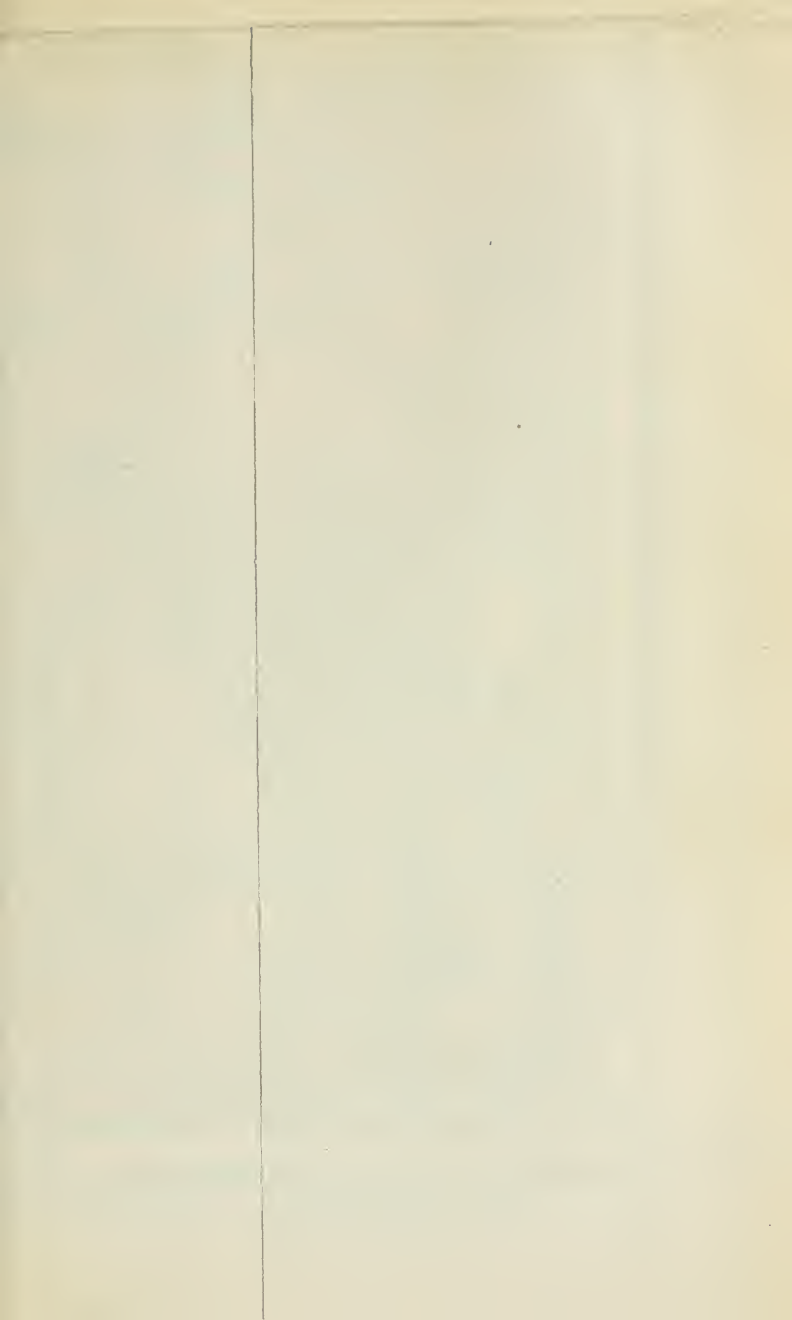
The troubles of Manitoba were over, but those of the North-West were to come. Louis Riel had been banished and his term was ended. He was residing in Montana, and had been naturalised in the United States, when, in June, 1884, the half-breeds on the Saskatchewan, who had some grievances, invited him to come over and put their demands into a form to be pressed upon the Dominion Government. Agitation continued all winter, and in March, 1885, the rebellion of 1869 was repeated. A provisional government was again formed, with Riel again as president. This rebellion was more dangerous than the former; for now some of the "Indians" took part with the half-breeds and broke out from their reserves. The rebels soon came into conflict with the authorities, and in the first engagement near Duck Lake, on 26th March, the loyalists retreated to Prince Albert with a loss of twelve men killed. This slight success inflamed the natives, but it also aroused the whole Dominion, and before four days were over the volunteer militia were on the move westwards; and indeed the emergency was serious, for some 2000 Crees and Stony Indians broke out from their reserves and commenced to plunder the settlers and to threaten the town of Battleford. They massacred the settlers of Frog Lake, including the Indian agent and the Roman Catholic priest in charge of the mission. The way was long and difficult, for the railway was not complete along the north of Lake Superior, but in less than a month a strong body of troops was upon the scene of action under General Middleton. The first engagement took place at Fish Creek. Gabriel Dumont, who commanded

for Riel, with the title of adjutant-general, had a natural gift for war, sharpened by the wild life of the plains, and had disposed his men very skilfully in rifle-pits. They were accustomed from childhood to the use of the rifle, and as they fired from shelter there were many casualties among the troops. Both of the aides-de-camp of the general were wounded, and he himself had a narrow escape, for a bullet passed through his cap as he was leading his men. The rebels evacuated the position during the night. They had lost fewer men than the attacking force.

The whole North-West was by this time in a turmoil. The powerful tribes of the Blackfeet were with difficulty kept quiet by the influence of Father Lacombe and his fast friend the war-chief Crowfoot. Some of the smaller posts had been abandoned, and small detachments of Mounted Police assisted by the settlers were holding Battleford, Prince Albert, Edmonton, and Fort Saskatchewan. A detachment under Colonel Otter had an engagement with a large body of Indians, under cover, at Cut Knife Hill, and had to retire to Battleford. The Indians knew how to avail themselves of every inch of cover, and the plunder of the agents' stores had given them abundance of ammunition. The rebellion was, however, crushed at the place of its origin in the parish of St. Laurent. There, at Batoche Crossing on the South Saskatchewan, Riel entrenched himself in a good position in ravines protected also by rifle-pits, planned with great judgment by Dumont, and before this position General Middleton was detained four days, for he was very careful in exposing his men. The rebels were well covered and were skilled marksmen well commanded, for the wild life of the plains is a good school for a soldier. On the other hand, the volunteers were on their first service and were impatient at the delay, and at seeing their comrades fall

by the bullets of unseen enemies. At last they were let go and they carried the position with a rush. The rebellion then collapsed—the half-breeds surrendered, and Big Bear and Poundmaker with their Indians gave up their arms. The half-breeds had made a good fight. All the Indians on the plains who had not actually revolted were in a state of excitement, and the Canadian troops had to patrol the frontier of the United States as well as to watch the Indians over the whole territory while attacking the rebellion at its centre. The first blow was struck on 26th March, and on the 12th of May the rebellion was crushed. In this short time the Canadian militia, who had never seen active service before, had got to the scene of action distant 1800 to 2500 miles from their homes, and had done a great deal of marching and some sharp fighting. There were 38 killed and 115 wounded in action, besides the losses by the fatigues and hardships incident in such a campaign. Gabriel Dumont, who was the life of the fighting, escaped to the United States. Riel surrendered, and, after trial, was hanged for treason; eight Indians who were convicted for murdering settlers were also executed. The memory of the murder of Thomas Scott in the first rebellion set public opinion strongly against any further clemency to Riel.

These events practically close the history of Manitoba and the North-West. The districts of Assiniboia, Saskatchewan, Alberta, and part of Athabaska, have been replaced by two provinces erected in 1905, namely, Saskatchewan and Alberta. The country is settling fast, the Indians are taking up civilised modes of life, and the grievances of the half-breeds are redressed, so that Central Canada has entered into that happy condition when it makes little or no history.



ALBERTA, SASKATCHEWAN & MANITOBA PROVINCES.

To face p. 50



Scale of English Miles
0 50 100 150

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Stanford's Geog. Estab. London

CHAPTER XIV

THE PROVINCE OF MANITOBA

Boundaries, etc.—Manitoba, the most easterly of the three prairie provinces of Central Canada, lies about the centre of the North American Continent, midway between the Atlantic and Pacific Oceans. It is bounded on the north by the North-West Territories and partly by the waters of Hudson Bay; on the east by Hudson Bay and the province of Ontario; on the south by the 49th parallel, which is the international boundary separating this province from North Dakota and Minnesota; whilst on the west Manitoba has its sister province of Saskatchewan as close neighbour all the way from the international boundary to the 60th degree of latitude. This province was admitted within the Canadian Confederation of provinces 15th July 1870, and up to 1912 its area comprised 73,731·72 square miles (47,188,298 acres), when 178,100 square miles were added to its territory by an Act of Parliament (2 George V., chap. 32, assented to 1st April 1912), passed at Ottawa, which Act came into force in the same year after the consent and approval of the Legislature of Manitoba had been obtained, and a proclamation issued by the Governor in Council. The total area of Manitoba was thus increased to 251,831·72 square miles, or 161,172,298 acres.

Whereas, in size, the province was larger than Scotland, Wales, and Ireland combined from 1870 to 1912, it is now more than twice the area of Great Britain and Ireland taken together, and larger than either Germany or France, its area having been increased three and two-fifths times.

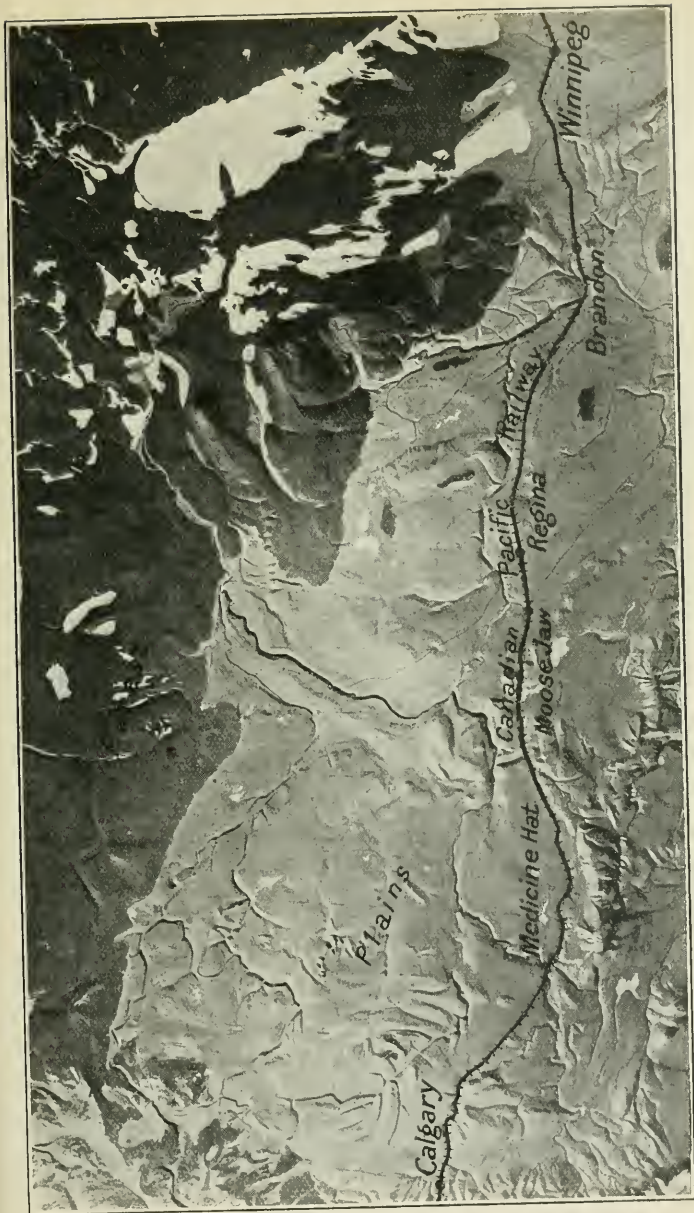
Manitoba extends north and south a distance of 750 miles, whilst it has a stretch of 260 miles in contact with the North-West Territories. Its greatest breadth is 500 miles, about latitude $56^{\circ} 50'$, between the most easterly point of the province at the intersection of the 89th meridian with the shores of Hudson Bay and the western boundary near Reindeer Lake. The narrowest part of the province is a trifle over 250 miles across, situated between the most westerly expansion of Hudson Bay, longitude $94^{\circ} 42'$ west, and the Saskatchewan boundary where the Cochrane river intersects the same. The extreme limits of the province are between the 89th and 102nd meridians, and between the 49th and 60th parallels of latitude. Manitoba is now within 350 miles distance from the province of Quebec, from its most easterly point on the 89th meridian to Cape Jones, the most westerly point of Quebec. All the islands of Hudson Bay form part and parcel of the North-West Territories, and were not transferred to Quebec, Ontario, or Manitoba in 1912, when the additions were made to their territory, but these three provinces share together with the Territories the privileges and responsibilities resulting from their maritime characters in the sea coast of Hudson Bay. As was the case with the provinces of Alberta and Saskatchewan, the Crown, *i.e.* the Federal Government, in the name of His Majesty the King, concurred and assented to by his Excellency the Governor-General of the Dominion, retains the lands,

mines, and minerals, and royalties incident thereto throughout the province of Manitoba, and these being vested in the Crown are administered by the Government of Canada for the purposes of Canada. The newly added territory comprises an area of 178,100 square miles taken from the North-West Territories lying to the north of this province, east of northern Saskatchewan, and north of "New Ontario" of early 1912. This addition is bounded on the north by the 60th parallel of north latitude and the waters of Hudson Bay; on the east by Hudson Bay and the district of Patricia, in Ontario; on the south by the district of Patricia and the former northern boundary of Manitoba; and on the west by the eastern frontier of Saskatchewan. This newly acquired area rounds off the province in a fashion which adds materially to its resources, and morally to its problems of an economical and political nature. Manitoba thus gains a vast extent of forested areas of which it had formerly but a limited amount; it obtains likewise mineral-bearing country of a promising character; it obtains the two best harbours on Hudson Bay, 400 miles of sea coast, vast numbers of fur-bearing animals and wild fowl, extensive sea and inland fisheries, water powers, fertile agricultural districts, new outlets for its marketable products, besides the new and quick highway to an ocean port which places the whole of Central Canada in closer and quicker touch with London and Liverpool, the two throbbing centres of British marine and mercantile activity to which the agricultural, dairy, and ranching products of that portion of the Dominion and of the neighbouring states of the Union to the south have free access. — Such acquisition, however, involved great responsibilities, but the faith that was strong in the men who made Manitoba what it is dwells deep

down in the hearts of the men of to-day who control its destiny in the onward march which makes for peace, progress, and prosperity, in a broad outlook and trust which binds together firmly the whole federation of British provinces in North America within the Dominion of Canada, and links it to the Empire on which the sun never sets.

This province was the first to be styled "the prairie province of Canada," and, while the greater part of its former area was held to consist of prairie country of the first and second prairie steppe, since the increase of 1912 was made Manitoba has a larger proportion of rugged, Archæan, forested, and well-watered non-prairie country.

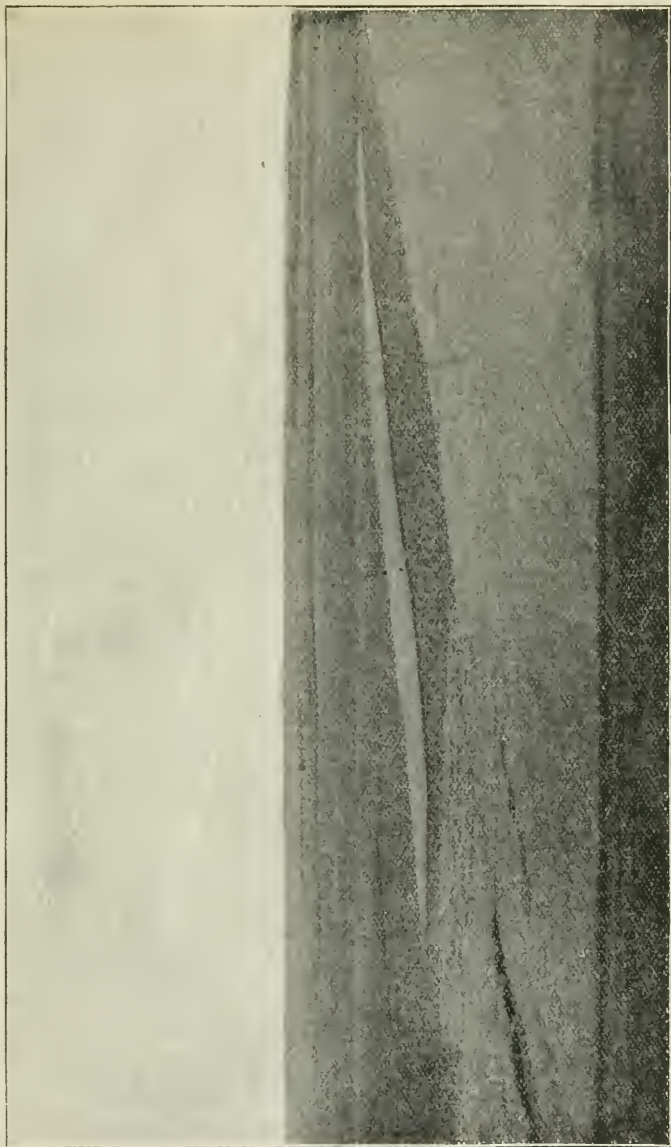
Physiography.—The topographical features of the province are varied, and the surface of the land presents at least *four* distinct types of relief depending upon the character and nature of the rock formations constituting the crust of the earth in this portion of the continent. These four include: (1) a Prairie Region; (2) a Lake Region; (3) an Archæan axis or granitic area; and (4) the Hudsonian plateau country. The *prairie region* lies in the extreme south-western portion of Manitoba, and comprises some 30,000 square miles of ancient lacustrine sediments of immense agricultural capabilities and value. The *lake region* forms a well-watered zone north-east of the prairie region, containing about 40,000 square miles of territory with extensive fisheries, forest, and agricultural products which are fast being developed. The Archæan axis or rugged region of granitic and gneissoid rocks constituting the backbone of the province is essentially and typically a Laurentian plateau area of about 150,000 square miles, where forest trees, minerals, fisheries, wild game, fur-bearing animals, and water powers abound. The swift-flowing rivers of the northern



TOPOGRAPHY OF THE PLAINS: WINNIPEG TO CALGARY.

half of this region flow north-eastwardly into Hudson Bay from the west, whilst the streams of the southern portion of this region east of Lake Winnipeg flow in a westerly and north-westerly direction into that lake which lies on the boundary between the Archæan and Palæozoic rocks. The maritime or Hudsonian plateau country of the most easterly corner of Manitoba is underlaid by flat-lying limestones and dolomites occupying the lower portions of the basins of the Churchill, Owl, Nelson, Hayes, and Shamattawa rivers, the area in question covering some 25,000 square miles, and containing forests, fisheries, water powers, and varied resources appertaining to a maritime region.

On reaching the threshold of southern Manitoba from the east, woods disappear, rough places are made smooth, the earth becomes a level lawn, lakes and rivers are not what they were in the Archæan country, and the horizon widens. The dividing line between woodland and plain is west of the provincial frontier near Whitemouth Lake, and, like many other lines of physical import, runs across the map from south-east to north-west. The traveller to Winnipeg by the Dawson route, from the north-west angle of the Lake of the Woods, will discern the first plain near Ste. Anne des Chênes, some 30 miles south-east of Winnipeg. For 1700 miles east of him, right to the Atlantic, there is nothing like this plain, whilst for 900 miles west of him, right to the Rocky Mountains, there is hardly anything but this. Thus, near Winnipeg, the commercial metropolis of the prairie-land, prairie-land begins, and in the Rockies the prairies end. Prairies are barer than "barrens," yet they are smooth, grassy, and generally dry: and they are flatter than the "downs" of England. There are *three* prairie steppes or table-lands in Central Canada: the *first*, from 700 to 950 feet above



THE PRAIRIE, MANITOBA.

tide in the east; the *second* is from 1250 to 1950 feet elevation in the middle; whilst the *third* is from 2200 or 2000 feet to 5000 feet above tide in the west. The easternmost or Manitoban steppe and tableland is in reality a concave basin between two rims: the western rim is a very palpable scarp from 360 to 400 feet high, which runs 300 to 400 miles north-north-west, from Pembina mountain on the United States frontier to the River Saskatchewan at a point between Fort La Corne and Cumberland House. The wooded heights of Pembina, Riding, Duck, and Thunder mountains, and Porcupine and Pasquia hills serve as successive towers, and countless hillocks serve as turrets to the scarps with the towers and turrets on the same level. This concave basin is divided into three tracts comprising lake, marsh, and dry land, which at one time were all one, as the lakes and marshes are relics of the past, and the dry land of to-day is the marsh of yesterday and the lake of the day before. *Lake Agassiz*, a Pleistocene lake of glacial origin, described and named by Professor Warren Upham, once filled the whole basin between rim and rim. The whole bottom was planed down and levelled so as to resemble flats, and the black silt left by the receding waters formed the most fertile soil in the world. These flats constitute the "first prairie steppe," and the contrast between the topography of old Canada and that of the Canadian prairies is as striking geologically as it is geographically. The geological contrast is superficial, for the lake mud is like a carpet, and immediately beneath is a rock floor of hard Ordovician, Silurian, or Devonian limestone in Manitoba and the west, not unlike that of the valley of the St. Lawrence and the southernmost peninsula of Ontario between the Great Lakes in nature, origin, and time of its formation. At times the underlying limestones crop out

above the general level of the country—rarely more than 14 feet high—as seen off and on for nearly 200 miles from Grassy Narrows in the south to Limestone Bay in the north, along the west side of Lakes Winnipeg, Manitoba, and Winnipegosis (the latter so graphically described by J. D. Rogers as a split shadow of Lake Winnipeg), together with their satellites, Lakes Dauphin, Red Deer, Swan, Waterhen, and St. Martin, are all connected like the great inland lakes of the St. Lawrence system, but very shallow and small in comparison—Lake Winnipeg, the deepest, being put down by Tyrrell as 96 feet deep. Nevertheless Lakes Winnipeg, Manitoba, and Winnipegosis, which are 710, 810, and 828 feet above the sea respectively, were once one vast lake filling the whole of the first prairie steppe, whose depth was at least as great as that of Lake Erie of to-day; but nowadays the Manitoba lakes are mere “*lagunes vives*.”

The Manitoba escarpment borders the lacustral plain on the west, rising from 800 to 1400 feet above the plain at its base. West of this escarpment comes the second prairie steppe, in which the relief is more strongly pronounced, the rivers often flowing in valleys which they have cut to a depth of several hundred feet, while many of the stony hills are rough and steep. The plateau constituting the second prairie steppe is underlain by soft shales and sandstones of Cretaceous age.

In the south and south-westerly portion of Manitoba, the prairie, with its even flatness, is in fact more apparent than real. From the city of Winnipeg (elevation 757 feet above the sea), along the Canadian Pacific Railway by way of La Salle, Morris, and Morden, to the summit rail on the same line near Manitou Station, about 100 miles distant, the elevation becomes 1625 feet, making a

rise of 868 feet. Further, along the original location of the same railway from East Selkirk to Kamloops, *via* Battleford and Edmonton, profile plans clearly show a decided gradient of an ascending order. From East Selkirk to Vandyke, for instance, through Manitoba *via* Logan and Thorwaldsen to Skalholt, there is steady rising from 744 feet to 1400 feet on the boundary between this province and Saskatchewan.

In southern Manitoba, the confluence of the Souris river with the Assiniboine takes place at an elevation of 1110 feet above tide, whilst at the "Elbow," Section 4, township 6, range xviii., west of Langvale, the elevation is about 1265 feet, and where the Souris crosses for the second time the international boundary line at longitude $101^{\circ} 57'$, the height of the prairie above the sea is 1650 feet, whilst the streams spanned by the Canadian Pacific Railway bridges near Alameda and Weyburn stations are 1711 and 1836 feet elevation respectively. Along the Qu'Appelle river, at the confluence of this stream with the Assiniboine, the bed of the former is 1262 feet above tide, whilst the height of land between Aiktow Brook and the Qu'Appelle is 1798 feet elevation. In north-eastern Manitoba the foot of the first or lowest limestone rapid on the Nelson river is about 90 miles above its mouth, at an elevation of only 50 feet above the waters of the bay, whilst the foot of "Broad rapid," 2 miles wide and full of bosses and ridges of Archæan gneiss formation, 111 to 116 miles from its mouth, is 125 feet above tide. Below Gull Lake 43 miles, the 12-foot chute is from 188 to 200 feet elevation, the lake itself being 420 feet altitude, and Split Lake, 440 feet; Sipiwesk Lake, 565 feet; Pipestone and Cross Lakes, 665 feet; whilst Sea-river Falls, 17 miles below Norway House, is 700-705 feet elevation, and

Great and Little Playgreen Lakes, as well as Lake Winnipeg, are 710 feet above tide.

In the northern or Archaean portion of the province there is a gradual but decided slope eastward from the Saskatchewan boundary and Reindeer Lake region (1150 feet elevation). Down to the bay the streams flow swiftly round and over the rugged masses of granitic and gneissoid rocks to form rapids, cascades, and falls, then fill numerous basins as lake expansions—whilst the streams of southern Manitoba discharge their waters, first, radially into the central basin of the greater lakes, and these in turn discharge their waters by way of Playgreen Lake and East and West rivers, surrounding the inland island of Ross northward to Pipestone and Sipiwesk Lakes, and finally into the Nelson River and Hudson Bay in a general north-easterly direction.

The highest land in Manitoba is to be found in the Porcupine mountains, about latitude $52^{\circ} 30'$, and longitude $101^{\circ} 10'$, where the summit is 2500 feet above the sea.

Hydrography

Drainage.—All Manitoba belongs to the Hudson Bay or Atlantic drainage system, and south of the Churchill river basin practically all the drainage of the province reaches the sea by the subsidiary basin of Lake Winnipeg. The three great lakes of the province, with their aggregate area of over 13,000 square miles, are the reservoirs for this drainage. The drainage of the extreme south-east reaches Hudson Bay by way of the Lake of the Woods and through the Winnipeg river, which flows into the lake of the same name at Fort Alexander near its southern extremity. Southern and south-western Manitoba are drained by the Red river and the Assini-

boine, its principal tributary, whose united waters and those of their branches flow into Lake Winnipeg by the several mouths of a delta below Netley Lake. Lake Winnipeg itself is drained into Hudson Bay, and eventually into the Atlantic Ocean by the Nelson river. The streams and lakes of northern Manitoba, including the Owl, Churchill, Etawney, Seal, and Egg rivers, and their affluents, drain directly into the bay from the west, the Churchill receiving the waters of Wollaston Lake (1300 feet elevation) in Saskatchewan, and of Reindeer Lake (1150 feet elevation) partly in Saskatchewan and partly in Manitoba.

Rivers.—In early days the rivers were the main arteries of trade and travel, but they have been in recent years supplanted by railways. Especially is this the case in the province of Manitoba and its sister provinces to the west, where the boundless prairie offers so few obstacles, save in the coulées or valleys carved by the streams themselves. The rivers of Manitoba are for the most part young rivers, that is to say, their beds have been carved out during comparatively recent times geologically speaking. The fact that they overflow their banks readily in springtime, and are linked with lakes and lake basins before they reach the sea, with falls and cataracts and smooth waters alternating, are as many indications of youth on their part. The Churchill and Nelson are the principal rivers of Manitoba. The Churchill river, known also by the names of English river and Missinipi river, is an important stream about 1100 miles long. Its head waters are very close to affluents of the Saskatchewan and Athabaska. Beaver Lake, one of the sources of the Beaver river, a main tributary of the Churchill, is within a few miles of Lake la Biche, which discharges into the Athabaska, and the

South Beaver river rises within 40 miles of Edmonton, and close to the White Earth river, falling into the Saskatchewan. The Churchill was the main highway of the fur-trading companies to the North-west, and from Fort Cumberland on the Lower Saskatchewan, near the present Manitoba frontier, the brigades of canoes went up the Goose river to Frog portage, only 380 yards across, to the main Churchill. From there the route followed



VIEW DOWN GREAT CHURCHILL RIVER.

Showing spruce timber near the mouth.

the Churchill up to its source in Methye Lake, and passed over into the Clearwater river which falls into the Athabaska below the Grand Rapids. This key-point of the Far West is $12\frac{1}{4}$ miles across, and is known as "the long portage," "Methye portage," or "Portage la Loche." References to it are met with continually in all books of North-West travel. Owing to the fact that the Churchill is also the main canoe route to the Mackenzie valley, the Churchill has been described by nearly all the great North-West travellers, Sir Alexander Mackenzie, Sir John Franklin, Sir John Richardson, and Sir George Back, but beyond the chief portage routes the country is very little

known. The Churchill enters the province from the west about the 56th parallel of latitude, and flows in a general north-easterly direction for upwards of 400 miles into Hudson Bay by way of Loon, Pukkatawagan, Nelson, Granville, South Indian, North Indian, and Churchill Lakes. It enters the waters of the bay between Cape Merry and Cape Eskimo at the entrance to Churchill Harbour. The Churchill flows for the most part over



Photo: Earl Grey's Trip.

NELSON RIVER: FIRST PORTAGE, SEA RIVER FALLS.

rugged Archæan formations, and is marked by many falls, cascades, and rapids, besides numerous lake expansions; the last 100 miles of the stream is over flat-lying rock formations of Ordovician age, and is less boisterous and rapid. There are numerous areas throughout the valley of the Churchill where sand, gravel, and sandy clay deposits occur which afford several tracts of arable land. Forest trees varying from 4 to 14 inches in diameter occur on the lower Churchill. Reindeer river is one of the chief tributaries of the Churchill, from the north.

The ultimate source of the Reindeer is Wollaston Lake—a beautifully clear body of water, 800 square miles in extent, discharging by two outlets—to the north by the Stone river into the extreme arm of Lake Athabaska, and to the south-east by the Cochrane river into Reindeer Lake, a large lake 135 miles long. This lake discharges into the Churchill by the Reindeer river, and a good



GREAT DYKE, CHAIN OF ROCK RAPIDS, NELSON RIVER.

canoe route to Lake Athabaska passes that way. From Black Lake at the northern end of this route there is a portage leading to the Dubawnt river, and through the centre of the Barren Grounds to Hudson Bay.

The Nelson river is the most important of the province. It is not 250 miles in length, yet it carries along its course the waters of the North and of the South Saskatchewan, the waters of the Red river of the north, and of the Assiniboine, the waters of the Winnipeg river and its drainage basin, thus extending its influence not only west to the Rocky Mountains, but also south into

the United States. Three-fifths of its course is over Archean rock-formations — in a comparatively level country where accumulations of sands, clays, and gravels have covered the granitic masses with a mantle which affords excellent soil for the cultivation of wheat and other cereals, and vast areas of forest growth comprising coniferous and deciduous trees varying in diameter from 4 to 18 inches, and near the basin of Lake Winnipeg,



Dr. Bell, Photo.

LOOKING DOWN RED RIVER, NEAR LOWER FORT GARRY.

north of Norway House, reaching 36 inches in diameter. The effect of the tide on the Nelson river extends to Gillam or Lower Seal Island, which is about 20 miles from Hudson Bay. Spring tides on the west coast of Hudson Bay are quite uniformly 11 to 12 feet, being greater than on the east coast. They are highest at the mouth of the Nelson river, amounting there to about 15 feet.

The Red river of the north is the best known river of the province, and one of the most important streams.

It flows from its source in the state of Minnesota directly north across the 49th parallel at Pembina, and, after a course of 100 miles in Canadian territory, falls into Lake Winnipeg. The river is very tortuous and winds through a bed which it has cut in stiff clay, 30 to 40 feet below the level prairie. For 50 miles from the frontier the banks are wooded. The city of Winnipeg is situated at the junction of its chief affluent, the Assiniboine. The Red river is navigable for steamers from Winnipeg up to Fargo in the United States, a distance of about 220 miles. On this river the St. Andrew's lock and dam, 15 miles north of Winnipeg, afford communication between Winnipeg and Lake Winnipeg. Its total length is 700 miles, its course being due north, and in early spring the water is released at its sources before the ice has given way at its mouth. The Assiniboine has a general west-to-east trend, like many other rivers of the great interior plain of Central Canada. One general characteristic distinguishing prairie rivers from those of Eastern Canada, is that they do not flow nearly level with their banks, but have cut through the softer materials of the western plains deep and broad valleys, often two miles wide, at the bottom of which they wind from side to side in their tortuous courses. There is often a descent of several hundred feet to the levels of the streams, and the great plain is graven with such river furrows; so that travellers are surprised by coming suddenly upon a river flowing at the bottom of one of these steep-sided valleys (*coulées*), where at a little distance the prairie seemed to be a continuous surface.

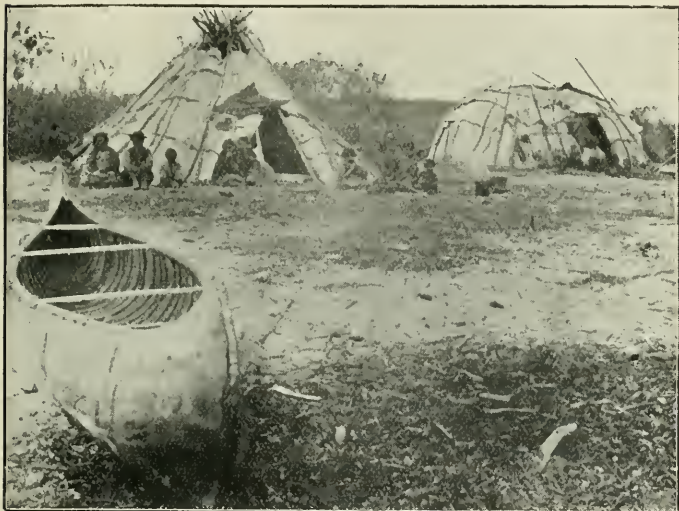
The Souris river enters the Assiniboine at Milford, and flows along the edge of the Missouri Côteau into the United States, then re-crossing the boundary it passes through a fine farming country to join the Assiniboine.

The Saskatchewan river enters Manitoba from the west between Cumberland House and The Pas about latitude 54° north. The Sipanok Channel connects the great stream with the Carrot river which also enters Manitoba from the west, but falls into the Saskatchewan at The Pas. Lake Saskeram lies between the forks made by the Saskatchewan and Carrot rivers just west of The Pas. The Saskatchewan then flows sluggishly in a south-easterly direction into Cedar lake, other branches and channels flowing into other lakes hard by, and forming part of the Manitoban lake chain, and Cedar lake waters with the Saskatchewan river waters connect eastward with Cross lake and Grand Rapids, then fall into Lake Winnipeg at the Hudson Bay Company's post of Grand Rapids.

The Roseau, Seine, Rat, and Cook rivers are feeders of the Red river from the south and east, whilst the Brokenhead drains directly into Lake Winnipeg through a small basin of its own lying between the basin of the Red river and that of the Winnipeg river. The Whitemouth and Boggy rivers are branches of the Winnipeg river from the south. The Shell river flows south from a small lake on the Duck mountains into the Assiniboine, and the Valley river flows east into Lake Dauphin.

Throughout the settled and agricultural districts of the province water is obtainable from rivers, lakes, and wells for domestic and irrigation purposes. The Whitemouth and south-eastern section is watered by lakes, rivers, and wells varying in depth from 20 to 60 feet; in the vicinity of Portage la Prairie, lakes and streams, and wells from 15 to 50 feet, constitute the sources of water-supply, whilst in the municipalities of Morris, Grey, Dufferin, Macdonald, and neighbourhood, water is furnished from streams and wells, the latter varying in depth from 25 to

50 feet. In the Birtle, Minto, Grandview, Dauphin, and Swan river section, water is from clear, rapid streams and springs, with good wells at a depth of 25 feet. The rolling and well-drained land of Turtle Mountain, around Daly, Sifton, and Whitewater is watered by creeks, and wells averaging 28 feet afford water-supply.



INDIANS CAMPED AT JACK FISH RIVER. LAKE WINNIPEG.

Lakes.—The drainage of the Saskatchewan and plains area is collected, preparatory to being discharged by the Nelson river into Hudson Bay, by a remarkable group of large, irregularly-shaped lakes—the deeper basins of the great lake of the Pleistocene age before referred to. Lake Winnipeg, the largest of the group, is 260 miles long, and its breadth varies from 5 to 65 miles. Its area is 9400 square miles, and its depth varies from 42 to 90 feet. The Red river flows in at the south, and at the north-

west corner all the water collected by the Saskatchewan in its double course from the Rocky Mountains pours over the Grand Rapids from Cedar lake into this great reservoir. It receives many tributaries from the Laurentian country on the east, and in the south-east corner the Winnipeg river, a turbulent stream, discharges all the water collected by Lonely lake and Lake of the Woods in the rough wilderness of lakes and streams bordering on the west and north shores of Lake Superior. The overflow of Lake Winnipeg is by a very narrow channel at the north-east corner, near Norway House; and, after passing through many lakes, the water shapes itself into the sea-like flood of the great Nelson river. The coast at the south is very marshy—the delta of the Red river is a reedy wilderness—but it is nowhere high, neither on the Laurentian or east side, nor on the west or Silurian side. Lake Winnipeg in a storm, when the wind blows up or down the lake, is a very serious piece of water, and the best course is to find shelter as soon as possible. The height of the lake is only 710 feet above the sea.

Lake Manitoba has given its name to the province. It is 122 miles long and from 5 to 24 miles wide, and it covers an area of 1850 square miles. It is a shallow lake with low shores, and the coast at the south is very swampy. It is 810 feet above the sea, and is connected with Lake Winnipeg by the Dauphin river and through St. Martin's lake. Manitoba is the Cree name for the narrows, and the name originally signifying "spirit narrows" has been extended to the whole lake and to the province.

North of Lake Manitoba is Lake Winnipegosis, of very irregular shape, covering an area of 2080 square miles. It is 130 miles long and, in many places, 27

miles wide, and is 828 feet above the sea. It is fed by many small streams from the west and by the overflow of Lake Dauphin (840 feet) through Mossy river. The outlet of this lake is into Lake Manitoba, by the very indirect way of Waterhen river through Waterhen lake, and is not apparent on the first glance at the map. The total area of this group of lakes is 13,500 square miles.



SITE OF FORT DAUPHIN, LAKE WINNIPEGOSIS.

Many smaller lakes occur in the prairie region of the province, some of which have no outlet, and the inflow is balanced by evaporation. These lakes are necessarily saline, and are readily recognised by the mineral salts deposited in greater or less quantity along their margins, as well as by the character of the flora surrounding them, producing brilliant effects of coloration.

The following are the principal lakes of Manitoba, their size and elevation above the sea being given in the subjoined table, whenever obtainable:—

Lakes.	Area.	Elevation.
	Square miles.	Feet.
Winnipeg	9460	710
Winnipegosis	2086	828
Manitoba	1775	810
Dauphin	196	860
St. Martin	125	795
Swan	121	855
Shoal	102	856
Waterhen	76	822
Lake of the Woods . . . . .	...	1057
Ebb and Flow	39	810

Other lakes in southern Manitoba are: Whitemouth, Whitewater, Oak, Clear, Inland, Dog, Manigotagan, Lac du Bonnet, whilst the chief lakes of Northern Manitoba, north of the old northern boundary of the province, are the following:—

Lakes.	Altitude.	Lakes.	Altitude.
Reindeer	1150 feet	Wekusko	800 feet
Island	900 ,,	Moose	846 ,,
Athapapuskow	935 ,,	Cedar	828 ,,
Setting	685 ,,	Namew	870 ,,
Paint	560 ,,	Split	440 ,,
Wintering	530 ,,	Sipiwesk	565 ,,

Other lakes in Northern Manitoba include—Kississing, Cranberry, Molson, Playgreen, Oxford, God's, Pipestone, Reed, Saskeram, Nelson, Granville, South Indian, North Indian, Reindeer, Churchill; and the following in the northernmost parts of the province—Etauwney, Big, Sabatjay, Geillini, Todatara, Kazanjerri, Nueltin, and Du Brochet.

Elisée Reclus regarded the lakes of Manitoba as shallow remnants of an ancient inland sea, whose very existence to-day depended upon the fact that the compact rocks below them will not allow the water to flow away into the depths below, but retain it as though each were

still a natural lake basin. The moisture which falls from the atmosphere, he thought, was retained in these depressions as evaporation does not take place rapidly, and the slopes towards the sea are not sufficiently inclined for the tributary rivers to pour down into Hudson Bay all their surplus waters. Geographically, these lakes are part of the western members of the Great Lakes system of Canada, part of that chain of vast inland seas which border the southern margin of the great Archæan shield, in whose immense northern basin lie the waters of Hudson Bay. Geologically, they are all that remain of the extensive glacial lake *Agassiz*, which geologists claim to have had an area of not less than 110,000 square miles. They are likewise a northern expansion of the Mississippi system of waters with which on the east (south of the Lake of the Woods) and on the west, near the Cypress Hills, there is still connection by muskegs and marshy streams. Great deposits of alluvium have increased the shallowness, and the valleys of the Red river and of the Assiniboine are entirely lacustrine formations, and these sediments were held by Dr. George M. Dawson to "constitute the richest wheat lands of Manitoba."

Climate. — Meteorological conditions obtaining in Manitoba indicate a comparatively dry, clear, and salubrious climate. A high percentage of possible sunshine hours during the spring and summer months of the year, a large number of days with temperatures above 50° (Fahr.), namely, 200 days; and above 70° (Fahr.), 100 days; together with a clear dry cold in the severe winter season, lasting rarely more than three or four months; with a comparatively limited snowfall, and an annual precipitation of moisture averaging about 21 inches, combine to produce a vigorous and bracing condition of

the atmosphere. The spring months are most invigorating, and the deep frost of the previous season, escaping from the ground, assures sufficient moisture for the vegetation until the June rains begin. Seeding usually begins the first week in April, and the summer season is of ample length and warmth to ripen the crops of wheat, oats, barley, rye, flax, besides garden and orchard products.

The mean annual temperature (Fahrenheit), and the average annual precipitation of moisture (in inches), for different points in the province are as follows:—

Station.	Mean Annual Temperature.	Average Annual Precipitation.
	Fahr.	Inches.
Winnipeg . . .	34°·9	22
Emerson . . .	32°·7	22
Hillview . . .	32°·7	22
Brandon . . .	33°·9	17
Elkhorn . . .	33°·7	17
Portage la Prairie . .	35°·2	17
Minnedosa . . .	34°·1	15
Aweme . . .	34°·8	17

Geology

General.—The nature, origin, mode of deposition, succession, as well as present distribution and extent of the rock formations of Manitoba would form a worthy theme for a compendium. In it the past history and geography of that portion of the North American continent and its resources would be recorded, and the numerous phases and conditions which characterised the different epochs represented, together with their influence upon the present face of Manitoba, would reveal important and practical facts. The principal features and salient characteristics of Manitoban geology are divisible into

five distinct parts, based upon the structure, age, and origin of the materials met with. These five divisions correspond to as many systems recognised in other parts of the world, and include: (1) the Archæan, (2) the Palæozoic, (3) the Mesozoic, (4) the Tertiary, and (5) the Quaternary. Certain phases of these systems are represented in Manitoba, and, although the geological column is incomplete, it is sufficiently filled and important to afford abundant material for study, for valuable monographs and reports for many generations to come. A rough estimate made of the areas covered by the various geological systems represented in a geological map of the province would show that the Archæan rocks, or most ancient crystalline crust of the earth, cover an area of some 144,000 square miles; the Palæozoic formations of south-western Manitoba have an area of 51,000 square miles, whilst formations of the same age in the Hudson Bay basin cover 30,600 square miles, making in all 81,600 square miles of Palæozoics. The Mesozoic formations have an area of 26,000 square miles, whilst the Tertiary (Laramie) outlier in southernmost Manitoba is only 500 square miles in extent. It must not be forgotten, however, that the Archæan rocks of the province are truly co-extensive with its area, namely, 251,831 square miles, and the Palæozoic formations of south-western Manitoba are not less than 77,000 square miles in area, although 26,000 square miles of their surface is covered by thick deposits of Cretaceous (Mesozoic). As for the Quaternary deposits, the sands, gravels, clays, silts, and similar deposits, constituting the soil on which the agricultural and forestry products of the province depend, they cover at least 225,000 square miles, and form a most valuable asset from every view point.

At the eastern edge of Manitoba, from the 49th parallel, and extending north-westerly, appears the old Archæan plain, on which, to the south-westward, are laid successive beds of Palæozoic limestones and associated strata, and these are in turn covered by heavy deposits of shales and sandstones mainly of Cretaceous age, whilst remnants of Tertiary deposits are found superimposed on the Cretaceous-Mesozoic plateau. The Palæozoic rocks, which disappear under the great mass of shales along its eastern edge, reappear in the Rocky Mountains by faulting, and their load of softer rocks is there almost completely removed, leaving traces only of the lower members in some of the valleys. The Ordovician, Silurian, and Devonian limestones of Manitoba rest unconformably on the Archæan floor and complex, and consist mainly of calcareous and dolomitic beds that are flat-lying and form inconspicuous topographic features. The Mesozoic section is, like the Palæozoic, incomplete in Manitoba, the upper members of the Cretaceous System alone being present, whilst the succession of the Rocky Mountain region is far more complete for both systems.

Archæan.—The crystalline rocks constituting the most ancient formations of the province cover more than one-half of its whole area, and form the floor upon which the stratified portions of the local crust of the earth rest. They extend from the 49th parallel and Lake of the Woods region in southernmost Manitoba to the extreme northerly limits of the province, beyond the valley of the Churchill, and are estimated to cover an area of 144,000 square miles. The strip of Archæan rocks in southern Manitoba is comparatively narrow at the international boundary, but widens gradually northwards to latitude $55^{\circ} 30'$, where these rocks attain a breadth of fully 460 miles, their total length being 750

miles. They consist of at least two distinct series ascribed, (1) to the *Laurentian*, and (2) to the *Huronian* systems in geology, and are part and parcel of that great V-shaped protaxis of primitive rocks, or "Shield" of Suess, having a general structure or folding, and banding with a decided north-east and south-west trend. They constitute a very ancient peneplain with broad and gradually sloping margins, forming a geo-anticline, upon both limbs of which (in the Port Nelson district and lake region of the province) newer formations rest unconformably. The Laurentian gneisses and granitoid masses are associated in the Archæan complex with Huronian eruptives and metamorphic rocks, whose relations and extent have been determined in but few localities within the province. The Huronian (the metalliferous rocks of Ontario and Quebec) system of Manitoba is represented in several areas of the Archæan, and has a general north-east and south-west trend, as if the rocks had been subjected to pressures from the south-east and north-west. The most southerly outcrop of the Huronian in the province is in the Lake of the Woods region, round the shores of Shoal lake. A small area also occurs in the Archæan north of Fort Alexander, near the southern extremity of Lake Winnipeg. These two areas were the only Huronian of old Manitoba previous to the extension of its boundaries in 1912. Three distinct areas occur on Island lake close to the Ontario boundary; several small outliers of the same metamorphic series were recognised round the shores of God's lake; whilst an extensive though narrow belt of Huronian rocks occur on Knee and Oxford lakes along the head-waters of the Hayes river, both above and below Oxford House, which belt extends westerly as far as Cross lake, where a small area occurs on the north-east arm of this lake. Another out-

lier of these rocks occurs south of the Burntwood river, half-way between Nelson House and Sipiwesk lake, with a decided north-east and south-west trend. To the south-west of this area are four distinct outliers of Huronian formations cropping out from beneath the Ordovician sedimentaries in that area lying between Grass river and the Saskatchewan frontier, around the shores of Athapapuskow, Cranberry, Reed, and Wekusko lakes. Detailed examination of the Manitoba Archæan will no doubt reveal a larger number of *Huronian*, and possibly also *Keewatin* areas, which may prove to bear gold, silver, copper, nickel, iron, and other useful or precious metals.

Ordovician.—The oldest series of Palæozoic sediments covering the Archæan crystalline rocks of Manitoba, so far recognised, consist of sandstones, limestones, and shales of Ordovician age, best developed, seen, and studied in the Lake Winnipeg and Hudson Bay basins. The Ordovician of the Lake Winnipeg basin comprises at least *five* distinct geological formations, forming a zone or belt extending north-west and south-east from the extremities of this lake. These formations include: (1) the Winnipeg sandstones, constituting the first Eparchæan formation in this portion of the Dominion; (2) the Lower Mottled limestone; (3) the *Cat Head* limestones; (4) the Upper Mottled limestones, characterised by *Maclurea Manitobensis* (Galena-Trenton group); (5) the Richmond shales and calcareous strata (“Hudson river group” of some geologists). The Ordovician of southern Manitoba varies in breadth from 40 to 50 and even 60 miles, stretching from the 49th parallel in a general north-westerly trend to the Saskatchewan boundary near The Pas and Lake Athapapuskow. These formations formerly extended eastward far beyond the basin of Lake Winnipeg, and covered a large area of the Archæan of central and

northern Manitoba, whilst westerly they extend beneath the newer overlying Silurian, Devonian, and Cretaceous strata of the province, not only within its limits, but also beyond in Saskatchewan.

In the Hudson Bay basin Ordovician strata are well developed, and constitute the most extensive series of Palæozoic sediments in this north-eastern portion of the province, occupying nearly two-thirds (20,000 square



RUNNING RAPIDS ON HAYES RIVER.

miles) of their area. They form a crescent-shaped zone of fossiliferous strata (limestones for the most part), 35 or 40 miles broad in its northernmost outcrop on the bay near Cape Churchill, and extend southward to the Nelson river, 20 miles east of Split lake, where the zone is 75 miles across, then eastward to the Ontario boundary where its breadth is greatest. The Ordovician of this basin is best seen along the valley of the lower Churchill, on the head-waters of the Owl river, and along portions of the valleys of the Nelson and Hayes rivers, also in the lower reaches of the Shamattawa river and its branches above

its junction with the Hayes river. The limestones of the Ordovician of southern Manitoba afford excellent building stone, much of which has been utilised in Winnipeg and other cities of this and adjacent provinces. The Stony Mountain Ordovician is Richmond in age, recalling in its *facies* strata of the same age in Lake Huron (Manitoulin Islands) and the St. Lawrence Valley (Anticosti Island). There appears to be a series of faults affecting the strata of Manitoba in the Stony Mountain district, resulting in block-faulting and associated phenomena.

Cambrian strata have been detected by Mr. Tyrrell in a strip of land between Cape Churchill and Fort Churchill, and further research may prove the presence of various hitherto unrecorded areas throughout the province.

Silurian.—The Silurian system of Manitoba is represented in the south-western part of the province by a series of sediments consisting for the most part of compact, thin-bedded dolomites and argillaceous limestones, lying beneath Devonian formations to the west, and overlying the Ordovician strata just described. They form a zone from 25 to 75 miles broad, lying west of the Ordovician area, stretching in a north-westerly direction from the international boundary at Emerson to Lake St. Martin, Cedar lake, Pas, and Lake Saskeram on the Saskatchewan frontier, which province it enters, but disappears beneath the newer overlapping Cretaceous strata. *Pentamerus decussatus*, Whiteaves, is eminently characteristic of the Manitoban phase of the Silurian, which may be correlated with the *Elkwan* formation of the district of Patricia in Ontario, or with the Niagara formation of the Niagara district of Southern Ontario and Northern New York State.

Devonian.—The newest Palæozoic sediments and rock

formations of the province belong to two distinct horizons of Devonian age, and a third ill-defined one at their base. From deep-well records in the Carman district of southern Manitoba north of the 49th parallel, and from outcrops of rocks of this system in the Lake Manitoba and Lake Winnipegosis districts as far north as Chemahawin, and north-west of this post to the Saskatchewan frontier in latitude 54° , the Devonian is recognised and divided into three parts: (1) An Eo-Devonian series, characterised by red shales and mudstones requiring further study and investigation. (2) A Meso-Devonian horizon, the *Winnipegosan* formation consisting of hard, compact, light-yellowish coloured dolomites, with *Stringocephalus Burtini* present. (3) Neo-Devonian strata, constituting the *Manitoban* formation, made up of light grey, hard, brittle limestones, underlaid by red argillites, together with red and grey shale—the uppermost members of the system.

Mesozoic.—Between the highest Devonian strata just described and the base of the next series of overlying sediments in Manitoba, there is a great gap marking a long interval of time, during which formations appertaining to at least *four* geological systems were laid down in other parts of Canada. This interval comprises (1) the Carboniferous period, when the productive coal-measures of Nova Scotia, New Brunswick, and Pennsylvania were deposited in Eastern North America; (2) and where the Permian, (3) the Triassic, and (4) the Jurassic periods of northern, western, and eastern Canada marked various phases of marine, estuarine, and continental conditions prevailing and succeeding one another as earth-movements, oceanic currents, and other physical agents produced. As in Ontario, there are no Carboniferous strata known in Manitoba; but above the highest

Devonian known, the great unconformity is followed by four geological formations of Cretaceous age. These are: (1) the *Dakota*, made up of soft, white, or light-grey sandstone often calcareous; (2) the *Benton*, consisting of a non-calcareous clay shale; (3) the *Niobrara* formation, with its calcareous clay shales and chalky limestone holding foraminifera; (4) the *Pierre* terrane, consisting of two distinct horizons—the *Millwood* and the *Odanah* formations of Tyrrell. It is on the Duck and Porcupine Mountains of Manitoba that the *Millwood* formation, with its light and dark grey or brown, soft, friable or brittle shales and limestones holding numerous radiolaria, is well developed. The *Odanah* formation consisting of light-grey, finely laminated shales and clays, are best seen on Shoal lake, at Deloraine, also along the valley of the Assiniboine, constitutes the uppermost member of the Cretaceous system in the eastern portion of the great plains or Interior Continental Plateau. The most easterly extension of the Cretaceous of Manitoba is at Gretna, along the 49th parallel, and in longitude $97^{\circ} 30'$ west.

Tertiary.—Overlying the newest Cretaceous of southernmost Manitoba, there occurs a series of sandstones, shales, and associated strata in the Turtle mountain and Souris river district, referred by some geologists to the “Laramie” terrane, and carrying *lignite coal*. The rocks hold an extinct flora of angiospermous and coniferous plants, and their extent covers an area of some 500 square miles, the outlier as developed in Manitoba being 50 miles long, 18 miles broad, and plano-circular in outline. Dowling has estimated that 200,000,000 tons of lignite are available in this field.

Quaternary.—According to Dr. George Dawson and Mr. Tyrrell, the Quaternary rocks of the prairie region

generally consist of (*a*) quartzite shingle and associated beds; (*b*) a lower boulder clay (glacial); (*c*) an interglacial deposit with peat; (*d*) an upper boulder clay (glacial); (*e*) stratified sands, gravels, and silts. The boulder clay consists of sand and clay firmly held together with a large percentage of quartzite and gneiss pebbles in the eastern portion, whilst sandstone pebbles become more numerous to the west, with fragments of lignite usually present. Ancient drainage systems, anterior to the present one, have been detected in many portions of the province and westward. In the Churchill river district Quaternary deposits include:—(1) Till, drumlins, moraines, kames, eskars, and ispatinows; (2) ancient shore lines; (3) sand plains; (4) recent lake beaches and flood plains of the present streams. It is not at all unlikely that marine sediments constitute part of the Quaternary formations of the prairie region of this and the sister provinces of Central Canada.

An enormous lake of glacial origin, called by Professor Upham "Glacial Lake Agassiz," larger than all the Great Lakes combined, once occupied the valley of the Red river of the North. The fine-grained sediment deposited on the bottom of this extinct lake has produced one of the most famous wheat regions of the globe in Manitoba and the great West. The surface of this region is so level and smooth that, after rain, water stands on the ground in sheets. It is not at all unlikely that among the stratified sands and gravels of the Quaternary system in the province, and possibly in the adjacent province of Saskatchewan, beneath the wheat-growing loam, there may be gold placer deposits of economic value.

Geological Resources.—The mineral resources of this province are still in their infancy. Gypsum was first mined in the province in 1901, when 600 tons were

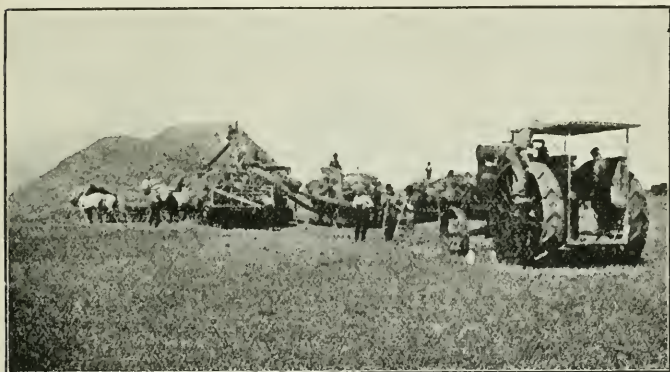
produced, valued at \$7800 dollars. Since 1908 the annual output has considerably increased, and in 1910 its value reached \$195,000. Besides gypsum, salt, as brines, occurs in several localities, and amber (chemahawinite), a fossil resin, in Cedar lake district, may prove remunerative. Lignite, from the Souris district and Turtle mountain area, has been mined for a generation, and from a study of the extent and distribution of its seams it appears that there are at least 200,000,000 tons within the Laramie basin in that part of Manitoba. Mineral springs also occur in the province and are being utilised.

The mineral production of Manitoba during 1912 and 1913 was \$2,463,074, and \$2,211,159, respectively, being 1.83 and 1.54 per cent. of the total production of the Dominion. The various geological or mineral products for 1909 and 1910 included the following:—

Product.	1909.		1910.	
	Quantity.	Value.	Quantity.	Value.
Gypsum . . . Tons	17,000	\$170,000	19,500	\$195,000
Clay . . . . .	...	559,008	...	781,605
Lime . . . Bushels	423,954	69,670	606,679	100,808
Cement . . Barrels	8,600	8,600	18,561	21,995
Sand-lime brick . .	6,400,000	54,200	7,817,785	331,672

The character of the country immediately north of Lakes Winnipeg and Winnipegosis has been carefully studied in recent years, and much valuable data obtained regarding its physical features and resources. The country about the shores of Atikameg, Reeder, Saskeram, Cedar, and Moose lakes, is generally level and limestone

formations prevail. Poplar, spruce, tamarack, and jack-pine occur, whilst potatoes, beans, corn, and ordinary garden vegetables are grown successfully. Along Cranberry lake, Reed lake, Cormorant, and Wekusko, as well as Kississing lakes, there is good timber, mostly spruce, also hay lands on clay loam soil; a burnt-over country extends along the western boundary, whilst east of these the southern portion of the "Clay Belt," com-



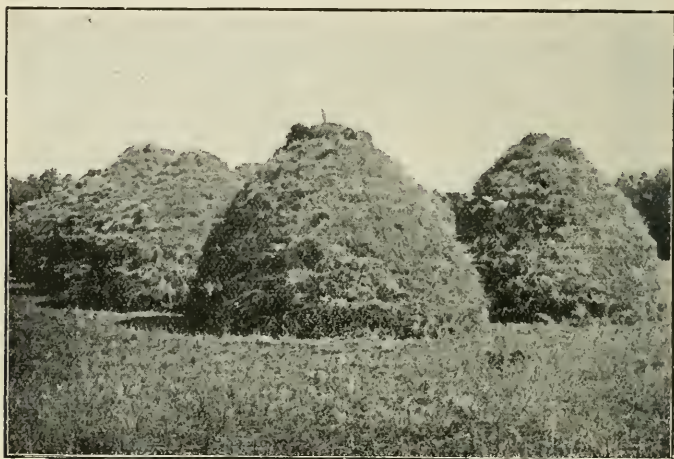
MODERN METHODS OF THRESHING IN MANITOBA.

prising 10,000 square miles of mineral formations, well-timbered areas, and generally level surface with varied forest, occurs, where wheat, barley, small fruits, garden vegetables, cucumbers, and melons are grown successfully. Many tracts of lands are suitable for cultivation.

Agriculture

Soil.—After its citizens, vigorous and healthy as the bracing climate of the province makes and keeps them, the soil of Manitoba is its best asset. It is for the most part a deep rich mould or loam, inexhaustible in its elements of

fertility and productiveness, especially in the centre belt of the southern part of the province. It is somewhat lighter in the extreme east and west on the higher levels. Though especially adapted for wheat growing—"Manitoba No. 1 hard wheat" being reputed by highest authorities to be second to none in the world—the soil of the province produces other field crops bountifully, as the



3500 BUSHELs WAITING FOR THE THRESHER, MANITOBA.

harvest returns for the past 35 years have shown. Summer rains are ample for the growth and ripening of the grain, whilst the summer sun shines clear and bright through a cloudless sky for a sufficient number of months, and during a high average number of possible hours per day during the growing season, to bring all crops, field and garden, to maturity.

It was estimated that there are 25,000,000 acres of land available for cultivation within the limits of Manitoba previous to the addition of territory in 1912.

In 1909 there were nearly 6,000,000 acres under crop, of which about 50 per cent was in wheat; whereas in 1881 there were only about 50,000 acres under crop.

Cereals.—In northern Manitoba wheat has been grown at Nelson House in latitude 56° , longitude 99° west; also at the Hudson Bay Company's post, Cross Lake; and at Norway House between 54° and 56° north latitude, and on the 98th meridian north of Lake Winnipeg.

The former yield of *one* acre of land was 27·86 bushels for wheat, 46·73 bushels for oats, 36·69 bushels for barley, but these averages have not been equalled of late years, though the aggregate of wheat production shows a satisfactory advance. Other important crops include rye, peas, flax, hay, potatoes, and turnips.

Dairy products in 1911 realised \$9,530,789, of which \$2,571,143 for butter, and \$321,361 for cheese. The number of milch cows in the province in 1910 was 164,746.

The fertility of the soil and agricultural capabilities of the province are too well known to be discussed at length.

The following table shows the acreage, production, and average yield, in bushels, per acre of wheat during eleven consecutive years in Manitoba:—

Year.	Acres.	Bushels.	Yield per Acre.
1901	2,011,835	50,502,035	25·10
1902	2,039,940	53,077,267	26·00
1903	2,442,873	40,116,878	16·42
1904	2,412,235	39,162,458	16·52
1905	2,643,588	53,761,416	21·07
1906	3,141,537	61,250,413	19·49
1907	2,789,553	39,688,266	14·22
1908	2,850,640	49,252,539	17·28
1909	2,642,111	45,774,707	17·33
1911	2,979,734	60,275,000	20·23
1912	2,653,100	58,899,000	22·20

In the last twenty-five years Manitoba has produced a grand total of 850,000,000 bushels of wheat.

The following table shows the total production of oats in Manitoba from 1901 to 1912 :—

Year.	Acres.	Bushels.	Yield per Acre.
1901	689,951	27,796,588	43·00
1902	725,060	34,478,160	47·50
1903	855,431	33,035,774	38·62
1904	943,574	36,289,979	38·80
1905	1,031,293	45,484,024	42·60
1906	1,155,961	50,692,977	43·85
1907	1,213,596	42,140,744	34·80
1908	1,216,632	44,686,043	36·80
1909	1,373,683	50,983,056	37·10
1911	1,260,736	57,893,000	45·90
1912	1,269,000	53,806,000	41·60

Fisheries.—“The fish fauna of Manitoba is not rich in variety of species or indeed of families,” writes Professor Prince. This is partly accounted for by the youth or infancy of the Manitoba lakes as compared with the Ontario Great Lakes system. Whereas the gar-pike (*Lepidosteus*) and the bowfin (*Amia*) abound in the eastern lake waters, they are both absent in this province. Of cartilaginous *ganoids* there are two sturgeons present, but they are no doubt migrants from the sea by northern or southern river channels or both. The tullibee (*Argyrosomus tullibee*), weighing from one to three pounds, is plentiful; whilst two species of the typical whitefish of Canada: *Coregonus clupeiformis*, the most valuable species, commercially speaking, and *Coregonus Labradoricus*, occur in Manitoba waters. The earliest fishery in the province was carried on by the aborigines for food for themselves and their dogs; later by the officers and men of the Hudson Bay Company

who depended upon fish food very largely, and since 1812, the date of Lord Selkirk's first colony of white settlers, a regular fishery had been pursued which has grown to enormous dimensions during the last thirty years. The commercial kinds of fish in the province include: (1) the unsurpassed lake whitefish (*Coregonus clupeiformis*), the pike-perch (*Stizostedion vitreum*), the sturgeon (*Acipenser*), and the pike or jack-fish (*Lucius*). The relative importance of the principal species may be judged from the following figures:—

Kinds of Fish.	1898.		1907-1908.	
	Pounds.	Value.	Pounds.	Value.
Whitefish	3,363,900	\$168,193	3,695,000	\$258,650
Pike-perch	1,343,000	53,721	3,995,000	239,700
Pike	639,973	6,399	2,321,000	81,235
Tullibee	359,410	3,594	1,380,000	48,300

The value of the fisheries of Manitoba for the year ending 31st March 1912 amounted to \$1,113,486, being \$189,293 less than the previous year.

Since the extension of the boundaries of Manitoba northward and north-eastward the value of the fisheries of the province have increased enormously. Trout, pike, and pickerel are caught in Reindeer lake and in the waters and tributaries of the Churchill river, including Granville and South Indian lakes. These three species also occur in the lakes and upper part of the streams south and east of the Churchill river as far as the northern frontier of the district of Patricia. The total area of the waters fished in the province previous to the addition of 1912 was not less than 20,000 square miles; the three largest lakes covering an area larger than the

Netherlands in extent. Other lakes: St. Martin, Dauphin, Shoal, Swan, and Waterhen, contribute their quota, ranging from 100 to 200 square miles, while Moose (552 square miles), Cedar (285 square miles), Playgreen, Island, God's, Atikameg, Saskeram, Kississing, Nelson, Granville, South Indian, Nelson, Du Brochet, Reindeer, Nueltin, Baralzom, Nejanitini, Etawney, Kazanjerri, Geillini, and many other waters, must now be included in the Manitoba fisheries. It is worthy of note that the Manitoba lakes are exclusively within Canadian territory, and are not shared, as the great lakes to the south-east, with another country. Hence, while Lake Superior is over three times the area of Lake Winnipeg, Huron twice and Erie about the same area, yet the superficial extent of the Canadian portion of these lakes does not exceed the total area of the Manitoba fishing grounds. The productiveness of these waters is proved by the fact that from 1890 to 1908 over 85,000,000 pounds of whitefish were shipped from Manitoba. There are at least 5000 persons more or less engaged in the fisheries, the actual number actively engaged being nearly 2000.

Unlike the fisheries of Ontario, Quebec, and the Maritime provinces, as well as British Columbia, the property and jurisdiction of Manitoba fisheries are solely in the hands of the Dominion Government, and hatcheries at Selkirk, Berens river, and Winnipegosis have been established for the planting of vast quantities of fry of whitefish and other valuable species each season as an aid of an effective kind.

Laws and regulations respecting the fisheries of the province, as imposed by the Federal Government, have been well kept and enforced when necessary, so that there is no danger of depleting the waters of Manitoba, and the prospects of increased production are good.

Professor Prince has listed 49 species of fish from southern Manitoba, appertaining to 14 distinct families. Manitoba fisheries for the year 1911-12 were valued at \$1,113,486, a slight decrease over the figures of the previous year. The Manitoba system of lakes, south of the Churchill river drainage basin, comprising all the greater lakes and lakelets which at one time formed part of the glacial lake Agassiz of geologists, is really the remnant of a northern expansion of the Missouri and Mississippi system with an outflow to the south. The presence of the *sturgeon* and of the *methy* or ling (*Lota maculosa*) indicates connection therewith, whilst none of the ancient freshwater types, such as the gar-pike, the bowfin, the great lake trout, the speckled char or brook trout, the lesser whitefish, the sea salmon, or the black-spotted trout (*Salmo Clarkii*) of Albertan waters, nor the "inconnu" of the Mackenzie, and various Arctic and Pacific salmon and trout, are present.

Forests.—The forest wealth of Manitoba has been dealt with incidentally in the chapter on the forests of the Dominion. With the exception of two treeless and prairie areas in southern Manitoba covering about 20,000 square miles, there is only one other section without trees, and that in the extreme north-eastern corner of the province, in the "barren lands" region traversed by the Thlewliaza, Egg, and Little Seal rivers, together with a narrow strip or zone along the bay, varying in breadth from 10 to 20 miles, as far south as the point where the 89th meridian intersects the south shore of the bay, comprising some 5000 square miles in area. The "Northern forest, not densely wooded," covers 30 per cent of the area of Manitoba; the "Northern forest, densely wooded," 50 per cent; and the "mixed prairie and woodlands," 10 per cent; whilst the treeless areas

cover the balance, or 10 per cent, or 25,000 square miles. There are six national parks and forest reserves in south-western Manitoba, and much encouragement is given to reforestation throughout the length and breadth of the province. Poplar, spruce, tamarack, and jackpine occur in the country between the Pasquia and Carrot rivers, and good spruce occupies the region about Overflowing river and the Cranberry Lakes district to the north, whilst birch, pine, aspen, larch, and balsam poplar occur in the clayey soil area north and west of Kississing lake. There is considerable timber and timberland along the route of the proposed Hudson Bay railway from The Pas to Split lake, and down the valley of the Nelson to Hudson Bay. Several areas have been burnt over and the timber destroyed; but merchantable spruce, aspen, tamarack, and balsam poplar occur along this highway, and its value will be greatly enhanced by the transportation facilities thus afforded. In the extreme east of Manitoba, from the 49th parallel northward, the province has a share of the typical forest which covers Central Ontario; and Manitoba can point to virgin forest with birch, spruce, and tamarack throughout the Archæan belt which runs northward and broadens as the newly added territory, or former northern boundary of the province, is reached. This area, and central as well as northern Manitoba, are the source of supply of much of the lumber used in the province.

There are forest areas also in the south-west on the Turtle Mountains and on the Brandon Hills; and the hills that mark the boundaries between the successive prairie steppes are unevenly wooded along their slopes. With a view of protecting the existing forests of the province, the Federal Government has established permanent forest rangers on the Beaver Hills and

Cooking Lake reserves, and forest nurseries on the Riding Mountains, Spruce Woods, and Turtle Mountain forest reserves. In 1909 the total distribution of trees for planting on farms in the prairie region of the west amounted to 13,751,825, of which there were 3,000,000 distributed during that year.

Wild Animals.—Before the appearance of white man the bison roamed in large herds all over the prairie country, affording the chief means of support for the native tribes. The bison is now almost extinct, but in the hills and forests of Manitoba, deer, moose, and antelope are found in considerable numbers; bears, wolves, lynxes, and other wild animals also occur there. On the lakes and ponds of the province wild ducks, geese, cranes, and other birds are plentiful, whilst the prairie is the home of large flocks of chickens.

Flora.—On the flora and fauna of northern Manitoba, and generally of the west coast of Hudson Bay, Mr. James M. Macoun, C.M.G., has made recent investigations, and finds no indications at Churchill of an arctic flora. Nor does the national herbarium at Ottawa contain any arctic species; on the contrary, the flora of Churchill is made up of plants found farther south,—the main difference between the flora of Churchill, in northernmost Manitoba, and that of York, in Ontario, being that fewer species are found at Churchill. Eskimo Point, Rankin Inlet, Daly Bay, Fullerton and Wager Inlet were visited. The Wager Inlet flora is essentially arctic, and at intermediate points between this locality and Churchill there was an intermingling of the arctic with the more southern flora. Macoun holds that there are no cold currents striking the west coast of Hudson Bay. The flora of the west coast changes from south to north, just as would be expected as higher latitudes are reached, whilst on the east coast

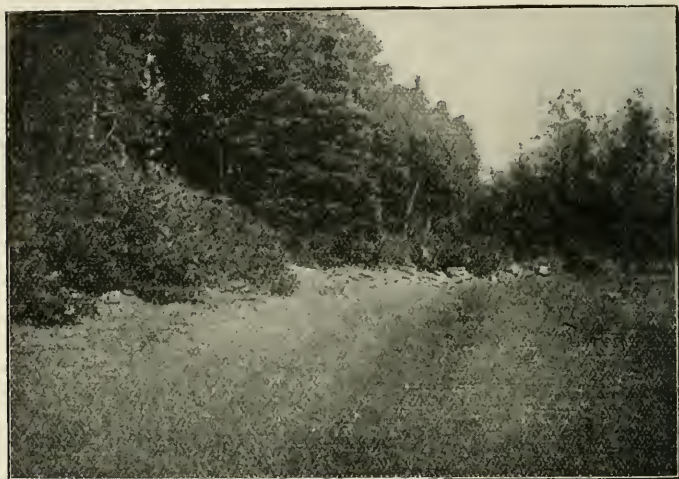
of Hudson Bay, "the flora indicates low summer temperatures as far south as James Bay." A considerable quantity of good spruce was observed on the Churchill river and its tributaries, also along Button Bay. Caribou proved to be very abundant, also wolves and deer. The Churchill river opened in mid-channel on June 11th 1910, and remained open until December 5th. The first boats from York Factory reached Churchill July 6. On November 24th, Macoun left Churchill for Split lake, and at that time the weather was still comparatively warm, and the Churchill river open.

Railways.—There is a total mileage of some 3608 miles of railway in Manitoba operated by the Canadian Pacific, Canadian Northern, and Grand Trunk Pacific as the main lines. Of these the Canadian Pacific was the pioneer railway which opened up not only this province, but the whole of the Great West of British America, and linked them firmly with the older established eastern provinces. Besides these lines the Government has undertaken the construction of the Hudson Bay railway from Pas to Port Nelson, where harbour facilities for traffic are being effectively and speedily constructed. A line of steamers from Montreal to Nelson and Fort Churchill is already established. The distance from Port Nelson to Liverpool is only 2966 miles, and as the Hudson Bay Company's ships have successfully navigated Hudson Bay and Strait for upwards of 200 years with only one casualty on record, it is confidently expected that the Hudson Bay route to British and other European as well as Canadian and other American ports will prove a success.

The Hudson Bay railway, in course of construction, will shorten the distance between Liverpool as well as northern Europe generally and the great fertile West of

Canada by upwards of 1000 miles. The country which this new highway of commerce will serve lies to the north-east of the lower Saskatchewan—extending from that river at Pas to Split lake, where the Nelson river approaches most closely the head-waters of the Little Churchill, having a general elevation of between 700 and 900 feet above tide. The railway will traverse (1) a more or less flat, well-watered tract underlaid by the horizontal dolomitic limestones of northern Manitoba; (2) an Archæan belt of somewhat broken and rugged country extending from the northern edge of the limestone escarpment northward and eastward until covered by the lacustrine sediments of the third or clay area; (3) a gently rolling clay-covered country from the valley of the Nelson northward towards the Churchill river—in general well suited for agriculture; (4) from Split lake by way of Onatawi river, Waskatowaka lake, Little Churchill river, Recluse lakes to the Great Churchill river, and thence on to Fort Churchill—or Churchill Harbour—on Hudson Bay, a country consisting of well-wooded alternating clay and rocky areas with fast flowing streams of enormous volume, and here and there peat and mossy swamps of undoubted value. The Nelson river, from Lake Winnipeg to Split lake, a distance of 225 miles, descends 270 feet between lake expansions, and has upwards of 12 falls yielding enormous water power. The volume of the river can best be appreciated by a consideration of the extent of its drainage area, as already pointed out, which embraces all the country westward to the Rocky Mountains, between the watershed of the Churchill and Athabaska on the north and the Missouri on the south, and eastward to the head-waters of the Albany river, and to within 50 miles of Lake Superior. In the Archæan portions, valuable forest

growth occurs in a country of attractive appearance, where lakes and rivers abound in marketable fish, whilst diversified here and there are small open tracts, where the grass-covered surface is free from trees, presenting park-like aspect. From the valley of the Nelson river westward to near Burntwood river and Wekusko lake, covering an



BEACH, CLEARWATER LAKE, MANITOBA.

area of about 10,000 square miles, there lies an extensive plateau of heavy clay soil and loam, the uppermost five to twelve inches of a deep brown colour owing to the admixture of rich vegetable matter. The climate of this region is decidedly favourable to the ripening of wheat and Indian corn, besides vegetables of many sorts, as the following table of summary of temperatures clearly indicates :—

Month.	6.30 A.M.	Noon.	6 P.M.	Mean Maximum.	Mean Minimum.	Maximum.	Minimum.	Monthly Mean.
July . .	58°·5	73°	72°	76°	53°	84°	40°	64°·5
August .	54°·5	70°	68°·5	75°	50°	91°	32°	63°·5
September .	48°·5	59°·5	57°·5	64°	44°·5	76°	26°	54°·3

The longer daily duration of sunlight in these high



LIMESTONE CLIFF, CORMORANT LAKE.

Grass River District, Manitoba.

latitudes must be taken into consideration, and for purposes of comparison with more southerly localities yearly averages of temperature are of no value. A region lying in a higher latitude, though showing a lower yearly average temperature, may, during the growing months, owing to its longer hours of sunshine, have quite as good an average. Atikameg, or Clearwater lake along with Cormorant and Reed lakes, are beautiful sheets of clear water, well stocked with fish, including

lake trout and whitefish, along the proposed line of the Hudson Bay railway. Atikameg itself, nearest to the Saskatchewan, is a sheet of quite colourless pellucid water, about $9\frac{1}{2}$ miles square, comprising 90 square miles.

The railway mileage already in operation affords excellent facilities for travel and commerce throughout the province, and the extension of lines goes hand in hand with the development of its agricultural areas. Elevators are built at all shipping points, and railroads or their branches are so numerous that but few farms are more than from 8 to 10 miles distant from a station.

There is excellent steamboat navigation on Lake Winnipeg from Grand Rapids to Winnipeg, a distance of 286 miles, including 30 miles along the Red river, with 8 feet draught at the St. Andrew's Locks. A meridian road, forming an international highway for motor cars, from Winnipeg to Emerson over Canadian territory, and from Emerson to the Gulf of Mexico over United States territory, has recently been opened and the Canadian portion inspected.

Manufactures.—The following table shows the records of Manitoban manufactures for the years 1900, 1905, and 1910, as taken in the years 1901, 1906, and 1911 respectively, according to returns of the fifth census of Canada, 1911:—

Year.	Establishments.	Capital.	Employees.	Salaries and Wages.	Value of Products.
	No.	\$	No.	\$	\$
1900	324	7,539,691	5,219	2,419,549	12,927,439
1905	354	27,517,297	10,333	5,909,791	28,155,732
1910	439	47,941,540	17,325	10,912,866	53,673,609

Population and Settlement.—The fashion in which settlement and population arrange themselves in a country or province the size of Manitoba depends upon the great tectonic lines and climatic zones prevailing. Given a favourable starting-point or centre like Winnipeg (selected with care and forethought as it was by officers of the Great Fur Company) in the great tectonic valley of the Red river, in the southern portion of the province, and close to the junction with the Assiniboine river, another tectonic feature, without let or hindrance in every direction of the compass, especially so towards the broad open west, population and settlement have flowed in and crystallised along north and south axes throughout the Red river valley, along east and west axes following the Assiniboine river, with Portage la Prairie and Brandon as secondary centres. Railway lines, constructed for the purpose of accommodating settlement and population, or assisting in opening the country to the settler and making it accessible, as laid down on the Dominion Railway Map, show the disposition of cities, towns, and villages of Manitoba, following the arteries of the province as represented by its life and activities in natural channels. Not less than 15 railway lines reach out radially from Winnipeg as a centre, not only directly north and south, along the valley of the Red river, but far out to the north-west, along the eastern flank of the Riding, Duck, and Porcupine Mountains, facing the tectonic chain of lakes (Manitoba, Dauphin, Winnipegosis, Swan, and Red Deer), the railway being constructed on the abandoned shore lines or ancient beaches of glacial *Lake Agassiz*, a leading tectonic feature of the country. Westwardly the railway lines fan out towards the Rocky Mountain base of the great wheat triangle of Central Canada, with its apex near the Lake of the Woods, and

population will continue to follow these lines and spread in a westerly and north-westerly direction.

The population of Manitoba in 1901 was 255,211 souls; according to the census returns of 1911 it was 455,614, or an increase of 200,403. Of the total population there were 255,240 living in the country, and 200,365 in cities, whilst in 1901 there were 70,473 in cities and 184,738 in the country. It will thus be seen that during the last decade there was a rural increase in population of 70,473, and an urban increase of 120,892. From 1871 to 1911, a period of forty years, Manitoba's population increased 430,386. The rate of increase in the population of the province for the past forty years was 1705·9 per cent. The rate of increase for the past decade was 78·52 per cent. In 1901, Manitoba, with its area of 73,731·72 square miles, had a population of 3·46 per square mile, and in 1911 it reached 6·18; but after the acquisition of new territory in 1912, with its present area of 251,831·72 square miles, Manitoba has a population of 1·80 per square mile only. According to the census of 1911 the population of the nine electoral districts of the province is as follows:—

Brandon	39,734	Provencher	27,950
Dauphin	44,000	Selkirk	40,693
Lisgar	23,501	Souris	29,049
Macdonald	35,841	Winnipeg City	128,157
Portage la Prairie	33,598		

The oldest settlement in the province is that of the Selkirk colony of 1812, made up for the most part of Scotch folk who settled on both sides of the Red river of the north below the Hudson Bay Company's post, Fort Garry, where the city of Winnipeg now flourishes. This colony remained under the protection, care, and regulations of the Great Fur Company until 1870, when the whole

western country, excepting British Columbia (which was already an independent colony), passed under the control of the Dominion by purchase.

Manitoba is a province of the Dominion organised in the manner of the other provinces, with a lieutenant-governor appointed by the Federal Government and a legislative assembly elected by the people. There is no second chamber, and the executive power is in a council of five ministers responsible to and having the confidence of the legislature. The assembly consists of 41 members elected by residents domiciled for six months and over. The aborigines, "Indians," are excepted if in receipt of annuity or treaty money, and all officials of the Dominion Government receiving salaries of more than \$350. If their salaries are less they are presumed to be qualified to vote at provincial elections.

The province is represented in the Dominion Parliament by seven members of the House of Commons and three Senators.

Law and Order.—The transfer of the Indian territories and Rupert's Land, containing large numbers of Indians threw upon the Government of Canada the responsibility of keeping the King's peace over the enormous area between lat. 49° and the uttermost North. The scattered traders of the Great Fur Company had lived and traded in peace, but when the country was opened to settlement, the same internecine struggle would have begun between the red and white races which had caused so much injustice and consequent bloodshed south of the line. To prevent this the North-West Mounted Police was organised, now a body of 1000 men armed like troopers to act together, and clothed by statute with the power to act individually as constables. The officers were entrusted with full authority as magistrates, and, in that way, law and order

were enforced over these immense regions. At the time of the transfer the North-West was being overrun by lawless traders, who, presuming on the waning power of the Hudson Bay Company, had commenced the corruption and destruction of the Indians by the sale of spirituous liquors. They were organised under a commissioner, superintendents, and inspectors, so as always to keep in view their civil functions; but they wore the scarlet uniform which the wild Indian had always associated with fair-play and justice.

Cities, Towns, etc.—Winnipeg is the capital city of the province of Manitoba, the residence of the Lieutenant-Governor, the seat of the Legislative Assembly, and the administrative centre for the various departments of the provincial government. It is situated on the "First Prairie Steppe," in the great and fertile valley of the Red river, which is made up of the bottom land derived from the sediments of *Lake Agassiz*, mentioned previously, a lake with a great ice dam or barrier on one side which allowed detrital matter and fine silts to accumulate that now form part of the great plains, region-plains which in Manitoba and in the vicinity of Winnipeg have unequalled fertility. The location of Winnipeg is fundamentally and geologically correct, the rock formations having contributed their share of wealth in the natural resources underlying and surrounding the capital city of the province. At the confluence of the Red river and the Assiniboine, some 60 miles from the United States boundary line, with the best of railway communications north, south, east, and west, Winnipeg is the metropolis and gateway to the Great Canadian West. It is already the largest grain market in the world, and is the main centre and distributing point for Manitoba, Saskatchewan, and Alberta, counting numerous wholesale business firms which turn

over about \$150,000,000 annually. Clearing-house returns in 1911 amounted to \$1,170,763,642. There are upwards of 300 factories (employing some 15,000 hands), producing cement, carriages, harness, iron-works, jewellery, clothing, farming implements, rolling mills, tents, cigars, etc., with an annual output of manufactured

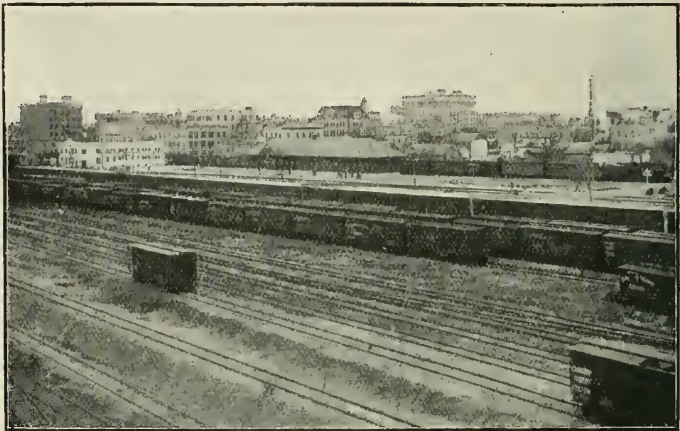


MAIN STREET, WINNIPEG.

products valued at \$39,400,608. The population of Winnipeg in 1901 was 42,340; and in 1911, the date of the last census, it was 136,035. The Civic Census of 1912 gave the population approximately 175,000. According to the latest Census returns, the value of manufactured products for the year 1910 was \$32,694,349, showing an increase of 279.45 per cent over the returns for 1900 and 482.65 per cent over the returns for 1890.

Bank clearings in Winnipeg for the year 1911 totalled \$1,170,763,642, whilst for the first six months of 1912 they amounted to \$691,535,251.

Brandon, the second city of the province, is situated on the Assiniboine at its junction with the Little Saskatchewan river, 133 miles west of Winnipeg, and is surrounded by excellent agricultural country. It is one of



BRANDON, MANITOBA.

the most beautiful cities of the west, with trees, orchards, and productive farms, indicating the great possibilities of that portion of Canada. It is the distributing point and clearing-house for an extensive radius of fertile prairie, having exceptionally favourable railway communications and rates. There are some 250 smaller towns and villages, with some 3500 retail merchants, 141 branches of chartered banks of Canada doing business, and a thriving population. Statistics ascribe to the Brandon distributing area an output of cereals, root and hay crops for the year 1911 valued at \$72,135,587; dairy

products, \$1,077,282; eggs, \$255,429; while the live stock was estimated at \$64,650,934; making a total aggregate value of \$138,119,232. In 1912 the values of farm products for the same district are given as follows:—

Wheat . . . 47,339,664 bushels	Peas . . . 32,552 bushels
Oats . . . 77,637,192 "	Potatoes . . 6,368,860 "
Barley . . . 24,313,728 "	Roots . . . 2,600,670 "
Flax . . . 1,971,597 "	Haycrops . . 237,608 tons
Rye . . . 60,041 "	Hay (native) . 322,010 "

Brandon is also an important divisional point on the Canadian Pacific, the Canadian Northern, and Grand Trunk Pacific lines of railway. The Canadian Pacific is establishing a four-track system on its main line, passing through Brandon, to Fort William for the prompt shipment of grain east, and for the increasing passenger traffic. The Government experimental farm at Brandon, established some 25 years ago, has done much to assist the farmer and gardener of the district. The city has excellent educational institutions, a technical school, normal school, a Ruthenian Training School, an "Indian Industrial School," besides many other institutions, including churches, hospitals, etc. Ten of the great banks of Canada do business in the city, and there is a large number and variety of manufactures and industries. The value of manufactured products for 1910 was \$2,330,430, showing an increase of 330.50 per cent over the value for 1900, which was \$541,327.

St. Boniface, the centre of French-Canadian influence in the province, the seat of the Roman Catholic Archbishop of Manitoba, with a population of 7483, is situated on the Red river opposite Winnipeg, and has 4 churches, 3 banks, several educational and charitable

institutions, likewise 5 brick factories, 5 lumber yards and planing mills, rolling mills, oil mills, 4 elevators, 6 sash and door factories, paint, and paper works, besides many other business concerns. It is also the headquarters of the Union Stock Markets Company, which spent \$500,000 in improvements in 1912. Portage la Prairie, once a keen rival of Winnipeg, 56 miles west of that city, and 15 miles south of Lake Manitoba, with its

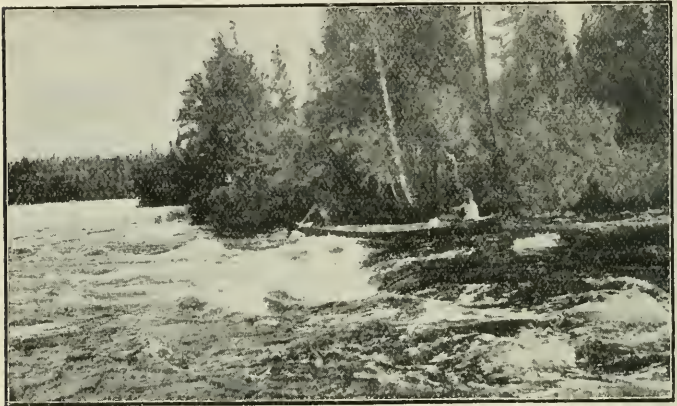


Photo: Earl Grey's Trip.

RUNNING RAPIDS, BELOW OXFORD HOUSE.

fisheries, etc., is on the main line of *four* trans-continental railway lines—the Canadian Pacific, the Canadian Northern, the Grand Trunk Pacific, and Great Northern. It is one of the most important wheat centres of the province, and has large elevators, flour mills, factories, foundries, several educational and other institutions of an advanced and progressive city. West Selkirk is a distributing point of supplies in the lower Red river valley. Morden and Carberry, Minnedosa and Neepawa, Dauphin and Deloraine, Melita, Boissevain, Killarney, Manitou,

Pilot Mound, Selkirk, and Souris are located in fine wheat-growing sections, and have excellent facilities for the storing and shipment of wheat. Pas, between Prince Albert (Saskatchewan) and Port Nelson (Manitoba), on the Hudson Bay railway, is a promising centre.

The Hudson Bay Company, with headquarters at Winnipeg, still maintains a large number of posts throughout the province. York Factory, Oxford House, Norway House, Nelson House, Pas, Churchill, Grand Rapids, Shoal river, Chemahawin, Cross Lake, Split Lake, Family Lake, Island Lake, God's Lake, Du Brochet, Mouth of Poplar river, are some of these posts or localities where they are situated in central or northern Manitoba; whilst Manitoba House, Berens, Selkirk, Fairford, Winnipegosis, and Swan Lake are other centres of influence and commerce of the same Company in the southern part of the province.

Marchand, Cartier, La Salle, Lorette, La Rochelle, Arnaud, St. Jean Baptiste, Royal, Larivière, St. Malo, St. Pierre, St. Pie, are some of the names of settlements familiar in French-Canadian life, history, and politics.

Education

All schools below the grade of high schools are free to children between the ages of five and fifteen years, and high schools in all the cities and larger towns are free to resident pupils. Winnipeg and Brandon maintain colleges of a very high standard. As in Saskatchewan and Alberta, two sections of each township are set apart, the income from the sale of which is applied to the support of free schools.

CHAPTER XV

THE PROVINCE OF SASKATCHEWAN

SASKATCHEWAN, erected into a province of the Dominion by an Act of Parliament during the year 1905, is the central one of the three prairie provinces in the Middle West of Canada, and has an area of 251,700 square miles, with a water surface of 8318 square miles. It is nearly rectangular in outline, measuring some 760 miles long from north to south, with an average breadth of 320 miles from east to west, the base-line along the international boundary and forty-ninth parallel measuring some 390 miles.

Saskatchewan is bounded on the north by the North-West Territories and sixtieth parallel of north latitude; on the east, by the province of Manitoba; on the west by the new province of Alberta; on the south by portions of the states of North Dakota and Montana, forming part of the United States.

Previous to 1882 Saskatchewan was organised as a provisional "District," extending eastward from longitude $111^{\circ} 20'$ west to the Manitoba boundary and Lake Winnipeg, and from the northern boundary of the district of Assiniboia to the southern boundary of Athabaska.

Saskatchewan province comprises within its limits

portions of the old districts of Assiniboia, Saskatchewan, and Athabaska, forming part and parcel of the North-West Territories of Canada, with the town of Regina as their formal capital and place of residence of the Lieutenant-Governor of the Territories.

The country or surface of the land consists for the most part of open rolling prairie appertaining to the greater part of "Second Prairie Steppe," which has an average elevation of about 1500 feet above sea-level. In the extreme north-east corner of the province Lake Athabaska has an altitude of only 690 feet above the level of the sea, whilst the Cypress Hills in the south-westerly corner rise to an altitude of 4243 feet above tide.

The province of Saskatchewan may be divided into four natural more or less well-defined zones, based upon physiographical as well as other physical features, as follows:—

I. Prairie Zone.—This zone comprises the most southerly portion of the province, and extends from the United States boundary as far north as the town of Saskatoon, and is marked by open rolling prairie country capable of producing magnificent crops of cereals, including wheat, oats, barley, rye, and flax. In the Beaver Hills and Touchwood Hills, north of the Qu'Appelle Valley, the country is diversified and intersected by numerous streams, forming an exception to the general open rolling prairie country in this zone.

II. Prairie and Woodland Zone.—This zone extends northward from Saskatoon to the southern edge of the Great Northern forest, and consists of mixed prairie country and woodland splendidly adapted for farming and stock-raising.

III. Dense Forest Zone.—The "Great Northern Forest"

is bounded on the south by a line passing from the Swan river in a north-westerly direction through the vicinity of the town of Prince Albert. It is bounded on the north by a line drawn from the northern part of Reindeer Lake to the southern part of Lake Athabaska. This third zone is well watered and well timbered also. It is covered with a forest growth of spruce, tamarack, jack-pine, poplar, and birch.

IV. Sparse Forest Zone.—The remainder of the country lying between Reindeer Lake, Selwyn Lake, and the Charlot and Gaudet river districts of Lake Athabaska, is not densely wooded, although black spruce, Banksian pine, and poplar are found in the far northern parts of this province.

Physiography

Hills and Streams.—(a) *The Cypress Hills* in the extreme south-westerly corner of Saskatchewan form a dome or tract of country from which several streams radiate. Among these are Lodge Creek, Battle Creek, and a branch of the Frenchman river, which drain a large area, then flow into the United States to form part of the Mississippi drainage basin, north of the Cypress Hills.

(b) *The Great Sand Hills* lie north of Maple Creek (Canadian Pacific railway), and the Many Islands, Bigstick, and Crane Lakes. Round these hills the south Saskatchewan river runs first in a north-easterly then in a south-easterly direction.

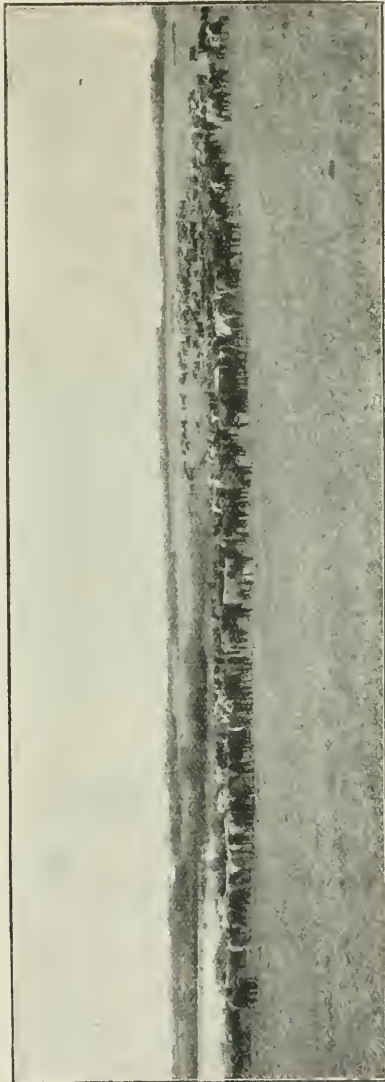
(c) *Wood Mountain* occupies an area of some 5000 square miles between a branch of the Frenchman river on the west and Willow Bunch Lake on the east, and from the international boundary northward to Twelve-mile Lake, whose waters flow into a branch of Wood

river. Many streams take their rise in Wood Mountain.

(d) *The Dirt Hills* mark a north-west and south-east elevation, extending from the town of Moosejaw (C.P.R.) to the United States boundary.

(e) *Last Mountain, Little Touchwood Hills, Beaver Hills, and Big Touchwood Hills*, occupy a triangular area between Last Mountain Lake, Big Quill Lake, and Birmingham, a station on the Grand Trunk Pacific railway. The "Beaver Hills Forest Reserve" was set apart by the Government as a National Park.

(f) *The Eagle Hills* occur in the vicinity of Battleford, and along their northern base portions of the Battle and north



CATTLE ROUND-UP, TOUCHWOOD HILLS, NEAR PUNNICHY, SASKATCHEWAN.

Saskatchewan rivers flow in a south-easterly direction towards Saskatoon. They are east of the Neutral Hills and Blackfoot Hills of Eastern Alberta, and south of them there occurs a more or less regular chain of twenty shallow lakes. The largest and most conspicuous of these, Manito Lake, occupies the trough or central portion of the prairie district between the Neutral, Blackfoot, and Eagle Hills.

(g) *The Pasquia Hills* and *Greenwater Hills*, south of the Carrot river, lie to the N.W. of *Porcupine Mountain* and the *Duck Mountains* of Western Manitoba. These hills are 1600 feet above the Carrot river, and covered with poplar, spruce, birch, and jack-pine. About one-third of the area of Porcupine Mountain and one-tenth of the area of the Duck Mountains are within the province of Saskatchewan in its extreme eastern boundary.

(h) *Moose Mountain* lies in the south-eastern portion of Saskatchewan, and has also been created into a Forest Reserve.

Drainage Basins.—In the province of Saskatchewan the drainage basins discharge their waters partly into the Hudson Bay basin, partly into the Mackenzie or Arctic basin, and partly into the Gulf of Mexico. Several branches of the Missouri river take their rise in this province north of the United States boundary line, whilst the head-waters of the Assiniboine, the North and South Saskatchewan rivers, and the Churchill, discharge their waters into the Hudson Bay basin, and the Athabaska river drains a goodly portion of north-west Saskatchewan, and carries its waters down to the Arctic Ocean by way of the Mackenzie.

Rivers.—Saskatchewan has many large lakes and several navigable rivers, especially in the northern half of the province. The province is traversed from east to

west by the Saskatchewan river, both branches of which, the North Saskatchewan and the South Saskatchewan, unite to form the Saskatchewan river proper, a little below Prince Albert and above Fort à la Corne. This river rises in the Rocky Mountains, and after winding its devious way across the plain for a distance of 1200 miles, empties into Lake Winnipeg and the chain of lakes drained by the Nelson river into Hudson



SMALL'S POINT, FORT QU'APPELLE.

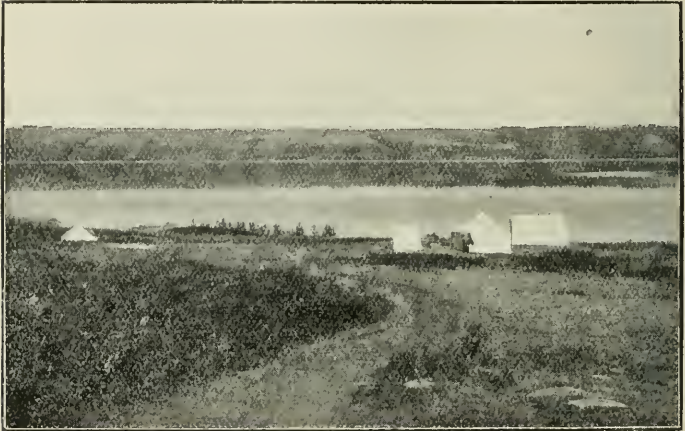
Bay. "Saskatchewan" is an Indian word meaning "rushing water."

The Churchill river, 1100 miles in length, as given elsewhere, has a drainage area of 115,500 square miles. The Clearwater, Beaver, Reindeer, Mudjatic, Haultain, Sandy, and Foster rivers are some of its chief tributaries in this province.

These two rivers—the Saskatchewan and the Churchill—carry by far the greatest part of the water flowing through Saskatchewan, but there are also a number of smaller streams whose beds are large and deeply eroded,

showing that they were at one time large and important rivers. The Qu'Appelle river, 270 miles in length, and the Souris river, 450 miles long, both tributaries of the Assiniboine, are examples of the latter class.

Lakes.—Lake Athabaska is the largest in Saskatchewan, whilst Reindeer and Wollaston lakes are also of considerable size. Nearly all the lakes of Saskatchewan abound in fish-life, but Lake Chaplin, Johnston Lake, and the Quill



LITTLE MANITOU LAKE, WATROUS, SASKATCHEWAN, G.T.P. RAILWAY.

Lakes in the south are exceptions. Lac la Ronge, Lac la Plonge, Montreal, Candle, Cumberland, Corneille, Buffalo, Shagwenaw, Clear Lake, and the Foster Lakes are some of the most important fresh-water lakes of northern Saskatchewan. Last Mountain Lake, a short distance north-east of Regina, in the famous Last Mountain valley, and many other lakes throughout the newly and more settled portions of the province, are becoming popular for summer and camping resorts, where æsthetic tastes and pleasant outings may be gratified and enjoyed. The

waters of Little Manitou Lake have recently been found to possess curative properties, and steps are being taken to erect a sanatorium on its shores.

Climate

Lack of information as well as the circulation of erroneous reports regarding the climate of the country now covered by the province of Saskatchewan alone are responsible for the apparent tardiness in the settlement of this part of North America. Enterprising farmers from Ontario and other eastern provinces of the Dominion of Canada pushed their way into this interior country, vast as an empire, and demonstrated that the climate is suited to the production of the best grain, vegetables, and live stock in the world, and that it is eminently healthful and invigorating to man.

There are a number of features pertaining to the climate of Saskatchewan which combine to make it a pleasant one. The elevation above the sea—1500 to 3000 feet—ensures a clear and dry atmosphere, the comparatively light precipitation being, however, quite adequate for all practical purposes; the equable temperature during the winter months and the light snowfall, the large proportion of sunshine, the summer breeze, and the clear, pure air are features of Saskatchewan climate. One of the potent factors which ameliorates the climate of Saskatchewan, as well as that of Manitoba and of the North-West Territories generally, is found in the proximity to that vast inland or mediterranean sea—Hudson Bay—whose 500,000 square miles of open sea, both in summer and winter, catch and absorb the rays of the warm summer sun, and spread their beneficent influence all the year round over a vast extent of territory. Hudson Bay

proper does not freeze over in winter; a zone of border ice, about three leagues in breadth, skirts the shores of the bay proper, and the northern portions, including the Straits, become congested owing to floating and drift ice for nearly eight months of the year.

June and July are the wettest months of the year, whilst May and August are only moderately dry. Two-thirds of the annual precipitation of moisture occurs in the form of rain between April and September.

The temperature in summer frequently rises to about 100° Fahr.; but the heat is tempered by a never failing breeze, and the nights are cool and pleasant even after the hottest days.

The number of hours of sunlight is greater here during the summer months than in more southern latitudes, and the clear, healthful atmosphere is both bracing and refreshing. The autumn season in Saskatchewan is probably unsurpassed in any other part of the world. The rare atmosphere, perhaps, is never so pleasing as at that time, when the warm, bright days, following nights during which the thermometer dips slightly below the freezing-point, produce an exhilaration of a most beneficial character.

The winter season in Saskatchewan is decidedly cold, extending from about the first of December to the middle or end of March; but, thanks to the aid of comfortable houses, suitable clothing and furs, it inspires no dread and is not unpleasant. The absence of moisture in the air, the large proportion of sunshine, the infrequent occurrence of rain and thaws, the stillness of the air during the coldest spells, all tend to make the winter healthful and even enjoyable. Blizzards, or severe snow-storms, occasionally occur, but they are not, as a rule, accompanied by extreme temperatures. Pneumonia and kindred

troubles, so much dreaded in more moist and changeable climates, are practically unknown in Saskatchewan.

During a few of the last twenty years the snow has disappeared before the end of February. Seeding is usually not in full swing until April, although in some seasons grain has been sown about the middle of March.

Chinook Winds.—South and west of Swift Current (C.P.R.), in the ranching district of south-western Saskatchewan, the dry and warm "chinook" (wind) occurs at intervals during the winter, and makes that portion of the province an excellent ranching country where the stock winters well on the open prairie range.

Average Monthly Precipitation.—The following table of the precipitation in Saskatchewan, by months, during the years 1905 to 1910, from the available data respecting precipitation recorded at the meteorological stations of the province, shows clearly the relatively high figures for the growing period of the year from April to September. Ten inches of snow are given as equivalent to one inch of rain.

AVERAGE MONTHLY PRECIPITATION IN SASKATCHEWAN

Month.	1905.	1906.	1907.	1908.	1909.	1910.	Average precipi- tation for ten years by months	Month.
Jan.	·48	·80	·96	·29	·62	·38	·70	Jan.
Feb.	·36	·26	·31	1·14	·36	·46	·66	Feb.
March	·38	·17	1·03	·99	·53	·84	1·03	March
April	·44	1·15	·74	·84	·69	·55	·72	April
May	2·58	2·21	·91	1·13	2·46	2·07	2·10	May
June	2·86	5·22	3·64	4·84	2·64	2·63	3·49	June
July	1·90	1·28	1·81	1·27	5·36	1·50	2·28	July
Aug.	2·42	1·16	3·49	2·06	1·41	2·12	2·41	Aug.
Sept.	2·60	1·57	1·41	·62	·72	·97	1·65	Sept.
Oct.	·95	·36	·29	1·31	·61	·29	·69	Oct.
Nov.	·69	1·52	·12	·54	·99	·71	·61	Nov.
Dec.	·37	1·38	·29	·45	1·62	·96	·60	Dec.
(Total)	15·94	17·08	15·00	15·48	18·01	13·48	17·00	Month.
April-Sept.	12·80	12·59	12·00	10·76	13·28	9·84	12·69	April-Sept.

Mean Temperatures.—A similar table, but giving the mean temperature (Fahr.) in Saskatchewan for each month from January 1905 to December 1910 is here presented, in which the monthly average for the five years in question, and the annual mean are also included, followed by a statement of the mean temperatures during the months of April to September, which practically covers the period of vegetation or growth of cereals and other plants in the province.

TABLE OF MEAN TEMPERATURES (FAHRENHEIT)

Month.	1905.	1906.	1907.	1908.	1909.	1910.	Average for ten years.	Months.
Jan.	-1.1	6.6	-14.6	10.0	5.5	5.6	2.9	Jan.
Feb.	4.5	6.5	6.2	8.9	0.6	1.7	3.8	Feb.
March	29.7	15.9	14.9	10.3	17.7	33.2	14.5	March
April	37.9	44.4	24.9	38.2	25.8	43.9	37.4	April
May	48.2	47.2	39.7	50.7	49.2	47.6	50.2	May
June	56.1	59.4	57.8	56.8	58.9	60.8	57.5	June
July	62.4	65.6	61.6	64.5	64.3	64.6	63.3	July
August	64.1	62.7	57.7	58.2	62.6	56.8	60.5	Aug.
Sept.	52.5	55.8	47.0	52.7	56.4	49.0	50.1	Sept.
Oct.	36.2	42.1	42.1	37.3	37.8	41.4	40.9	Oct.
Nov.	27.3	21.9	26.3	27.0	17.1	17.0	25.0	Nov.
Dec.	14.7	3.3	14.7	9.9	2.5	8.4	10.4	Dec.
Annual Mean	36.0	35.9	31.4	35.4	32.2	35.5	33.8	Month.
April-Sept.	53.5	55.8	48.1	53.5	52.9	53.8	53.1	April-Sept.

The following statement obtained from meteorological records taken at the stations in Saskatchewan indicates the mean temperatures during *three* consecutive years, from the month of October of one year to the month of March (inclusive) of the following year, which period marks the yearly rest in plant life.

Period of Year.	Years.	Mean Temperatures.
October	1907-1908	18·7° Fahr.
to	1908-1909	14·3° „
March.	1909-1910	15·9° „

The Soil

The province of Saskatchewan is essentially an agricultural province. The soil of Saskatchewan, made up of the detritus or debris of a great variety of rock-materials derived from many geological formations, some of which are rich in natural phosphates and other ingredients of equal value for agricultural purposes, and scattered throughout the province by the action of the glaciers, etc., during the great Ice Age, and by other physical forces, is characterised by the ability to produce a high average yield of wheat, oats, barley, and potatoes for many years in succession without the application of fertilisers. Years of experience have shown this to be the case; nevertheless it is not expedient to encourage the procedure of raising heavy crops from virgin soil without ever adding fertilisers, but of going hand in hand with Nature in supplying the materials which make for fertility and the availability of plant food in the soil. From experiments carried on at Indian Head—the headquarters of the Experimental Farm subsidised by the Dominion Government—it has been ascertained that the high average yields of wheat, oats, barley, and potatoes on that farm are not only maintained from year to year, but are actually larger than at any of the other Dominion Experimental Farms scattered throughout Canada.

Subjoined is a comparative statement of the average

AVERAGE YIELD OF WHEAT PER ACRE IN BUSHELS

Countries, etc.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	Countries, etc.
Saskatchewan	22.57	19.44	17.51	23.09	21.40	13.52	13.68	22.1	15.58	Saskatchewan
Kansas	10.40	14.10	12.40	13.90	15.10	11.00	12.60	14.50	14.04	Kansas
Minnesota	13.90	13.10	12.80	13.30	10.90	13.00	13.00	16.80	16.00	Minnesota
North Dakota	15.90	12.70	11.80	14.00	13.60	10.00	11.60	13.69	5.00	North Dakota
South Dakota	12.20	13.80	9.60	13.70	13.40	11.20	13.00	14.10	12.80	South Dakota
Nebraska	20.90	15.70	13.60	19.40	22.00	18.10	17.00	19.40	16.10	Nebraska
Iowa	12.70	12.40	11.60	14.20	15.70	13.40	17.20	14.69	21.00	Iowa
Russia	11.10	10.60	11.50	10.20	7.7	...	...	12.07	10.93	Russia
United States	14.50	12.90	12.50	14.50	15.50	14.00	14.10	15.80	14.10	United States

CHARACTER OF SOILS IN SASKATCHEWAN

Locality.	Character of Soil.	Organic and Volatile Matter (Loss on ignition).	Nitrogen.	Phosphoric Acid (P_2O_5).	Potash (K_2O).	Lime (CaO).	Available Constituents.		
							Phosphoric Acid (P_2O_5).	Potash (K_2O).	Lime (CaO).
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Moosomin . . .	Black loam . . .	11.79	.479	.116	.306	.95	...	...	...
Tisdale . . .	Grayish-black loam . . .	14.23	.480	.202	.622	1.11	.024	.041	.568
Saltcoats . . .	Black, sandy loam . . .	13.54	.572	.213	.340	2.89	.018	.033	1.110
Yorkton . . .	" " . . .	14.01	.504	.211	.486	1.17	.025	.048	.531
Wolseley, N.E. $\frac{1}{4}$ sec. 27 . . .	Black loam (cultivated) . . .	13.93	.514	.391	.555	.87	.005	.011	.306
" S.W. $\frac{1}{4}$ sec. 27 . . .	" " . . .	10.98	.389	.369	.512	.76	.005	.018	.264
Indian Head . . .	Black clay loam. Taken to a depth of 4 inches . . .	13.31	.409	.212	.863	1.26	.036	.070	1.187
" " . . .	Black clay loam. Taken to a depth of 8 inches . . .	12.83	.371	.234	.868	1.41	.032	.059	1.261
" " . . .	Black clay loam. Taken to a depth of 4 inches (cultivated) . . .	10.20	.259	.159	.839	3.44	.016	.039	1.384
" " . . .	Black clay loam. Taken to a depth of 8 inches (cultivated) . . .	10.70	.254	.163	.898	3.51	.013	.038	1.336
Vermilion Hills, Tp. 21, R. 5, W. 3rd . . .	Dark brown sandy loam . . .	10.43	.354	.164	.164	.50	.044	.050	.383
Maple Creek, sec. 16, Tp. 11, R. 26, W. 3rd . . .	Heavy clay loam . . .	5.54	.134	.064	.300	1.06	...	...	...

yield of wheat per acre, as recorded from 1902 to 1910, in Saskatchewan and other countries, including different portions of the United States, showing the extremely favourable position of Saskatchewan, excepting the years 1907, 1908, and 1910.

Saskatchewan soils are rich in those constituents which make for fertility. In "total" phosphoric acid they are decidedly above the average of the best soils, but the amounts of this constituent immediately available are very small. Typical soils from the southeastern portion of the province possess abundant stores of plant food, and, judged by accepted standards, rank as of high fertility. The method of continuous cropping with grain in certain portions of the province, as elsewhere, results clearly in enormous losses of organic matter and nitrogen.

The table of results on the preceding page, obtained by Professor F. T. Shutt from soils taken in Saskatchewan, calculated to "water-free basis," indicates the comparative richness of the soils at the respective localities.

When the yield of the crops in Saskatchewan is compared with the yield of similar crops in other localities, the only conclusion to which it is possible to arrive is, that not only is the precipitation of moisture sufficient, but other essentials, such as warm summer days filled with sunshine hours, joined with an extremely fertile soil, and the degree of natural availability of the plant food for field crops, are adequately present to ensure the results that are making the Canadian West so well known.

Seeding and Harvesting.—The months of May, June, July, and August usually witness the seeding, growth, and maturing of the grain crops. The earliest recorded date of the beginning of seeding in Saskatchewan is

March 22nd, in 1894, and the latest was May 11th, 1907. The earliest harvest was that of 1894, when the cutting of oats began on July 24th. The average date since 1899 of the beginning of harvest at Indian Head is as follows:—

Wheat	.	.	.	August 21st.
Oats	.	.	.	„ 20th.
Barley	.	.	.	„ 17th.

The average length of time from seeding until harvest is as follows:—

Barley	.	.	.	107 days.
Oats	.	.	.	114 „
Wheat	.	.	.	129 „
Flax	.	.	.	104 „

The special fitness of southern Saskatchewan for agriculture has induced settlers to locate therein, but population will gradually press onward towards the more northerly and wooded portions of the province.

Wheat, oats, barley, and flax constitute the four leading grain crops of Saskatchewan. Between 1900 and 1913 the area under cultivation in acres, total production in bushels, and average yield per acre also in bushels, obtained from Government official returns, are as follows:—

PRODUCTION OF WHEAT

Year.	Acres.	Yield in Bushels.	Average Yield per Acre.
1900	332,540	3,443,671	9.00 bushels
1902	580,860	13,110,330	22.57 „
1905	1,130,084	26,107,286	23.09 „
1908	3,703,563	50,654,629	13.68 „
1909	4,085,000	90,215,000	22.10 „
1910	4,228,222	66,978,996	15.84 „
1911	5,256,474	109,075,000	20.75 „
1912	5,582,000	106,960,000	19.16 „
1913	5,720,000	121,559,000	21.25 „

PRODUCTION OF OATS

Year.	Acres.	Yield in Bushels.	Average Yield per Acre.
1900	96,173	1,604,561	16·68 bushels
1902	193,200	6,975,796	22·57 „
1905	449,936	19,213,055	23·09 „
1908	1,772,976	48,379,888	13·68 „
1909	2,240,000	105,465,000	22·10 „
1910	1,888,359	58,922,791	31·20 „
1911	2,332,912	107,594,000	46·12 „
1912	2,556,000	117,537,000	45·99 „
1913	2,755,000	114,112,000	41·42 „

PRODUCTION OF BARLEY

Year.	Acres.	Yield in Bushels.	Average Yield per Acre.
1900	8,303	150,822	18·16 bushels
1902	14,275	293,632	20·91 „
1905	32,946	893,396	27·11 „
1908	239,574	3,965,724	17·28 „
1909	244,000	7,833,000	32·10 „
1910	129,621	3,061,007	23·61 „
1911	273,988	8,661,000	31·61 „
1912	292,000	9,595,000	32·87 „
1913	332,000	10,421,000	31·39 „

PRODUCTION OF FLAX

Year.	Acres.	Yield in Bushels.	Average Yield per Acre.
1902	16,694	153,709	9·80 bushels
1905	25,315	398,399	15·73 „
1907	128,528	1,364,716	10·62 „
1909	319,100	4,448,700	13·90 „
1910	506,425	3,893,160	7·68 „
1911	682,000	7,672,500	11·25 „
1912	1,780,000	23,033,000	12·94 „
1913	1,386,000	15,579,000	11·24 „

Grain Crops.—The crop districts of Saskatchewan have a total area of 86,826,240 acres. Of this estimated area the principal grain crops in the year 1910 covered

7,382,065 acres, or 8·5 per cent of the area of the crop districts. The southern half of this province, with its extensive areas of arable land, is unsurpassed in fertility and capability of producing a high average yield of wheat, oats and barley, and potatoes for many years.

Facilities.—For the purpose of handling and marketing the grain produced in Saskatchewan both the Federal and Provincial Governments are doing much to assist the producers, and safeguarding them against loss through either dishonest intentions or financial embarrassment of the dealer. All grain is sold according to grades established by law, after due inspection. Nearly all the railway stations in Saskatchewan have one or more elevators; Indian Head, on the line of the Canadian Pacific Railway, has *nine* elevators in operation, with a total capacity of 327,000 bushels, while Yorkton counts *eight* with a capacity of 265,000 bushels. Farmers may either deliver their wheat to the elevator and receive cash for it, or store it in the elevator for a time with a prospect of obtaining a better price; or they may load their grain into a car from the loading platform without dealing with the elevator, if they prefer.

In 1901, the capacity of all elevators in the area now comprised in the province of Saskatchewan was 2,987,000 bushels. In 1913 there were 1246 elevators and six warehouses for storing grain, having a total capacity of 36,503,000. The average price received by the farmers for the wheat crop of 1911—all grades—was 78 cents (3s. 1½d.) per bushel of 60 pounds, which means that the wheat crop was worth to the producers \$56,679,791—about £11,680,000.

Saskatchewan has a total land area estimated at 143,927,680 acres. The areas comprised within the surveyed sections up to January 1st, 1911, not including

the surveyed lands in the Forest Reserves (all water-covered lands being deducted) amount to 65,733,061 acres. The total water-covered lands in surveyed sections of the province amount to 1,571,027 acres.

The area of road allowances in Saskatchewan, at the same date, amounted to 1,363,181 acres; parishes and river lot settlements total 81,974 acres, whilst the area of Forest Reserves contains 599,642 acres. From figures furnished by the Department of Indian Affairs at Ottawa, the total area of Indian Reserves in Saskatchewan is estimated at 1,141,893 acres—which figures include 6683 acres north of the surveyed area of this province. The total area of Indian Reserves surrendered to the Crown up to 1911 amounts to 262,016 acres.

This new province, with its broad fertile prairies in the south, with its prairies and park-like homesteads in the central portion, has within its bounds one of the greatest wheat producing areas of the Dominion.

The great wealth of these two sections is in the top ten inches of soil, on which thousands of colonists have settled within the last few years, cultivating grain crops, gardens, or live on ranches where herds of cattle or bands of horses graze the native grasses. The chief products of the province are undoubtedly agricultural, such as wheat, oats, barley, flax, all kinds of vegetables and small fruits, horses, cattle, hogs, and poultry. Of the above wheat and fat cattle are exported.

Geology

The geological structure of Saskatchewan is simple. Very ancient, highly crystalline, contorted and foliated or schistose rocks consisting of granites, granitoid gneisses and gneisses, together with metamorphic rocks and

eruptives, form a floor or basal complex of Archæan rocks referable to the Laurentian and Huronian systems in geology. Upon this floor of primitive rocks there rests unconformably an interrupted succession of evenly bedded and for the most part stratified sedimentary formations, ranging from the Keweenawan, of supposed Cambrian age, through the Palæozoic and Mesozoic to the Tertiary and Quaternary ages inclusive.

The following table gives the geological succession of the strata, etc., of Saskatchewan in descending order:—

TABLE OF ROCK FORMATIONS IN SASKATCHEWAN

QUATERNARY	$\left\{ \begin{array}{l} \text{POST-GLACIAL} \dots \left\{ \begin{array}{l} \text{Loam, peat, and lake sands,} \\ \text{and gravels.} \end{array} \right. \\ \text{GLACIAL} \dots \dots \left\{ \begin{array}{l} \text{Glacial and interglacial deposits,} \\ \text{till, eskars, etc., etc.} \end{array} \right. \end{array} \right.$
TERTIARY	$\left\{ \begin{array}{l} \text{MIOCENE} \dots \dots \text{Sandstones and conglomerates.} \\ \text{LARAMIE} \dots \dots \text{Sandstones and shales.} \end{array} \right.$
MESOZOIC	$\left\{ \begin{array}{l} \text{CRETACEOUS} \dots \dots \text{Shales.} \end{array} \right.$
PALÆOZOIC	$\left\{ \begin{array}{l} \text{DEVONIAN} \dots \dots \text{Dolomitic limestones.} \\ \text{SILURIAN} \dots \dots \text{Impure limestones.} \\ \text{ORDOVICIAN} \dots \dots \text{Impure limestones, etc.} \\ \text{KEWEENAWAN} \dots \dots \text{Sandstones.} \end{array} \right.$
ARCHÆAN	$\left\{ \begin{array}{l} \text{HURONIAN} \dots \dots \text{Gneisses and granites.} \\ \text{LAURENTIAN} \dots \dots \text{Schists and eruptives.} \end{array} \right.$

Archæan

Laurentian and Huronian.—The oldest rock-formations of Saskatchewan, consisting of highly altered crystalline rocks referable to the Laurentian and Huronian systems, are well developed in the northern portion of the province, being exposed over an area of about 50,000 square miles. They consist of granites, granitoid gneisses, gneisses, schists, and various kinds of volcanic rocks of various ages, forming a basal complex, with a broad general dual character, part of that great "shield" of

Suess, which later rose above the surface of a probably world-wide ocean, marking the first continent, "Laurentia," on whose shores were formed, laid, and solidified the first Eparchæan formation in various localities, of varying thickness, and covering a varying amount of time.

The whole of Saskatchewan is underlaid by these crystalline, mineral-bearing rocks, so that no matter where out-crops of them occur, or where newer sedimentary formations overlie them in their least or greatest expression, they can be readily distinguished by their characteristic constituents, such as felspar, mica, quartz, hornblende, with other accessories, such as iron, copper, silver, gold, etc.

A bore-hole put down through several thousand feet of sedimentary strata and formations, superimposed one upon the other, in the Cypress Hills or Wood Mountain districts of southern Saskatchewan, as well as elsewhere in the southern portion of the province, would eventually reach the Archæan crystalline rocks. The Archæan rock-formations of this province have received comparatively little attention as yet at the hands of geologists and explorers, but the general extent and distribution of both the Laurentian and Huronian areas have been fairly well determined and mapped by the Geological Survey of Canada. Two small areas or basins of Huronian rocks have been recognised and differentiated from the main mass of Archæan crystallines:—

(1) In the extreme north-westerly corner of the province, on the north side of Lake Athabaska, there are at least *three* isolated outcrops of Huronian rocks, *two* to the west of the Charlot river, the other a little to the south-east of the same river. These *three* probably formed part and parcel of a single basin in which Lake Athabaska is now situated.

(2) The *second* outcrop of Huronian rocks forms a

small triangular area (lat. $54^{\circ} 30'$ and long. $102^{\circ} 25'$) between the foot of Lake Amisk (1025 ft. above the sea) and the eastern boundary between Manitoba and Saskatchewan west of Lake Athapapuskow (935 ft. above tide). It forms part and parcel of a larger basin of Huronian rocks which lies for the most part within the province of Manitoba, and has a general north-east and south-west trend, strike, or plane of shearing, whose southern extension along the line of outcrop is covered by Palæozoic rocks of Ordovician age.

The remainder of the Archæan area is covered by rocks ascribed to the Laurentian system.

Much interesting and useful petrological work and study in mineralogy remain to be done in these important areas of Archæan rocks, both of Laurentian and Huronian age. The zone of contact between the Archæan and Palæozoic formations marks an extensive series of fresh-water lakes, and furnishes numerous and valuable water-powers.

Palæozoic

Keweenawan.—An extensive area of sedimentary rocks ascribed to the Keweenawan formation occurs south-east of Lake Athabaska in northern Saskatchewan. It has a circular outline extending about 200 miles from east to west, and 150 miles from north to south. The general dip of the basin is northward with the Waterfound, Cree, Grand Rapid, and Gaudet rivers flowing over it in that direction. These streams all take their rise in the vicinity of Cree Lake (1530 feet above tide), and flow into Lake Athabaska or to waters connected therewith, Lake Athabaska being 690 feet above sea-level.

The junction of the Waterfound and Stone rivers, close

to Wollaston Lake (1300 feet above tide), forms the eastern limit of this Keweenawan area, whilst the western limit extends as far as $110^{\circ} 50'$ west longitude. The northern outcrop of this area of sandstones is marked by Lake Athabaska and Black Lake (1000 feet above tide). This basin consists for the most part of evenly bedded sandstones, with an irregular basal series of arkose strata—all of sedimentary origin. It forms part of the first Eparchæan formation deposited and remaining in this portion of North America, as well as a typical example of an outlier of the "*Keweenawan*" so well developed in the Lake Superior region of Canada and the United States. The precise geological age of this basin is not known definitely, but it may belong to the Cambrian system near the base of the Palæozoic.

Ordovician—Silurian—Devonian

Ordovician.—Ordovician strata, consisting for the most part of impure limestones, form a zone of flat-lying formations, extending 290 miles across this province in a north-westerly direction, from the vicinity of Lake Amisk (N. lat. $54^{\circ} 30'$, W. long. $101^{\circ} 50'$), to Clear Lake (N. lat. $56^{\circ} 12'$; and W. long. $108^{\circ} 45'$); and varying in breadth from a mere narrow outcrop of a few yards to a strip of country at least fifty miles across. They no doubt extended much farther north and east at one time, but now extend to the south and west beneath the newer overlapping members of the Silurian, Devonian, or Cretaceous systems, depending upon irregularities both in deposition and subsequent erosion. Much of the country is covered by drift and fertile soil, so that the precise thickness and extent of these Ordovician rocks cannot be ascertained definitely.

About 4000 square miles of Ordovician strata have been traced in Saskatchewan. They afford, as in their extension in Manitoba, excellent building stone and other materials for construction, such as lime, cement, and the like. These rocks form part and parcel of that series so eminently characteristic of Manitoba, in the Lake Winnipeg basin, with which they are continuous.

Silurian.—Light-coloured and evenly-bedded limestones and dolomites of Silurian age occur in the middle east of the province along the Manitoba boundary near Cumberland House (N. lat. $53^{\circ} 35'$; W. long. $101^{\circ} 50'$), where they are about 50 miles in breadth. They extend in a westerly direction to a point 140 miles distant. Their greater breadth—60 miles—lies between the Hudson Bay Company's post on the Carrot river, through Cumberland House, to the southern shore of Lake Amisk. They are traversed by the Saskatchewan river, and have numerous lakes and lake basins eroded and dissolved in them. These Silurian strata about Cumberland House constitute the most northerly outcrop and occurrence of this age around the western edge of the great Archæan "shield." It is bounded on the south by rocks of Cretaceous age, and is covered at many intervals with much drift. Salt springs and brines occur in rocks of this age. Gypsum and salt also may be looked for.

Devonian.—A belt, varying in breadth from *thirty* miles to less, consisting of highly fossiliferous impure limestones and shales of Devonian age, has been recognised in the southern half of northern Saskatchewan, extending from the vicinity of Doré lake, south of Lac la Plonge, in a north-westerly direction, to the western boundary of the province near Methye Portage on Lac la Loche. The Devonian strata of Saskatchewan are for the most

part covered by drift and newer overlying deposits, chiefly Cretaceous. The Devonian of Manitoba, so extensively developed and well known in that province—around the shores and islands of Lakes Manitoba and Winnipegosis, representing the *Manitoban* and *Winnipegosan* formations—reaches the very easterly edge of Saskatchewan at a point about ten miles west of Red Deer lake, into which Red Deer river flows, and north of the Porcupine mountains, where it is abruptly cut off by the overlying Cretaceous. The rich faunas of these Devonian rocks include corals, molluscs, trilobites, and fishes, indicate the tropical climate of the period, and furnished the evidence which led Dr. Whiteaves to determine for the first time in North America the occurrence of both the *Stringocephalus* and *cuboides* zones in this portion of the Dominion. Petroleum and natural gas are known to occur in rocks of this age in other portions of Canada, and may be looked for in Saskatchewan where conditions are favourable.

Mesozoic.—Cretaceous and Laramie (in part)

Cretaceous.—Marine Cretaceous shales and associated strata follow unconformably the calcareous and dolomitic deposits of the Devonian. Here a great gap occurs. The Carboniferous system, with its useful productive coal-measures, so extensively developed in Nova Scotia, Pennsylvania, and Virginia, is absent here. The Permian, Triassic, and Jurassic systems of rock-formations also are absent.

Saskatchewan has at least 125,000 square miles of Cretaceous rocks covering its surface in varying thickness. These extend from the point where the "Height of Land" crosses the Alberta boundary near Methye Portage, in

N. lat. $56^{\circ} 25'$, and W. long. 110° , in a south and easterly direction to the boundaries of Manitoba and the United States, along which latter boundary they are capped by Laramie and Miocene Tertiary formations. Cretaceous rocks consist of soft and flat-lying sediments, mostly shales, in which an Upper Cretaceous fauna is recognised. They form a large trapezium-like area, with Saskatoon in the centre, and the south Saskatchewan river divides this area into two sub-equal portions—one in which the north Saskatchewan and Beaver rivers flow, the other drained by the Souris, Qu'Appelle, Assiniboine, and Red Deer rivers. Shales suitable for pottery, tiles, and similar products will no doubt be found in the formations which characterise the Cretaceous of Saskatchewan. Gypsum deposits also occur in rocks of this age. The climate of the Cretaceous was tropical and sub-tropical. A luxuriant growth of forest characterised this province in Cretaceous times.

Laramie.—A triangular area of rocks of this age, consisting of sandstones, shales, calcareous bands, and coal-bearing strata, occurs in southern Saskatchewan, with Moosejaw the main line of the Canadian Pacific Railway, Estevan, and Wood mountain at the three angular points respectively. It covers about 10,000 square miles, and forms an eminence or dome over which is the "Height of Land" separating the waters which flow into the Atlantic by way of Hudson Bay from those flowing into the same ocean by way of the Mississippi basin and the Gulf of Mexico. The floras of the period indicate a highly temperate zone and climate; and the coal deposits (lignites) which are of commercial value have been worked for more than a half-century. About 200,000,000 tons of lignite occur in this area of Laramie deposits. A basin of lignite coal has been recently

discovered north of the Saskatchewan river on the south shore of Lake Wapawekka. In 1909 there were shipped from the mines at Estevan over 190,000 tons of lignite.

Tertiary

Miocene.—Tertiary deposits, consisting of sandstones and conglomerates, holding a distinctly Miocene fauna and flora, have been found capping the Cypress hills in south-western Saskatchewan. They are of sedimentary origin and mark a period when torrential, semi-arid, and semi-tropical climate and conditions prevailed. These conglomerates overlie Laramie, and stand out as prominent “buttes” or hills in the generally flat and even prairie country.

Post-Tertiary

Pleistocene.—The last of the deposits to be mentioned is that mantle or covering of sand, clay, gravel, loam, and soil which is spread over the fertile prairie of Saskatchewan. These are of glacial, marine, and fresh-water origin, and form the so-called “drift” deposits of the West. In an even and very level, scarcely undulating, manner these materials have been laid over the subjacent rocks of the province, and mark the last phase in its geological history. They cover not only a large proportion of the Archæan areas in northern Saskatchewan with their materials—chiefly local—but also the Keweenawan, Ordovician, Silurian, Devonian, Cretaceous and Laramie and Tertiary formations in central and southern Saskatchewan. The farther south the greater the variety and complexity of these Pleistocene deposits. The process of assortment and reassortment of the materials of the subjacent formations in their “drifting”

by ice or water or wind-action, has produced a succession of stratified and unstratified sheets superimposed one upon the other in various localities from various sources of origin, chiefly from the north and east, but also from the west, which now characterise the province.

Geological Resources

The total value of the mineral production of Saskatchewan for the years 1911 and 1912 was \$636,706 and \$1,165,642 respectively, making 0.60 per cent and 0.79 per cent of the total value of production for the Dominion of Canada.

Lignite Coal.—Coal-mining has perhaps attained the greatest development of all mining industries. According to Dowling of the Geological Survey, Saskatchewan coal areas measure 7500 square miles, where some 200,000,000 tons of lignite coal are stored. In the southernmost portion of the province, at Estevan, Rouleau, Dirt Hills, Broett, Roche Percée, Pinto, Bienfait, and vicinity, large quantities of coal are found, deposits have been developed, and large quantities are shipped to south-eastern Saskatchewan and Manitoba. The lignite-bearing areas extend from Roche Percée in a north-westerly direction below the elbow of the south Saskatchewan river. Along the eastern escarpment or boundary of the third prairie steppe are found numerous outcrops of lignite. Not less than 30 coal-mines were in operation in Saskatchewan during the year 1910, when 208,902 tons were mined, giving employment to 376 persons.

A coal seam, seven feet in thickness, underlies the Maple Creek district, at a depth of 300 feet, whilst at Wood mountain, Cypress hills, and different places inter-

vening, lignite deposits could be worked profitably when transportation facilities are available. Gold, silver, copper, cobalt, iron, mica, peat, pigments, ochres, and natural gas are among the natural and geological resources of this province.

An area of north-eastern Saskatchewan recently examined geologically by Mr. W. M'Innes furnishes the following facts:—

In the Lac la Ronge district of Saskatchewan, pre-Cambrian rocks—resembling the Grenville series of Quebec, but defined as the Lac La Ronge series—are impregnated with sulphides. These pre-Cambrian rocks are overlain unconformably by limestone of Devonian age; and farther east by Cretaceous sediments, thought to be of Dakota age. The Cretaceous is made up in the main of white quartz sands and sandstones, very free of impurities, and well adapted for the manufacture of glass. They contain also a bed of lignite that, where exposed on the shore of the lake, has a thickness of 29 inches of clean coal.

The following is the succession of geological formations:—

Quaternary—Recent.—Lacustrine clays, sands, and river sands and gravels. Pleistocene.—Morainic boulder ridges and erratics.

Mesozoic—Cretaceous—Dakota.—White quartz sands and sandstones, with lenticular beds of quartzite grit and conglomerate (lignite bearing).

Paleozoic—Devonian.—Buff-coloured magnesian limestones, sandstone, and conglomerate (fossiliferous).

Pre-Cambrian—Lac La Ronge Series.—Fine biotite gneisses, augen-gneisses, quartz schists, crystalline limestone, etc. Keewatin—Chloritic and hornblende schists, diorite, diabase, etc. Laurentian—Biotite, granite gneisses.

Igneous—Biotite, granite, and pegmatites. Diorite.

In the Pasquia Hills and Lower Carrot river region, much drowned land exists, where drainage would make it available for settlement. Clay iron-stone nodules occur which yield over 20 per cent of metallic iron.

Fisheries

The fisheries of Saskatchewan are still in their infancy. Three species of fish are especially sought at present, and the catch was as follows:—

Whitefish . . .	173,580 pounds
Pike	315,000 „
Sturgeon	24,000 „

There were 565 men, using 565 boats, engaged in the fisheries; the value of the boats, nets, and other fishing materials used, amounted to \$21,000.

The lakes and rivers of southern and central Saskatchewan abound in fish, and afford a supply of wholesome food to the settler, besides adding to the material wealth of the province. Northern Saskatchewan, of which comparatively little is known as yet, will no doubt prove a source of immense value in years to come, as it possesses innumerable lakes and rivers teeming with fish life, giving sport and some wealth to the hunter.

Saskatchewan has quantity enough of fish food to supply millions of people. A beginning has been made in this industry, and the catch of 1912–1913 in Saskatchewan waters amounted to \$111,839.

Fur-bearing animals, etc.

Deer, caribou, moose and musk-oxen, wolves, antelopes, foxes and marten, beaver, lynx, and other minor quad-

rupeds; geese, ducks, and numerous varieties of birds give the settler, sportsman, and hunter a wealth of health, pleasure, and profit throughout the length and breadth of the province, especially in the north, where the forests, open glades, and moss-covered barren lands furnish food-supply and protection to the game and fur-bearing animals.

Game and Fish.—Saskatchewan was once the home of mighty herds of bison; but with the wide stretches of prairie being converted into cultivated fields by an increasing and industrious farming population, the interest of the explorer, naturalist, hunter, and trapper is rapidly ceasing. But in the north-western portion of the province moose, elk, caribou, blacktail deer, whitetail deer occur. Water-fowl in immense numbers still breed about the prairie lakes, while grouse, the jack rabbit, and coyotes are prevalent on the prairies in the fall and winter. Many millions of dollars' worth of furs have been exported from this province in years gone by, but none of the species are extinct, though they have their years of scarcity and plenty. Beaver have once more become numerous in Saskatchewan. The total value of furs exported from this province in 1909 was \$192,942.

Lumber

North of Prince Albert lies the lumbering districts of Saskatchewan, with spruce, both white and black, larch and jack-pine among the coniferous trees, and aspen or white poplar, balsam or black poplar, white birch, among the deciduous trees. White spruce, found growing to a size of from 24 to 30 inches, is the principal tree used in Saskatchewan for the manufacture of lumber. Black spruce, 7 or 8 inches, and jack-pine.

from 12 to 18 inches in diameter at the stump, are cut principally for the purpose of making railway ties. The forest belt contains an abundant supply of excellent timber for many years to come.

The lumber cut of 1913 amounted to 114,800,000 feet, board measure, valued at \$1,908,482.

Forest Reserves

The northern portion of Saskatchewan has a most valuable and conspicuous forest of conifers and some deciduous trees stretching across from east to west joining the forest zone of northern Manitoba to the east, with that of northern Alberta and British Columbia farther west. Forest reserves along the heights of land have been created by the Federal Government, with a view of conserving and encouraging not only the natural growth, but also of keeping up a permanent supply of water at the fountain-head of streams which radiate from various centres in every direction. These are:—

Porcupine Forest Reserve.	Beaver Hills Forest Reserve.
Prince Albert ,,	Duck Mountain ,,
The Pines ,,	Riding Mountain ,,
Moose Mountain Forest Reserve.	

Population

The population of Saskatchewan, according to the census of 1911, numbers 492,432 souls, an increase of 401,153 since 1901. On June 24, 1906, when the intermediate and special census was taken, the population of Saskatchewan was 257,763. One-half of the population of this province, according to the latest census figures, was born in Canada. Great Britain added 35,518 of the population in 1906, and an equal number of people

came from the United States, whilst Austria-Hungary is represented by 21,865 persons, Russia 16,551, and the remainder from Scandinavia, Germany, France, Belgium, Holland, and other countries.

At the beginning of this century the settled portion of Saskatchewan was mostly confined to a narrow belt of territory extending about fifty miles west of Manitoba and to a strip of about the same breadth traversed by the Canadian Pacific Railway, as far west as Moosejaw, and to settlements adjacent to Prince Albert and the Saskatchewan river above that point, together with a sparse population in Battleford, Maple Creek, and other centres. The map of Manitoba, Saskatchewan, and Alberta, indicating the disposition of lands by the Interior Department up to January 1911, shows clearly the trend of population and settlement north, south-east, and west of Regina and Saskatoon in this province. The construction of numerous railway lines and branches has met the demands of the great influx of settlers in this land of wheat and promise.

Previous to the rush of settlement of the last decade, ranching, or live stock raising, was the principal industry of the province. Where grain growing has not yet become general, and where large herds of cattle and sheep remain on the open range the year round, ranching is still of prime importance. South of the 54th parallel of latitude grain growing is preferred, but the live stock industry is second as well as complementary to the other. Large numbers of cattle are, however, raised in the wooded belt north of the main line of the Grand Trunk Pacific, the Sheho-Lanigan branch of the Canadian Pacific Railway, and the main line of the Canadian Northern Railway, which belt stretches in a north-westerly direction across the province, and varies

in width from 75 to 150 miles. In 1910 there were 552,574 horses, 224,745 milch cows, 527,305 other cattle, 164,855 sheep, 329,046 swine, and 4,626,118 poultry. The average quantity of butter per creamery produced in Saskatchewan in the year 1910 was 66,000 lbs.

Chief Cities, etc.

The chief city of Saskatchewan is Regina, the former capital of the North-West Territories, the place of residence of the Lieutenant-Governor, as well as the seat of the local legislature or provincial Government. It



REGINA, CAPITAL OF SASKATCHEWAN.

is also the headquarters of the Royal North-West Mounted Police—a most efficient body of men that has served to establish British law and order in the more sparsely settled portions of North America, a body whose prowess and success in their arduous duties spread over such a vast area is rightly proverbial. Regina is on the main line of the Canadian Pacific Railway, and in the heart of an exceptionally fine agricultural country. It has a population of some 30,213 souls. It is a modern city, with abundant supply of pure water, possesses excellent public and high schools, and a normal school for teachers in training. It has ten chartered banks, and a clearing-house established in 1909. Electric light and power plants are operated by the municipality, and the city has five miles of well-paved streets, besides ten miles of granolithic sidewalks. Regina is fast becoming a manufacturing as well as a distributing centre for the province.

Moosejaw, with a population of some 13,823 souls, lies nearly midway between Calgary and Winnipeg, on the Canadian Pacific Railway main line, being 442 miles east of the former and 398 miles from the latter. It is an important railway, grain and stock centre, and has nine banks, excellent schools and churches. It is a growing city in the midst of an agricultural district, noted for the uniformly good average yields and the splendid quality of its crops.

Saskatoon (population, 12,004) is in the heart of an exceedingly fertile and extensive hard-wheat area, in almost the very middle of the West, and in the centre of the province of Saskatchewan. Its location makes it the strategic centre and point of distribution in an area of at least 45,000 square miles. This area embraced in 1912 upwards of 180 towns and villages chiefly along railway lines. Saskatoon has nine different railway outlets

by means of the three great Canadian transcontinental railway companies. The city has a modern water and sewage system, electric light and power plants, local and long distance telephones, and several newspapers, together with the comforts and conveniences of large and growing cities. Saskatoon is also the seat of the University of Saskatchewan, with its Agricultural College and farm, for which institutions 1333 acres of agricultural land



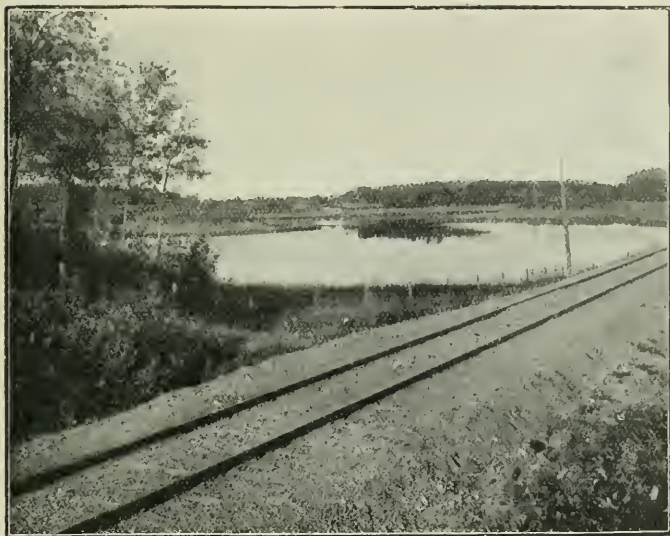
SASKATOON.

were secured by the Government. Indian Head, on the main line of the Canadian Pacific Railway is the headquarters of the Experimental Station established by the Federal Government.

Subdivisions.—For electoral and other political purposes the province has been divided into a number of counties of various sizes. Beginning south and proceeding in a northerly direction, they include the following subdivisions:—(1) *Assiniboia*: with Estevan, Macoun, Browning, Lampman, Frobisher, Wauchope, Walpole, Creelman, Gainsborough, Mair, Carlyle, Forget, Dumas,

Service, Kingsford, and Stoughton as settlements within its borders. (2) *Regina*: with Regina, Aylesbury, Craven, Bulyea, Drinkwater, Ibsen, Trossachs, Jameson, Fushimi, Bryant, Lang, Keddlestone, Penzance, Chamberlain, Kronau, Dilke, Lumsden, and Strassburg as centres of population along railway lines. (3) *Qu'Appelle*: with Wolseley, Indian Head, Davin, Carlsburg, Odessa, Burrows, Moosomin, Kipling, Hawthorne, Kaiser, Adair, Calva, M'Lean, Ingram, Lovat, Montmartre, Sedley, Baring, and Nassau among the towns and villages where an agricultural population is flourishing. (4) *Saltecoats*: with Esterhazy, Saltecoats, Welby, Hazeleliffe, Stockholm, Zeneta, Lipton, Patrick, Dysart, Melville, Cana, Neudorf, Abernethy, Lemberg, Dubuc, Tantallon, Atwater, Bangor, Goodeve, and Birmingham as thriving settlements. (5) *Moosejaw*: among the chief centres of population along the lines of railway are Moosejaw, Besant, Melba, Pasqua, Euston, Secretan, Chaplin, Twain, Waldeck, Aikens, Swift Current, Antelope, Piapot, Maple Creek, Marquis, Keeler, Tugaske, Brownlee, Belbeek, Beadle, Kindersley, M'Gee, D'Arcy, and Bridgetford. (6) *Mackenzie*: with Yorkton, Oreadia, Beaverdale, Springside, Rama, Canora, Mikado, Fort Pelly, Côté, Verigin, and Runnymede, chiefly along the Canadian Pacific and Canadian Northern Railway lines. (7) *Humboldt*: with Mostyn, Watrous, Touchwood, Leross, Kutawa, Punnichy, Tate, Raymore, Semans, Lockwood, Stalwart, Cymric, Venn, Nokomis, Zenith, Guernsey, Jansen, Esk, Candahar, Dafoe, Wishart, Young, Zelma, Plunkett, Viscount, Carmel, Dana, Howell, Humboldt, Muenster, Watson, Clair, Kuroki, Wadena, Englefeld, Quill Lake, and Kylemore, for the most part situated along the Canadian Pacific and Canadian Northern Railway branches, which traverse this well-watered and picturesque section of Saskatchewan. (8) *Saskatoon*: the

city of Saskatoon is surrounded by a number of new and thriving towns and villages, for the most part along the railways. Allan, Bradwell, Clavet, Duro, Nutana, Farley, Grandora, Hawoods, Iwana, Juniata, along the Grand Trunk Pacific Railway; Blucher, Cheviot, Floral, Sutherland, Cory, Dunfermline, Asquith, Rhyl, Aitkow, Elbow,



LAKE NEAR NOKOMIS, SASKATCHEWAN, G.T.P. RAILWAY.

Loreburn, Strongfield, Hawarden, Glenside, St. Aldwyn, and Outlook, along the Canadian Pacific Railway; and Bladworth, Kenaston, Hanley, Dundurn, Haultain, Nutana, Eaton, Vanscoy, Delisle, Laura, South of Saskatoon, with Aberdeen, Vonda, Clark's Crossing, Clarkboro, Osler, Hague, Warman, Borden, Radisson, Langham, Dalmeny, Hepburn, Rosthern, Alvena, on or near the Canadian Northern Railway system, which is extensively developed in the county of Saskatoon. (9) *Battleford*: Zealandia,

Harris, Tessier, Anglia, Herschel, Stranraer, Mackinnon, Baliol, Denzil, Primate, Macklin, Zumbro, Artland, Evesham, Rutland, Senlac, Buccleugh, Tako, Scott, Reford, Coblenz, Palo, Oban, Biggar, Mead, Keppel, Perdue, Vance, Castlewood, Naseby, Traynor, Wolfe, St. Elphège, Wilkie, Adanac, Swinburne, Vera, Winter, Yonker, and Battleford, are on the Canadian Pacific Railway and the Canadian



LAKE NEAR TOUCHWOOD, SASKATCHEWAN, G.T.P. RAILWAY.

Northern Railway lines or proposed lines, south of the Battle river and the North Saskatchewan river, east of Battleford; whilst north of these streams the Canadian Northern Railway has the following villages and towns along its recently constructed line traversing the county from Radisson to Lloydminster, as follows: Fielding, Maymont, Ruddell, Denholm, Brada, North Battleford, Battleford Junction, Highgate, Delmas, Paynton, Birling, Maidstone, Waseca, Lashburn, Marshall, and Aberfeldy—the latter being about twenty miles south of Fort Pitt

on the North Saskatchewan. (10) *Prince Albert*: the Canadian Northern Railway has lines to Prince Albert from Saskatoon North, and from Manitoba in a westerly direction along the southern section of the county or subdivision with the following settlements and railway stations: Roscoe, Hudson Bay Junction, Greenbush, Prairie River, Bannock, Mistatim, Peesane, Murphy, Tisdale, Valparaiso, Star City, Naisberry, Melfort, Beatty, Kinistino, Weldon, Brancepeth, Birch Hills, Fenton, Davis, Kirkpatrick, Clouston, Macdowall, Roddick, Carlton, Laird, and Shellbrooke.

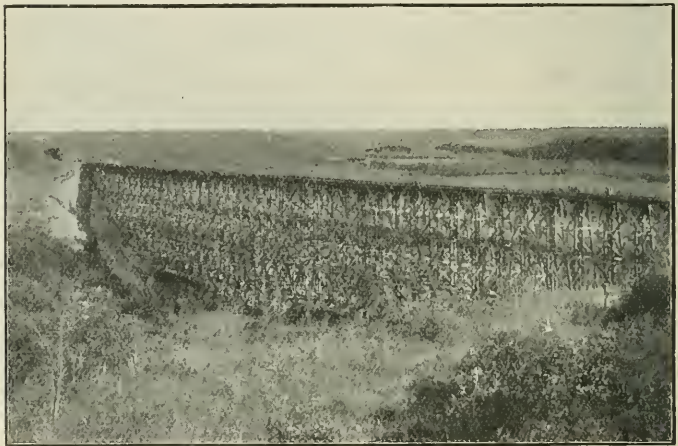
Hudson Bay Company Posts

Northern Saskatchewan counts many posts established by this ancient and honourable company, where trading is carried on, partly as it was formerly, and partly in tune with modern methods and requirements under present conditions. These are some of the leading posts and their locations:—(1) Fond du Lac, north side and eastern end of Lake Athabaska; (2) Reindeer Lake, north end; (3) Methye Portage, La Loche Lake; (4) North end of Buffalo Lake; (5) Southern extremity of the peninsula between Buffalo Lake and Clear Lake; Churchill river, three posts; (6) Near outlet of Snake Lake; (7) Stanley and (8) South of Stanley. (9) North shore of Miron Lake near Manitoba boundary; (10) Ile à la Crosse; (11) Martens Lake, eastern end; (12) Waterhen Lake, eastern extremity; (13) Trout Lake, north shore, south of Lac La Ronge; (14) Green Lake, northern extremity; (15) Meadow Lake, eastern extremity; (16) Stony Lake, west shore; (17) Egg Lake, south-west of Lake la Ronge; (18) Cumberland House, south shore of Cumberland Lake; (19) Small Lake, south-west of Goose Lake, about 30 miles

south of Cumberland House on the Carrot river; (20) Fort Pitt, North Saskatchewan river; (21) Fort à la Corne; (22) Hudson Bay Company post, 50 miles north-west of Prince Albert; (23) Fort Pelly.

Railways

The *Canadian Pacific Railway* has done pioneer work in this province, and its lines are spread in every direction



CUTARM TRESTLE, QU'APPELLE VALLEY, SASKATCHEWAN, G.T.P. RAILWAY.

of the compass in different parts of the province, and counts some 1700 miles of rails, having added 168 miles to their operated tracks, and graded 338 miles, with new lines to be constructed. The old Manitoba North-Western Railway also operates here. The Canadian Northern Railway Company had not less than 1320 miles of railway in operation in 1910. In 1907 that company purchased the Qu'Appelle, Long Lake, and Saskatchewan Railway and Steamship Company extending from Regina

to Prince Albert, and has completed a line from Regina to Brandon. It has also been first to construct a line from Hudson Bay Junction, west of Lake Winnipegosis, to Pas, whence the Dominion Government has decided to construct a line to Port Nelson on the bay.

The *Grand Trunk Pacific Railway* has 415 miles of its main line, from Fort William at the head of Lake Superior through to Winnipeg and Edmonton to the Rocky Mountains, which lie within the province of Saskatchewan, and a number of branch lines are under construction and surveyed. In 1912 there were 3754 miles of tracks laid, with many buildings, depots, elevators, etc., constructed to meet the demands of the increasing population that have settled in the province. Many branches are under construction.

The *Canadian Northern Railway* has numerous lines throughout the province, especially in the north, where it sends out its branches in every direction, and is pushing its steel to Hudson Bay *via* Pas.

Local Government

As a result of its autonomy terms, Saskatchewan, as a province, occupies the unique position of being able to conduct its provincial affairs without having to resort to a system of direct taxation. The revenue of the province is almost wholly derived from Dominion subsidies granted in lieu of the ownership of the lands within its borders, which are administered by the Federal Government. The only "supplementary revenue" is for educational purposes, and this tax—which averages 6·6 mills on the dollar in city districts, 8 to 10 mills in town districts, and from 5 to 6 mills in rural districts—varies according to extent of rateable territory and type of school created.

The municipal laws are excellent and taxes for municipalities low, the average assessment per acre being in small local improvement districts about 4 cents per acre, while the maximum assessment which can be levied is 5 cents per acre. In rural municipalities the average assessment is 5 cents per acre, and the maximum which can be levied is $6\frac{1}{4}$ cents per acre. The borrowing powers of a municipality (comprising nine townships) are limited to \$3000 per township, and a debenture cannot bear a greater rate of interest than 8 per cent.

Education

The University of Saskatchewan is situated in Saskatoon, whilst the Department of Education has its seat in Regina. This department is training the young farmers of the province to become scientific agriculturists. It is presided over by one of the ministers who directs the provincial system, which includes the kindergarten, elementary (public) schools, both urban and rural, secondary schools (high schools and collegiate institutes), and the University. School districts are now (1912) being erected at the rate of 400 a year. The schools, both elementary and secondary, are supported by local taxes and provincial grants. The University of Saskatchewan, at the head of which is a board of non-political governors, receives no Government grants. It has, however, been the recipient of generous gifts in the form of scholarships from private individuals. The University comprises two colleges: (1) Arts and Science; (2) Agriculture and Theological schools exist affiliated to the University. Schools in Saskatchewan have increased apace with settlement. Whereas on September 1st, 1905, when the province was established, there were

942 school districts organised, in the year 1910 the number of school districts had increased to 2251. In 1909 there were 53,969 scholars in attendance in village, town, and city schools; 880 pupils in the high schools and collegiate institutes. The Government grant for that year was \$315,596.10.

Two Acts for the furtherance of higher education have been passed by the Legislature: "The Secondary Education Act" and "The University Act."

General Progress

An indication of the general progress and advance made in Saskatchewan may be derived from the following table:

PROGRESS AND IMPROVEMENTS IN SASKATCHEWAN

Year.	1901.	1909.	1911.
Number of farms	13,612	81,303	96,371
Acreage of grain crops	577,393	7,383,000	9,137,502
Grain elevators	111	909	1,246
Capacity of elevators	2,978,000	26,465,000	36,503,000
School districts	453	2,251	2,573

Besides the above items, evidence of progress is found not only in the establishment of upwards of 1000 post offices, and some 300 branches of chartered banks in the province, the publication of over 100 newspapers, but also in the rapid extension of the telephone systems, which are in the hands of the province, with 5769 miles of wires, and 1772 pole miles of long distance lines, which, with the establishment of 133 rural companies, give a service of great social and economic value throughout the province.

CHAPTER XVI

THE PROVINCE OF ALBERTA

Oh would ye hear, and would ye hear
Of the windy, wide North-West ?
Faith ! 'tis a land as green as the sea,
That rolls as far and rolls as free,
With drifts of flowers, so many there be,
Where the cattle roam and rest.

MOIRA O'NEILL.

Boundaries.—Alberta, the most westerly of the three prairie provinces of Central Canada, lies between Saskatchewan on the east, and British Columbia on the west ; between the United States to the south, and the North-West Territories to the north. The 116th meridian forms the eastern limit of this province, and the 49th and 60th parallels of north latitude form respectively the southern and northern limits of the same. The western boundary of Alberta is delimited by the main axis or watershed of the Rocky Mountains from the international boundary line, in a more or less tortuous way, to a point near the intersection of the 54th parallel of north latitude with the 120th meridian, along this same axis, thence northward along the 120th meridian to its intersection with the 60th parallel of north latitude.

The total length of Alberta from north to south is 750 miles, and its greatest breadth 400 miles. It has an area of 255,285 square miles, containing 161,872,000 acres of land, being much larger than either France or Germany, and nearly twice the area of Great Britain and Ireland. Its water area covers 2360 square miles.

COMPARATIVE STATEMENT OF AREAS

	Sq. miles.		Sq. miles.
Alberta	255,285	Germany	208,780
Great Britain and Ireland	121,391	Austro-Hungary	241,333
France	207,054	New England States ¹	165,745

Physiography

Orography.—The magnificent chain of the Rocky Mountains affords scenery of unsurpassed grandeur, even



MOUNT ASSINIBOINE, ALBERTA.

by the heights and Alps of Switzerland, whilst its lofty peaks and glacier and forest-laden summits provide abundant water-supply to the great streams which traverse the foot-hill country and cross the great fertile prairies to the north and east. The flat open prairie

¹ In the above, the New England States comprise Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania.

region of northern, central, and eastern Alberta is succeeded on the west by the gently undulating and partly dissected and disturbed section of the "foot-hills," which are, in turn, followed upward and westward by the Rocky Mountains proper. These mountains are truly called "rocky," for they are most destitute of vegetation throughout their line of outcrop owing to the



RUNDLE MOUNTAIN FROM VERMILION LAKE, BANFF, ALBERTA.

activity of the agencies of erosion. The principal peaks, domes, and hills of the Rocky Mountains along or near the boundary line between Alberta and British Columbia include the following:—

Name.	Altitude. Feet.	Name.	Altitude. Feet.
Mount Geikie . . .	11,000	Mount Cascade . . .	9,826
„ Hooker . . .	10,505	„ Sulphur . . .	8,030
„ Coleman . . .	11,000	„ Beehive . . .	8,500
„ Wilson . . .	10,500	„ Assiniboine . . .	11,860
„ Tyrrell . . .	8,846	„ Forbes . . .	13,400

Name.	Altitude. Feet.	Name.	Altitude. Feet.
Mount Lefroy . . .	11,290	Mount Collie . . .	10,700
Grotto Mountain . . .	8,870	,, Lyell . . .	12,000
Saddle Peak . . .	9,278	,, Columbia . . .	14,000
Mount Brown . . .	9,050	,, Huber . . .	11,400
,, Alberta . . .	14,000	,, Thompson . . .	10,700
,, Bryce . . .	13,000	Milk River Ridge . . .	3,550
,, Stephen . . .	10,523	Hand Hills . . .	3,575
,, Cathedral . . .	10,284	Beaver Hills . . .	2,525
,, Aylmer . . .	10,365	Buffalo Head Hills . . .	2,500
,, Inglismaldie . . .	9,715	Mount Fox . . .	10,125
,, Rundle . . .	9,665	,, Whyte . . .	10,365
,, Balfour . . .	10,330	,, Hector . . .	11,235
,, Temple . . .	11,637	,, Ball . . .	10,930
,, Murchison . . .	13,500	,, Macoun . . .	8,697
Wind Mountain . . .	10,100	Moose Mountain . . .	7,970
Castle Mountain . . .	9,576	Knee Hills . . .	3,100
Three Sisters, East Peak	8,840	Chiniquy Hill . . .	5,287
,, ,, West Peak	9,734	Mount Bryce . . .	13,000
Mount Rae . . .	10,160	,, Field . . .	8,554
Gould's Dome . . .	10,125	,, Vaux . . .	10,741
Mount Daly . . .	10,255	,, Freshfield . . .	12,000
,, Bourgeau . . .	9,517	Chancellor Peak . . .	10,780
,, Gordon . . .	11,130	Porcupine Hills . . .	5,000
,, Wileox . . .	10,000	Peace Hills . . .	3,625
Big Hill . . .	4,275	Clear Hills . . .	f 2,000
Sareee Butte . . .	3,030		l to 3,500

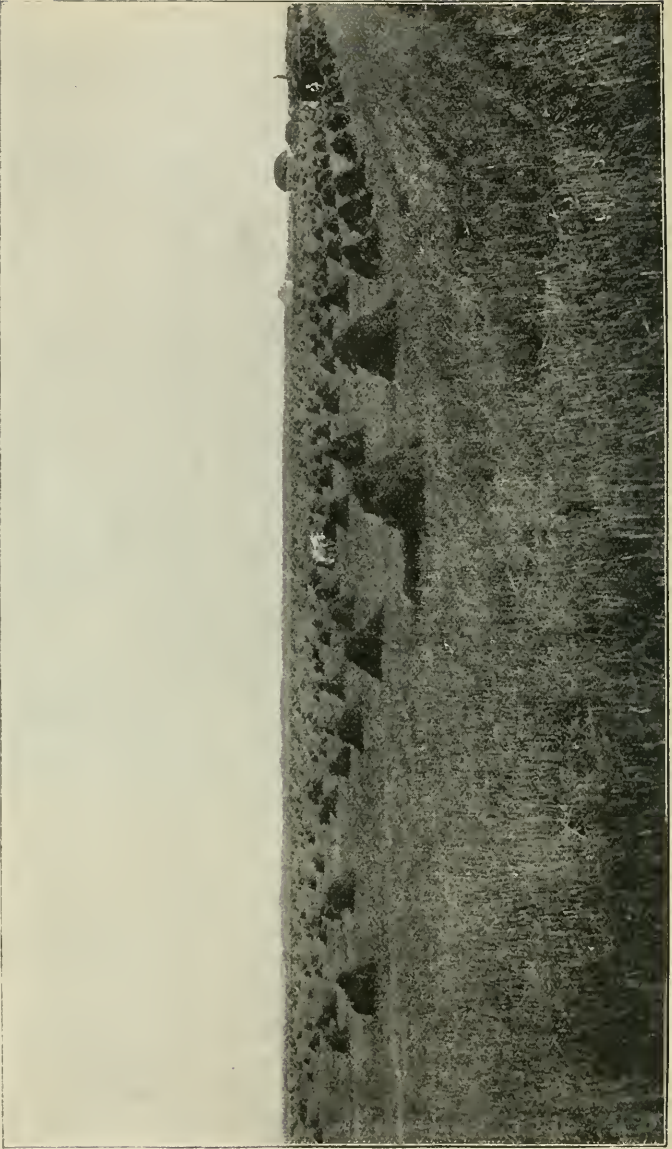
The province of Alberta may be divided into three natural divisions or zones, as follows:—

I. Southern Alberta, or Prairie Zone.

II. Central Alberta, or Park Zone.

III. Northern Alberta, or Forest Zone.

I. Prairie Zone of Southern Alberta.—This true prairie section extends from the international boundary line to about 100 miles north of Calgary, comprising the basin of the south Saskatchewan, covering an area of 65,500 square miles. The altitude is high and the rainfall light. The warm winds of the Pacific passing over the Rocky Mountains and sweeping through the passes,



FARM NEAR EDMONTON, ALBERTA.

moderate the climate in winter with the balmy "chinook." This district consists practically of rolling prairie land, very little timber being found.

This is the great ranching country of the West and of Alberta, where herds of cattle and bands of horses feed all the year round on the prairie. The construction of extensive irrigation works, of late years, however, has induced farmers to settle in this district, and land thus irrigated has yielded splendid crops of grain and vegetables of all kinds. Fall wheat has also been proved to thrive in southern Alberta even without irrigation. In the year 1909, six years after its introduction, upwards of 2,000,000 bushels of fall wheat were harvested, there being many yields of 40 bushels of wheat per acre, and upwards. Sugar beets have also been successfully raised in this irrigated zone.

II. Central Alberta, or Park Zone.—The central division extends from the Red Deer river northward, including the basin of the North Saskatchewan as far as the height of land between this river and the Athabaska. Open prairie country, broken by stretches or clumps of woodland presenting a park-like appearance, characterises this section. Spruce, tamarack, and poplar are the chief timber trees. This portion of Alberta is specially well adapted for mixed farming, and grain crops of all kinds yield abundantly, including spring and fall wheat, oats, barley, rye, and flax being the more common. Timothy and clover are grown successfully, and with the native grasses supply an abundance of excellent fodder for stock of all kinds.

III. Northern Alberta, or Forest Zone.—This is a generally well-wooded zone embraced within the basins of the Peace and Athabaska rivers although there are many areas of semi-open, park-like country, and even

open prairies with excellent grazing. This northern half of the province of Alberta has not yet been settled to any great extent, but the experience of the existing settlements as to climate and other conditions proves it to be quite as favourable to successful and profitable farming, both in grain-growing and stock-raising, as are the central and southern zones.

Hydrography

Rivers, Lakes, etc.—Four main rivers—the South Saskatchewan, the North Saskatchewan, the Athabaska, and the Peace—having their source and origin in the Rocky Mountains—flow easterly and north, as well as north-easterly, across the province of Alberta. The first two and their tributaries drain, and supply water to, southern Alberta, whilst the last two perform the same functions in northern Alberta. A low and almost imperceptible col, or height of land, separates the waters of the North and South Saskatchewan rivers, which unite near Prince Albert in central Saskatchewan and flow into the Hudson Bay and Atlantic basin, from those of the Peace and Athabaska flowing into the Mackenzie or Arctic basin.

The South Saskatchewan river, with its main tributaries, the Bow and Belly, Waterton, Old Man, St. Mary, and Red Deer rivers, drain a large portion of southern Alberta, including the counties of Medicine Hat, Macleod, and portions of Red Deer and Calgary. These rivers unite close to the eastern province line to form the main stream of the South Saskatchewan.

The North Saskatchewan river, with the Clearwater, Sturgeon, Blindman, Vermilion, and Battle rivers, and the Brazeau, drain the northern half of southern Alberta,

including part of the counties of Calgary, most of Red Deer and Strathcona, and a small fraction of southern-most Edmonton and Victoria, as at present delimited. The Peace and the Athabaska, mighty rivers of northern Alberta, are the two greatest arteries of the Mackenzie river system and drain 177,000 square miles of territory out of the 1,000,000 square miles ascribed to the Mackenzie basin.



THE NORTH SASKATCHEWAN, NEAR EDMONTON.

All these streams have many tributaries, rivers, creeks, and coulees, forming part and parcel of the hydrographic system.

Lakes abound in Alberta, varying in size from Lake Athabaska, part of which, only 100 miles in length, is in northern Alberta; Lesser Slave lake, 60 miles long; Lake Claire, 33 miles in length; Hay lake, 50 miles long, to less important lakes and ponds whose united area cover a surface of 1,510,400 acres. Besides the above-mentioned lakes of Alberta are the following: Bitscho, Whitefish, Sturgeon, Island, Lac la Biche, Cold,

Lobstick, Ste. Anne, Frog, Gull, Dowling, Sullivan, Gough, Buffalo, Tide, Louise, Pakowki, and Verdigris.

The Peace river counts numerous tributaries. The most important are: Fish Creek, Price, North, and Clear (rising in the Clear hills), Montagneuse river, Keg, and Boyer rivers, all flowing through the left bank; the Pouce



Notman, Photo.

LOUISE LAKE, ROCKY MOUNTAINS, ALBERTA.

Coupé, Rat, Brulé, Heart, Puskwaskaman, Wapiti, Smoky, Moose, Simonette, Little Smoky, North Heart river, Cadotte, the Wolverine, Bear, and Dark rivers, Loon, Wabiskaw, which in turn has the Pine, Wood, Buffalo, Bear, Shoal and Trout rivers as feeders, also the Whitefish river.

The Athabaska river, taking its rise, like the Peace, in the Rocky Mountains, has the following tributaries discharging along its left bank, from its source to Fort

M'Murray, namely: the Snaring, Marshead, Little Slave, Calling, Pelican, and Loon rivers, which latter stream marks the beginning of the famous "Rapids" and the "Grand Rapids" just about the mouth of that stream. The following are the "Rapids": Brulé, Boiler, Middle, Long, and Mountain Rapids—at the foot of the Thickwood hills—ending at Fort M'Murray, where the Clearwater, Christina, Grizzly Bear, High, and Swan rivers discharge their waters into the Athabaska. From this point below the Red, Moose, Willow, Tar, and Calumet rivers, taking their rise in numerous lakes, enter the Athabaska from the west, whilst the Steepbank, Muskeg, and Firebag rivers enter the same river from the east. The Athabaska river, after flowing eastward and northward, a distance of some 600 miles, enters the lake of the same name opposite Fort Chipewyan.

The lakes of Alberta are comparatively few, and none are very large. From the open shallow prairie ponds and broader lakes with alkaline waters, to the beauteous, sweet, clear, and sequestered lakes of the mountains, there is great diversity of type and origin. Lake Athabaska, which is 690 feet above sea-level, and lies wholly in a granitic and Archæan country, contains 2842 square miles of water, of which upwards of 1000 square miles are within the province of Alberta. Claire lake near by has an area of 405 square miles, whilst Lesser Slave lake in the heart of the Cretaceous area counts 480 square miles. Lac la Biche, 1650 feet above tide, covers 125 square miles; Beaver lake, 2173 feet above tide, measures 89 square miles; Sullivan lake covers 94 square miles; Buffalo lake 55 square miles; and Pakowki lake measures 72 square miles of surface. The height above tide of other Albertan lakes is as follows:—

Lake.	Altitude.	Lake.	Altitude.
Eagle . . .	3006 ft.	Dowling . . .	2563 ft.
Bear . . .	2648 „	Cooking . . .	2400 „
Pigeon . . .	2824 „	Gull . . .	2905 „
Louise . . .	5675 „	Agnes . . .	6850 „
Mirror . . .	6530 „		

Hills.—Whilst the south-western portion of the province is most picturesque, and counts some of the highest peaks along its boundary line with British Columbia, in the Rocky Mountains axis, and diversified hills in the “Foothill” country adjacent to the Rockies, the remainder of the province, usually described as a great plain or prairie district, is nevertheless studded with hills of more or less importance, and include the following:—

Buffalo Head Hills, situated in the country between the Peace river and its tributary the Loon river; they are nearly 50 miles in length and 25 miles across, with Buffalo lake at the southern extremity. *The Birch Hills*, or mountains, lie west of the Athabaska river and east of the Birch river, a little-known stream which flows north into Lake Claire. These hills have a general north-east and south-west trend, and are about 100 miles long and 50 miles across. *The Thickwood Hills* lie immediately south of the Birch mountains, west of Fort M'Murray, and compel the Peace river to turn sharply eastward in its northerly course from Athabaska landing to Lake Athabaska. *Trout Mountain* is an isolated hill, north of the Trout lakes and west of the Thickwood hills, south of the Wabiskaw river, a tributary of the Loon river, though it appears to be in reality the main branch. *Pelican Mountain* or Hills, situated between Lesser Slave lake and the Athabaska river, south of Pelican lake, are about 65 miles long and 25 across. They have a chain of lakes along both their southern and northern borders. *Martin Mountain* is the

name given to a prominence just west of the Pelican Mountain. *The Clear Hills* form a more or less continuous east and west series of hills, varying in height from 2000 to 3500 feet, situated north of the Peace river in its south-western expression, between Peace river landing and Fort St. John in the Peace river block. Nearly 100 miles of these hills are within the province, but extend in a westerly direction along the head-waters of the Hay river. *The Moose Hills* of Saskatchewan enter Alberta Province about 50 miles north of Lloydminster on the Canadian Northern Railway, and stretch between the North Saskatchewan and the Beaver rivers near the inter-provincial boundary. *The Neutral Hills* have a north-easterly and south-westerly trend in the neighbourhood of Sounding lake and Ribstone Creek, in the easternmost portion of Red Deer District. *The Blackfoot Hills* lie north of the Battle river, in the extreme north-easterly corner of the Strathcona district of Alberta. They have a general north-north-west and south-south-easterly axis. *The Beaver Hills* lie east of Edmonton, between the capital and Beaver lake, extending a distance of some 30 miles in a number of more or less inconspicuous elevations in the general plateau and prairie country. *The Porcupine Hills* form a narrow stretch of elevated country east of the Rocky Mountains between the Livingstone river and Willow Creek, fully 100 miles in length between Macleod and Morley. They have an almost due north and south axis.

The following are some of the main "passes" leading into the mountains of Alberta with their height above sea level:—

	Altitude. Feet.
Crowsnest Pass (summit)	4449
„ „ (trail summit)	4845
South Kootenay Pass (summit range) . .	7100

	Altitude. Feet.
North Kootenay Pass (summit range)	6750
North Fork Pass	6773
Kananaskis Pass	6200
Simpson Pass (summit).	6650
Yellowhead Pass	3663

Other Rocky Mountain passes and their altitude are as follows:—

	Altitude. Feet.	
Kicking Horse Pass	5329	
Little Fork Pass	6775	
Baker Pass	6700	
White Man's Pass	6807	
Vermilion Pass	5264	
Thompson Pass	6800	
Sinclair Pass	4662	
Howse Pass {	according to Wilcox	5300
	„ Collie	4800
	„ C.P.R.	4500

Climate

There is no inland country in the world in the same latitude as Alberta possessing such a favourable climate. The winters, though cold, are remarkably free from violent storms, and in the dry atmosphere little suffering is experienced which characterises low-lying countries even when the temperature is higher. The summer season, while warm enough to induce vigorous growth in all kinds of grain, vegetables, flowers, grasses, and small fruits common to temperate zones, is free from the sweltering mid-summer temperatures of regions with lower altitudes.

The Director of the Meteorological Service of Canada makes the following statement regarding the climate of Alberta in his Annual Report for the year 1909:—

“It is doubtful whether there is any region of the globe where the distribution of atmospheric pressure has so pronounced an effect on weather conditions as in southern Alberta, and this because a barometric gradient for northerly winds in winter means the transference of air from continental high latitudes across this country, while a westerly gradient means the flow of mild ocean air still further raised in temperature by the ‘chinook’ effect.”

A study of the isotherms for the year, and particularly for the summer months, indicates the reliability of the above statement. The isotherms bend northward from the province of Manitoba, showing that the climate many miles to the north and west is as warm as that in southern Manitoba or Minnesota. The *line of greatest heat* passes through Fort Vermilion, on the Peace river, 350 miles north of Edmonton, the capital of the province, a fact which indicates that during the summer months the climate is actually warmer in northern Alberta than in the central and southern parts; and summer in the valley of the Peace is as warm as in the valley of the Saskatchewan, some 300 miles farther south.

The following table of mean summer temperatures taken at points distributed over the entire length of Alberta, indicates how evenly and how far north the heat is distributed.

Localities.	Latitude.	Longitude.	Mean Summer Temperature.
Cardston . . .	49° 12'	113° 18'	59° Fahr.
Macleod . . .	49° 44'	113° 24'	60° ”
Calgary . . .	51° 2'	114° 2'	59° ”
Edmonton . . .	53° 33'	113° 30'	61° ”
Fort Vermilion	58° 29'	116° 3'	61° ”
Dunvegan . . .	55° 56'	119° 2'	60° ”

The country slopes gently from the south to the north, so that while the southern half of the province is from 2500 to 3500 feet above sea-level, the Peace river country to the north has an average of some 2000 feet only above sea-level. This lower altitude appears to offset the difference which would otherwise be made by the difference in latitude, and tends to make the summer season comparatively uniform in warmth and duration throughout the entire length of the province.

An important factor in modifying the winter climate of Alberta is the "chinook," or warm wind from the Pacific, which blows over and through the Rocky Mountains and their passes, spreading its benign influence over the entire province.

The "chinooks" are warm winds that blow from the mountains, and are caused by the condensation of the air and the compression of the moisture as the currents descend from the mountain-tops liberating heat. It has been estimated that the air rises 10° centigrade for every 400 feet it descends. These chinooks occur along the whole range of the Rockies from southern Alberta to the Peace river, nevertheless they are more characteristic of southern Alberta where the name originated. They have been known to cause a rise in temperature of 60° in a few hours.

Owing to the Japanese current the water of the North Pacific Ocean along the west coast of British Columbia is warm, and the winds which sweep through the mountains to the plains are mild and balmy even in mid-winter. These winds unload their moisture on the high peaks of the Cordillera, especially in the Selkirks, and produce a warming as well as a drying influence as they reach the eastern slope of the Rocky Mountains.

Rainfall is scant, especially in the south, but is ample for mixed farming purposes. Irrigation is being carried on extensively in southern Alberta with excellent results.

The following table from meteorological records obtained in different sections of the province indicate the annual precipitation of moisture in inches:—

AVERAGE ANNUAL PRECIPITATION OF MOISTURE IN ALBERTA

Locality.	Moisture.
Banff	19 inches.
Calgary	16 „
Edmonton	17 „
Fort Chipewyan	13 „
„ Dunvegan	19 „
„ St. John	16 „
Macleod	12 „
Medicine Hat	13 „
Red Deer	22 „

The average annual precipitation of Ontario is 31.62 inches.

The average annual precipitation of Alberta is 15.95 inches.

Snowfall is moderate, though variable, and there are occasional winters when there is very little. In southern Alberta the “chinook” frequently carries off the snow entirely as if by enchantment. The ranches of this district depend largely upon this phenomenon, and cattle and horses are left to feed out all winter, though provision of hay is usually secured for emergencies.

Soil

The soil of Alberta is one of its chief assets, and the province is essentially and primarily a farming and stock-raising country. In 1911 at least two-thirds

of the active population of Alberta lived on farms and ranches.

The soils of northern Alberta are, for the most part, characterised by high percentages of organic matter and nitrogen, and in this respect are somewhat superior to those in the southern part of the province. Whilst southern Alberta is of a true prairie character, northern Alberta may be said to be largely wooded, enjoying a greater rainfall, and is naturally a country better adapted for mixed farming. There exists a decided relationship, as Professor Shutt has clearly pointed out, between the rainfall and the organic content of the soil.

The results, obtained by Professor Shutt in his recent investigations of Albertan soils, calculated to water-free basis, are given in the table on following page.

The Albertan soils all have one feature in common; they are well supplied with the finer particles that hold water near the surface for the crop. The Lethbridge soil is light and easily worked, Lac la Nonne is much heavier, having a large proportion of clay.

The conservation of soil moisture for the crops' needs is the important question of prairie farming, and the best means to this end is by deep ploughing for the storage of rainfall in the soil, and the formation by frequent cultivation of a dry earth mulch to check evaporation. Southern Alberta may be considered as a semi-arid country, and one where irrigation on an extensive scale may therefore be carried on. The Canadian Pacific Railway Company's scheme will eventually irrigate an area around Calgary covering about 1,100,000 acres, where a heavy black loam of from 4 to 8 inches in depth with a subsoil of chocolate-coloured clay constitutes a region well adapted to diversified farming.

No.	Locality.	Character of Soil.	Organic and Volatile Matter (Loss on ignition).	Nitrogen.	Phosphoric Acid (P_2O_5).	Potash (K_2O).	Lime, (CaO).	Available Constituents.		
								Phosphoric Acid (P_2O_5).	Potash (K_2O).	Lime (CaO).
			Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
1	Tilly, Tp. 16, R. 13, W. 4th	Sandy loam . . .	11.12	.398	.174	.266	.37	...	...	...
2	Lethbridge (1st foot) .	Dark grey or black sandy loam	5.89	.215	.123	.462	1.04	.008	.029	.959
3	Calgary, N.W. 4, Sec. 21, Tp. 23, R. 1, W. 5th	Black granular, sandy loam	13.69	.530	.210	.520	.71	.009	.035	.498
4	Calgary, S.W. 4, Sec. 15, Tp. 23, R. 1, W. 5th	Black granular, sandy loam, non-irrigated	16.12	.549	.240	.380	.90	.004	.028	.440
5	Calgary, S.W. 4, Sec. 15, Tp. 23, R. 1, W. 5th	Black granular, sandy loam, irrigated	15.30	.574	.180	.380	1.28	.012	.035	.568
6	Innisfail (1st foot) .	Black, sandy loam .	12.09	.403	.155	.384	.68	.016	.015	.392
7	Lacombe (first 8 inches)	" " " "	8.78	.326	.136	.250	.63	.023	.024	.385
8	Lac la Nonne . . .	" " " "	17.63	.673	.190	.611	1.00	.037	.022	.584
9	" " " "	" " " "	14.34	.514	.197	.673	1.24	.050	.035	.799

Flora

Ninety-six different varieties of native grasses have been identified in Alberta, and of these not less than forty-six make excellent hay; whilst there are at least ninety-four varieties of sedges and rushes, many of which make good hay, and all make splendid pasture during spring and early summer. The true grasses occur on the uplands, and grow with wild pea, vine, and vetches. The sedges of lowlands and marshes, especially if the latter should be saline, are diligently sought for by the stock, and especially by horses, which show particular fondness for them and gain flesh at once. Native hay, western rye-grass, blue grass, buffalo grass, and bunch grass abound in luxuriant stretches, where they are "cured" on the ground during the winter, and afford excellent feeding until the spring comes. There is one common flora extending from the international boundary line northward to Lake Athabaska and the Peace river. The prairie flora enters the mountains through the passes, and fills the valleys with a luxuriant growth of luscious plants for cattle, mixed with flowers of exquisite colour and beauty, during three out of four seasons of the year.

Geology

The geology of Alberta is as diversified as its scenery. In the Rocky Mountains, or south-western edge of the province, geological features are exhibited on a grand scale, whilst the structure of the foothill country and of the prairie sections are proportionately complex or simpler as one proceeds in an easterly, north-easterly, or northerly direction. The succession in the strata and other rocks comprised in the geology of Alberta includes

rock-formations belonging to the following systems in descending order :—

TABLE OF ROCK FORMATIONS IN ALBERTA

QUATERNARY . . .	{ POST-GLACIAL . . . GLACIAL . . .	{ Loam, sands, gravels, silts; river and lake deposits, raised beaches, etc.
		{ Upper boulder clay. Inter- glacial deposit with peat. Lower boulder clay. Till, kames, eskars, moraines, drumlins, etc. Shingle and associated beds.
TERTIARY . . .	{ MIOCENE EOCENE	{ Miocene. (White river beds.) Paskapoo. Coal. Yellow sandstones, and blue and olive sandy shales.
		{ Edmonton. Fine and sandy clays, etc. Bearpaw. Grey shales. Belly river. } Upper pale series. (Coal.) } Lower yellow series. Claggett. Grey shales. Eagle. Light coloured sand- stone.
CRETACEOUS . . .	{ MONTANA COLORADO	{ Niobrara. Grey calcareous shales. Cardium. Benton. Black shales.
		{ Dakota. Sandstones, shales, and conglomerates.
	KOOTANIE	(Jurasso - Cretaceous.) Coal. Sandstones and shales.
JURASSIC . . .	FERNIE	Black and brown shales, sandy argillites, grey sand- stones.
TRIASSIC . . .	BANFF (shale) . . .	Red, sandy shales and yellow dolomitic limestones.
CARBONIFEROUS.	BANFF (lime) . . .	Rundle formation.
DEVONIAN . . .	Intermediate series .	Hardened dolomitic lime- stones with some sand- stones and quartzites.

PRE-CAMBRIAN . (LAKE ATHABASKA)	Athabaska.	Sandstones, etc.
ARCHÆAN . . .	$\left\{ \begin{array}{l} \text{HURONIAN} . . . \\ \text{LAURENTIAN} . . . \end{array} \right.$	$\left\{ \begin{array}{l} \text{Schists and other meta-} \\ \text{morphie rocks.} \\ \text{Gneisses and granitoid} \\ \text{gneisses, etc.} \end{array} \right.$

Eruptives.—Besides the above sedimentary and metamorphic rocks there are a few basic eruptives, laccolites, etc., in the extreme south-western portion of the province.

Archæan, etc.—At the base of all the geological formations of the province, and in the extreme north-eastern corner, an outcrop of primitive crystalline rocks of Archæan age and referable to the Laurentian and Huronian systems occurs, covering an area of nearly 2000 square miles, capped by pre-Cambrian sedimentary deposits in the vicinity of Lake Athabaska, the latter forming part of a larger mass or outlier extending into Saskatchewan. The Laurentian series consists for the most part of banded gneisses and granitoid masses, with occasional bands of Huronian materials: schists and schistose rocks of great antiquity, but limited in extent, as at present recognised in this part of Alberta. More detailed work is required before these can be more accurately mapped.

Devonian.—The Archæan and crystalline rocks of this region are overlain unconformably by a comparatively thin mantle of Palæozoic formations referable to the Devonian system, indicating clearly the total absence in this section of the province of Silurian, Ordovician, and Cambrian formations (which are known to crop out in the south-western or Rocky Mountain area of Palæozoic sediments), indicating the occurrence of a great gap and unconformable overlap at the junction of these two systems. The Devonian rocks of north-eastern Alberta are practically horizontal, have a general north-westerly and south-easterly trend, and cover an

area of about 15,000 square miles. They must extend, however, in a south-westerly direction, beneath newer strata, from Lake Claire, near Athabaska lake, to the Rocky Mountains proper, increasing moderately in thickness in the same direction. **Mesozoic** strata of Triassic and Cretaceous age follow. Between them and the Devonian rocks below, an enormous break occurs in the succession of sediments, where the whole of the Carboniferous, the Permian, and a large portion of the Triassic and Jurassic formations are absent. A geological map of Alberta shows clearly the enormous extent which the Cretaceous system covers in the province, an area of at least 200,000 square miles, which in its south-westerly extension is capped by Laramie and Tertiary beds of great economic value, especially in their coal-bearing strata. The **Cretaceous** formations themselves form a most important economic factor in the natural resources and wealth of the province, whilst the Laramie and the Tertiary system follow the Cretaceous in Alberta, covering an area of about 50,000 square miles. These latter have been linked together by geologists as constituting an uninterrupted series of beds in the west, the lowest members of the former being an upward extension of the Cretaceous system, and the highest members constitute the base of the Tertiary system. The base of the Laramie contains marine sediments; these are superimposed by estuarine deposits, which in turn are capped by fresh-water beds whose relations, faunas, and floras, as well as economic values, Tyrrell has carefully described in the *Geological Survey* reports. The basal or Eocene series of the Tertiary (Paskapoo series) is capped by newer Tertiary strata, probably referable to the Miocene, Pliocene, and Pleistocene.

Apart from the relatively small exposures of Archæan

crystalline rocks of extreme north-eastern Alberta, whose structure is exceedingly complicated and involved, and apart from the disturbed, folded, overthrust portion of the Rockies and foothills of the south-western portion of the province, the geology of Alberta is simple, and the remarkably flat and prairie-like character of the country, even in the woodland and northern timbered sections underlaid by the Devonian, Cretaceous, Tertiary, and later formations, owes its present topographic features to the evenly-bedded character of the underlying geological formations themselves. The south-western or Rocky Mountain and "Foothills" country, on the contrary, has suffered enormous deformation, in the uplifting of the strata composing this region, and the consequent erosion and dissection of a great plain of marine sediments; also in the powerful earth movements of pronounced upward and easterly direction on the part of well-marked and rigid formations, which have produced lines of thrust and breaks resulting from strains and stresses, due to the desiccation process going on in the earth's crust in this portion of the continent, intensified no doubt by the enormous development of volcanic and other igneous masses throughout the Cordilleran region. The forces of nature involved in the building up of the Rocky Mountains and of the foothills are still active, as is evident in the great thrust or landslide at Frank, in Alberta, where a very ancient mountain mass actually rode over newer strata, and is still advancing in a decidedly threatening attitude. The great bulk of the rock-formations of Alberta, however, have suffered but little metamorphism outside of the Archaean and those of the Rocky Mountain areas. The principal mineral products of the Alberta formations comprise gold, coal, natural gas, cement, clay, and other products used in construction.

Geological Resources

The geological resources of Alberta are varied, and their development is as yet in its infancy. The gold-bearing gravels of the Saskatchewan, the natural gas, oil, and tar deposits, the coals of various geological formations, clay, lime, salt, and various other materials, will furnish the growing population with supplies at its very doors. The "tar sands" of northern Alberta are a striking feature in the geological resources of this province.

Mr. R. G. M'Connell has estimated that the area of tar sands amounts to at least 1000 square miles, which with an average thickness of 150 feet would give 28.4 cubic miles of tar sands, or 4,700,000,000 tons of bitumen, or 6.5 cubic miles of tar.

Natural gas forms an important factor in the economic products of the rock formations of Alberta, and tests were made at Dunmore Junction, Medicine Hat, Stair, Suffield, Latham, Bassano, and Bow Island, at depths from 700 to 1000 feet in sandstone bands, probably belonging to the Niobrara shale formation. The "Bow Island well" on the Crowsnest Railway, some 2000 feet deep, drilled in 1908, has a reported output of 8,000,000 cubic feet of gas per day, with a rock-pressure of 800 pounds to the square inch. From samples of coal and fossil remains obtained by surveyors and explorers of the Dominion Lands Branch (in 1909) from the Smoky and Muskeg rivers, north of the Grand Trunk Pacific, it appears that a basin of Kootenay coal-bearing strata occurs in that latitude—referable to same geological coal formation, from which the high grade bituminous and anthracite coals of the Crowsnest and Bow river passes are derived. We have thus, in all likelihood, an almost uninterrupted zone or belt of coal-bearing strata from

the southern portion of the Eastern Cordillera to its northernmost expression within the Dominion of Canada, a source of untold value and wealth for generations to come in fuel and power-giving elements, as well as other economic relations which arise therefrom.

The Bighorn coal basin, lying between the Bighorn range and the first range proper of the Rocky Mountains, extending from the North Saskatchewan to its tributary, the Brazeau, was discovered in 1906 by Mr. D. B. Dowling of the Geological Survey of Canada. Owing to its proximity to the lines of the Canadian Northern Railway and Grand Trunk Pacific Railway, which run over a lignite-bearing country, this basin can furnish a coal much superior as a steam producer, and in great abundance. The geological section of the district, according to Mr. G. S. Malloch, is as follows:—

PALÆOZOIC . . .	{	1. Intermediate beds: consisting of calcareous shales and impure limestones.
		2. Lower Banff limestone.
		3. Lower Banff shale.
		4. Upper Banff limestone.
		5. Rocky Mountain quartzite.
TRIASSIC? . . .		6. Upper Banff shale.
JURASSIC . . .		7. Fernie shale.
CRETACEOUS? . . .		8. Kootanie formation: the coal-bearing formation consisting of a succession of sandstones and black shales.
	{	9. Dakota sandstone: this also includes some shale.
CRETACEOUS . . .		10. Benton shale.
		11. Cardium sandstone and intercalated shales.
		12. Claggett shales.
		13. Judith river sandstones and shales.

Section of the strata bearing coal seams on Trail and George Creeks reveal a large quantity of coal available in numerous seams. Analyses of the coals from the

Bighorn and Brazeau rivers, nearly all excellent coking coals, gave the following results to Dr. Milton Hersey:—

Field.	Mark.	Moist.	Volume Com- bustible Matter.	Volatile Matter.	Fixed Carbon.	Ash.	Coke.	Sulph.
Brazeau.								
1	3	·28	29·04	29·32	64·52	6·16	70·68	·68
2	4	·90	27·60	28·50	60·08	11·42	71·50	·46
3	6	·50	20·10	20·60	49·62	29·78	79·40	·56
4	8	·36	26·72	27·08	62·35	10·57	72·92	1·21
5	12	·56	22·82	23·38	70·30	6·32	76·62	·69
6	14	1·46	24·04	25·50	67·93	6·57	74·50	·70
7	9	·30	24·58	...	62·95	12·17	75·12	...
8	11	·20	24·33	...	69·34	6·13	75·67	...
Bighorn.								
1	A	·38	22·62	...	68·85	8·15	77·00	...
	B	·20	22·95	...	69·78	7·07	76·85	...
2	C	·32	19·51	...	71·47	8·70	80·17	...
3	5	·34	25·28	...	68·13	6·25	74·38	...

The coals of the Cascade basin brought into use by the construction of the Canadian Pacific Railway Company in 1884 have proved to be high-grade and excellent as steam producers. The sections examined by Mr. Dowling gave 23 seams with an aggregate thickness of 89 feet of coal, and the probability of several additional seams in the same basin which do not crop out on the surface of the ground.

Assuming that where the whole thickness of measures is present, there is an average of 90 feet of coal capable of being mined, and available coal amounts to 150,000 tons to the acre, or 96,000,000 tons to the square mile, for the average of the area as mapped, allowing for dirty seams and coal left in the mine, approximately 65,000,000 tons per square mile should not be an excessive estimate.

Of lignite coals in Alberta, their importance and

value as fuels is assured. Besides mines in operation on and near the Canadian Pacific Railway, and others being opened on the Grand Trunk Pacific and Canadian Northern railways, the following mines during 1907 yielded the output indicated on next page.

The general output of lignite for Alberta for 1907 is given in the provincial report as 639,335 tons. This includes the mines of Lethbridge, Taber, Magrath, Woodpecker, Lundbreck, High River, and Pincher Creek, a total of thirty coal producing mines. Their product should be called lignitic coal, and thus separated from the true lignites, of which there was approximately 240,000 tons. Of the latter Edmonton produced 112,588 tons. For the two new provinces the following table shows the rapid increase in output:—

Provinces.	1881.	1891.	1901.	1906.
Alberta . . .	1590	174,131	280,000	1,385,000
Saskatchewan . . .	...	...	40,909	170,582
Totals . . .	1590	174,131	320,909	1,555,582

The rapid increase of population forms a valuable index to the corresponding demand for coal. The population of the prairie provinces for the same years is here given:—

POPULATION ¹

Provinces.	1881.	1891.	1901.	1906.
Alberta . . .	18,075	26,277	68,376	185,412
Saskatchewan . . .	19,679	40,522	90,564	257,763
Manitoba . . .	62,260	152,506	255,211	365,688
	100,014	219,305	414,151	808,863

¹ Population of Alberta in 1911, 374,663.

Name of Mine.	Locality.	Seam.	Thickness.	Output, 1907.
White Star Mine	5 miles south of Strathcona .	Probably Strathcona .	5 ft. 8 in.	Tons. 12,000
Strathcona	Strathcona	Strathcona	5 ft.	18,368
Humberstone	Clover Bar	Clover Bar	8 ft.	8,665
Milner Coal Company	"	"	7 to 8 ft.	2,000
Clover Bar	"	"	8 ft.	13,281
Parkdale	Edmonton	"	4 to 5 ft.	3,800
Standard	"	"	4 ft. 6 in. to 6 ft.	21,200
Fraser and Freeman	Clover Bar	"	6 ft.	5,500
Daly	"	"	6 ft.	4,700
Keith and Fulton	"	"	"	4,294
Byers	Clover Bar	Clover Bar	7 ft.	2,010
Ottwell	"	"	7 ft.	9,025
Davkins	"	"	"	580
Lindsay	Namoo	Probably Clover Bar	4 to 5 ft.	2,191
Smith and Steffos	"	"	5 to 7 ft.	1,190
Cardiff	Morinville	"	10 to 15 ft.	(Large output at present developing.)
Alberta	"	"	10 to 15 ft.	
Twin City	Strathcona	Clover Bar and Twin City	4 to 5 ft.	
Rosedale	Edmonton	Clover Bar	5 ft.	
Namoo Coal Company	Namoo	Probably Clover Bar	6 ft.	
United Collieries	Edmonton	Clover Bar	4 ft.	
Frank Coal Company	"	"	6 ft.	
Dawson	"	"	6 ft.	
Rupert's Land Coal Company	Oliver	"	8 ft. and 6 ft.	

The output of anthracite in the Cascade coal basin forms an important item, and a table is here appended for ten years.

OUTPUT OF ANTHRACITE

	Tons.		Tons.
1898 . . .	23,000	1903 . . .	5,185
1899 . . .	22,000	1904 . . .	23,363
1900 . . .	17,549	1905 . . .	43,653
1901 . . .	14,742	1906 . . .	235,597
1902 . . .	16,587	1907 . . .	305,700

The increasing output and value of one of Canada's anthracite coal basins in the Rocky Mountains given above is a sufficient reply to the statement often advanced that no anthracite coal deposits occur within her borders.

The Minnewanka Lake District of Alberta in the Rocky Mountains gave H. W. Shimer the following table of formations from sections made across four blocks in a region where "fault blocks" occur as a general feature in the geological structure:—

TABLE OF FORMATIONS

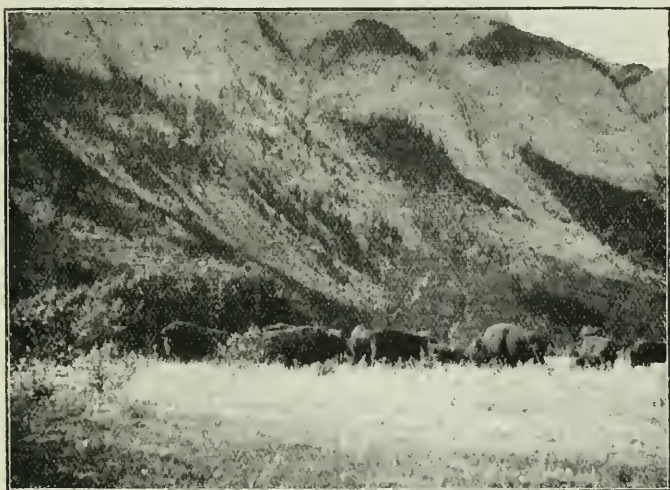
The rocks are entirely of sedimentary origin; the seven formations studied consist almost entirely of limestones and calcareous shales.

Permian		Upper Banff shale.
Pennsylvanian	} Carboniferous.	{ Rocky Mountain quartzite.
		{ Upper Banff limestone.
Mississippian	}	{ Lower Banff shale.
		{ Lower Banff limestone.
Devonian		Intermediate limestone.
Cambrian		Castle Mountain group.

The total value of the mineral production of Alberta for the years 1912 and 1913, as furnished by the department of Mines, was \$12,073,589 and \$13,844,622 respectively, making 8.94 per cent and 9.61 per cent

of the total value of production for the Dominion during the same two years.

Parks.—Rocky Mountains Park, stretching from near the head-waters of the Kananaskis river in the south, to the bend of the Clearwater in the north, and to the height of land along the main axis of the Rockies, through which the main line of the Canadian Pacific

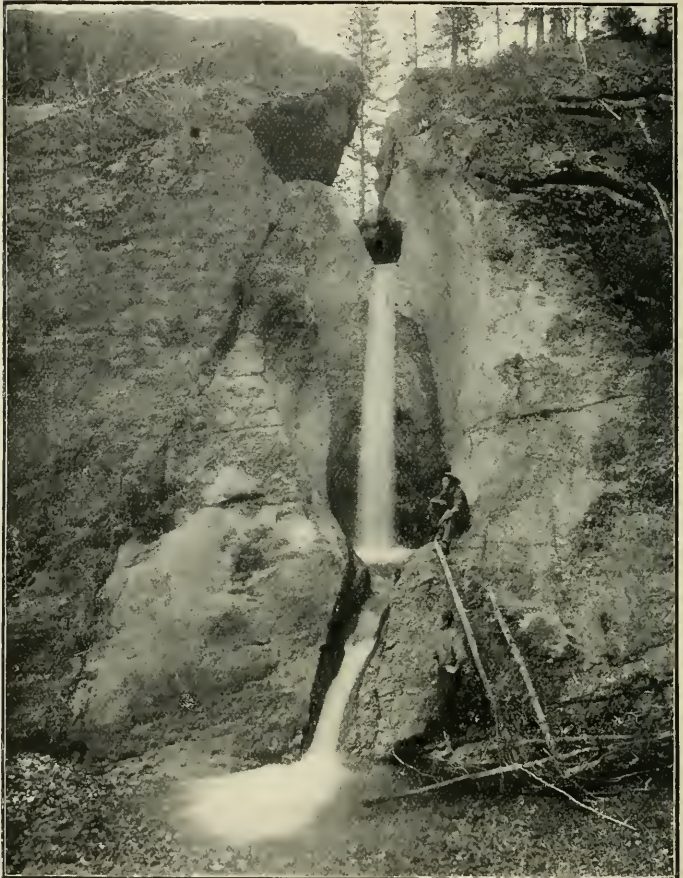


BISON IN ROCKY MOUNTAINS, NATIONAL PARK.

Railway passes, forms one of the most sublime pleasure grounds of the world, with scenery of exquisite beauty, grandeur, and vastness, with facilities afforded on all sides for comfort and ease in a series of world-famed hostelries situated in the heart of Nature, where roads, paths, and trails have been made for tourists and explorers. Swiss and other guides are available at Banff, Lake Louise, Field, and the leading places of interest.

Jasper Park is a national park and forest reservation,

where the fauna and flora will be allowed to thrive without interference so far as man can permit. The Hot



PUNCH BOWL FALLS, NEAR G.T.P. HOTEL, JASPER PARK.

Springs of Jasper Park will, no doubt, prove medicinal in their properties and delightfully situated for a rest resort.

Analyses by Mr. F. T. Shutt, M.A., F.C.S., Chemist of the Central Experimental Farm at Ottawa, prove these waters to be of much value. Beds of travertine are deposited on the hillsides and in the creeks adjoining the springs which emerge from a broken anticline in the limestone strata.

In Jasper Park, Mr. D. B. Dowling points out that the Lower Cretaceous rocks of the Kootanie formation are exposed in the numerous folds to which this eastern extension of the Rocky Mountain Range or system of the Cordillera has been subjected. Coal-seams ranging from 5 to 10 and 13 feet occur at the Jasper Park Collieries. These and other coal mines of the district will be a source of enormous wealth and development in the near future, inasmuch as branch lines of railway are being built to connect with the Grand Trunk Pacific and Great Northern railways, the two most northerly of the Canadian transcontinental railway lines.

Agriculture

The number of acres of land under cultivation in Alberta, together with the amount, in bushels, of the production of spring and winter wheat, oats, barley, and flax, in the province for the years 1898 to 1909 are given in the following tables, which also seem to show that it was not until 1903 that Alberta was reckoned as a province in which winter wheat could be raised to advantage. It is rather remarkable that between the years 1903 and 1909 not less than 9,563,612 bushels of winter wheat were produced in this new province, with a yield per acre ranging from 18.33 bushels as a minimum in the year 1904, to 29.47 bushels per acre as a maximum for 1908.

ACREAGE AND PRODUCTION IN ALBERTA

Spring Wheat

Year.	Acreage.	Bushels.	Yield per Acre.
			Bushels.
1898	31,348	792,417	25·27
1899	35,090	833,123	23·74
1900	30,361	583,806	19·22
1901	34,890	857,714	24·58
1902	45,064	850,122	18·86
1903	59,951	1,118,180	18·65
1904	47,411	786,075	16·58
1905	75,353	1,617,505	21·46
1906	115,502	2,664,661	23·07
1907	123,935	2,261,610	18·25
1908	212,677	4,001,503	18·81
1909	324,472	6,155,455	18·97
1910	674,665	6,736,680	9·98
1911	1,334,186	28,872,000	21·64
1912	1,378,000	29,675,000	21·54
1913	1,310,000	30,130,000	23·00

Winter Wheat

1903	3,440	82,418	23·95
1904	8,296	152,125	18·33
1905	32,174	689,019	21·41
1906	61,625	1,301,359	21·11
1907	83,965	1,932,925	20·66
1908	104,956	3,093,422	29·47
1909	102,167	2,312,344	22·63
1910	204,636	2,323,530	11·35
1911	305,788	7,730,000	25·28
1912	212,000	4,628,000	21·83
1913	202,000	4,242,000	21·00

Oat Production in Alberta

1898	38,964	1,734,197	44·50
1899	51,929	2,189,441	42·16
1900	77,616	2,625,581	33·82
1901	104,533	4,253,284	40·68
1902	118,997	3,776,970	31·74
1903	162,314	5,187,511	31·95
1904	180,698	5,609,496	31·04
1905	242,801	9,514,180	39·18
1906	335,728	13,136,913	39·12
1907	307,093	9,247,914	30·11
1908	431,145	15,922,974	36·93
1909	693,901	24,819,661	35·76
1910	783,072	16,099,223	20·56
1911	1,221,217	59,034,000	48·34
1912	1,461,000	67,630,000	46·30
1913	1,639,000	71,542,000	43·65

Production of Barley in Alberta

Year.	Acreage.	Bushels.	Yield per Acre.
			Bushels.
1898	8,742	279,826	32·00
1899	6,655	178,395	26·80
1900	9,256	234,971	25·37
1901	13,483	442,381	32·81
1902	22,201	473,108	21·31
1903	42,219	1,077,274	25·51
1904	61,549	1,608,241	26·12
1905	64,830	1,773,914	27·36
1906	73,588	2,157,957	29·32
1907	54,698	1,082,460	19·78
1908	77,876	1,949,164	25·03
1909	107,764	3,310,332	30·72
1910	121,435	2,480,165	20·42
1911	164,132	4,356,000	26·54
1912	187,000	6,179,000	33·05
1913	197,000	6,334,000	32·15

It was in 1902 that flax began to be cultivated to any appreciable extent in Alberta, there being then 373 acres under cultivation, which produced 4476 bushels, with an average per acre of 12 bushels. Since 1902 there has been a very steady increase in the production of flax in Alberta.

Production of Flax in Alberta

Year.	Acreage.	Bushels.	Yield per Acre.
			Bushels.
1902	373	4,476	12·00
1903	830	7,753	9·34
1904	367	5,003	13·63
1905	581	8,337	14·34
1906	3,647	38,491	10·54
1907	6,488	50,002	7·87
1908	9,262	73,762	7·96
1909	12,479	131,531	10·54
1910	31,076	78,480	2·53
1911	107,171	1,114,000	10·39
1912	132,000	1,693,000	12·83
1913	105,000	1,155,000	11·00

That wheat can ripen in the Peace river district is a fact known not only to the settlers of that region in Alberta but to the world; but that winter wheat flourishes in this province has only been realised within the last decade. Irrigation has of recent years played a most important part in southern Alberta, and lands at one time held to be of but little value, except for ranching, are now cultivated, and producing abundant crops of fall wheat and other cereals. The cattle industry and dairying have likewise been carried on successfully. Mixed farming and dairy industries in a community made up for the most part, as it is, of an English-speaking and Scandinavian population, are the best proofs of the adaptability of the country to agriculture. In one district alone—Red Deer—not less than 500,000 pounds of creamery butter and 100,000 pounds of cheese of first-class quality were shipped in the year 1910 from *eleven* cheese factories and creameries then in existence.

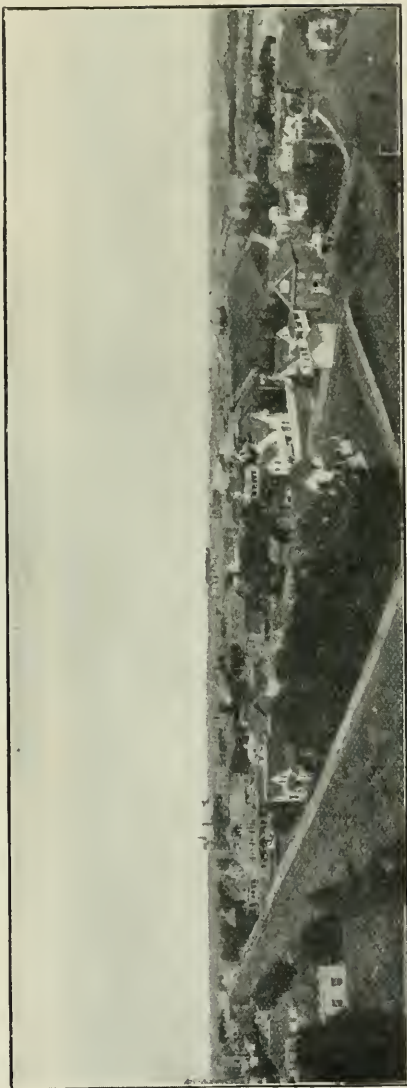
Population

Cities and Towns.—Edmonton, the capital of the province, with a population of 24,900, is beautifully situated on the north bank of the North Saskatchewan river. It is the terminus of the Calgary and Edmonton Railway, a pioneer branch of the Canadian Pacific Railway, with ramifications in many directions, and the Grand Trunk Pacific Railway has made this city a divisional point, whilst the Canadian Northern Railway has its present terminus here. The city owns and operates its own electric light and power plant, water works, sewerage, telephone, and street railway systems.

Strathcona, with a population of 5579, is situated immediately opposite Edmonton, on the south bank of

the North Saskatchewan river, is the seat of the University of Alberta and is fast becoming a popular residential district. Fort Saskatchewan, Vegreville, and Vermilion are thriving and trading towns on the Canadian Northern Railway.

Calgary is the chief city of south Alberta, being the most populous and enterprising of the province. Its population at the time of the Census in 1911 was 43,704, but it is increasing very rapidly. Pleasantly situated in the valley of the Bow, a tributary of the South Saskatchewan river, within sight of the Rocky Mountains, and on the main line of the Canadian Pacific Railway, with



EDMONTON, ALBERTA.



CALGARY, ALBERTA.

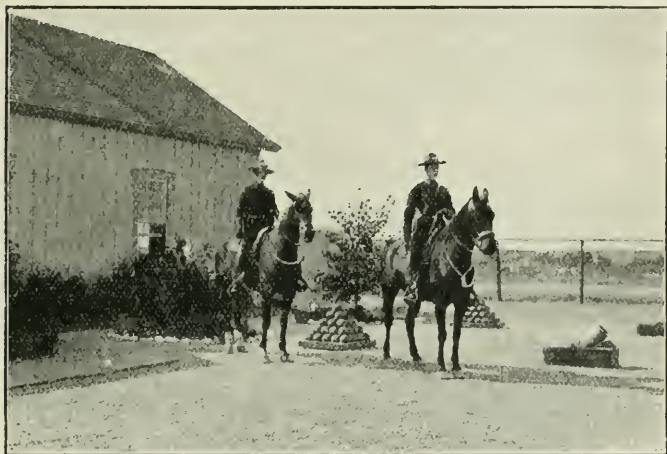
branches to Macleod and Strathcona, it has electric light, telephone, water and sewerage systems. A street car service is also in operation. The population of Calgary in 1901 was 4392.

Leduc, Wetaskiwin, Ponoka, Lacombe, Red Deer, Innisfail, and Olds, are the larger towns along the Calgary and Edmonton Railway, and are rapidly growing as settlement extends throughout the surrounding districts.

With its enormous wealth of almost untapped coal, abundant and cheap supply of power and natural gas, Calgary is the commercial and agricultural focus of the life of a territory embracing some 100,000 square miles.

Lethbridge, with a population of 8050, is

a thriving coal-mining centre, whilst Medicine Hat is an important town in the centre of a rich ranching district, with natural gas wells of great value, and a population of 5608 at the last Census. Macleod is a progressive town of nearly 2000 inhabitants in the heart of a splendid ranching country. Cardston, close to the international boundary, and in the extreme south-westerly



ROYAL NORTH-WEST MOUNTED POLICE, MACLEOD, ALBERTA.

corner of the province, is growing very rapidly. Canadian banks have established a large number of branches throughout the province, and the Government post-offices and savings banks afford additional facilities for financial, commercial, and other economic purposes. A large number of elevators have been erected at different railway stations to facilitate the handling and exportation of the wheat and other cereals of the province.

Districts.—The province of Alberta has been divided into a number of districts or counties for electoral and

other objects. They are as follows:—Macleod, Medicine Hat, Calgary, Red Deer, Strathcona, Victoria, and Edmonton.

All along the railway lines a large number of thriving towns and villages have arisen within the last two decades, and communities come up as if by enchantment; new post-offices, branches of banks, and other economic factors mark the onward and upward steady progress in the march of civilisation. Hundreds of such centres of population are now established with a bright and encouraging future ahead.

Education

An excellent system of education prevails in Alberta, and liberal aid is given by the state towards securing the highest advantages in keeping up the standards of work and the professional qualification of teachers. School districts are organised by the Government, but are controlled and maintained by the rate-payers, yet the Government grants to the public schools 66 per cent of their maintenance. In 1909 these grants were \$5·70 per head of the school population. Since the province was organised in 1905, there were 1784 new school districts established, while the school population increased from 24,000 to 45,000.

In 1908 the provincial Normal School was opened at Calgary for the training of Alberta teachers. The staff comprises five experts, with a model practice school department, and in equipment and architectural beauty is second to none in Canada. Alberta has been drawing the best teachers from the older provinces, and has the highest percentage of first-class certificated teachers and University graduates in the profession of any province.

The University of Alberta opened its doors in October 1908 with 33 students. In 1912, it counted 250 students registered in the Arts and Applied Science faculties of the University.

Transportation Facilities

The three railway companies, as well as the roads and trails of the province, provide an excellent means of communication, and throughout the unsettled prairie section no general obstruction to slower transportation exists.

From 1905 to 1911 the province had spent nearly \$8,000,000 in public improvements, roads, and bridges, of which latter 1600 were built or repaired during those years. It is a fundamental rule in Alberta that "good roads are indispensable to the progress of agriculture."

Grain grown in Alberta now goes east by way of Winnipeg and the Great Lakes, to Montreal and Liverpool, etc. The Canadian Pacific Railway is giving rates to Vancouver, which makes it possible to ship wheat and other grain from the Pacific Coast *via* Cape Horn, or the Isthmus of Panama by train to the European markets. Several shipments have been made this way, which are believed to be forerunners of an extensive grain trade. Large mills are in operation at Calgary and Edmonton for grading wheat.

It is also confidently expected that the construction of the railway line connecting Hudson Bay ports with the Alberta system of railroads, will provide a new and shorter freight route to British and other ports, which will save at least five cents per bushel on all wheat shipped by this line.

The completion of the Panama Canal as an inter-

national highway of commerce will also furnish a new route from Vancouver, Prince Rupert, Victoria, and other Pacific ports to Central America, the West Indies, the Atlantic, and Mediterranean ports.

Railways

The main line of the Canadian Pacific Railway crosses the southern portion of Alberta from east to west, going through Medicine Hat, Calgary, Canmore, and Banff, to Laggan and Hector, where it crosses the great divide between the Atlantic and Pacific. From Calgary, one branch follows north to Strathcona and Edmonton, and then runs south to MacLeod.

Two branches run easterly from the Edmonton branch: one at Lacombe, the other at Wetaskiwin—which latter extends through the province into Saskatchewan, passes through Saskatoon, and traverses that zone of rich prairie country between Saskatoon and Winnipeg, along the main line of the Grand Trunk Pacific and the Canadian Northern Railways, in what constitutes one of the best wheat growing areas of North America.

From Medicine Hat a branch leaves the Canadian Pacific Railway main line, following westerly through Lethbridge (coal mines), MacLeod, to Pincher and Michel, on to Fernie, and other points in British Columbia. From Lethbridge the Alberta Railway and Irrigation Company's line runs south-easterly to the international boundary line, with a branch line in operation as far west as Cardston.

The Canadian Northern Railway enters the province from the east at Lloydminster, crosses the Saskatchewan at Fort Saskatchewan, reaches Edmonton, where it continues in a westerly direction as far as St. Ann, and

also northward. The Grand Trunk Pacific Railway traverses the central part of Alberta, from east to west, entering at Biggar, crossing the Battle river near Wainwright, the North Saskatchewan at Edmonton, and follows westerly to Jasper House, along the Rocky Mountains in the Yellowhead Pass, through British



ROCKY MOUNTAINS FROM BANFF SPRINGS HOTEL, ALBERTA.

On the C.P. Railway hotel system.

Columbia, to the waters of the Pacific at Prince Rupert. The total length of railways in the province of Alberta in the year 1913 was over 2200 miles, with many more in course of construction by the three railway companies above mentioned.

Telephones

Alberta was the first province of the Dominion to own and operate a telephone system of its own. In

1905, the year of incorporation of Alberta as a province, telephone rates were high and unsatisfactory. In the year 1911 the province owned and operated 3500 miles of long distance lines, and about 2500 miles of rural or farmers' lines, with 11,600 subscribers in the province, of whom 3000 are farmers.



BRITISH COLUMBIA PROVINCE

To face 205



Scale of English Miles. 0 50 100 150

London: Edward Stanford Ltd. 12, 13 & 14, Long Acce. W.C.

Stanford's Geog. Inst. London

CHAPTER XVII

BRITISH COLUMBIA

EVEN now, when populous cities stud the shores of the Pacific Ocean, when great steamships start daily from crowded wharfs for far-off lands from which the mists of fable have only recently cleared away—even now, when western science and western activity have invaded those dreamy regions where the west changes into the east, it is difficult to divest the mind of the romantic interest associated with the great South Sea of the early sailors. The more one has read of their voyages and the more familiar one is with Hakluyt—that prose Homer of the English race—the more wonderful become the achievements of the past sixty years.

Not one hundred years had elapsed after Alexander Mackenzie, partner in a Montreal fur-trading company, broke through the western mountains and pressed on his perilous journey until he saw the tide rising at the mouth of the Bella Coola, when a Canadian Pacific Railway train left from alongside the ocean shipping of the same port to pursue an unbroken journey to Vancouver, to the Pacific, to the *Mar del Sur* of the good Sir Humphrey Gilbert's prolix discourse. What may be in store for our country in the hidden counsels of Providence no man can know, but the destinies

of the people who dreamed such a dream must be high destinies, and the memory of the men who realised it for them will not soon perish; for they accomplished the will of the Canadian people who stood behind them all the while and supported them throughout their daring enterprise.

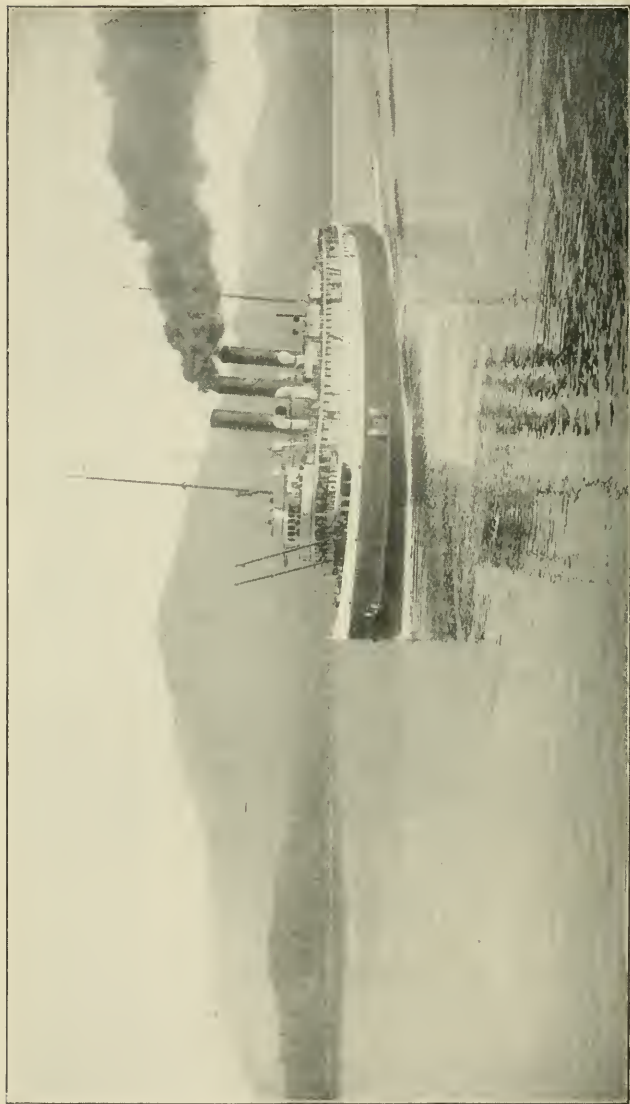
Boundaries.—British Columbia is the name given by Queen Victoria in 1858 to the most westerly or Pacific province of the Canadian Dominion, thus linking with historic interest early Spanish explorations with later British discovery and occupation in that portion of the New World. It is bounded on the north by the parallel of 60° , and on the south by the parallel of 49° , as far as the Strait of Georgia, or Gulf of Georgia, as it is locally called. The whole of Vancouver Island is included in it, and south of the island the province is bounded by the Strait of Juan de Fuca. The line passes through the centre of the nearest to Vancouver Island of three navigable channels. On the east the province is bounded by the summits of the Rocky Mountain chain, from 49° to about 54° north, thence the boundary line separating it from Alberta follows up the meridian of 120° west longitude to the northern boundary. On the west it is bounded by the Pacific Ocean as far as the Portland Canal; thence the western boundary is the narrow strip of the Alaskan coast as delimited by the 1903 London award.

The change in the northern boundary of this province from what it was under the Act of 1858 includes not only the whole of the Skeena, the upper part of the Peace, the Canadian Stikine, but also fragments of the river systems of the Liard and Yukon, thereby producing much confusion as between British Columbia and the Yukon district, especially at the

junction of the Frances river with the upper Liard, at Teslin and Atlin lakes, and at Rainy Hollow and Bennett.

Area and Population.—The area of the province is 355,855 square miles. It is the third largest of the provinces of the Dominion, and is very sparsely populated. The total population in 1901 was 178,657, whilst in 1911 it was 392,480, an increase of 213,823, or 119.68 per cent. The increase of the rural population during the last decade was 100,318, and of the urban population, 113,505. The population is chiefly in the southern part of the province, and on Vancouver Island, where railway enterprise, climatic conditions, mineral, agricultural, and horticultural resources are dominant factors.

Physical Features.—The province has very strongly marked characteristics, and differs greatly from all the other provinces of Canada. Its physical peculiarities can best be explained by its hydrography; but geological structure and orography is the key to the geography of British Columbia. However, the general alignment of the mountain ranges and valleys of this province and of the Yukon conform to the main axes of the outcrops of the primitive and fundamental (Archæan) rocks of the earth's crust as exposed from the Arrow lakes district to Revelstoke and northward for fully 350 miles, forming what may be termed the Revelstoke massif; then along the valleys of the Parsnip and Finlay rivers 250 miles, constituting the Fort Grahame massifs; to the most northerly expression of this basal series in the Yukon massifs near the headwaters of the river bearing the same name. Interior plateaus stretch north-west and south-east, 500 miles, from the Coast Range eastward for 100 miles along the line of the Canadian Pacific Railway, while, northward, in the vicinity of the 52nd



S.S. PRINCE GEORGE LEAVING PRINCE RUPERT, B. C.

parallel they widen to 200 miles. South of the railway mentioned, the mountain ranges narrow the plateaus down to a breadth of about 75 miles, whilst in the centre of the province, between the 52nd and 53rd parallels, the plateau is again constricted. Between the two constrictions in the south and centre of the province there is a series of smaller plateaus drained by the Fraser. The physical geography of the province is exceedingly complex and difficult to understand. The rivers are abrupt in their turns, swift and turbulent, and navigable only in short stretches; the lakes are narrow and deep, with precipitous mountain shores, and, in fact, they are more like the troughs of mountain ranges than the broad expanses of the lakes of central Canada. There is fertile agricultural land in abundance, but it is scattered over the province and not collected in broad areas of arable plains. There are several distinct climates, comparable with the genial climate of Devon, the humid climate of the west of Scotland, and the extreme continental climate of central Canada.

The conditions which, in the opening chapter of this book, were seen operating to soften the climate of Europe at the expense of that of America are here reversed. The eastern or Atlantic outline of America is almost reproduced in the eastern or Pacific outline of Asia, and the great westward equatorial current of the Pacific impinges upon the counterpart of the Gulf of Mexico in the overlapping peninsulas and islands of the eastern archipelago, and its waters flow in a return current similar to the Gulf Stream of the Atlantic. The China Sea, the Banda Sea, and the Celebes Sea are so many caldrons from whence the heated water overflows to the north-east along the coast of Japan. For ages this current has been known to the Japanese as the "Kuro Sivo," or the black

river, from its dark blue colour contrasted, as in the Atlantic, with the lighter green of the adjoining sea. Controlled by the same general laws, it turns to the eastward towards the north-west coast of America, and, as in the Atlantic, throws up a branch to the Arctic Ocean; but the parallel ends there, for Bering Strait is very shallow, having an average depth of only 25 or 30 fathoms. There is no wide and deep opening to the Arctic waters, and although there is a northward current through Bering Strait, which prevents the southward passage of icebergs, it is not like the great current which reaches the Spitzbergen Sea. The mass of the Japan current is thrown upon the coast of North-West America, whence it turns to the south and rejoins the great equatorial circuit. From this it results that the climate of Sitka and the Aleutian Isles is mild and intolerably rainy though near the latitude of 60° —the latitude of Hudson Strait—while in the gardens of Victoria, Vancouver Island, flowers may bloom all the year round. Notwithstanding the large quantity of moisture precipitated, the proportion of sunshine compares favourably with the proportions for London or Torquay, which are 27 per cent for the former, 37 per cent for the latter, and 34 per cent for Victoria in British Columbia.

The province extends from 49° to 60° latitude, or 761 miles on the mainland, and the northern and southern boundaries are straight lines. As far as a line almost upon latitude 54° , or for 346 miles, the eastern and western boundaries are the summits of the Rocky Mountains and the Pacific coast respectively, and these are approximately parallel lines running south-east and north-west. On the parallel of 54° the width of the mainland is from longitude 120° to $130^{\circ} 30'$ or 427

miles. The southern portion is therefore approximately a rhomboid. The portion north of 54° is bounded on the east by a perpendicular line—the meridian of 120° —and is thus included within three straight lines containing two right angles. The western boundary, on the side of Alaska, is irregular; but this northern portion may be considered as a square 414 miles from north to south, with an average width of 550 miles.

Although such attempts to compel the physical features of a country within mathematical lines are rough, they are an assistance in unravelling a tangled geography; and, in this instance, the belt of division between 54° and 55° really corresponds to a marked natural division. There is a line of water-parting a little north of 54° dividing the basins of the Skeena and Peace rivers from the basin of the Fraser. Summit lake at the Giscome portage from the Fraser to the Parsnip is in latitude $54^{\circ} 15'$, the divide of the Babine is at $54^{\circ} 20'$, and Cape Chacon, the southern point of Alaska, is at $54^{\circ} 40'$; the narrow projections of the sub-valley of the Stuart river may be disregarded. Cross ranges of mountains between 54° and $55^{\circ} 30'$ also contribute to shut off this northern part from the southern half of the province. From more recent explorations, surveys, and mining records the northern portion is proving attractive to miners and settlers, whilst the construction of the Grand Trunk Pacific Railway and its numerous branches will do much to open and develop a region rich in agricultural, forest, and mineral products as well as scenic grandeur.

Mountain Ranges

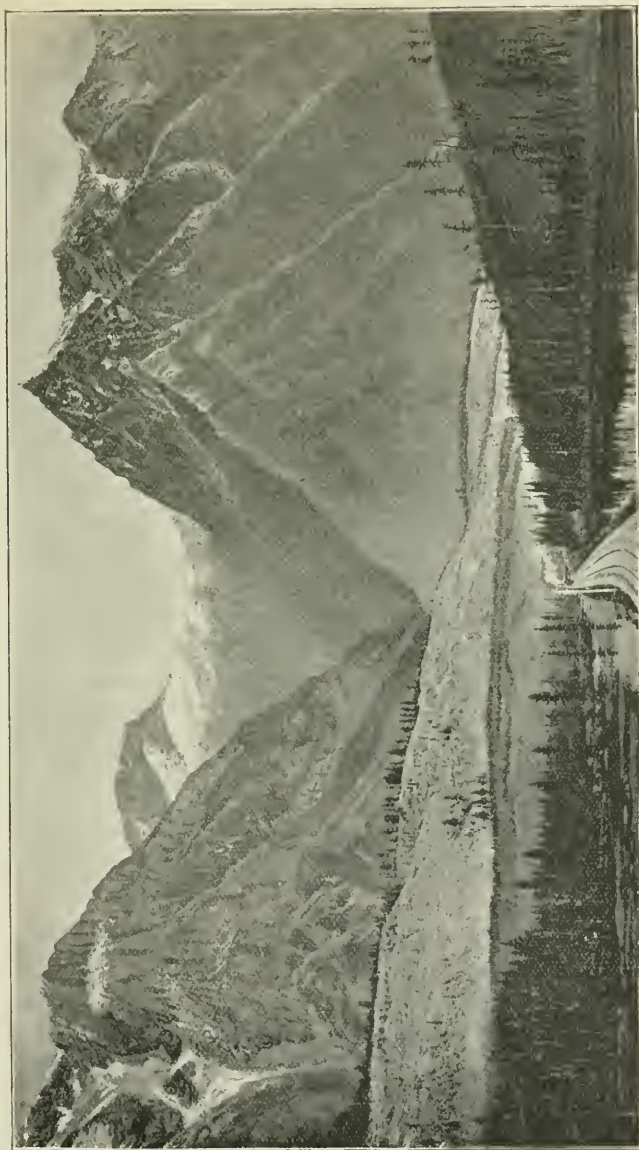
Two great physical features dominate the geography of British Columbia—the Rocky Mountains and the

Coast Mountains. Other mountains in more than abundance there are, but these are continuous and persistent through the whole extent of the province, and form the eastern and western rim of the "sea of mountains."

The Cordillera.—It was in 1879 that Dr. George M. Dawson announced the possibility of a natural division of the mountains of British Columbia between the forty-ninth and fifty-fifth parallels into three broad belts paralleling the coast. Based upon Dr. Dawson's work, and on the results of his own geological and physiographic researches, Dr. Reginald A. Daly has given what appears the latest and most approved classification of the North American Cordillera in the vicinity of the forty-ninth parallel.

The "Rocky Mountain System" as defined has its natural western limit in the almost rectilinear trough styled "The Rocky Mountain Trench," formed by the old Columbia river valley and involving portions of the valleys of the Canoe, Columbia, and other streams, passing through Donald in a north-westerly to south-easterly trend to Flathead lake, whilst its eastern limit in the great Plains or Prairie region finds an expression in the dying echelons of the Rocky Mountains proper. West of the Rocky Mountain System, Daly recognises the "Selkirk System" and "Purcell Range" with a trio (if not a quartette) of small mountain massifs, including the "Cœur d'Alène, Cabinet, Flathead," and possibly the "Mission Mountains"—the last practically entirely within United States territory, the preceding three partly in one country and partly in the other, running, like geological formations, from one country to another quite independent of political boundaries.

The "Selkirk Valley" marks the western limit of the



OTTER TAIL RANGE, ROCKY MOUNTAINS.

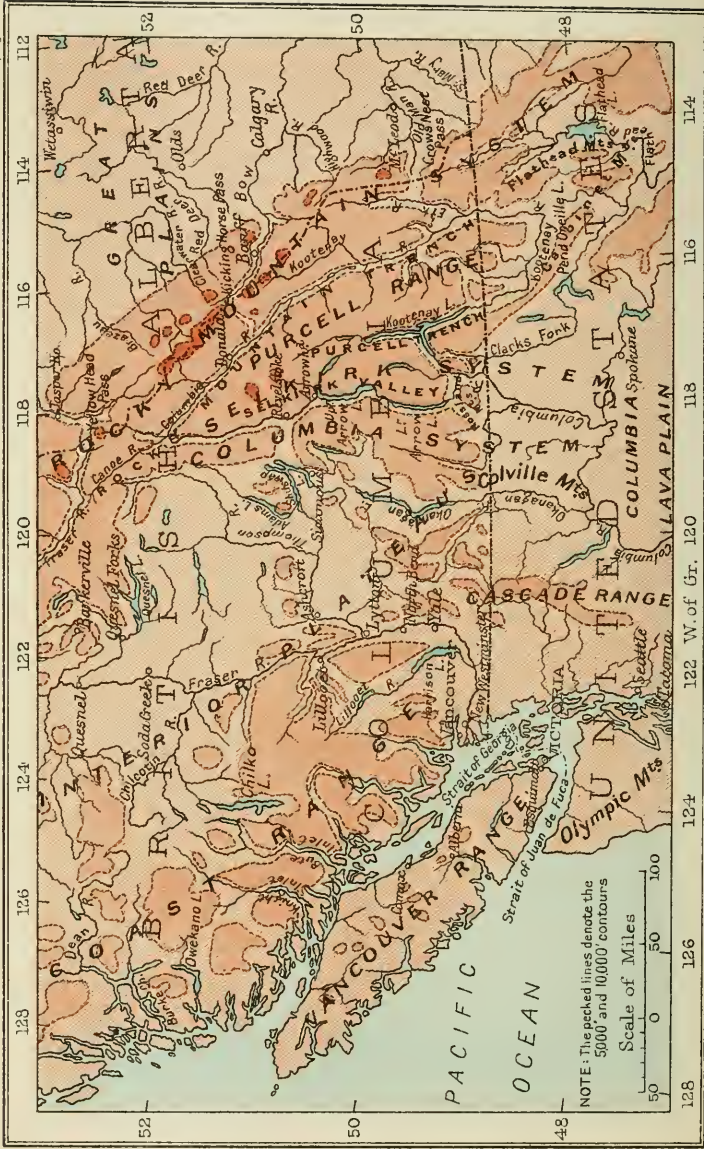
Selkirk System of mountains to the west of the Purcell Range. It is a first-rank valley draining southward by the Columbia river, and is expanded upstream into the long Arrow lakes. In its northern extremity this valley is confluent with the Rocky Mountain Trench. The southern termination of the valley regarded as a primary limit for these mountain ranges occurs about 60 miles south of the forty-ninth parallel, where the Columbia enters the vast lava plain of Washington. The two trenches and the Selkirk Valley lie respectively westward of the Rocky Mountain System, the Purcell Range, and the Selkirk System of mountains. The Selkirk System is bounded on the east by the Purcell Trench, on the west by the Selkirk Valley, on the south by the Columbia lava plain, Pend d'Oreille lake, and a short unnamed trench extending from the latter to the Purcell Trench at Bonner's Ferry.

The *Purcell Range* forms a somewhat narrow pear-shaped massif of mountains lying between the Rocky Mountain Trench, described above, and that whole string of valleys from Bonner's Ferry to the mouth of the Beaver, a distance of approximately 200 miles, which forms a topographic unit that may be called the "Purcell Trench," and which stretches from Donald on the Canadian Pacific Railway to the most northerly point of contact between the Flathead and Cabinet Mountains to the south.

The *Columbia System* of mountains is definitely limited on the east by the Selkirk Valley and by a part of the Rocky Mountain Trench, on the south by the Columbia lava plain, on the west by the lower Okanagan Valley, by the eastern edge of the interior plateaus, 30 miles of which are in the main Kettle river valley, and farther north by a trench occupied by the headwaters of the

MAP OF PART OF THE CORDILLERA
 according to Dr. Daly's latest classification of the Rocky Mountain Ranges

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Standard's Geog. Estate, London.

North Thompson river and by an affluent of the Canoe river. The "Colville" and "Rossland" groups of mountains form natural divisions of the "Columbia System," whilst the remaining mountains in the northern portion of this system have not yet been grouped, and require further study and explanation.

The belt of "Interior Plateaus" forms an important factor in the orography of the Cordillera. Its boundaries are difficult to state precisely. The belt fades gradually on all sides into the loftier and more rugged peaks encircling it. The *Cascade Range* and the *Coast Range*, the former defined on the principle of "continuity of crests" rather than on its rock-composition, because of the infinite superiority of the former as a primary principle in grouping mountains, are terms adopted in both official and popular texts for those immense ranges of mountains "lying west of the Columbia lava plain, Colville Mountains, and belt of interior plateaus." In British Columbia Dawson adopted the name "Coast Range" to enforce the view that the granite-schist British Columbia Mountains on the sea-board should be distinguished from the lava-built "Cascades" as originally named at the Columbia river. The name "Coast Range" has meanwhile survived, and is, in fact, the only name officially approved by the Geographic Board of Canada for any principal divisions of the "Cordillera."

The name "Vancouver Range" has been applied to the mountains of the island of that name. The "Olympic Mountains" are bounded on the north by the Straits of San Juan de Fuca, on the east by Hood Canal and other natural waterways, and on the west by the waters of the Pacific Ocean.

The Rocky Mountains extend southward and form the United States chain of the same name. They enter

Canada at longitude 114° West. The boundary line between the province and Alberta follows the summits of the range as far as 54° , the point where it turns away north to follow the meridian of 120° West. The Rockies continue their north-west course within the province. At the valley of the Peace river their elevation is greatly reduced; but, rising again, they continue along the western margin of the Mackenzie river valley, until they die gradually away as they approach the shores of the Arctic Ocean.

The "Coast Range," frequently called the Cascade Range, commences just at the southern frontier in longitude 122° West, and continues along the Pacific to the head of Lynn Channel close to the northern frontier—a distance of 900 miles. It is this range which gives such a strong character to the sea coast; to it are due the profound and gloomy fiords and the stupendous precipices which render the coast line an exaggerated reproduction of Norway. The Rocky Mountains proper are 60 miles across, and the Cordilleran belt to the west is 400 miles.

Before attempting to describe these mountain ranges, it should be remarked that the core of the rhomb of Southern British Columbia, enclosed between the coast range and the ranges to the east, is considered as a plateau and called "the Interior Plateau." This "Interior Plateau" is a region about 100 miles broad and 500 miles long from north to south. It is in a special sense only that it can be called a plateau; for viewed from a high level it appears to consist of a number of isolated plateaus of an average elevation of 3500 feet, so that it is a plateau chiefly by contrast with the lofty bordering mountain ranges. During the Tertiary period it was a true plateau, but now the surface is deeply furrowed by streams. In this region, however, there are many plains

and valleys and benches of rich land, comprising a large area of agricultural and grazing land.

Rising from a region of foot-hills 20 miles wide, formed by the folding of newer strata, the Rocky Mountains present to the traveller from the east an abrupt and serrated outline against the sky, revealing by their acute



MOUNT ROBSON, BRITISH COLUMBIA.

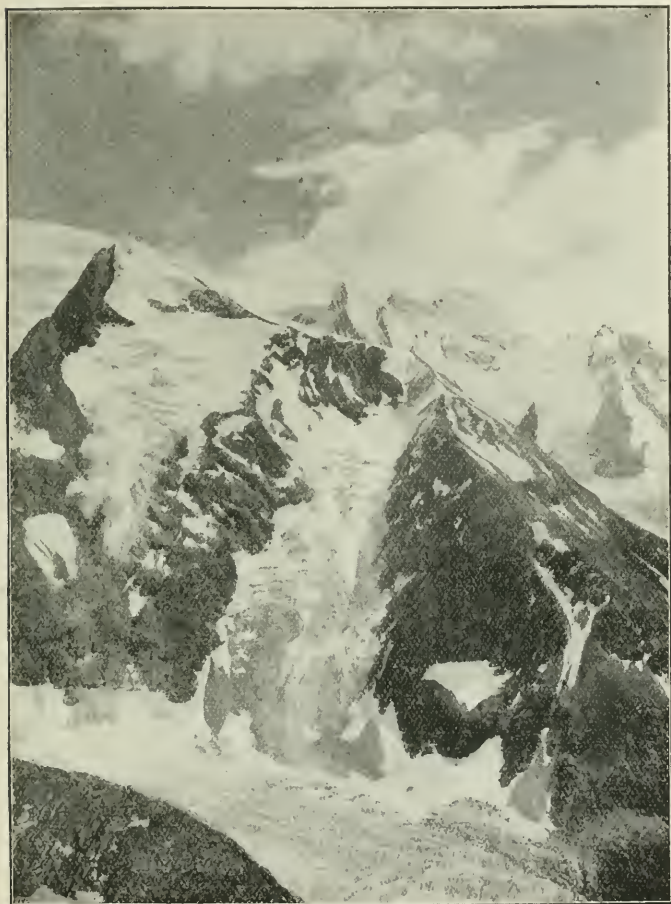
summit peaks a recent geologic age. It is the latest formed of all the mountain chains of the province, as is shown by the inclusion of comparatively new rocks in its flexures. The mountains themselves are, however, composed chiefly of old rocks, ranging in age from the Cambrian to the Carboniferous. Crystalline rocks are scarcely represented, and whole mountain ridges are often formed of massive limestone strata which no doubt underlie the eastern plains, and are here uplifted and upturned on their edges, and advancing bodily eastward,

covering in their progress and upturning as well as displacing the softer more recent strata of the prairie and foot-hill region. This range is 60 miles wide at the parallel of 49° , and continues in a north-west direction (narrowing to 20 miles at latitude 56°) for 850 miles to the valley of the Peace river, where, as before mentioned, it falls to a lower elevation; rising again in a range in oblique echelon a little more to the east, and continuing along the border of the Mackenzie valley.

The average height of the range along the United States boundary is 8000 feet, and it culminates between 50° and 52° where the North Saskatchewan, Peace, and Athabaska rivers take their rise in the glaciers of the loftiest valleys of the range. Several peaks near the boundary reach 10,000 feet, the highest peaks being Mount Murchison 13,500 feet, Mount Hooker 13,500, Robson Peak 13,700 feet, Mount Brown 9,050 feet, all near the sources of these rivers. Other peaks include:—

Mountains.	Feet.	Mountains.	Feet.
Assiniboine	11,860	Goodsir	11,400
Bonney	10,205	Habel	10,600
Bullock	13,000	Hermit	10,194
Bush Peak	13,000	Hooker (Athabaska Pass)	10,505
Carruthers	10,100	Howse	10,800
Cathedral	10,284	La Pérouse	10,758
Chancellor Peak	10,780	Lefroy	11,080
Collie	10,700	Lituya	11,745
Columbia (<i>circa</i>)	14,000	Lyell	12,000
Crillon	12,750	Mummery	12,000
Daly	10,255	Nelson (Selkirk Mts.)	10,000
Dawson	11,110	Robson Peak	13,700
Deltaform	10,945	Rogers	10,528
Deville	10,892	Sir Donald (Selkirks)	10,808
Dome (Rocky Mts.)	11,850	Swiss Peaks	10,515
Fairweather	15,292	Thompson (N. Saskatche-	
Fox	10,449	wan). . . .	10,700
Freshfield	12,000	Vaux	10,741
Geikie	11,000	Victoria (Rocky Mts.)	11,150

There are many well-known passes over the Rockies.



PEAKS OF THE SELKIRKS.

Mount Fox on the left, Mount Dawson behind Mount Fox in the distance,
Geikie Glacier in the foreground. View from Mount Geikie.

Commencing from the south, the chief are—the South

Kootenay or Boundary Pass 7100 feet, the North Kootenay Pass 6850 feet, the Crow's Nest Pass 5500 feet (where the Canadian Pacific Railway opens up extensive coal-fields), Kananaskis Pass 5700 feet, Kicking-horse or Wapta Pass 5300 feet (the Canadian Pacific Railway Pass), the Howse Pass 4800 feet, the Athabaska Pass 6025 feet, the Yellowhead Pass 3738 feet (the route of the Grand Trunk Pacific Railway, which was recommended by Sir Sandford Fleming to the Canadian Government in 1870), the Smoky River Pass 5300 feet, the Pine River Pass 2850 feet, the Peace River Pass 2000 feet. This last is scarcely a mountain pass, for the Peace river flows through it, and excepting for a portage of 12 miles at what is called the Cañon of the Peace, 40 miles east of the Rocky Mountains, it is navigable for 557 miles far up into the heart of the northern part of the province. Farther north is Laurier Pass, 6000 feet. On the western side of the Rocky Mountains there is a continuous valley, 700 miles long, through which flow the Kootenay in its southward course and the Columbia in its northward course. These two rivers flow through and around these stupendous ranges of mountains in tranquil marches and counter-marches without a parallel elsewhere in the world for their abrupt changes of direction. The northward flowing portion of the Fraser also follows this valley, and, where it turns suddenly, after the manner common among the rivers of this province, to flow in a diametrically opposite direction, the Parsnip river takes up the valley and occupies it until its junction with the Peace.

The Rocky Mountains are appropriately named. The summits are massive edges of fractured limestone strata bare of soil. The effect of their great height is diminished on the eastern side by the rise of the foot-hills and the

height of the passes. It is only on descending into the western valley that their full height is appreciated.



MOUNT DAWSON AND GLACIER, BRITISH COLUMBIA.

The western slopes are the more densely wooded. On the eastern side the slopes are covered with trees where there is soil, and interspersed with grassy prairie areas. The mountains abound in coal-bearing formations, from

the Crow's Nest Pass basin, near the international boundary line, northward to the Yukon district, some of which is *anthracite* of excellent quality. In the easterly ranges of the Rocky Mountains Park of Canada, the Cascades, Palliser, and Costigan coal basins occur in deeply eroded valleys where some 7000 feet of strata have been removed; and where heavy block-faulting has taken place, and the mountains present a serrated edge along the skyline, with gentle slopes on the south-west extension of those basins between the Red Deer and Clearwater rivers, the existence of 114 feet of coal in 24 seams, of which 15 were between $4\frac{1}{2}$ and 11 feet in thickness, has been proved.

West of the Rockies, distinct in composition and much earlier in geological age, are three ranges of mountains, of almost equal importance to them. These ranges rise directly from narrow valleys, and there are no foot-hills to detract from their height. They are all three composed mainly of crystalline or highly metamorphosed rocks—granites, schists, and gneisses; but, though related geologically in age and composition, they are very distinct geographically, having valleys clearly marked by narrow lakes or rivers. Commencing from the east, they are known as the Purcell, the Selkirk, and the Gold Ranges, although they are frequently called by the officers of the Geological Survey by the collective name of the Gold Mountains, because of the identity of their structure and the fact that they are the chief source of the gold and silver found in the province. They are not known to rise much higher than 10,000 feet, the chief measured peaks being Mount Sir Donald, 10,808 feet, Mount Macdonald, 9440 feet, and Mount Tupper, 9030 feet—all in the central or Selkirk Range. It has been previously pointed out that the Rocky Mountains run from south-east to north-west; consequently they make an angle of

45° with the frontier, and bound the south-east corner of the rhomb of the southern half of the province. These three inner ranges run almost north and south, as will



Notman, Photo.

MOUNT MACDONALD.

appear on a consideration of the rivers and long narrow lakes which mark their valleys, and, if prolonged, they would cut the long inner valley of the Rocky Mountains. They are not prolonged, but interrupted. The Purcell

Range in the eastern angle is the shortest, and is enclosed in the loop between the head of the Kootenay and Kootenay lake. The Selkirk Range is the next to the west. The Columbia flows round this range. Issuing from the Columbia lakes it flows north along the eastern base of the Selkirks to a place called the Boat Encamp-



Henderson, Photo.

THE HERMIT GLACIER, SELKIRK RANGE.

ment, where it sweeps round the head of the range in a sudden curve, and flows in a diametrically opposite direction, south, between the Selkirk and the next range to the west—the Gold Range.

The contour of these inner ranges is more rounded than that of the Rockies, and the upheaval is more confused. There are, indeed, in the Selkirks many abrupt peaks; but the general character of the whole

chain is less serrated, both from the character of the rock masses and the greater age of the system. The width of the Selkirk Range is about 80 miles. Below the snow-line, especially on the western side, it is densely forested, and enormous glaciers fill the upper valleys. The scenery in this part of the Cordilleran belt is grand beyond description.

The Gold Range is about 60 miles in width. It rises from the valley of the southward-flowing Columbia to a height of 8000 to 9000 feet. Being of a similar composition, much that has been said of the Selkirks applies equally to it. The scenery is not so grand as among the Rockies and the Selkirks, although in any other country it would be thought so. In British Columbia it suffers by contrast. The Gold Range continues much farther to the north, where it is known as the Cariboo Mountains, and as the region of the chief early discoveries of gold in British Columbia. In that region the chain curves and runs parallel to the Rockies, until the Fraser river, repeating the course of the Columbia on a larger scale, sweeps round it and changes its course to a diametrically opposite direction, flowing southwards, enclosing the whole series of inner mountain ranges to the east between it and the boundary of the province.

The Coast Range, or great western rim of the mainland of the province, rises on the ocean margin with a breadth of 100 miles. This is often and inaccurately called the Cascade Range, for the Geological Survey staff has shown that the Cascade Range of the United States is essentially different, both in composition and geologic age, and the Coast Range is a distinct system, originating just within the southern boundary and continuing through the whole length of the province. It is an older range than the Rocky Mountains, and consists chiefly of crystalline rocks—

granite, gneiss, and schists. It attains a height of 7000 to 8000 feet and abuts on the shore in many places in spurs which, rising almost out of the sea on the borders of abyssmal fiords, show the full measure of their height to every observer. This range is very rugged, and on the western side is heavily timbered. The constant condensation from the warm winds of the Pacific has formed many glaciers on the upper seaward valleys of the northern part of the range, and many of the summits are snow-capped. The fiords are usually too deep for anchorage, for they are narrow, submerged valleys of the chain, running up sometimes for 30 or 40 miles between precipitous mountain walls, with a general width of 1 or 2 miles. Where there is any level land on the shore it is densely forested, for the climate is mild and rainy, and the trees grow to an enormous size.

Before passing to the island portion of the province a few remarks may be appropriate concerning northern British Columbia. Considerable areas of this country have been explored by officers of the Geological Survey, by mining engineers, geographers, and alpine climbers, but the north-eastern corner of British Columbia is for the most part virgin field for the geographer. Much of it is a plateau about 2000 feet high. The eastern portion, watered by the Peace river, is in part open, fertile land, and suitable for a grazing country. The "Peace river block," comprising 3,500,000 acres, was ceded to the Dominion by an Act of the legislature of British Columbia in 1883, but is still under provincial laws. It is situated along the eastern boundary of the province through which the Peace river runs. It includes Fort St. John, and is watered by the following streams:—Pine, North and South Branch; Moberley (rising in Moberley



VIEW IN THE COAST RANGE, SOUTHERN BRITISH COLUMBIA.

lake), Mud river, the Dawson branch of the Pouce Coupé river of Alberta, Fish Creek, and Middle river. Efforts are being made to restore this block to the province. An inner range (the Cassiar and other mountains) runs parallel to the Coast Range at some distance. In this northern plateau the tributaries of the Liard and the Peace rivers of the Mackenzie system take their rise. On the western side are the Skeena and Stikine rivers, and far on the northern border of 60° , rising in a series of ranges, are the springs of the Pelly and Lewes rivers, tributaries of the Yukon. Large areas of this country are underlaid with Carboniferous and Devonian rocks, and in the valley of the Parsnip river is an extensive area of Cambrian.

The Atlin district, with its Coast Range and Interior Plateau topography, presents a gradual transition from the mountain belt to the plateau. Lakes abound in trout, whitefish, and grayling, and forests fill the valleys with fine timber. The mountains, especially nearer the coast, are high and rugged and glacier-laden, especially south of Atlin lake and Taku Arm, where the Great Llewellyn Glacier is met which overrides all but the loftier peaks. Cairnes has recently (1911) described this area and its resources. Rich gold-tellurium ores, gold-silver ores, silver-lead ores, native copper, antimony ore, and iron ores, besides coal, occur in this district, especially on Taku Arm.

The geology is somewhat complex, and many types of rocks are represented, including sedimentary, metamorphic, volcanic, and plutonic. Highly altered schists, gneisses, and limestones, as well as more recent andesites, sandstones, arkoses, tuffs, and shales have been extensively invaded by granite rocks. This complex is in turn intersected and partly buried by andesites, andesitic tuffs and granite, and syenite porphyries overlain by a newer

group of rhyolites and rhyolitic tuffs and breccias, in turn covered, in places, by superficial deposits. The superficial deposits consist of glacial and later deposits, for the most part unconsolidated. The glacial deposits, consist chiefly of gravels, sands, silts, and boulder clays, which floor all the master valleys of the district, and in fact the presence of the numerous lakes is due to their valleys being dammed by glacial accumulations. The channels of the larger streams are also mainly in these deposits, which, in many places, reach well up on the hillsides. Overlying these Pleistocene materials are the recent accumulations, composed mainly of fluvial and littoral sands, gravels, and silts of the present waterways, muck, and soil.

The Archæan or fundamental rocks as developed in the Revelstoke area crop out again and reappear to the surface along the Parsnip and Finlay rivers in a series of long narrow outliers with a north-east and south-west trend. These consist of highly altered rocks, with granitoid gneisses, mica-schists, and eruptives having newer series associated therewith. Flanking these are measures ranging in age from the Cambrian (and possibly pre-Cambrian) to the Triassic, forming a broad zone varying in breadth from 100 to 200 miles, overlain on the north-east and south-west slopes by newer Cretaceous materials in which newer Tertiary basins are found. Numerous granitic and eruptive masses are also found not unlike the coast granites which form so conspicuous a feature of the western portion of British Columbia.

Gold (chiefly placer), coal, copper, and other valuable minerals have been discovered in northern British Columbia, which, with the railway facilities at hand, are bound to prove very profitable, and mining centres as well as salmon canneries at the mouths of the Nass, Skeena,

and other rivers, besides the railway and timber interests, are doing much to attract a thrifty population. Such centres occur at Glenora, Laketon in Cassiar, Taku, Atlin, Hazelton, Fort George, Prince Rupert, Kaien, Port Simpson, Nass Bay, Stewart, Ellison, Telkwa, Babine, Germansen, Lakelse, Skeena, Port Essington, Lowe Inlet, Hartly Bay, and numerous other settlements, including those of His Grace the Duke of Sutherland.

What is known of the geology of this northern half of the province indicates that in complexity and variety it rivals the southern part. Rocks ranging in age from the Archæan to the Tertiary have been found.

Vancouver Island and the neighbouring region form the western part of the western geosyncline of the Canadian portion of the North American "Cordillera" as defined by Dawson. Some 89,600 feet of volcanic and sedimentary rocks occur in this series. The pre-Cretaceous rocks are for the greater part heavily mountain-built, and invaded by eruptive rocks, with as late as Miocene strata tightly folded and metamorphosed in places. The axes of folding correspond usually with the axes of the mountain ranges, the strike being north-west south-east. At the base is a complex of gneisses, mica-schists, marbles, and quartzites, with igneous intrusives: the Shuswap series, unconformably overlain by the Nisconlith and Adams lake series, with metamorphic sedimentary and volcanic rocks, argillites and mica-schists, and chloritic and feldspathic schists largely of pre-Cambrian, Cambrian, and Ordovician ages, but probably containing infolded younger rocks. The above are overlain by the Cache Creek Group (Carboniferous). The lower Cache Group consists of argillites, cherts, quartzites, and volcanic rocks, with serpentine and interstratified limestones; whilst the upper division consists almost

entirely of massive limestones, with occasional intercalations of rocks similar to those of the lower part. In the Central plateau region of British Columbia and in the Island of Vancouver, are the Nicola and the Vancouver Group, unconformably overlying the Cache Creek Group, largely of Triassic and Jurassic Age. Much folding and faulting probably occurred in later Jurassic time with invasions of granitic rocks. In the Coast Range the granitic rock, largely granodiorites, forms virtually a single continuous batholith about 1000 miles in length, but on Vancouver Island the granitic rocks are exposed in relatively small irregular batholiths. Above these, again, unconformable deposits occur of Upper Mesozoic and Eocene age, consisting chiefly of conglomerates, sandstone, and shales, with *coal* at certain horizons, the oldest of which occur in the Queen Charlotte Islands, and are lower Cretaceous, and said to be equivalent to the Shasta Group of California. To the south the sediments are progressively younger, Upper Cretaceous on Vancouver Island, and Tertiary in southern British Columbia. The three successive formations or series have been called the Queen Charlotte Islands, the Nanaimo and the Puget formations; the Nanaimo, or intermediate stage being equivalent to the Chico Group of California. These rocks have all been folded. Volcanics and sedimentaries unconformably overlying the Cretaceous and possibly Eocene sediments, of younger Tertiary age, chiefly Oligocene and Miocene age occur in British Columbia. These occur in small basins of southern Vancouver Island, on the southwest coast. Extensive vulcanism occurred in the coast region in Middle Miocene time, and continued in the Pleistocene. Farther north in Canada and Alaska volcanic activity lasted to very recent times. In Alaska and the Alaskides volcanoes are still active.

Pleistocene deposits are very extensive, and consist of glacial "till" and of stratified deposits in part of marine origin, but consisting largely of glacial detritus. The Pleistocene deposits have recently been uplifted and the amount of uplift in the vicinity of Vancouver Island and neighbouring coast region is from 200 to 400 feet.

The economic resources of southern Vancouver Island include deposits valuable, or possibly valuable, for gold, copper, iron, fuels, fluxes, lime and cement, pigment, clay, sand, gravel, and stone. *Coal* has been the chief source of mineral wealth, and copper and some gold have also been commercially produced, whilst lime, cement, clay, sand and gravel and crushed stone, as well as coal are being produced at present. Coal occurs near the base of the Nanaimo formation in the Comox basin, and in the northern part of the Nanaimo basin, from 600 to 1500 feet above the base.

Hydrography

The rivers of British Columbia are in strong contrast with the rivers of central and eastern Canada. Here are no long stretches of a thousand miles of navigation, but the courses of all the rivers are contentious, struggling, and turbulent, circumventing obstacles by unexpected and abrupt bends, or bursting through barriers and rushing down steep and gloomy cañons to the ocean. There are many navigable stretches, but they are not continuous, and the rivers widen to long narrow lakes or real deep lochs of still water, of which Kamloops, Quesnel, Chilko, Tatla, François, Shuswap, Okanagan, Kootenay, Babine, Arrow, and Columbia lakes are the most important; but the province is studded with similar lakes of smaller size, in strong contrast to the broad expanses of the eastern provinces. Shuswap lake is almost as deep as Lake

Ontario, and Adams lake, its sister lake, is deeper than Lake Superior. The lakes of British Columbia cover a surface of 1,560,830 acres, the chief ones being:—

Lakes.	Acres.	Lakes.	Acres.
Adams	33,280	Lower Arrow	40,960
Arrow	63,897	Okanagan	86,240
Atlin (part)	211,680	Owikano	62,720
Babine	196,000	Quesnel	94,080
Chilko	109,760	Shuswap	79,150
Columbia	2,995	Stuart	141,120
François	62,259	Tatla	86,240
Harrison	78,400	Tagish (part)	58,180
Kamloops	15,052	Teslin (part)	78,400
Kootenay	141,120	Upper Arrow	63,500

Although the Peace and Liard rivers drain a very large area in British Columbia, they are more properly treated in connection with the Mackenzie system, of which they are a part. The most northern river of importance is the Stikine. It discharges into the Pacific near Fort Wrangell in Alaska. It is 250 miles long, and is navigable by steamers for 130 miles as far as the Great Cañon. The route to the Cassiar gold-mining region passes up by its valley, a difficult and laborious route at best. A trail from the Grand Cañon leads to Dease lake, from whence Dease river leads to the Liard river.

The Nass is a large river with a number of native villages and fishing stations, but a more important river of the north is the Skeena. It draws its chief supply from Babine lake, and falls into the Pacific after a course of 300 miles, of which 180 miles, as far as Hazelton, is navigated by small steamers. This is the route selected for the Grand Trunk Pacific Railway, already constructed a large portion of the way through the mountains. Along its valley from the mouth to Hazelton are numerous railway stations already located

and established, besides towns and villages with wharves for steamers and commercial and industrial purposes. There are several important native villages along this valley and in the vicinity of Prince Rupert, including Metlakatla. The principal tributaries of the Skeena from the south are the Ecstall river discharging at Port Essington, and the Copper or Zymoetz river which drains that large triangular area between Hazel-



ROCHERS DÉBOULÉS MOUNTAINS, BRITISH COLUMBIA.
From the junction of the Skeena and Bulkley rivers.

ton and the Telkwa Mountains, where coal, silver, copper, and other minerals have been recently discovered.

Two river systems only call for notice in the southern or rhombic half of the province—the Columbia occupying the south-eastern corner, and the Fraser occupying nearly all the rest.

The Fraser river is the chief feature of the hydrography of British Columbia. - It is 740 miles long, and its tributaries branch out over the country between the

summits of the Coast and the Rocky Mountain Ranges, south of 54° , excepting the extreme south-east corner. They interlock with the sources of all the great rivers, but though they seem on the map to give access by short portages to the Skeena, the Peace, the Parsnip, the Athabaska, the Saskatchewan, and the Columbia, and though they search out all the interior valleys of the



THOMPSON RIVER, BRITISH COLUMBIA.

great mountain ranges of the southern half of the province, it must be remembered that many of them are unnavigable even with canoes. It is a characteristic Columbian river, being contained entirely within the province, and it accentuates all the peculiar ways of others. The Fraser takes its source on the western slope of the Yellowhead Pass, between Robson Peak (13,700 feet) and Mount Geikie (11,000 feet), one branch rising at the foot or northern slope of Mount Brown (16,000 feet). It flows at first north-west for 160 miles, then makes an abrupt

turn round the head of the Cariboo Mountains with the Telegraph range to the west, and flows directly south until, at Hope, it turns abruptly west and falls, after a course of 80 miles, into the Strait of Georgia at New Westminster. It is a turbulent and rapid river—an exaggerated mountain stream in all its upper courses; at last, summoning to its aid all its tributaries, it bursts



“BOOM” OF CEDAR LOGS, COLUMBIA RIVER, BRITISH COLUMBIA.

its way through the Coast range and foams and rages through the stupendous cañons which bear its name; then, all its trials over, it issues out a broad and noble river, with a rapid current, but navigable for 80 miles from Yale to the sea. The Fraser has many large tributaries; and the Nechako, the Stuart, the Thompson, the North Thompson, the South Thompson, the Blackwater, the Chilcotin, the Lillooet, the Bridge, and their branches form a network of flowing waters through all the deep furrows of the interior plateau.

Lastly, in the south-east corner of the province, the

THE KOOTENAY DISTRICT.

To face page 27



Columbia river and its chief tributary, the Kootenay, perform their eccentric evolutions in a sort of hide-and-seek round mountain ranges until they find each other just before they cross the frontier together. Their courses resemble the military evolution called a counter-march by ranks. They rise, overlapping each other, in the long western valley of the Rockies and flow past each other in opposite directions, as it were elbow to elbow, just grazing each other at the head of Columbia lake so closely that a canal a mile long unites their waters. They rise back to back, and the watershed between them is a large morass, where "it is impossible to cross even on foot between the two without going in water." The Columbia as it flows north-west meets the Canoe river front to front; they become one and pass westward, forming one of those T-shaped rivers common in mountainous countries. The Kootenay flows south into the United States, and the Columbia flows north to the head of the Selkirks at the Boat Encampment; until, having got 300 miles away from each other, they both turn abruptly about and counterflow inwards in opposite directions—the Columbia south to the Arrow lakes, and the Kootenay north to the Kootenay lake in British territory, whence it flows across to join the Columbia twenty miles from the United States frontier. Commodious steamers navigate the Columbia from the Columbia lake to the first crossing of the Canadian Pacific Railway, and from the second crossing at Revelstoke through the Arrow lakes to the boundary. The Kootenay is navigable from Kootenay lake to some distance within the United States.

Whether in the mountains, or along the coast, the numerous and turbulent streams of British Columbia are proving a source of tremendous energy and power for

industries of all sorts and in the electricity derived therefrom. For cities and mines its uses are numerous and varied. In British Columbia the Skeena, as well as the Fraser, makes a breach in the Coast Range. In the interval of 500 miles are many passes of historic moment to which affluents of the Fraser and oceanic fiords, sounds, or inlets point from either side. Thus, the Nechako affluent leads from the top of the great bend of the Fraser towards Gardner Inlet; the Nechako, Blackwater, and Chilcotin affluents towards Bella Coola, Dean Inlet, Burke Channel, and Fitzhugh Sound; the Chilcotin towards Homathko river and Bute Inlet; Seton and Anderson lakes, forming part of the Middle Fraser, by a different route towards Howe Sound, or by an easy route down Lillooet and Harrison lakes and rivers to the lower Fraser to which they belong, and so to the sea. The inlets are high-walled, narrow, straight, and deep; some, like Fitzhugh Sound, Bute Inlet, Jervis Inlet, and Portland Canal, run due north; others north-west, parallel to the coast; and a few, like Bella Coola and Gardner Canal, run at right angles to the predominant direction.

Discovery and Development

The mainland of British Columbia was unknown and hidden behind the barrier of the Rocky Mountains, until 1793, when Mackenzie entered it by its natural gateway, the Peace river. He followed that stream to its forks, and then traced up its chief tributary, the Parsnip, to its source, and crossed a short portage into the waters of the Fraser. The North-West Company soon followed up his discoveries with their trading posts, and, on the union of the great fur companies, the Hudson Bay Company established on the Columbia river the headquarters of

their operations in the Pacific district. Communication was by pack trails through the Yellowhead or Athabaska passes to the Boat Encampment at the great bend of the Columbia, where the packs were transferred to clinker-built boats and floated down to headquarters on the

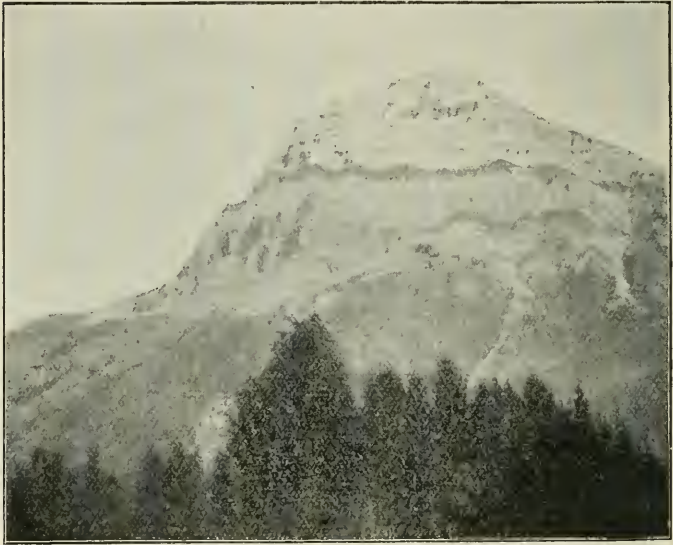


THE GAP : ENTRANCE TO THE ROCKIES, C.P. RAILWAY.

lower Columbia. The construction of the Canadian Pacific Railway was essential to the continued existence of the Dominion of Canada, and the people rose to it. The railway is the answer of the native Canadian spirit to the foreigners, within and without, who wish to bring strange fire to burn on our hearths, and to smother the aspirations of a people to whom British freedom, justice, responsibility and connection are more than all else.

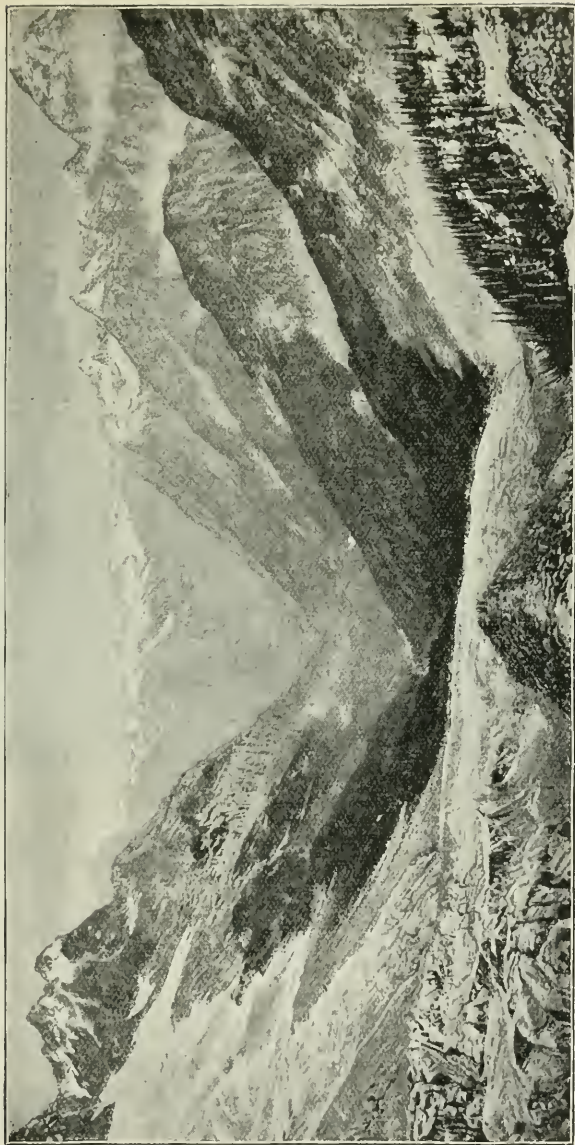
The Canadian Pacific and other Railways

The Bow river takes its rise in glacier-fed lakes high up in the heart of the mountains, 5530 feet above sea-level, and issues out upon the lower levels at the foot-hills through a cyclopean portal known as "The Gap," flanked



MOUNT STEPHEN AT FIELD, BRITISH COLUMBIA.

by two almost vertical mountain walls. Through this portal the Canadian Pacific Railway enters the mountains, and it follows up the Bow river to Laggan, 7 miles from the summit of the pass; thence it follows a small tributary creek through the connecting valley across the divide. Banff Hot Springs, Lake Louise, Lake Agnes (the lake in the clouds), Lake Mirror, Mount Stephen at Field, Emerald lake, the Yoho valley, the Ta-ka-kaw falls and



Notman, Photo.

THE HEART OF THE SELKIRK OR NELSON MOUNTAINS.

district, are some of the specially interesting spots which travellers visit and enjoy, where snow-clad peaks, massive ranges, and the spire-tops of the dark-green giant conifers pierce the blue skies of the Rockies and reveal panoramas of unrivalled splendour in a land where comfort and ease of travel are joined to scenic beauty. Near the summit of the divide (Hector, 5296 feet) is Stephen station, named after Lord Mount-Stephen, the first president of the road. Two miles farther west is Lake Wapta—the source of the Wapta river, whose precipitous course the railway follows to its junction with the Columbia. This stream, and the pass itself, was discovered about 1858 by Sir James Hector, and is known also by an English name—“the Kicking-horse.” It quickly gathers volume from the neighbouring glaciers. In the first five miles it falls 1100 feet, through rapids and deep and narrow cañons and over steep falls, and in a short course of 40 miles it drops 2746 feet to the town of Golden. The railway follows the river, crossing from side to side and clinging along the ledges of dizzy precipices. It issues out at last from a gloomy cañon upon the broad valley of the Columbia river flowing quietly on its northward course.

By the selection of the Wapta Pass the first parallel of interior mountains, the Purcell Range, has been flanked; but here, at Golden, is seen across the valley the range of the Selkirks, its steep forest-clad slopes rising through lofty glaciers in snow-crowned peaks—a precipitous mountain rampart 10,000 feet high, over which, until 1883, no foot of white man or savage had ever passed. Beyond this range in a direct line is the Eagle Pass through the third or Gold Range, and, by following up the Columbia 100 miles north to the Great Bend, the Selkirks might also be flanked, but every mile would have to be travelled

back to cross the Gold Range at the Eagle Pass. The Government of Canada had intended to cross the Rockies farther north by the Yellowhead Pass, and follow down the North Thompson to Kamloops, which was the objective point in all the proposed routes, but the company which had assumed the work resolved to avoid so long a circuit,



THE GREAT GLACIER, SELKIRK MOUNTAINS.

and to pass through to Kamloops on a direct western course. With amazing courage and faith they built their line from both ends, and in 1883 the sagacity of Major Rogers discovered a pass over the Selkirks so long sought in vain.

Leaving the town of Golden the railway follows north along the Columbia to Donald, where it crosses and continues along the western bank to Beavermouth. There the Beaver River issues from the mountains, through a

gorge so narrow that a felled tree might span it. Up the steep valley of this stream the railway climbs its dizzy way, clinging to the precipitous sides of the lofty mountains, and winding in sharp curves round rocky spurs, or tunnelling through them when no ledge could be found. Half-way up the ascent the main Beaver valley is left for that of Bear Creek, and, between two



ILLECILLEWAET GLACIER, BRITISH COLUMBIA.

gigantic peaks, the summit of the Rogers Pass spreads out into a pleasant mountain meadow 4300 feet above the sea. The summits of all these mountain passes have been reserved from sale by the Dominion Government to form parks, and this is the grandest of all, for the Great Glacier of the Selkirks is very near, and many other glaciers are visible among the distant peaks. At Glacier House, near the foot of the Great Glacier and in sight of Mount Sir Donald, is the culmination of fine scenery. From above the Albert cañon, on Scott's Peak, looking southward, a magnificent view of the Selkirk

range may be had, not less than a hundred glaciers having been counted among the summits between Mount Sir Donald and Eagle Pass by the writer in 1891.

With much wisdom and forethought, the Dominion Government has created a number of parks throughout the Canadian Cordillera. A list of these parks, under a commissioner, includes :—

1. Rocky Mountain Park	4500 square miles.
2. Yoho Park	828 „ „
3. Glacier Park	576 „ „
4. Buffalo Park	162 „ „
5. Elk Island Park	16 „ „
6. Jasper Park	5000 „ „
7. Kootenay Lakes Reserve	54 „ „
8. Revelstoke	(just created).

This makes a grand total of 11,136 square miles of protected forest, a refuge for many varieties of otherwise rapidly disappearing game. The control and direction of fire guardians and game wardens form a special feature of the Commissioner's duties, besides the construction of roads, trails, and bridges, which serve to open these parks to the traveller and student of nature and her infinite resources. The fauna and flora of the parks will always attract the naturalist, as these can be studied to advantage in normal conditions, where the sound of the rifle and the whizzing of the bullets to kill inoffensive creatures are not heard. The hot and other springs of the parks at Banff and elsewhere have attracted many oversea tourists, and a large contingent annually from the United States.

There is a flourishing *Alpine Club* in Canada, established for more than a decade through the energy and forethought of Mr. A. O. Wheeler. Its headquarters and club-house are at Banff, in the heart of the Rocky Mountains; and the annual gatherings and excursions

of its membership from every part of the Continent and Europe prove most inspiring and profitable, having contributed not a little to our knowledge of the geography of that ever-fascinating scenery of the Rockies and Selkirks, their valleys, forests, peaks, and glaciers. In 1909 Edward Whymper, the veteran Alpine climber of Switzerland, paid his third and last visit to the Canadian Rockies along with a number of English,



PACK HORSES AT GLACIER, BRITISH COLUMBIA.

Scottish, Dutch, and American Alpine Club members. The indescribable beauties of the lakes, peaks, snow heights, and forested slopes of these parks are now proverbial, and in the Rocky Mountain park about Banff, Hot Springs, Lake Louise, Yoho Valley, Mount Stephen, and Glacier House, scenery of the most gorgeous and attractive type can be thoroughly enjoyed in and about the Canadian Pacific Railway lines, where the best hotel accommodation can be had. As health resorts the park springs and mountains of Western Canada are proving most popular in both hemispheres.

The road descends for a second time to the Columbia by the valley of the Illecillewaet, a stream which hurries its headlong career down 2825 feet in 46 miles, and after passing through stupendous cañons and gorges, at last emerges once more upon the Columbia now flowing southward, a quiet navigable stream with all its turbulent rapids behind it.



GREAT LOOP IN THE SELKIRKS, SHOWING FOUR RAILWAY TRACTS.

Near Revelstoke the road crosses the river and enters the Gold Range by a pass, at its highest point only 525 feet above the level of the Columbia. Four beautiful lakes occupy the whole width of the summit level, and the road follows the Eagle river, the outlet of the westernmost, down to Sicamous Junction in the interior plateau of the province. Sicamous is upon the group of lakes called the Shuswap lakes, and there a railway branches off south to Vernon on Okanagan lake. The Pacific

Railway follows along the South Thompson to Kamloops, and along the south shore of Kamloops lake, plunges into the black cañon of the Thompson, and emerges to follow the Fraser in its titanic struggles through narrow cañons to reach the sea.

Railway development in British Columbia includes not



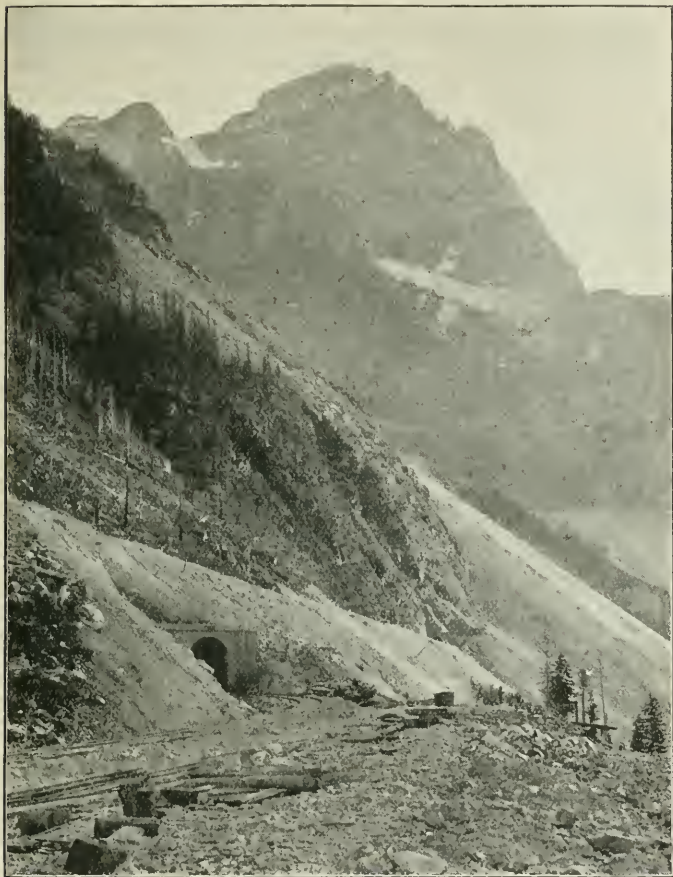
FOUR TUNNELS, FRASER CAÑON, BRITISH COLUMBIA.

only the main line and branches of the Canadian Pacific Railway Company, but also the construction and completion of the Grand Trunk Pacific Railway (1914) and its branches, as well as the Canadian Northern Railway Company's lines, besides mining railways in various parts of the country. The Yellowhead Pass, forming the route of the Grand Trunk Pacific Railway through the Cordilleran section, has a maximum gradient of only four-tenths of

one per cent, making a rise of 21 feet in the mile, against east-bound traffic between Prince Rupert and Edmonton; whereas the maximum gradient against west-bound traffic is but 5 feet in the mile additional, which fact can perhaps be better understood when it is borne in mind that the gradient is precisely the same along and through the apparently level country of the prairie section from Winnipeg to Edmonton. The maximum altitude in crossing the mountains is only 3712 feet. Of all the North American transcontinental lines, including that of the Canadian Pacific Railway and all those of the United States to Mexico, this has the lowest gradient. The Grand Trunk Pacific also affords the shortest route between Europe and Asia. A railway connects the Arrow, Slocan, and Kootenay lakes from Nakusp to Kaslo. There is also a railway joining Nelson, Castlegar, Trail, Rossland, Grand Forks, Phoenix, Greenwood, Midway, and Carmi. It continues across the frontier and connects with the Great Northern at Spokane, and a branch connects Nelson with Robson. Another line connects Spence's Bridge with Merritt, Nicola, and Coldwater. A branch road at Mission City on the lower Fraser, one at Moyie, one at Cranbrook, and one at Grand Forks, connect with the United States roads; and Vancouver, the terminus of the Canadian Pacific Railway, is thus connected by rail with the southern railway system. On Vancouver Island the coal region of Nanaimo is connected by a railway with Victoria and the harbour of Esquimalt; whilst a line from Nanaimo to Alberni is in course of construction. The main line of the Grand Trunk Pacific Railway crosses the Cordilleran chain from Fitzhugh to Prince Rupert, traversing Jasper Forest Park and the Rocky Mountains proper, then skirts the northern edge of the Cariboo Range, at Fort George, and the Telegraph Range,

follows the great fertile belt where fruit and farm lands prevail along the Nechako and other valleys, proceeding north-westerly across the pass between South Bulkley and North Bulkley, along the Babine Range and the Bulkley river at its feet to Hazelton, where the Skeena river valley opens, cutting the Coast Range, and leads to Port Essington, whilst the railway terminus is at Prince Rupert, a little south of Metlakatla and the well-known harbour of Port Simpson. The British Columbia Government has reported some 2,000,000 acres of agricultural land along the Canoe, Fraser, Peace, Stuart lake, Nechaco, Blackwater, Endako, Ootsa lake, Bulkley, Babine, Kispiox, Copper, Kitsumgallum, and Lakelse river valleys, and the country generally, served by the Grand Trunk Pacific Railway. To extend the sphere of influence and usefulness of this transcontinental railway the Grand Trunk Pacific Railway Company has projected numerous branch lines from Fort George directly south to Vancouver along the Fraser River valley, and north to Dawson City in the Yukon. These will serve to open up that great mineral-bearing zone of country lying between the Cassiar mountains and the Coast Range to the valley of Teslin lake and river, reaching Teslin below Lake Laberge and Whitehorse, then following the great valley of the Lewes and Yukon rivers through the gold-bearing territory of the Klondike to Dawson. Besides these three main arteries, the same company purposes building a line from Victoria to Fisherman's Cove, the north-west extremity of Vancouver Island, coupling with this system the establishment of a line of steamships joining Vancouver and Victoria, Victoria and Prince Rupert, Victoria and Seattle, also the ports of Masset, Skidegate, and Collison Bay in the Queen Charlotte Islands to Prince Rupert, besides Skagway, which is the southern terminus of the Canadian

White Pass and Yukon Railway now many years in



TUNNELS ON C.P. RAILWAY, ROCKY MOUNTAINS.
New Grade Reduction Loops, near Field, British Columbia.

operation. The scenery along the magnificent water-ways on the west coast of British Columbia through the Strait

of Georgia, Queen Charlotte Sound, Hecate Strait, Dixon Channel, and northward through and among the Alaskan islands, has features all its own, depending not only upon their peculiar physiographic features, but also upon their position. There is on every hand, likewise, abundant human interest in the numerous quaint and industrious

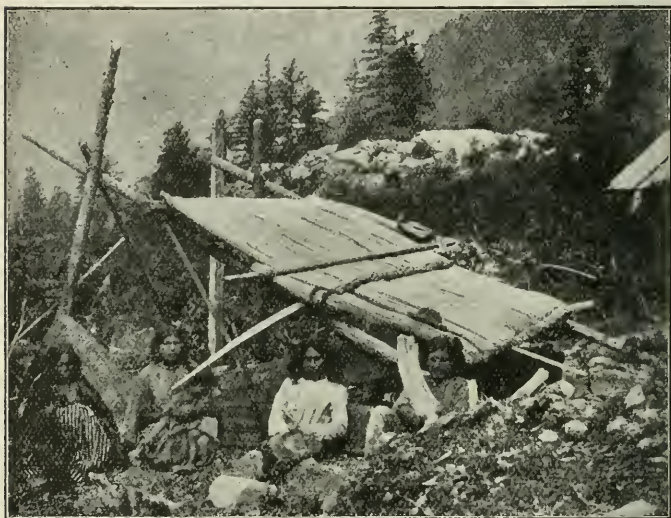


Photo: Dr. Dally, 1855.

INDIAN CHIEF'S HUT, FRASER RIVER, BRITISH COLUMBIA.

tribes of aborigines who have lived here for centuries, whose grotesque homes and villages are monuments of intense interest to the student of ethnology and history. These tribes possess features, languages, and manners held to be of Asiatic origin. More distant steamship connections on the part of the Grand Trunk and Canadian Pacific Railway Company join the extreme Orient (Yokohama, 4283 miles distant to Vancouver), through the Strait of Juan de Fuca, and to Prince Rupert, the

terminus of the transcontinental line, only 3800 miles distant.

Steamboat Travel and Routes.—From Vancouver to Stewart on the Portland Canal the Canadian Pacific Railway Company has established a regular steamboat service to many points including Prince Rupert. These coast steamers are making accessible that vast region of



HEAD OF PORTLAND CANAL, LOOKING TOWARDS STEWART.

the Pacific coast and its indentations. At the entrance to the Portland Canal is Wales Island, and farther on Pearse Island, two portions of land awarded to Canada by the Alaskan Boundary Commission. Thirty-five miles up this inlet brings the steamer to the forks with Observatory Inlet to the right and Portland Canal on the left, the latter a straight water-strip of 60 miles long and from one to two miles across, forming a beautiful and picturesque international boundary line between Canada and Alaska. The mountains on each side of this stretch of water rise from 2000 to 5800 feet high.

North of the mouth of Bear river, at the head of the Canal, is the new mining town of Stewart—the mines being situated from 5 to 15 miles inland. From Vancouver to Skagway in Alaska, for a distance of 900 miles by steamer, the route is one of continuous beauty, where rugged peak and wooded slope mingle, with marine coast scenery and the countless islands about, to charm the



INDIAN VILLAGE, CANNERY, ETC., ALERT BAY, BRITISH COLUMBIA.

traveller. These inland water-ways through a mountainous district are very popular. From Vancouver through the Seymour Narrows, one of the swiftest passage-ways of the coast leads to Alert Bay, a quaint Kwakiutl village with cedar lodges, its fleet of war-canoes, and the most complete collection of totem poles to be found anywhere on the whole Pacific coast. The shores of the Nimpkish river across from Alert Bay count some of the richest timber limits of the province. Queen Charlotte Sound is soon entered, forming an open water, where whales and

porpoises are frequently seen in sportive mood. To the west lie the Queen Charlotte Islands, where the company's steamships have a service stopping at Jedway, Kedda Bay, Queen Charlotte City, and Skidegate, the principal towns. Rivers Inlet and Namu, with their canneries,



Photo : Dr. Dally, 1855.

LADOSKI'S GRAVE, ON FRASER RIVER BANK, BRITISH COLUMBIA.

Bella Bella on Campbell Island, and Laura Passage, lead to Milbank Sound, where the islands are far apart and the channel much wider; then through Finlayson Channel to Swanson Bay, Grenville Channel, Douglas Channel (leading to the fertile valley of the Kitimat), Lowe Inlet, until the mouth of the Skeena river is reached. The Skeena is one of the most important rivers of the province which traverses a very fertile section. It is at present

navigable for 180 miles, and powerfully built boats ply up and down every few days, bound for the interior. Port Essington, Prince Rupert, and Port Simpson follow, all of which, though in their infancy as towns, are bound, owing to their proximity to the terminus of the Grand Trunk Pacific Railway, to play an important part in the future development of that portion of Canada. Port Simpson is a town of historic interest. On emerging from Chatham Sound, Cape Fox, the southernmost point of Alaska, is passed. From Dixon Entrance to Revillagigedo Channel one passes into the almost landlocked Tongas Narrows, where, close by, Ketchikan, the port of entry and outlet for an extensive copper-mining district, is reached. Fine examples of aboriginal basketry are seen here. After leaving Ketchikan, the steamboat traveller passes Prince of Wales Island, traverses Clarence Strait, passes Etolin and Zarembo Islands, and winding through the Wrangell Narrows—a tortuous passage at the end of which is Frederick Sound—reaches Chatham Strait and the Lynn Canal. Baird and Patterson glaciers are the first and most important to be seen in this district. Stephens Passage, with the Sundurn glacier, leads to Taku Bay, where the wonderful and monster Foster glacier, two miles wide and one hundred miles long, extends to Atlin lake in the Yukon Territory. Taku Harbour, Treadwell, the famous gold-mining locality, where the largest quartz mills in the territory are located, counting 900 stamps in operation day and night, follow, with Douglas Island, the residential district for the mining town, whilst across the Gastineau Channel lies Juneau, the capital city of Alaska, which nestles under the shadow of its mammoth mountain, and the Lynn Canal beyond, brimful of wonders in mountain and glacier scenery, typical of the Alaskan coast mountains.

At the only bend in the Lynn Canal lies Skagway—beyond abandoned Dyea—the head port of navigation, where the “White Pass and Yukon Railway” has its southern terminus after traversing from Dawson to Skagway a route of scenic splendour peculiar to that region.

Vancouver Island and Coast

British Columbia is not only a region of lofty mountains and rapid rivers, it is a maritime country with one of the most remarkable sea-coasts in the world, measuring with all its indentations more than 7000 miles, abounding in commodious harbours, and fringed with an archipelago of innumerable islands. Of these the largest is Vancouver Island, and upon it Victoria, the capital city of the province, is built. This island is 285 miles long, and from 40 to 80 miles broad, covering an area of about 20,000 square miles—very nearly the size of Nova Scotia, its counterpart on the Atlantic. Vancouver Island is bounded on the south by the Strait of Juan de Fuca, and is separated from the mainland of the province by the Strait of Georgia and Queen Charlotte Sound. The mountain ridge which forms the backbone of the island rises again from the ocean on the north to form the Queen Charlotte Islands, an extensive group at present inhabited by the Haida Indians and a few white settlers. The partially submerged range of mountains forming the nucleus of these islands runs parallel to the Coast Range of the mainland; and, while it consists largely of crystalline rocks, it contains areas of the Cretaceous formation, in which are extensive basins of true coal—bituminous in Vancouver, and anthracite, as well as bituminous, in the Queen Charlotte Islands. The general height of the mountain range is from 2000 to

3000 feet on Vancouver Island. Some of the peaks are 6000 feet, and Victoria Peak is 7484 feet high. On the Queen Charlotte Islands some of the higher summits are 5000 feet. The islands of this group are generally mountainous, but the north-east part of Graham—the largest island—is a gently rolling plain. All the islands are densely forested. As might be expected, the waterways around and throughout the whole archipelago fringing the coast of British Columbia are exceedingly deep, and the shores are bold, for they are the longitudinal and cross valleys of the sunken or drowned range.

The Strait of Juan de Fuca, from the open ocean to the shore of the mainland, is 100 miles long. For 60 miles it runs along the densely wooded coast of Vancouver Island, with a width of 11 miles of very deep water. As it turns round the southern end of the island it is subdivided by islands into many channels. Three of them are broad and navigable for the largest ships—the Haro, the Middle, and the Rosario channels.

The Strait of Georgia extends in a north-west direction, and is continued by many channels through a crowd of smaller islands into Queen Charlotte Sound. The strait varies in width from 14 to 20 miles. All the channels are deep, the soundings ranging from 70 to 200 fathoms. All the way along the coast of the province, from its southern point, and even much beyond it, to Cross Sound in Alaska, the largest ocean steamship may pass securely through sheltered channels for 800 miles, and, except for a very short distance, without encountering the swell of the main ocean. The Queen Charlotte Islands are separated from Alaska by the Dixon Entrance, and from the main province by Hecate Strait. Where the Stikine enters British Columbia, a number of peaks arrest the attention in ascending the river, as follows:—

Mount Whipple, 6200 feet; Mount Turner, Mount Robertson, Middle Mount, Saddle Mount, Pereleshin Mount, Cone Mount, 6100 feet, and Mount Gordon.



HEAD OF BUTE INLET AND WADDINGTON HARBOUR.

About 15 miles north of the boundary is the delta of the Fraser. The city of New Westminster, at one time the capital of the mainland province, is built at the mouth of the river where the delta commences. Ships

drawing 14 feet can pass 30 miles up the stream as far as Langley. Seven miles north of New Westminster Burrard Inlet stretches for 12 miles into the land—an arm of the Strait of Georgia, an ideally perfect harbour, 2 to 4 miles wide, and opening practically into three harbours, commodious, and with excellent anchorage all over. It is easily accessible and open at all seasons. When the Pacific terminus of the Canadian Pacific Railway had to be decided upon, it was impossible to overlook a place so marked out by nature for the purpose, and Vancouver came into existence. Halifax on the Atlantic and Vancouver on the Pacific are twin harbours unexcelled in the world, and both within easy reach of coal-mines.

Passing northward, all along the coast deep sounds, channels, or inlets penetrate far inland—Howe Sound, Jervis Inlet, Toba Inlet, Bute Inlet, Loughborough Inlet, Knight Inlet, Kingcome Inlet, Seymour Inlet, Smith Inlet, Rivers Inlet, Fitzhugh Sound, Burke Channel, Dean Channel, Finlayson Channel, Douglas Channel, Gardner Canal, and many others. They spread out into branching arms within their entrances. Many are too deep for anchorage, but they are sheltered by steep mountains rising 5000 to 8000 feet. Some of these inlets run up 40 miles into the land, and usually at their termination the land is low and some river forms a little delta. The scenery on these fiords is grand in the extreme.

The dense archipelago, through which the Strait of Georgia passes into Queen Charlotte Sound, is permeated by numerous channels of deep water, and the islands are high and bold. Discovery Passage, the chief channel, is close to the Vancouver shore. It is on an average a mile wide, and is from 30 to 60 fathoms deep. At Seymour Narrows the tides flowing from the north cause

swift currents, for the passage closes in there to a width of about one-third to one-half of a mile. A scheme is on foot to build a bridge over the Seymour Narrows to connect Vancouver Island to the mainland of British Columbia.

The same general characters prevail on the coast of Vancouver Island. The harbour of Esquimalt, on the Strait of Juan de Fuca, is another of these ideally perfect harbours like Halifax and Burrard Inlet. It is very easy of access and very commodious, opening out, from an entrance one-third of a mile across, to a broad sheet with good anchorage all over in never less than 6 fathoms. A railway to the coal-mines at Nanaimo makes it complete as a naval station. It was the chief station on the Pacific for the British Navy for many years; and a dock 480 feet long, 65 wide, and with $26\frac{1}{2}$ feet over the sill, affording every facility for repairs, has been erected by the Home Government. Only 2 miles distant is the harbour of Victoria; the inner harbour is available for ships drawing 14 or 15 feet, but somewhat intricate of entrance. Outer wharfs, with 30 feet of water, provide for large steamships. An excellent harbour is found at Nanaimo for the large coaling fleet which clusters there. The Strait of Georgia, which is in reality an inland sea, has tides and currents which are affected by that arm of the great Kuro-Sivo, or Japanese current, flowing off the west coast of Vancouver Island, which here may be styled the Vancouver current previous to its reaching the Californian coast, where it is called the Californian current. This inland sea, owing to its nature and location, has become the heart or centre of greatest activity of the province, both in its internal and external relations.

The outer or west coast of Vancouver Island is a

repetition of the mainland coast, but on a less magnificent scale. The inlets are there also, and they search far into the land, but the mountain sides are not so high, and anchorage within them may be conveniently found. Alberni Inlet is 20 miles long, with a fine harbour at its head. It is a lumber-shipping port, for all the island is densely wooded with fine timber. The width of the inlet varies from half a mile to one mile. Nootka Sound is 6 miles wide, and stretches three arms into the land, 7, 14, and 18 miles long respectively, with a depth of 40 to 160 fathoms. Barclay, Clayoquot, Esperanza, Kyuquot, and Quatsino Sounds also penetrate deeply into the island. There are many smaller bays, and all are surrounded by high land, but the mountains on the island are in general much lower than on the mainland shore. The interior of Vancouver Island is very little known, but resembles the mainland in having many long mountain lakes. It is a rough country with dense undergrowth and difficult to traverse.

Climate

The climate of British Columbia presents all the conditions met with in European countries lying within the temperate zone, and is highly salubrious. It is as varied as its complex geography would indicate. It is the resultant, in the main, of the prevailing westerly moisture-laden winds impinging upon a dissected coast bordered by a high mountain range, and blowing over a territory of successive mountain ranges of increasing height. Where these winds strike fairly they exercise a moderating influence upon the climate of the coast and provide a copious rainfall, whilst under the lee of the mountain ranges it is dry. The temperature of the ocean waters

outside Vancouver Island is fully 8° (Fahr.) warmer than that of the Strait of Georgia waters. In the northern part of the province the Rocky Mountains are lower and do not afford so much shelter from the easterly and northerly winds from across the plain or from the regions of the Arctic Ocean. The climate of the northern interior is therefore a continental climate, and, excepting on the coast, it is cold in winter and warm in summer. The conditions of climate on the west coast of America are the same as in western Europe, with the important difference that in Europe the westerly winds do not encounter the full broadsides of the mountain ranges, for the coasts are low, and such ranges as there are run mostly east and west with the axis of the land, and are taken in flank by the winds from the ocean.

The inner coast of Vancouver Island is drier than the ocean coast, being sheltered by the mountains, and the clouds bearing moisture from the ocean pass over to the mainland. In summer the south-eastern end of the island enjoys cool breezes from the snow-capped Olympian mountains to the south, so that the climate of Esquimalt and Victoria is like that of South Devonshire, but drier. At Esquimalt the mercury, in the course of years, rarely goes below $21\frac{1}{2}^{\circ}$ in winter or higher than 79° Fahr. in summer. On the mainland it is more humid, for the clouds are arrested by the Coast Range, and yield up a large portion of their moisture in ascending the western side of the mountains. This is the region of the densest forests and the largest trees.

The *dry-belt* of the interior of British Columbia is the northern extension of the "Dry Belt" which begins in Mexico, traverses the Sonora and Arizona desert lands, obtains northward throughout the United States in that extensive zone of arid country between the Coast Range

and the Rocky Mountains, besides that portion of the prairies farthest from the Atlantic. In British Columbia the dry plateau country is divided into *two* zones, by the Selkirks and Rockies proper, giving *four* zones of climate in the southern part of the province: (1) interior arid plateau; (2) humid Selkirks; (3) semi-arid plateau of the broad tectonic eastern valley of the Columbia; (4) Rockies, fairly well-watered zone, but less than the Selkirks. Thus a series of alternate moist and dry belts is formed whose longer axes coincide with the general trend of the Cordillera.

Under the lee of the Coast Range is a long strip of arid land, where the soil, though excellent, requires irrigation to produce crops. On the Gold Range, the Selkirks, and the Rocky Mountain ranges these conditions are repeated. The higher strata of air from the west and the descending clouds are deprived of their last particle of moisture by the successive ranges of mountains. The most easterly of these ranges is the highest, so that, when the movement of the atmosphere over the eastern plains draws away from the mountains, the western winds come down from the Rockies perfectly dry, producing the phenomena of the chinook winds described in a previous chapter.

From recent investigations in British Columbia and Alberta by Superintendent Stupart, inversions of temperature are found to be rather common in the higher levels of the Rocky Mountains. It has also been ascertained that the Alberta "chinook" wind is a strong south-west or west wind, which blows between the coast and Alberta when a well-marked area of low barometric pressure is passing eastward across the more northern part of the province, and with these conditions a heavy general precipitation occurs on the outer coast-line and also in a more

spasmodic manner on the western slopes of the mountain ranges of the interior. The "chinook" is not pronounced unless the barometric gradient be steep enough for strong winds.

Proceeding northward along the coast the climate becomes more humid as the winds from the Japan current strike more squarely against the mountains. The summits are perpetually snow-clad, and great glaciers form in the upper valleys. The snowfall in winter is much lighter across the range, though the climate is colder.

The climate of Vancouver Island is genial, and although there may be slight falls of snow in winter, the snow lies a short time on the ground. On the mainland at New Westminster, the Fraser river in some winters may freeze for a few weeks, but the winter is more a rainy season than a season of snow and ice. On the interior plateau in winter the thermometer sometimes falls below zero, as shown by the accompanying tables. The snowfall is light, but many of the lakes are frozen from December to March. The Cariboo and Chilcotin country has a more severe climate than the Kootenay, but very moderate compared with that of Central Russia of the same latitude. Far to the north, in the region of the rivers draining into the Mackenzie, the climate corresponds to the conditions of that basin. That portion of the Peace river valley lying within the province, but east of the Rockies, enjoys as mild a climate as the more elevated region farther south. Winter is actually shorter on the Peace than in Manitoba. At the far south-east corner of the province the Kootenay and the Columbia valleys have a climate of their own. They are high valleys enclosed by mountains. The precipitation is not nearly so great as on the coast, the snow-

fall being light, and on the western slope of the Rockies there is sufficient rainfall. Navigation is continuous all the year round on the Columbia and the Kootenay lakes. It is cold in winter, but owing to the elevation the air is rarefied and the climate is bracing and invigorating.

The same general conditions as to fogs exist on the coast of North-west America as along the corresponding coasts of North-west Europe. October and November months have the greatest total number of days of fog.

The following table shows the annual rainfall, snowfall, and the highest, lowest, and average temperatures (Fahrenheit) at forty stations in British Columbia:—

Localities.	Annual Rainfall. Inches.	Annual Snowfall. Inches.	Highest Temp. Degrees.	Lowest Temp. Degrees.	Average Temp.
Midway . . .	6·72	30	96	-21	41·2
Princeton . . .	9·25	75·2	92	-26	41·2
Okanagan (Vernon). . .	11	37	93	-13	44·7
Griffin Lake . . .	52·30	133	110	-18	—
Kamloops . . .	8·25	37·2	96	-10·7	47·5
Nicola Lake . . .	8·73	46·5	87·5	-15·5	42·2
Spence's Bridge . . .	6·87	82·8	104	-13	—
Lillooet . . .	5 to 8	35 to 60	85 to 95	-10 to 20	—
Barkerville . . .	20	120	82	-28	34·2
Stuart Lake . . .	8·51	74·8	88	-39	32·2
Golden . . .	13	100	88·5	-16·5	—
Tobacco Plains . . .	14·54	41·4	91	-25	42·6
Cranbrook . . .	17·38	—	—	—	—
West Kootenay . . .	18·73	91·9	85	-8	44·50
Pilot Bay . . .	—	—	90	-3	46·8
Ladners . . .	33·47	17·5	82	-2	—
Chilliwack . . .	59·20	29·3	92	10	49
Matsqui . . .	58·25	20·8	92	8·5	48·9
New Westminster . . .	59·73	35·1	90·7	2	48·9
Agassiz . . .	51·88	28	95	1	47·5
Nicomen . . .	70·94	13	94	9	49·5
Vancouver . . .	64·39	30	86	6	48·9
Point Garry . . .	37·72	17	78·8	7	47·8
Goldstream Lake . . .	62·60	106·5	—	—	—
Victoria . . .	30·54	16·1	86·2	12·3	50·2

Localities.	Annual Rainfall. Inches.	Annual Snowfall. Inches.	Highest Temp. Degrees.	Lowest Temp. Degrees.	Average Temp.
Duncan	50	10·6	87	11	—
Kuper Island	45·20	39·5	95	16	—
French Creek	39·79	7·5	88	11	47·9
Nanaimo	40·36	28·5	90·3	7·3	48·9
Carmanah	112·86	10	70	18	—
Alberni	71·59	36	94·2	12·9	49·3
Clayoquot	146·56	nil	87	18	48·9
Cape Scott	137·76	nil	81·5	16	46·3
Bella Coola	36·20	46	91·5	10	44·9
Point Atkinson	63·23	20·2	—	—	—
Naas Harbour	58·16	17·9	—	—	—
Port Essington	121·10	68·5	—	—	—
Rivers Inlet	105·66	42·8	84·1	16·1	46
Masset	30·4	59·4	78	20	46·2
Port Simpson	71·26	34	74	15·6	46
Bulkley Valley	—	16	90	-38	55
Prince Rupert	109·51	72·40	74	0·6	43

TOTAL NUMBER OF DAYS OF FOG IN AN AVERAGE YEAR.

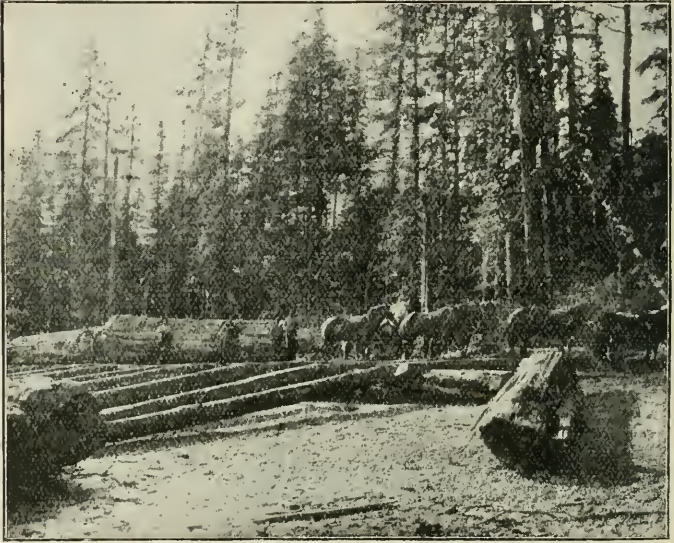
	Days.		Days.
S.E. Coast of Vancouver Id.	26	Interior, North Cariboo	0
West „ „	31	„ far North	2
Mainland coast, South	4	Kootenay, S.E. corner	0
Interior Plateau	2		

Of these 26 days of fog at Esquimalt 15 were in October and November, and of the 31 days of fog at Alberni there were 30 during the same months.

Forests

The forests of British Columbia occupy nearly three-fourths of its vast area. Except for the arid zone of the southern interior plateau and for the high altitudes of the mountain ranges they would cover the province entirely. The number of families represented diminishes as one proceeds north. There are two zones of forest country according to Macoun: (1) The Southern; (2) the Northern. The former comprises the forests of

southern British Columbia, of the coasts, and of the western ranges; the latter, in the northern portion of the province, covering from the Coast Range to Hudson Bay and part of the prairie and barren lands region. They consist almost entirely of conifers, and the varieties are few. On Vancouver Island there are areas of oak,



LUMBERING, SOUTHERN BRITISH COLUMBIA.

whilst poplar is found throughout the province. The broad-leaved maple is met with on the lower reaches of the Fraser and in the country around Victoria. Many other trees are found, but of the total output of all the lumber mills of the province 85 per cent is of the Douglas fir. It is tough and strong, and is highly valued for ships' spars as well as for building purposes. The lumbering industry, though one of the oldest in

the province, has not, however, attained the development which might have been anticipated, for the province has practically been opened but recently to the world, and capital is drawn chiefly towards mining and fishing.

Entering the province from the east the chief trees of the Rocky Mountains are white spruce, Engelmann's spruce, black pine, balsam fir, and Douglas fir. Spruce, black pine, and Douglas fir, with poplars and a few other deciduous trees, characterise the valleys. The western slopes, where not too rocky, are generally thickly clothed with spruce or black pine; the Douglas fir does not there grow very high. The balsam fir and black pine, with Lyall's larch, attain a higher elevation than the other trees, and die away in stunted growths along the snow-line.

Nearly the same trees recur in the Selkirk and Gold Ranges, but in sheltered valleys the cedar grows very large, and great tall western white pines are found. Hemlock grows in some localities, and the western larch, a tall, slender, straight tree, occurs in others.

It is in the valley of the Columbia that the cedar begins to assume the huge proportions which distinguish it in this province. On crossing the Gold Range and descending upon the interior plateau, the absence of sufficient rainfall is immediately evident. The yellow pine becomes the most prominent tree in the valleys, growing in clumps or singly in open lands. Higher up on the plateaus, Douglas fir, spruces, and black pine form thick woods, and white-barked pine is found in some places at high elevations. Then, upon crossing the Coast Range, the traveller enters into a dense forest region extending down to the ocean and covering Vancouver Island; for the humid western winds have their full influence, and nourish into their wonderful growth the

gigantic firs and cedars, which astonish all who see them for the first time.

In the New Westminster district a dense forest growth occupies the gentler slopes and the relatively narrow valleys. Douglas fir, cedar, hemlock, and spruce are the principal trees. Stunted pine trees occupy in part the steeper slopes in a region where the mountains range from 3000 to 5000 feet, with occasional and individual peaks from 1000 to 3000 feet higher.

The Douglas fir (*Pseudotsuga Douglasii*) is often found 300 feet high, and from 10 to 12 feet in diameter. The trees which are the best for handling and make the best lumber are those 5 to 6 feet in diameter, and running clear 160 feet to the first branch.

The cedar (*Thuja gigantea*) is, however, even larger than the Douglas fir. It sometimes attains the enormous girth of 60 feet. It is used for fine dressed lumber, and for shingles, as these trees decay at the heart on attaining maturity. Though hollow, they remain perfectly healthy. The grain of this wood is very beautiful, and it is exceedingly durable.

Other trees attain a great size on the coast region. The yellow cedar or cypress does not extend far inland, but is found throughout Vancouver and the Queen Charlotte Islands, especially on the west coast. It is often 6 feet in diameter. Oak is met chiefly on the south-eastern part of Vancouver Island, and is often 3 feet in diameter. The western hemlock is found wherever there is abundant moisture, and on the coast often grows to a height of 200 feet. Yew occurs along the coast and on Vancouver Island, and attains a diameter of 18 inches to 2 feet. The alder becomes a small tree, and is sometimes two feet in diameter on the lower Fraser. The broad-leaved maple sometimes attains a

diameter of 4 feet. It is never found far away from the coast-line.

Macoun compares the flora of the Nechaco valley, in latitude 54° , with that of Belleville, near the eastern end of Lake Ontario, much farther south (45°).

The stand of merchantable timber in British Columbia has been estimated at upwards of 300,000,000,000 feet, and the growth greater and faster than in any other province of the Dominion. A thorough system of forestry has been established for the province.

By an Act respecting forest reserves and parks, the Federal Government has set aside 2115.25 square miles, or 1,356,760 acres, constituting *nine* forest reserves in British Columbia proper.

Geology and Mineral Resources

Geology.—The most salient features characterising the geological structure of British Columbia include the north-west to south-east trend of the various ranges of the great Canadian Cordillera, ranges which consist of rock-formations varying in age from the primitive crystalline Archæan to the Tertiary, with enormous development of sedimentary strata, of which there are at least 40,000 feet beneath the Cambrian, which latter system, as well as the Ordovician, Silurian, Devonian, and Carboniferous (Mississippian and Pennsylvanian of United States authors) form a large part of the Rocky Mountain massifs which were bodily uplifted, and in their eastern expression have been subjected to thrust movements, folding, and dislocation since Eocene times (Tertiary). Enormous development of igneous rocks (batholiths) occur along the western or Coast Range, as well as in the interior of the southern portion of the province in the Arrow Lakes

region, whilst effusives of Tertiary age play an important part in the structure and physiographic features of the same portion of the province. The remaining troughs are occupied by Palæozoic and Mesozoic formations, at times highly metamorphosed, at other times less so, with basins of coal-bearing strata not only on the mainland (Jurassic and Tertiary), but also in the Queen Charlotte and Vancouver Islands in lower and upper Cretaceous strata respectively. The faunas of the Palæozoic of British Columbia, such as those found in the Belt Terrane, in the Stephen formation, the various horizons of the Cambrian about Mount Stephen, Mount Burgess, Mount Field, Mount Robson, and other localities, as well as those of the Ordovician of various horizons in the valley of the Kicking Horse, with graptolites, etc., together with the Silurian, Devonian, and Carboniferous remains, constitute one of the most stupendous succession of strata, exposed in boldest and most attractive form in a region of magnificent scenery where comfort as well as facilities of transportation abound, especially along the line of the Canadian Pacific Railway. At Banff, Lake Louise, Moraine Lake, Field, Emerald Lake, etc., geologists, travellers, Alpine climbers, and tourists generally can find material for investigation, discovery, and enjoyment at every point. The economic resources of British Columbia from a geological view-point are many; but as the country is opened up by railway and settlement, further discoveries must certainly follow and the wealth of the province increase.

The mineral resources of British Columbia cannot be easily over-estimated, for new discoveries of importance are continually being made. The great Cordilleran belt extends throughout the province, in many ranges, with a breadth of 400 miles. These mountains, through the whole

length of the two American continents, by whatever name they are called, are known to be highly metalliferous, and they preserve that character in the immense development they attain in this province. As previously observed, the interior mountain ranges of the south are classed very frequently together under the general name of the Gold Mountains, as being the source of the gold in the river valleys, and it may be said generally that the rivers of the province are all auriferous. The Fraser, with its affluents, is a true Pactolus, for it drains in its rapid course all the interior mountain ranges of the southern half of the province, and far up in the almost inaccessible north, similar conditions exist. Placer mining is carried on in the Omineca district, in the basin of the Peace river, and some of the bars on the Liard are worked for gold. The Pelly, the Lewes, the Stuart, and other chief branches of the Yukon are all known to be auriferous, and miners are working on these streams, and have taken out considerable quantities of gold by the ruder methods which, however, are fast being superseded by more thorough and practical as well as modern methods. The gold mountains of Cariboo, the copper and gold of Rossland, Grand Forks, Boundary and Trail Creeks, the silver-lead region of Moyie, Kimberley, and the Slocan, and the silver and gold of Nelson and the Lardeau, the gold of Hadley, the iron of Texada, as well as the copper, silver, and coal of the Skeena and its tributaries, characterise various types of mineral-bearing mountains and districts.

Gold was first observed in 1851 on the coast of one of the Queen Charlotte Islands, and it is recorded that \$20,000 was taken out, and that working was abandoned because the reef ran under the sea, and could not be followed for more than a few feet down. In 1857 at Fountain, above Lillooet, on the Thompson and Simil-

kameen rivers, at Antler Creek, in the Cariboo district, gold diggings were discovered; and extraordinarily rich placers on Williams and Lightning Creeks, the latter alone yielding \$2,179,272 worth of gold. In 1863 the maximum production was reached, namely \$3,913,563. In 1868 to 1869 discoveries in the Omineca district (lat. 56°) brought the yield up. In 1874, gold was found in Cassiar still farther north, \$1,000,000, representing the first year's production from this remote field. The total placer mine production of British Columbia from 1858 to 1907, compiled by Mr. W. Fleet Robertson, Provincial Mineralogist, presents the total value to be \$69,549,103. Lode mining in British Columbia may be said to date back to the completion of the Canadian Pacific Railway from coast to coast. Discoveries were made first in the Kootenay, then in 1890 in the Nelson, Rossland, Slocan, and Boundary districts, which first attracted the attention of capitalists to the rich mineral resources of the province. The production of lode mines from 1887 to 1913, inclusive, from the report of the Minister of Mines, shows a total output value of \$224,195,819. Silver and lead were the first minerals to be marketed. The first ingot produced in British Columbia from the Campbell smelter in Revelstoke was obtained by the writer in 1891, and contained, according to Mr. Campbell, silver, lead, and zinc from an admixture of ores from the Field, Golden, Slocan, and Lardeau districts.

The total value of lode gold for the year 1913 was \$5,627,490. The gold placer production for the province in 1913 amounted to only \$510,000, 94 per cent of which was derived from Atlin and Cariboo districts. Wherever the interior ranges extend gold is found in the streams.

The total value of the production of metals in British

Columbia, according to official returns, to the year 1913, inclusive, is as follows:—

Gold placer	\$72,704,603
Gold lode	76,486,512
	<hr/>
Total gold produced . . .	\$149,191,115
Silver	35,832,546
Lead	29,696,585
Copper	80,818,051
Other metals, zinc, etc. . . .	1,852,824
	<hr/>
Total value of metals . . .	\$297,391,121

The greatest activity in mining development has taken place in the Kootenay and adjacent portion of the province. The Boundary district became a copper-producing centre in 1900, and in 1909 had already produced 247,895,303 pounds of copper. The principal mines are: Knob Hill, Ironsides, Monarch, War Eagle, Gold Drop, Snowshoe, Emma, Rawhide, Oro Denoro, Mother Lode, and Sunset. Gold and silver are important factors from these mines. Phoenix, situated above Grand Forks and Greenwood smelteries, at an elevation of from 4200 to 4600 feet above sea-level, is an important mining centre. The ore is a finely disseminated chalcopryrite, with pyrite and hæmatite in a gangue of epidote, garnet, quartz, calcite, and chlorite. The ore bodies are held to be of Jurassic age.

Framalin Camp and Boundary Creek district of British Columbia are very similar in their complicated geological structure: crystalline limestones, hornfels, breccia, or conglomerate-like rocks, argillites, and greenstone, intruded by a gabbro-like rock and porphyritic syenite. These are all cut by an acid granite with numerous dykes and stringers, whilst Tertiary rocks, consisting of gritty tuffs and other ash rocks, formerly

capping the whole continuously, are in turn overlain by lava-flows consisting of andesites, trachytes, and agglomerates formed from these, besides basalts and ash-beds. The minerals consist of iron and copper sulphides, galenablende and chalcopyrite, magnetite deposits with copper and iron sulphides in altered lime silicates, quartz veins with molybdenite, chalcopyrite, and arsenopyrite, together with chalcopyrite in fractures and replacing minerals of the granodiorite or porphyritic syenite.

The city of Nelson, situated on the west arm of Kootenay lake (1769 feet above sea-level) has a population of 7000, and is the commercial centre, as well as the distributing point for East and West Kootenay. Its history begins in 1886, when one of the pioneer mines, the Silver King, was staked on Toad mountain. It is connected with the Crowsnest coal area and the East, as well as with Vancouver and the West, by the Canadian Pacific Railway system; whilst the Canadian Northern links it with Spokane and the south. Ore deposits of Nelson occur in the granitic rocks of the local batholith, or in the schists and limestones of the Rossland volcanic group, where gold-silver, copper-gold-silver, silver-copper, and non-metallic minerals occur of economic value. The principal metallic minerals found in the Nelson area include: native gold, silver and copper, pyrargyrite (ruby silver), iron pyrite, chalcopyrite (yellow copper), bornite (peacock copper), tetrahedrite (grey copper), chrysocolla (silicate of copper), azurite (copper carbonate - blue), malachite (copper carbonate-green), stromeyerite (sulphide of copper and silver), besides molybdenite, galena, zinc blende, pyrrhotite, calcium tungstate, magnetite, and limonite held in a gangue of quartz, calcite, siderite, barite, fluorite, garnet, actinolite, and epidote.

The production of the Kootenay Bonanza Mines, with

the forty claims on Toad mountain, to the end of 1910 amounted to 198,650 tons, containing 3,614,762 ounces of silver and 13,140,005 pounds of copper.

Rossland.—As nearly as can be computed Rossland had produced to 1st January 1906, 2,217,295 tons of ore containing 1,240,331 ounces of gold, 1,723,249 ounces of silver, and 60,753,330 pounds of copper valued at about \$34,879,239. The ore deposits of the Le Roi Mine occur in veins along the contact between the augite porphyrite and the tongue of granified rock which lies between the main and south lodes, also in a dyke of quartz-bearing porphyry. A large deposit of magnetite, over thirty feet in breadth, occurs a few miles north of Rossland, near the contact between the Nelson granodiorites and the "Rossland Volcanic Group," augite-porphyrity with stratified rocks including limestone with a fine-grained micaceous syenite-porphyrity along the hanging wall. In the Rossland mining district the War Eagle, Le Roi, Centre Star, Idaho, and other mines, have sunk their shafts to great depths following the biotite rich porphyritic monzonite zones.

Camp Hedley, in the Osoyoos Mining Division, is entirely a gold producer, and the ore deposits owe their origin to contact metamorphism: the result of the metamorphism of sedimentary rocks by igneous intrusions. Arsenopyrite, the leading ore mineral, monzonite, especially the more acid variety, have caused the most intense contact metamorphism in the intruded rocks with which the richest deposits of the district are generally associated. Chalcopyrite, specularite, pyrrhotite, with silver and gold, also occur in the ore bodies.

The Lardeau district, in the midst of high mountains, consists of sedimentary series, with included greenstone, schists, and granite dykes which have their origin in the

granite massif on the divide. Quartz veins yield gold and lead; pyrite, siderite, chalcopyrite, zinc-blende, and galena also occur here.

The Slocan district lying within the Selkirk system of mountains with sharp crests, varying in altitude from 6000 to 8000 feet above sea-level, yields silver-lead and zinc ores from the igneous rocks of the Selkirk and Slocan series. Galena, zinc-blende, tetrahedrite (freibergite, grey copper), are the chief metallic minerals, whilst ruby and native silver and argentite occur in a few deposits. During 1909 the shipping mines of the Slocan mining district were the Whitewater, Whitewater Deep, Ruth (Hope claim), Richmond-Eureka, Rambler-Cariboo, Lucky Jim, Van-Roi, Cork, Reco, Slocan-Sovereign, Last Chance, Standard, Wellington, Bismarck, Flint, Index, Utica, Alama, Gold Cure, Silver Glance, Fisher Maiden, Marion, Molly Hughes, M'Allister, and Panama. The three last were producers of dry ore, and the Lucky Jim was the only property worked exclusively for zinc ore.

Recent explorations by Camsell in the Similkameen and Tulameen districts resulted in the discovery of diamonds in peridotite from the Tulameen District. Lode-metals, including gold, silver, platinum, copper, also occur, whilst Tertiary coal deposits have been developed covering some 3254 acres of coal lands. Some 20 feet of coal appear to be available, making a total of 65,000,000 tons of coal that can be extracted in mining. Asbestos also occurs at Okanagan Falls in serpentine-bearing rocks of the Shuswap series, consisting of granite and diorite gneisses, mica, hornblende, talc, schists, and limestones.

The Tulameen district of British Columbia, forming part of the Similkameen mining division, within the drainage basin of the river of the same name, whose

branches are Granite Creek on the south, Otter Creek farther south, with branches rich in gold and platinum placer deposits comprising the Bear, Slate, Champion, Boulder, and Cedar Creeks, is a heavily forested region with grassy country above 6000 feet elevation. The highest elevations are in the south-west (6100 feet) in the Lodestone mountains, whilst the highest mountains in the north-east are only about 5000 feet, but all have rounded summits. Valleys have been dissected down to a depth of 3800 feet. Gold and platinum placers, gold-bearing quartz veins, copper and gold-copper deposits, silver and silver-lead, magnetite, chromite, molybdenite, asbestos, and coal form the most important deposits of the Tertiary (Oligocene) and pre-Tertiary to Triassic rocks of the district. For many years the placers of the Tulameen river and its tributaries have been profitably worked for gold and platinum. The Tulameen was formerly the principal producer of platinum on the North American continent. The recent discovery of this mineral *in situ* will no doubt lead to the production from lode-mining of quantities surpassing the output of the best days of placer-mining.

Boring operations revealed that in the vicinity of Princeton an 18-foot bed of coal occurs at a depth of 49 feet below the surface, and coal seams aggregating 35 feet 7 inches were crossed in the first 90 feet of the bore-hole. On the western edge of this Tertiary coal basin a bore-hole 863 feet deep revealed seventeen seams of coal aggregating $50\frac{1}{2}$ feet in thickness, the thickest seam being 9 feet. These coals are very young, being still in a primary stage of formation.

In the Roche river district, the ore-bodies occur in talc, chloritic and hornblende schists with gold and copper, the former usually in quartz fissure veins, carry-

ing, besides gold, bornite, tetrahedrite, chalcopyrite, and pyrite, with a reputed discovery of sylvenite—an ore of tellurium.

In the Portland Canal district, in a region of intense glaciation, where a bold and rugged topography presents glaciers to a height of 5500 feet, on steep mountain slopes at times in sheer unscalable cliffs, is to be found gold, silver, and copper deposits of economic value. Some sixty-two claims are recorded, described, and mapped by R. G. M'Connell of the Geological Survey. Mount Gladstone (6800 feet) and Mount Dickie (6600 feet) are the highest peaks, and Bromley glacier is the largest of the district. The rock formations include: (1) *Bitter Creek* formation: argillite, limestone, tuffs; (2) *Bear River* formation: porphyrite, tuff, breccia, agglomerate; (3) Augite porphyrite; (4) *Nass* formation: argillite, tuffaceous sandstone; (5) Gabbro; (6) Granite, granodiorite and quartz porphyry; (7) Boulder (glacial) clay, sand, clay, gravel, and alluvium.

Gold, silver, pyrrhotite, arsenopyrite, bornite, chalcopyrite, galena, malachite and azurite, tetrahedrite and argentite also occur here throughout the region which is in close proximity to the western terminus of the Grand Trunk Pacific main line across the continent.

The Telkwa mining district, which the Grand Trunk Pacific has recently opened, was examined geologically in 1906, and its mineral wealth revealed. Besides an excellent coal basin of undetermined extent and of semi-anthracitic character, copper ores occur in the form of chalcopyrite, bornite, copper glance, and copper carbonates, and iron ores as hematite and specular iron. The Lower Cretaceous coals occur in clay shales, highly disturbed and faulted; whilst the ores of copper and iron are found in volcanic rocks, especially where these have

been decomposed and replace the country rock, and occasionally in the vicinity of dykes cutting the volcanic rocks in various directions. At Telkwa, in the Bulkley valley, important discoveries of copper ores were made and reported by Mr. W. W. Leach of the Geological Survey; also gold, iron, and manganese, whilst on Coal Creek, at the head-waters of the Morice river, large areas of high-grade (anthracitic) coals occur, analyses of which gave the following result:—

Bulkley Valley Coals.	Moisture.	Volatile Combustible Matter.	Fixed Carbon.	Ash.
1. 5 ft. 6 in. seam . . .	1·36	10·87	80·82	6·95
2. 7 ft. 3 in. seam . . .	0·80	11·10	78·90	9·20
3. 4 ft. seam	0·58	10·80	82·70	5·90

Other coal occurrences in this district were found on Goldstream and other streams, notably Driftwood Creek, at Moricetown and Hudson Bay Mountain, in the form of isolated areas or basins—presumably all connected at one time—in which the coal varies from a lignite to a semi-anthracite. Jurassic rocks, of the Hazelton group, also termed the “porphyrite group” by Dawson, are described by Malloch as overlain conformably by coal-bearing strata of Lower Cretaceous age—the Skeena series. The “Bulkley-eruptives” form an important factor from the metalliferous and miners’ viewpoint, consisting of a series of granite areas newer than the group and series preceding. The copper ores of the Telkwa and the silver-lead veins of the Hudson Bay Mountains, together with those of the Six-mile, Nine-mile, and Twenty-mile Mountains, north of Hazelton, form valuable ore-deposits,

whilst gold values, so far as known, are small. Coals, recently discovered on the Morice river and Babine lake, belong to the same coal-bearing strata as the ore on the Telkwa, being of Lower Cretaceous age. From our knowledge of the geological relations north and south of this new highway into the interior of the mountains, there is no doubt that economic development of great importance can be predicted for the near future. The construction of the Grand Trunk Pacific will make the timber of the Fraser and other river valleys valuable, especially at the low cost of hauling over the easy grades of the Yellowhead Pass.

By districts, the tonnage of ore mined in the lode mines of the province during the year 1913 was 2,663,809 tons, a decrease from the preceding year of 24,723 tons, or 0·92 per cent. Boundary, 69·30 per cent; Trail Creek (Rossland), 9·52 per cent; Coast District, 8·67 per cent; Slocan District, 4·35 per cent; all other districts, 8·16 per cent. The number of mines from which shipments were made in 1913 was 110, and of these only 58 shipped more than 100 tons each during the year. The mines were distributed as follows: 12 in the Cariboo and Cassiar District, 4 in the East Kootenay District, 72 in the West Kootenay District, 16 in the Boundary District, 1 in the Lillooet District, 5 in the Coast District. In addition there were 28 non-shipment mines working during the year.

The value of the mineral products of the province for the year 1913 amounted to \$30,296,398—\$2,144,402 less than that of the previous year. The following table shows that there was in 1913 a decrease in the production of placer gold of some \$45,500, but at the same time an increase in the output of lode gold of \$305,048, making a total increase of \$259,548 in the production

of that metal. The amount of silver produced in 1913 was 3,465,856 oz., having a gross value of \$1,968,606, an increase in the number of ounces produced of 333,748, due to an increased production in the Slocan District, the Coast District, and the Boundary District. The gross value of the silver product showed an increase over that of the previous year of \$158,561, notwithstanding a slightly lower market price of silver. The table shows an output of lead in 1913 amounting to 55,364,677 pounds, valued at \$2,175,832, which is an increase over the production of the preceding year of 10,493,223 pounds of lead. The production of copper in 1913 was 46,460,305 pounds, valued at \$7,094,489, a decrease in amount of 4,996,232 pounds, or about 9.76 per cent. The value of the product was less than that of the preceding year by \$1,314,024, or a decrease of 15.6 per cent.

	1911.		1912.		1913.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	oz.	\$	oz.	\$	oz.	\$
Gold, placer . . .	—	426,000	—	555,500	—	510,000
„ lode . . .	228,617	4,725,513	257,496	5,322,442	272,254	5,627,490
Silver . . .	1,892,364	958,293	3,132,108	1,810,045	3,465,856	1,968,606
	lbs.		lbs.		lbs.	
Lead . . .	26,872,397	1,069,521	44,871,454	1,805,627	55,364,677	2,175,832
Copper . . .	36,927,656	4,571,644	51,456,537	8,408,513	46,460,305	7,094,489
Zinc . . .	2,634,544	129,092	5,358,280	316,139	6,758,768	324,421
	tons.		tons.		tons.	
Coal . . .	2,193,062	7,675,717	2,628,804	9,200,814	2,137,483	7,481,190
Coke . . .	66,005	396,030	264,333	1,585,998	286,045	1,716,270
Miscellaneous products . . .	—	3,547,262	—	3,435,722	—	3,398,100
		\$23,499,072		\$32,440,800		\$30,296,398

The following table shows the value of the total production of the mines of British Columbia for each year from 1892 to 1913 (inclusive), during which period

the output has increased about tenfold; also the total production from 1852 to 1891 inclusive:—

1852 to 1891 (inclusive)	\$78,111,539	1904	\$18,977,359
1892	2,978,530	1905	22,461,325
1893	3,588,413	1906	24,980,546
1894	4,225,717	1907	25,882,560
1895	5,643,042	1908	23,851,277
1896	7,507,956	1909	24,443,025
1897	10,455,268	1910	26,377,066
1898	10,906,861	1911	23,499,072
1899	12,393,131	1912	32,440,800
1900	16,344,751	1913	30,296,398
1901	20,086,780		
1902	17,486,550		
1903	17,495,954		
		Total	\$460,433,920

TABLE SHOWING THE TOTAL GROSS VALUE OF MINERAL PRODUCT
MINED IN BRITISH COLUMBIA UP TO THE END OF 1913

Gold, placer	\$72,704,603
Gold, lode	76,486,512
Silver	35,832,546
Lead	29,696,585
Copper	80,818,051
Coal and Coke	142,068,615
Miscellaneous	21,464,883
Zinc	1,362,125
	<hr/>
Total	\$460,433,920

A few thousand tons of iron ore are produced from time to time, whilst platinum and palladium are recovered from the placers of the Tulameen river at irregular intervals. In 1913 there were 55,364,677 pounds of lead produced in British Columbia, valued at \$2,175,832. Cassiar and the two Kootenays are the chief producers of lead.

Coal

However important are the metalliferous resources of the province, its wealth in coal is supremely so. It leads the markets of Washington, Montana, Idaho, and in general all the north-western United States. It is exported to Hawaii, Petropavlovsk, Alaska, and elsewhere on the Pacific coasts. Here again the province has been favoured by nature, for coal occurs in many places and in extensive areas readily accessible by sea and of superior quality; for it is acknowledged to be the best on the whole coast of the Pacific, and, in fact, there is no coal on the coast until Puget Sound is reached.

Coal mining takes precedence of all established industries in British Columbia, and in point of tonnage, output, and value, it is the most important mining industry of the province. Coal was first discovered by servants of the old Hudson Bay Company at Fort Rupert in 1835, but no developments occurred until 1847 when the extensive coal measures of Cretaceous age at Nanaimo on Vancouver Island were first opened. The valuable Crowsnest Pass field was not opened until 1897. The area of this field is estimated to be 144 square miles, and as the aggregate thickness of 80 seams is 300 feet of coal, an idea may be formed of the immense quantity available. The vastness of the coal output and modern method of handling the fossil fuel of this basin are appreciated when it is considered that for the two collieries working actively in the Crowsnest Pass field, the steel tippie built at Coal Creek, is designed to handle an output of 4000 tons every 10 hours, whilst other improvements comprise the installation of compressed air haulage at the Michel colliery to replace horse haulage. Since then, mines have been opened and worked on the

western slope of the Cordillera, in the Nicola Valley, on the Thompson, in the valleys of the Telkwa and Skeena, and on the Queen Charlotte Islands. The coal, in general, is bituminous, and of excellent quality, that of the Crowsnest Pass in particular being an excellent steam and coking coal. The total yield of coal in British Columbia since 1836, as given in the Mines Report for 1913, shows a total output of 39,388,420 long-tons, valued at \$126,168,678. Coke, produced for the first time in British Columbia in 1895, has yielded up to 1913, inclusive, 2,867,292 tons, valued at \$15,899,937.

In 1913, coal mining operations were actively pursued—(1) At the Crowsnest Pass Collieries in East Kootenay; (2) the Canadian Collieries, Limited (Dunsmuir areas), on Vancouver Island; (3) the Western Fuel Company; (4) Pacific Coast Coal Mines; (5) the Vancouver-Nanaimo Coal Mining Company on Vancouver Island; (6) the Nicola Valley Coal and Coke Company; (7) the Diamond Vale Colliery Company; (8) The Pacific Coast Colliery Company; (9) the Inland Coal and Coke Syndicate; (10) the Princeton Coal and Land Company; (11) the Columbia Coal and Coke Company; (12) the United Empire Colliery; (13) Hosmer Mines, Limited; (14) the Corbin Coal and Coke Company. The total production of coal for the province during the year 1913 was 2,570,760 tons of 2240 pounds, valued at \$9,197,460. British Columbia exported 627,515 tons of coal to the United States, but none to other countries. Coke is manufactured from coal mined in the Crowsnest field of East Kootenay and in the Comox field of Vancouver Island. In 1913, the province produced 286,045 tons of coke valued at \$1,716,270. There were 50,626 tons exported to the United States, but none to other countries.

Mines are extensively worked on Vancouver Island,

at Nanaimo, and at Comox. The coal is a bituminous coking coal, and is found in seams of from 6 to 10 feet thick on the very shore of the Strait of Georgia, and on harbours suitable for the accommodation of the largest vessels. The mines of Nanaimo have been worked for sixty years with an increasing output, as the trade of the Pacific Ocean has greatly developed.

In East Kootenay petroleum was found in 1891, oozing from the shale, and natural gas was also observed.

Wild Animals (Fauna)

In Cassiar, reputed the best game district of British Columbia, moose is fairly plentiful, and increasing in number; goats are numerous, whilst black and grizzly bears, wolves, and beaver are not infrequent, as are also caribou and Stone's mountain sheep. Vancouver Island and the adjacent coast of mainland have wapiti on the island and goat and bear up the big inlets, whilst black-tailed deer occur everywhere. A fair quantity of mule-deer is found near Savonas on the Canadian Pacific Railway. In the Bridge river and Chilcotin country, with its splendid grazing lands and delightful climate, the big-horn (*Ovis montana*), goat, grizzly and black bear, mule-deer, and in parts of Chilcotin caribou are plentiful. Game-warden Russell of the Lillooet district reports having counted 844 head of deer and 242 head of sheep in a six-day trip in April 1907. Caribou is still fairly plentiful in northern Okanagan, and in places goat, deer, and bear are easily located, whilst on the lake there is a small band of sheep, a few deer, and many wild fowl. East Kootenay has the greatest variety of game in the province; east of the Columbia there are moose, wapiti, big-horn sheep, mountain goat, mule-deer, white-tailed deer, also both black and grizzly bear. Deer and bear,

besides goat and caribou, occur in the Nelson district of West Kootenay. From Fort George as far as the Little Smoky river is a magnificent moose country.

From Kamloops to the Clearwater river, mule-deer, caribou, and bear, are to be found.

Following is a succinct list of the best-known wild animals of British Columbia, and where they live:—

- Moose (*Alces gigas*). Plentiful, north interior, Cassiar.
 Wapiti (*Cervus Canadensis*). Vancouver I. East Kootenay, scarce.
 Caribou (*Rangifer montanus*). Selkirks, northward to 54°
 Osborn's Caribou (*Rangifer Osborni*). Cassiar district.
 Mule-deer (*Odocoileus hemionus*). Rare south of 54° N. lat.
 White-tailed Deer (*Odocoileus Virginianus*). Coast Range valleys, Babine Range, and Fraser valley.
 Columbian or Coast Deer (*Odocoileus Columbianus*). Islands and coast, except Queen Charlotte Islands.
 Big-horn Sheep (*Ovis Canadensis*). Rocky Mountains, Gold and Coast Ranges.
 Stone's Sheep (*Ovis Stonei*). Abundant north, Cassiar.
 Saddle-back Sheep (*Ovis Fannini*). South end Atlin lake.
 Yukon or Dall's Sheep (*Ovis Dalli*). Teslin lake.
 Mountain Goat (*Oreamus montana*). High mountains, everywhere.
 Grizzly Bear (*Ursus horribilis*). Plentiful north; also Cariboo, East Kootenay, and Lillooet.
 Black Bear (*Ursus Americanus*). Vancouver I., coast.
 White Bear (*Ursus Kermodei*). Gribble Island and vicinity.
 Timber Wolf (*Canis occidentalis*). Vancouver I., everywhere.
 Coyote (*Canis latrans*). Plentiful throughout interior.
 Cougar, Mountain Lion, Panther (*Felis concolor*). Vancouver I., Okanagan, and boundary.
 Lynx (*Lynx Canadensis*). Mainland; best in the interior.
 Wild Cat (*Lynx fasciatus*). Mainland coast, northward.
 Black, Silver and Cross Fox (*Vulpes decussata*). Northern interior.
 Beaver (*Castor fiber*), throughout the province.
 Muskrat (*Fiber zibethicus*). Mouth of Fraser, everywhere.
 Sea Otter (*Enhydris lutris*). Scarce, Hecate Strait, etc.
 Land Otter (*Lutra Canadensis*). Everywhere, but plentiful north.
 Raccoon (*Procyon lotor*). Coast, and up rivers.
 Marten (*Mustela caurina*). Mainland and islands, best north.
 Mink (*Lutreola vison*). Coast, generally everywhere.

- Wolverine (*Gulo luscus*). Chiefly on mainland.
 Badger (*Fanidea Americana*). Interior of the province.
 Porcupine (*Erethizon epixanthus*). Everywhere on mainland.
 Northern Hare (*Lepus Americanus*). Everywhere.
 Jack Rabbit (*Lepus Texanus*). Okanagan, rare.
 Baird's Hare (*Lepus Bairdii*). Okanagan, rare.
 Fur Seal (*Callorhinus ursinus*). Hecate Strait.
 Hair Seal (*Phoca vitulina*). All along coast.
 Sea Lion (*Eumetopias Stelleri*). Coast north of 51°.

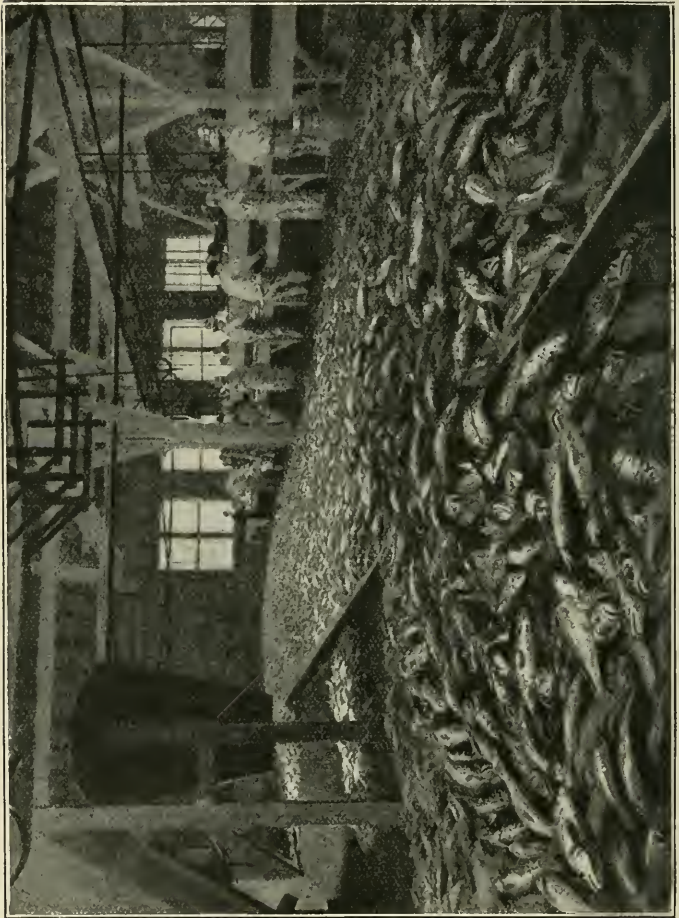
Besides these are a number of smaller fur-bearing animals such as the Little Chief hare, the polecat, or the little striped skunk, the skunk, the weasel, and others belonging to different families.

Fisheries

There are treasures of the ocean also which must be taken into account in any enumeration of the resources of British Columbia. The province comprises, with the whole of its sea-front, sounds, bays, and inlets, many stretching inland for considerable distances, an actual shore line, including Vancouver Island and the Queen Charlotte group, 15,000 miles in extent. Beyond this great natural and national fish preserve, the North Pacific and Bering Sea afford deep-sea fishing grounds, which compare more than favourably with the North Atlantic in their wealth of food fishes. On March 31, 1912, British Columbia counted 8608 men employed on its 26 vessels (tonnage 2287), 3267 sail-boats, 2098 gasoline-boats, and 141 tugs, smacks, etc., besides 6559 persons in fish-houses, freezers, and canneries; in all, 15,167 persons. The total value of the fishery-outfit for the province is \$8,903,000. The total value of the fisheries of the province for the year 1911-1912 amounted to \$13,677,125,¹ being an increase

¹ For 1912-13, \$14,455,488.

of \$4,513,890 over the preceding year's figures. There were 1,103,666 hundredweight of salmon caught and



SALMON CANNERY.

landed in a green state, 25,065 cwt. of cod, 545,442 cwt. of herring, 196,486 cwt. of halibut. The salmon

industry alone amounts in value to \$9,851,897; 989,911 cases having been "canned" during the year, totalling in value \$7,424,332. There are sea fisheries of halibut, rock cod, red cod, anchovies, herring, and of many other kinds. The amazing runs of salmon in the rivers, and the dense masses of fish which crowd up the Fraser must be actually seen to be believed.

The salmon of British Columbia differ from those of the Atlantic coast, and so much confusion exists in relation to the subject, that the following memorandum has been obtained from Professor Prince, the well-known Commissioner of Fisheries for Canada:—

The rivers of British Columbia are resorted to by at least *seven* different species of salmon. Four of these are of great economic importance, viz. the Quinnat, the Sockeye (Sawquai), the Cohoe and the Steelhead.

The Quinnat, or spring salmon, are the first to ascend from the sea. They run from spring until July, but they are not sufficiently numerous to be of great value for canning. Their large size, varying from 20 lbs. to 40 lbs., or even 80 lbs. weight, renders them inconvenient to handle, as the many processes involved in canning make uniformity in size very desirable. They are canned, however, to some extent, and the quality of the flesh is most excellent. They are perhaps the best salmon caught in Pacific waters, but as compared with the vast "runs" of other Pacific salmon the Quinnat do not ascend in great numbers. They appear to frequent the Strait of Georgia and inshore waters during the main part of the winter, and are then taken by Indians and anglers who troll for them with spoon-bait.

The Sawquai, in current conversation Sockeye, or red salmon, is the most valuable of all the British Columbia fish. The great canning industry may be said to be dependent on the supply of this fish, which ascends the river, in incredible quantities, from the end of June until September. The Sawquai is a small species, 6 lbs. to 10 lbs. in weight, and its flesh, being firm and of a rich red colour, gives it pre-eminence in the market. When the Sawquai run draws to a close, the canneries, for the most part, cease operations, but during the few weeks of the main run each

cannery receives on an average, it is estimated, probably not less than a quarter of a million of salmon. The Sawquai ascends great distances, and the principal spawning grounds are in remote lakes near the head-waters of the principal rivers. Most of other British Columbia salmon are content to make a less lengthy and less perilous course, and many, such as the Humpback, appear to resort to the lower tributaries only.

The Cohoe is a fine fish, but the chief schools enter the rivers so late that until recently they were utilised less for canning than for the frozen fish and fresh fish markets. The flesh is of a fine pink colour, but much paler than the rich orange-fleshed Sawquai. In size they range from ten to twenty pounds, or more, and they continue to enter the rivers until early November.

The Steelhead, which run late and are caught more or less numerously all through the winter, differ in the most marked manner from all the British Columbia salmon. This fish resembles, in fact, the great sea-trout of the Atlantic estuaries with its bright large scales and thick fleshy tail. It is more closely allied to the Eastern and British salmon than the foregoing species, but it has not proved suitable for canning, on account of the dense character of the bones, and the fact that it ascends from the sea in scattered schools rather than in the compact and dense runs of the Sawquai. For refrigerator purposes this fish could not be excelled, and it has been largely utilised in that way. The average weight of these fish is 12 pounds, but they often reach a weight of 25 or 30 pounds. They are an exception to most of the Pacific salmon, because they afford capital sport with the rod.

The Dog-salmon, the Tyhee, and other species are too unimportant to require notice.

The Humpback salmon comes in from the sea in immense schools before the Sawquai run is over, and as they are practically valueless commercially, they are a serious annoyance to the fishermen, who frequently take in the course of a morning 60,000 Humpbacks to 10,000 or 15,000 Sawquai salmon. The name given to this species is due to the fact that soon after the schools enter fresh water the males acquire a peculiar outline, the body deepening enormously, the back rising in the form of a blade-like ridge, and the jaws increasing in length, so that the creature presents a most grotesque and distorted appearance. The flesh is pale, and, unless canned very soon after capture, becomes soft and insipid.

There are *three* fishing districts in British Columbia :—

- I. Fraser river district.
- II. Queen Charlotte Islands district.

{	1. Skeena river, including Prince Rupert.
	2. Rivers Inlet.
	3. Nass river.
	4. North Coast.
	5. Queen Charlotte Islands.
- III. Vancouver Island and mainland adjacent.

{	1. Nanaimo.	6. Alert Bay.
	2. Cowichan.	7. Quathiaska.
	3. Victoria.	8. Comox.
	4. Clayoquot.	9. Mainland.
	5. Alberni.	

The Fraser river district reports the total pack of all varieties for the year 1911-12 at 301,978 cases as against 163,116 in 1907-8; Japanese fishermen caught, salted, and shipped to the Orient 7,054,400 lbs. of dog salmon; cod taken, 1,416,500 lbs.; halibut, 15,854,100 lbs., a decrease. The Queen Charlotte Islands district reports the total value of fish and fish products for the year at \$4,722,761 against \$3,470,729 for 1910-11. From Vancouver Island district, returns show a total value of its fisheries for the year at \$2,786,302, as against \$2,358,423 for the year ended March 31, 1911; the value of the salmon alone totalling \$1,485,517. For the furtherance and improvement of the fisheries the Dominion Government maintains *twelve* hatcheries—(1) Fraser river and Morris Creek; (2) Lakelse lake, Skeena river; (3) Granite Creek (supplying Kamloops, Kootenay, and other lakes); (4) Harrison lake; (5) Pemberton (Birkenhead river); (6) Rivers Inlet; (7) Babine hatchery; (8) Stuart lake; (9) Cowichan lake hatchery; (10) Anderson lake; (11) Kennedy lake; (12) Nimpkish hatchery. About 75,000,000 of salmon and trout were distributed during the year. The first hatchery,

at Bon Accord on the Fraser, was opened in the year 1885.

The catches of the chief kinds of fish, etc., throughout the province in 1911-12, as well as those of 1910-11, were as follows:—

Kind.	1911-1912.	1910-1911.
Salmon	110,366,600 lbs.	93,782,700 lbs.
Cod	2,506,500 ,,	2,033,400 ,,
Herring	54,544,200 ,,	27,519,300 ,,
Halibut	19,648,600 ,,	21,906,300 ,,
Oysters	5,385 barrels	2,722 barrels
Clams	9,677 ,,	3,458 ,,
Whales	1,199	958

Oysters transplanted to the Pacific coast are propagating, and the possibilities of the industry are "enormous" according to the investigations carried on at the Biological Station by Professor Prince, and Professor Stafford of McGill University, under federal government auspices.

After many years of contention and international discussions between the United States, Russia, Japan, and Great Britain, as well as on the part of the Canadian Government directly interested, regarding fur-seal fisheries of the North Pacific Ocean, a convention between representatives of Great Britain, Japan, the United States, and Russia was signed at Washington on July 7, 1911, for the adoption of means looking to the preservation and protection of the fur seal. By this treaty an eminently satisfactory settlement has been effected of what for many years had been a difficult and vexed question. The species protected are: *Callorhinus ursinus*, *Callorhinus Alaskanus*, and *Callorhinus Kurilensis*, which inhabit the waters of the North Pacific Ocean, north of the *thirtieth*

parallel of north latitude, including the seas of Bering, Kamchatka, Okhotsk, and Japan.

A marine biological station, involving a programme of careful scientific and fishery investigations, has been established at Departure Bay. The Government is taking steps, by judicious restrictions, to perpetuate the salmon in the northern rivers: the Skeena, the Nass, and other large streams, as well as in the Fraser river. *Five* cruisers are employed in the protection of the Canadian fisheries on the Pacific coast. The principal markets for British Columbia canned salmon are:—Japan, Australia, New Zealand, China, Great Britain, Germany, France, and Italy, besides Canada and the United States.

Agriculture

Although British Columbia will always be thought of first as a country of minerals, lumber, and productive fisheries, it contains many areas of fertile land. These are not like the illimitable prairies of Alberta, Saskatchewan, and Manitoba, nor the broad and level farmlands of Southern Ontario, nor yet like the long river valleys of Quebec, but they are areas scattered over the province, in the deltas of the rivers and the valleys of the lakes and streams, and on the lower terraces of the mountains. Far away north there are rich prairies in the valley of the Peace river.

In the south-west corner of the province are several very extensive tracts of arable land of the richest quality, notably the lower Fraser valley, Westminster district, Vancouver Island, and adjacent islands in the Gulf of Georgia. South of 52° north latitude, and east of the Coast Range, the Okanagan has 250,000 acres of rich agricultural lands available; North and South Thompson

valleys, 75,000 acres; Nicola, Similkameen and Kettle river valleys, 350,000 acres; Lillooet and Cariboo, 200,000 acres; whilst east and west Kootenay have 125,000 acres. It is estimated that there are at least 6,500,000 acres of wheat and other cereal-growing region in the north central portion of the province, where settlements are actually established and include those of Chilcotin, Nechako, Blackwater, Bulkley, Kispiox, Skeena



400-ACRE ORCHARD, KELOWNA, BRITISH COLUMBIA.

and Peace river valleys. Professor Macoun has stated that "the whole of British Columbia south of 52° , east of the Coast Range, is a grazing country up to 3500 feet elevation, and a farming country up to 2500 feet, wherever irrigation is possible or the precipitation sufficient.

Wheat is grown in the Fraser, Okanagan, and Spillimacheen valleys, and in the Kamloops country. Barley and oats are abundant crops of excellent quality. Potatoes, turnips, carrots, mangolds, and all other roots grow in profusion wherever cultivation has been attempted. Hop

culture is carried on in the Okanagan, Agassiz, and Chilliwack districts. Sugar-beets, tobacco, and celery are also cultivated. At Kelowna, the tobacco-growing industry yielded an average of 1190 pounds of leaf to the acre in an experiment made in 1911 of three fields of $14\frac{3}{4}$ acres. Peaches grow well in all the valleys south of the main line of the Canadian Pacific Railway; whilst grape-growing in the same areas is proving successful.

In the district of Yale is the bunch-grass country, where horses and cattle find abundant and nutritious food on the slopes and plateaus. The country is open, and the trees are chiefly along the river bottoms or in small clumps. Large ranches have been established with very successful results. The country about Kamloops is specially adapted for ranching. The snowfall is light, and, if the rainfall is deficient, the country is netted with mountain streams.

West of the Coast Range all the farming land is on the deltas of the Fraser and other rivers. There the soil is rich, and on the lower reaches of the Fraser there is a large area of productive farm-land. The slopes of the mountains are rough and densely wooded. The opposite conditions exist in this region, for the rainfall is in excess, and the lands must be drained and often dyked.

Fruit-farming in the province has grown rapidly during the last twenty years. Southern British Columbia is one of the finest fruit countries in the world. Though in its infancy, fruit-farming has won signal honours in North America, and in Great Britain, the most critical fruit-market in the world. Apples especially do very well. The recognised fruit-districts of the province include the southern part of Vancouver Island and the Gulf Island, lower Fraser river valley, Thompson river

valley, Shuswap lake, Okanagan, Spillimacheen, Osoyoos, Similkameen, Upper Columbia valley, Kootenay lake, Arrow lake, Lower Columbia valley, and Grand Forks; the west coast of Vancouver Island, the west coast of the mainland where patches of fruit lands are found at the heads of the numerous inlets, the lower Fraser valley, Nicola, Grand Prairie, and many other localities. Apples have been successfully cultivated since 1904, as far north as Hazelton, on the Skeena river, between 55° and 56° north latitude.

In 1891 there were only 6500 acres of the province devoted to fruit culture; in 1908 there were 100,000 acres under cultivation. In 1902 there were 1956 tons of British Columbia fruit shipped, whereas in 1908 there were 6496 tons, an increase of 4540 tons in five years. In the so-called "dry-belt" of the province, fruit-farming has proved remunerative, and in definite instances has displaced the Oregon and Washington output on the Winnipeg market.

On Vancouver Island, though it is in the main covered with thickly forested mountains, there is also much productive farm-land. In the Esquimalt, Metchosin, Sooke lake, Goldstream, and Highland districts and near Victoria the land is fertile, and on the peninsula of Saanich are many fine farms, as well as at Cowichan and Comox. The land at the head of the Alberni Canal is good farm-land; the difficulty here is not so much the quality of the land as the cost of clearing the dense forest and undergrowth. The smaller islands in the Strait of Georgia are, in many cases, occupied by farmers for mixed farming and for sheep ranches.

Hay and grain crops form the chief agricultural products of the Grand Trunk Pacific Railway belt between the Yellowhead Pass and Prince Rupert. Many excellent

areas are already producing crops with records of wheat, 25 bushels to the acre; oats, 50 bushels to the acre; and barley, 35 bushels to the acre. Potatoes, cabbages, celery, onions, and other root crops are a success, besides dairy and kindred farm industries. The introduction of irrigation in certain districts of the province has wrought great changes in agricultural methods and results; whilst dry-farming in Southern Yale opens up a region of wide promise. In the Queen Charlotte Islands good crops of wheat, oats, and barley are grown, and hops grow plentifully and of good size. All kinds of vegetables, celery, onions, cauliflowers, lettuce, cabbages, parsnips, beets, mangolds, peas, beans, turnips, and potatoes give good returns. Some 400,000 acres of arable land occur on Graham Island.

The total value in 1911 of lands owned, buildings, farm implements, and live stock on hand in British Columbia was \$179,359,601, with an average value per holding of \$9712, as compared with a total value of \$33,386,886, and an average value of \$4954 in 1901. The total value of field crops, vegetables, and fruits, according to the census of 1911, that is, for the year 1910, was \$9,619,281, as against \$3,536,371 in 1900. The value of live stock sold in 1910 was \$3,296,647, being an increase of \$2,860,853 or 656 per cent over the figure of ten years previous. The total yield of grain for the province during the year 1912 is estimated at 2,107,800 bushels, of which oats totalled 1,817,000 bushels.

Discovery, History, and Development

Victoria, the capital city and the first actual settlement in British Columbia, was staked out in 1842, seventy-three years ago, and, until Captain Cook's arrival

upon the coast in 1778, British Columbia was either a blank on the maps, or the space was filled with imaginary details. Even as late as 1811 William Cullen Bryant, in his stately poem, *Thanatopsis*, could find no stronger instance of solitude and remoteness than these mysterious shores when he wrote:—

Take the wings
Of morning, pierce the Barcan wilderness—
Or, lose thyself in the continuous woods
Where rolls the Oregon, and hears no sound
Save its own dashings—yet the dead are there.

It is in the poet's mind the culmination of loneliness, and yet the imagination of sailors and geographers had been busy with it for three hundred years; for there was the termination, on the "Mar del Zur," of the Strait of Anian—the waking dream of Hakluyt and Purchas and Michael Lok and Sir Humphrey Gilbert and Sir Walter Raleigh, and all those other Elizabethan worthies with whom geography was a passion. To them it seemed contrary to the order of the world that there should be no passage to Cathay through that interminable barrier continent which stretched from the frozen cliffs of Meta Incognita on the north to the snow-clad summits of Tierra del Fuego on the south, and they would now rejoice to see, at its narrowest point, the triumph of modern engineering skill. It was, in effect, the Pacific end of the Strait of Anian that Captain James Cook was sent to discover, and it was the Atlantic end that Parry, amongst many other explorers, searched for in 1821 along the western shore of Hudson Bay. Through all these years faith was kept alive by eagerly accepted stories of passages made, or nearly made; and so this history, almost of yesterday, is preceded by an age of fable and romance.

There was after all a great deal of truth in the dreams

of these imaginative old sea-dogs. On those far distant coasts there is an abundance of gold and silver wherewith to replenish the veins of old-world commerce; and the waterways of the "river of Hochelay" and the "Mer douce" do open up the way to the great southern ocean. It is really possible to cross the continent by water with but a few short portages. The old canoe route leads to the Athabaska Pass, or to the Peace river, from which water flowing to the Pacific is not far distant—but the way is long. The Strait of Anian does really exist, but it is far to the north and is at times ice-bound. That such should be the case was incredible to the old sailors, and to use a modern phrase, it was unthinkable. Besides, had not the Portuguese passed safely over the tropics round the Cape of Good Hope? The sea was not boiling, as the old writers had taught; and Robert Thorne showed to King Henry VIII. that there was no more reason to suppose the sea at the north was impassable for cold than the sea at the south for heat; and then Christopher Columbus had actually been to Iceland in winter and the sea was not frozen! No wonder, then, that some sanguine sailors thought they had found the long-sought strait. Some had met people who had sailed through; and others, finding everybody ready to believe them, boldly affirmed that they themselves had passed through.

In this way it came to pass that even the short history of our most recent province, whose beginnings we ourselves may perchance remember, had its mythopoetic age. As for this Strait of Anian, is it not laid down on Jeffrey's standard map of 1768? and it leads from the position of Vancouver into Hudson Bay; and there, too, we may see the Haro river leading into the "N.E. Tartarean Sea," and the "country of the dwarfs." There, too, is

“Fou Sang,” discovered by Buddhist monks from China in the year 499, concerning which the curious may consult the Year Books in the Imperial Library at Peking—and this Fou Sang is no other than our own British Columbia, which, on Jeffrey’s map of 1768, guards the western end of the Strait of Anian.

Then Sir Humphrey Gilbert, who was the soul of honour and truth, heard the Mexican friar Urdaneta explain to Sir Henry Sidney how he had passed through the strait, and he saw also the map of the route. Then the pilot Juan Ladrillo had also sailed through it—not to speak of Scolmus the Dane, or of the East Indians thrown on the coast of Germany; for the particulars of which event the gentle and learned knight refers us to Quintus Curtius and Cornelius Nepos, to Aristotle, Berossus, and the first chapter of Hester, to Arrianus, Philostratus, and Sidrach in his “Discourse of the warres of the king of Bactria.” If time presses, the hurried reader may omit these authors and consult Gemma Frisius, and learn how three brethren sailed westward through this strait, whence it was called *Fretum Trium Fratrum*; and he may look it up on the map, and find that it also comes out near the site of our own Vancouver, which the Canadian Pacific Railway Company founded a little more than a quarter of a century ago.

But to be more precise, there is Maldonado—Lorenzo Ferrer de Maldonado—an exceedingly circumstantial narrator, who laid before the Council of the Indies a full detailed account of this strait. He sailed in 1588 from Lisbon to Labrador at latitude 60° , thence on a north-west course to 64° , then north to 70° , and then north-west to 75° . At that point the Strait of Labrador turned, and he passed down south-west to the Strait of Anian at 60° ; so again we are brought to British Columbia. This

person was a good guesser, for the Fury and Hecla Strait is exactly at 70° , and Melville Sound is at 75° ; and it is just there where Parry would have got through had it not been for the ice.

Then, in 1592, there was Juan de Fuca—a Greek, with all the mythopoetic powers of that highly gifted people—a much travelled and much enduring mariner who sailed through from the Pacific to the North Sea, but did not continue farther because of hostile Indians, though he knew the way. His real name was Apostolos Valerianus and he was a pilot well advanced in years. This shifty person made an offer to Michael Lok to pilot the ships of Queen Elizabeth through the strait, if she would make good the sum of 60,000 ducats, of which he had been plundered by the sea-rover Cavendish on the coast of Mexico. He too was a good guesser; for he placed the western end of the Strait of Anian at 47° to 48° . His name is perpetuated in the Strait of Juan de Fuca at 48° to 49° ; but no trace of him can be found in the records of Mexico or Spain. His story, however, did some duty against us in the settlement of the boundary with the United States.

These persons, however, were serious persons compared with Admiral Bartholme de Fuentes. The details of his exploits appeared first in the monthly *Miscellany* for 1708. The narrative was accepted as fact, and on Jeffrey's map are portrayed the geographical results of his expedition. It was accepted also in France by Voltaire, who states in his *History of Russia* that the strait had been discovered. J. N. de l'Isle and Buache, the geographer to the king, presented in 1750 a memoir to the Academy of Sciences, *Sur les nouvelles découvertes au nord de la mer du sud*, with a map which perhaps Jeffrey, the English royal geographer, followed. In this

the strait was laid down to Hudson Bay. The Academy was not deceived, but the voyage and the maps were put in as evidence by the Spanish Government in the Nootka Sound dispute. The real fact is that the story was a pure fabrication by a clever contributor to the magazine. It is necessary to know this story to understand the maps of that period.

It will thus be seen that a very respectable mass of mythology has grown up around the history of British Columbia, and yet this, as all other mythology, has a certain substratum of fact; for the shortest and most direct way to Cathay and Cambaluc and Mangi and Quinsay is indeed through the great waterway discovered by Cartier to the La Chine of La Salle, and by the Canadian Pacific Railway to the Fou Sang of the Buddhist monks at Vancouver—the terminus on the Pacific, of the Strait of Anian; for, to-day, railways as well as sea-ways are the channels of commerce.

The real history of British Columbia may be very shortly told. It commences with the expedition of Captain Cook. The success of Hearne in 1771 in reaching the shore of the Arctic Ocean had awakened public interest, and Cook was sent to the Pacific with instructions to search the whole coast, north of the new Albion of Sir Francis Drake, for a passage eastward to Hudson Bay. Whether Drake reached 42° , 43° , or 48° is irrelevant here. He did not pass 48° , and therefore did not discover British Columbia. Captain Cook commenced at latitude 44° , and coasted to the north, but did not notice the Strait of Juan de Fuca. He discovered Nootka Sound (which he named King George's Sound) on Vancouver Island, and refitted his ships there in the spring of 1778, and then passed up northwards into the Arctic Ocean as far as Icy Cape, where further progress

was stopped by the ice pack coming down upon the land. He came to the conclusion that there was no opening westward at a lower latitude than 72° , and returned to Hawaii with the intention of renewing his attempt at a northern passage the following year, but he was unfortunately killed.

Bering, together with his associate Chirikof, had made many discoveries previously. Sailing from Kamchatka he had discovered the sea and strait which bear his name, and, on his last voyage in 1741, he had passed down the coast of Alaska as far south as 56° ; so that Cook's survey overlapped the Russian discoveries. It was Chirikof who first saw north-western America. He lost some of his men near the present Sitka. Bering, a few days later, struck the land at Mount St. Elias. It is also more than probable that Juan Perez, a Spaniard, commanding an expedition from San Blas in Mexico, saw this part of the coast four years before Cook, but the discovery was kept secret until many years later. The history of the province commences, then, with Cook's visit in 1778.

Captain Cook was killed, and his successor, Captain Clerke, died, and Captain King, upon whom devolved the command, touched at Petropavlovsk on his return voyage; and his visit waked up the Russian fur merchants to organise a Russian fur company in 1783, which established trading posts in Alaska. The news spread in the east, and some English merchants in China fitted out a small trading vessel under Captain Hanna in 1784, and thus commenced the direct trade in furs with China; for there was a great demand for sea-otter skins among the wealthy Chinese, and enormous prices were readily paid for them.

In those days every British vessel trading in the Pacific round Cape Horn required a licence from the

South Sea Company, and every vessel trading east of the Cape of Good Hope required one from the East India Company. In 1785 a company under a licence from the South Sea Company was organised in London to take up this fur trade at Nootka Sound. It was called the King George's Sound Company, and sent out two vessels under Captains Portlock and Dixon. Before they arrived, however, vessels commanded by Englishmen, and sailing under the Portuguese flag and the flag of the East India Company, were trading on the coast. In that way Meares and Tippett and Strange and Duncan and Colnett carried on their operations; and Barclay, who sailed under the flag of the Austrian East India Company. These officers made minor discoveries as they traded along the coasts, and many places still bear their names, though Nootka Sound, as it soon was exclusively called, became the general centre of the trade. Boston, then the chief port of the United States, and renowned for the enterprise of its merchants, aspired also to a share in so profitable a business, and the *Columbia* (Captain Kendrick) and the *Washington* (Captain Gray) arrived in those seas in 1788, and found Meares at Nootka building a ship and a trading-house.

Spain, which for centuries had been asleep on the shores of the Pacific, at last heard of these doings in what she conceived to be her territory; for she claimed up to latitude 61° , where the Russian discoveries were supposed to end, and in 1789 two Spanish ships of war arrived at Nootka Sound and seized Captain Meares's two vessels and his house and establishment. This brought England and Spain to the brink of war. The matter was, however, settled by a treaty called the Convention of the Escorial, with the result that Meares was to be reinstated and reparation made; it was to carry out this

convention and reinstate Meares that Captain Vancouver was sent out in 1791. The Spanish officers made difficulties, and Lieutenant Broughton was sent home for further instructions, while Vancouver went on with a careful survey of the coast so thorough and so accurate as to prove for the first time that Vancouver was an island. Eventually in 1795 the Spanish flag was struck and the Union Jack hoisted, and British Columbia became an acknowledged possession of the Crown of Great Britain.

While Captain Vancouver was exploring the coast, Alexander Mackenzie, a Scotsman in the employ of the merchants of Montreal known as the North-West Company, made the first canoe journey attempted by a white man west of the British Rockies, and penetrated this province in a mission whose avowed purpose was the extension of the sphere of activity of his company between the territory under the control of the Hudson Bay Company to the east, and the Pacific Ocean. On the 10th day of July 1792, accompanied by a few French-Canadian boatmen and trappers, he ascended the Peace river, established a post and wintered there. The following spring he crossed the Rockies, followed a native trail, which, from valley to valley, from portage to portage, led from the slopes of the Peace to the great Elbow of the Fraser, thence to Bella Coola, and Burke Inlet, which he reached on June 23rd, 1793. For his labours and discoveries Mackenzie received a knighthood.

Mackenzie travelled and built forts or trading centres which the North-West Company established and followed up all along the line of his explorations. A second line of forts reached the Pacific by the Skeena. Thus were Fort MacLeod, Fort George (1805-7), Fort Simpson (1831), Fort MacLaughlin (1833), the latter on Bella Bella Island, from the Rockies to the Pacific,

along more northern trails. Nearly all the factors were Scotsmen whose names and deeds are commemorated as place-names throughout the province: Finlay, MacLeod, Stuart, Fraser, Simpson; the name of Quesnel, however, is that of a French Canadian in the employ of Simon Fraser. It was Simon Fraser who, in 1806, called the interior country "New Caledonia," or "New Scotland." The "voyageurs," or "trappeurs," or "coureurs des bois" employed by the Scotch factors to treat with the aborigines, and who, from the days of Sir Alexander Mackenzie served as forerunners or guides to the explorers, were for the most part half-breeds—mostly French Canadians, speaking French and the language of the natives. They went from village to village of the aborigines, especially along waterways, giving names to places where accidents or incidents occurred; for example, the Nechako, Chilcotin, Cache des beaux jours, Cache de la Tête Jaune (Yellowhead), lac des Français, lac Babine (Lip), Liard (rivière aux Liards), etc.

In the south, the Hudson Bay Company, which supplanted and absorbed the North-West Company in 1821, whose headquarters were located at the mouth of the Columbia (now part of United States territory), also had Scotsmen as *factors* and French Canadians and half-breeds as trappers, covering the whole basin of the Columbia and the mountains, as well as the prairies where they joined their comrades of Fort Garry on the Red river, where Winnipeg now stands, whose territory extended south and west as far as Oregon and Wyoming, from which they could spy out the horses and fires of the "*vaqueros*" and of Mexican prospectors—in which region French and Spanish names are in close contact.

It was in 1810 that a German furrier, established in New York city—John Jacob Astor, undertook to

federate all the scattered fur companies of the United States into one large powerful company after the plan of those in Canada, free from local competition,—in fact, formed the first *trust* known in the United States; and at the same time sought legislation throughout the various states of the Union to forbid Canadians from operating south of the frontier. Without ascertaining if the territory which they covered belonged to England or Spain, who shared the Coast, the United States companies pushed their zones of activity to the Pacific. In 1811 the Pacific Fur Company was organised by Astor, who, in 1811, built Fort Astoria on the estuary of the Columbia, the first United States establishment on the Pacific coast. When Astoria was built, the North-West Company, alone in Columbia, covered all the region abandoned by the Spaniards and allowed no one else within those limits.

David Thompson, astronomer-topographer, on behalf of the North-West Company, made *three* traverses across the Rockies: one by the Yellowhead, one by the Howse (1807), and one by the Athabaska Pass (1810); he traced the great Columbia-Kootenay valley, wintered in it (1807-8), discovered and named the Nelson Mountains, afterwards designated "the Selkirks," after one of the most influential shareholders of the Hudson Bay Company after its amalgamation with the North-West Company. Thompson circumvented the mountains from 1808-11, and ascended the Columbia to its mouth, where he found Fort Astoria in course of construction. He had discovered the streams now bearing his name and erected Fort Kamloops close to the native village. The Hudson Bay Company seized Fort Astoria and kept it from 1814 to 1818, when it was restored to the Astor Company. The treaty said nothing as to the ownership of the mouth of the Columbia owing to the desire to eliminate

the possible claims Spain might make. As Madrid was then occupied with colonial revolts, the two fur-trading companies continued to occupy the non-contested territory. In 1821 the North-West Company was absorbed by its powerful English rival, the Hudson Bay Company, and its domain thus spread from ocean to ocean, the British Government granting a monopoly of the commerce, and all the royal rights and privileges which it enjoyed in its other possessions over the whole of the territory now constituting British Columbia until 1841, with power to renew the same. These privileges were extended between 1835 and 1843 to 1859, and in 1863 for *seven* years longer. Then the Government reserved to itself the right to cancel these at any time, and in 1867 used this prerogative. This Company did much to conserve the game and fur-bearing animals. They won the confidence of the aborigines, and by justice, tact, and courage prevented the internecine struggles between the white and native races, which broke out south of the boundary line. The system was only one of transition, but the autocratic rulings of the company were of the greatest advantage to the aborigines and to the British Government. If it was also of commercial benefit, it was well merited. Whalers in the Pacific did much business early in the nineteenth century, and the Hudson Bay Company sold them, and at a good profit, wood from its forests, salmon and other fish caught and dried on the spot; wheat flour brought from England in vessels; sugar and coffee as well as salt from farther south, besides rice from the Far East. In 1830 it established stores in Honolulu, and in 1841 a *depôt* in San Francisco, then Mexican.

The sea-otter trade had almost vanished owing to recklessness,—massacres of entire herds,—and the East

India Company's ships no longer sought furs for the Chinese trade. For purposes of commerce the Hudson Bay Company had a merchant marine, built in England, but from 1829 these were constructed on the Pacific Coast. Interested in holding its monopoly, and powerful enough to defend its rights, this Company withdrew from certain limits contested by the Russians in the north, and by traders from the United States in the south. The Russian Company sought an alliance with the United States traders against the English Company. The latter obtained through the King of England a treaty signed in 1825 in which the spheres of both companies were defined. The first Fort Simpson, the most northerly Hudson Bay Company post, had to be removed to its present location at Port Simpson, and in 1826 Fort Essington was established at the mouth of the Skeena, where ocean and river navigation meet at this point. In 1824 Finlay had discovered that branch of the Peace bearing his name, and MacLeod penetrated into those deep forested wildernesses along the Liard, a branch of the Mackenzie in the Cassiar Mountains, reached and descended the Stikine and Taku (1834-1839). The Company attempted to build forts at the mouths of these streams, but the Russians, armed with the treaty, prevented them. However, in 1837, they rented from the Russian Company that portion of the coast which was not occupied by them. Meanwhile, in the southern contested region the Hudson Bay Company had twelve forts or posts, among others Fort Vancouver, above Fort Astoria on the lower Columbia, now Vancouver of Washington State, where the Company's headquarters were located for the territory west of the mountains. In 1839 colonists were established in the vicinity of this fort to supply dairy and

other farm products to the Company's agents. But the rival United States traders also were active, and began to colonise the north-west coast, and with the help of the clergy and missionaries from the east appealed to the patriotic and religious sentiments of the people of the United States to possess this land.

After the election of 1844, the democratic party then in power formulated its famous policy, which Polk declared clear and undoubted, claiming the whole of the coast from California, then Mexican, to the southern boundary of the Russian coast. "*Fifty-four forty . . . or fight*," was the party's cry. To ward off any untoward event Great Britain sent a squadron to Vancouver Island, and at the same time opened negotiations with Washington; and after several concessions were made, the United States signed the treaty of June 1846, and the 49th parallel was established as the international boundary line, the limit of the Spanish possessions of 1775. By this the Hudson Bay Company lost 12 out of 22 establishments. Having lost Fort Vancouver on the lower Columbia, and a vast amount of territory for itself as well as for the British people, in 1846 the same company transferred its headquarters to Fort Victoria (built three years previously); and from that time on Victoria has virtually remained the Columbian capital.

Colonisation.—To compensate for their losses the British Government granted the Great Fur Company similar exclusive privileges of trade and administration on the island of Vancouver as it had in other regions, but for five years only. In 1854 these privileges were renewed for another five years, till 1859, precisely the same year when privileges were to cease on the continent. Alone England reserved the right to choose

a place for a naval station owing to the threats of war, and Esquimalt, near Victoria, was later designated and established. The Company cared little for colonists. When the first truly English colonists landed in 1849, they were coolly received and sent to Sooke. In 1850 80 colonists arrived, 120 in 1851, 200 in 1853, but all were in the employ of the Company, part of their salary being paid in lands. They were Scotsmen for the most part.

Coal was first discovered in 1835 and used at Fort MacLaughlin, and the Nanaimo basin was discovered in 1850. In 1851 the first specimen of native *gold* was brought to the factor at Port Simpson, who informed the Governor at Victoria. The latter fitted out two vessels, only one of which returned with gold-bearing quartz. Then followed a "rush" to the Queen Charlotte Islands, whence the gold came, but the vein was soon exhausted. At the close of 1853, Vancouver Island counted as inhabitants 17,000 natives and 450 whites, of whom 300 were in Victoria and Sooke, 125 in Nanaimo, 25 at Fort Rupert. As the colonists increased in number constitutional government and representation was demanded. For three years (1856-1859) Governor Douglas called together a Legislative Council elected by the people, to act conjointly with the functionaries of the Company, but considering this a troublesome task he ceased calling them. In 1857 the Company had 27 posts, as European centres, for the most part north of the Fraser basin, with Fort Simpson as chief post, around which 45,000 natives were estimated to live. In 1823 Langley had been established as a salmon fishery, and Fort Hope was built in 1847, and Yale in 1849. In 1857 Langley counted 4000 aborigines in the delta and plain, whilst Hope and Kamloops had 2000 on the

Southern Interior plateau. From 1858 until 1864 thousands of gold and fortune seekers, many rough and lawless, for the most part an overflow from California, came to Victoria, and along the valleys of the Thompson and the Fraser. The Hudson Bay Company profited much, but its commercial monopoly within the limits of what is now British Columbia was withdrawn by the Home Government in 1858, which decided that the whole of the territory west of the Rocky Mountains, except Vancouver Island, be erected into a Crown Colony. To the mainland colony the name BRITISH COLUMBIA was given by Her Majesty Queen Victoria, in place of New Caledonia of former days. New Westminster was chosen as the first capital, and was erected into a municipality in 1860.

As the two capitals, Victoria for Vancouver Island, and New Westminster for the mainland, were in close proximity, the British Government, for economy's sake, instructed the Company Governor in Victoria to exercise at the same time the function of Governor on behalf of the Crown in New Westminster. Later, a separate governor was appointed for the mainland; but administrative rights having been withdrawn from the Hudson Bay Company, the Crown decided to unite all its Western North American possessions under one designation, namely, British Columbia with Victoria as sole capital (1866). The total population of Vancouver Island about this time numbered some 7500 whites, and the mainland counted nearly 10,000. A parliament was elected, and the Royal Governor chose a ministry from the majority party at the polls. All public works, concessions of lands, mines, and rights, are administered by British Columbia, as well as laws respecting colonisation.

The federation of the Crown Colonies and provinces

of Eastern British North America in 1867 was further strengthened on July 20th, 1871, by the admission of British Columbia as a province of the Dominion of Canada. The movement was warmly approved by the Imperial Parliament, and from that date a new era dawned. A small set-back, however, occurred in the delimitation of the frontier with the United States; but finally, in 1872, on the proposition of General Grant, Wilhelm I. of Germany was chosen arbiter. He declared the island of San Juan to be United States territory, and the boundary line now follows the middle of Haro Strait.

Exploratory, geological, and topographical surveys by the Federal Government at Ottawa were followed by railroad construction, settlement, and the utilisation of natural resources. In 1885 the Canadian Pacific Railway was completed through the province, and Vancouver chosen the terminus, a city of 140,000 souls to-day, the great port of the West and gateway to the Far East, where giant trees once raised their proud tops over the Pacific waters of Burrard Inlet. The Crowsnest and other branches of the same railway penetrated the great coal basins and rich gold, silver, copper, and lead mining districts of the Kootenays and adjacent regions, where population and industry went hand in hand making for progress and advancement.

The discovery of gold in the Klondike region of Canada, followed by a great rush of miners and prospectors from all parts of the world, led to further discovery and settlement of British Columbia and the Yukon Territory adjacent in extreme north-western parts of the Dominion. Steamship, railway, telegraph, and road communications were effected, and law and justice administered. One result was the closer delimitation of the Alaska-Canada boundaries in 1903. The opening

of the Atlin and Bennett regions in northernmost British Columbia; of the Telkwa, Bulkley, and other mining and coal districts of the New Grand Trunk Pacific Railway and transcontinental line—precisely located along Mackenzie's trail, and those of the founders of the historic line of forts to Port Simpson on the Pacific—coupled with the development of the great sea-fisheries, fruit-farming, and agricultural capabilities of the province, sound education and good government, have led to phenomenal progress and advancement.

Population, Cities, etc.

The population of British Columbia at the time of the last census (1911) was 392,480. In 1901 it was 178,657, marking an increase of 213,823, or 119.68 per cent, during the ten years preceding. The total urban population of the province was 203,684, whilst the rural population numbered 188,796, making an increase of the former of 113,505, and of the latter, 110,318.

Seeing that the province has been discovered very little more than a hundred years ago, it cannot be expected to contain large cities: Victoria, the capital of British Columbia, possesses, however, many natural advantages. The foundation of the city in 1846, and the choice of its first name, Fort Camosun, have already been noted. For a short time it was called Fort Albert, but the eventual selection of the name "Victoria" was a happy inspiration, for its surroundings had all the natural charms of the summer and winter homes of England where the Most Noble Empress and Queen who gave the province its present name resided.

The city of Victoria is situated on the eastern side of a narrow inlet opening from the Strait of Juan de Fuca,

upon gently rising ground and facing to the south and west. The inner harbour is sufficiently deep for vessels drawing 16 feet; and at the wharfs of the outer harbour vessels of any size find accommodation. The land-locked and strongly fortified harbour of Esquimalt, 3 miles distant and connected by electric railway, was formerly



VICTORIA HARBOUR, BRITISH COLUMBIA.

reserved for the North Pacific fleet of His Majesty's Royal Navy. This harbour is now open to merchant vessels. The "Canadian Pacific Naval Station" has been established (whose sphere of activity includes the waters north of 30° north latitude, and east of the 180th longitude), and in Esquimalt's spacious shelter there is anchorage for the largest ships afloat.

The population of Victoria proper increased from 20,919 in 1901 to 31,660 in 1911, and it is now

estimated at close upon 40,000. Its importance as a naval station, from the proximity of the coal mines of Nanaimo, has always obtained for the city much consideration in England. This Pacific city has an English air, due to the large proportion of settlers direct from Great Britain, and to the nautical proclivities of the people.



LEGISLATIVE BUILDINGS, VICTORIA, BRITISH COLUMBIA.

There is also an old-world appearance about it, from the different nationalities represented in its population, not only European, but Asiatic; for there are many Chinese and Japanese drawn thither by its commercial connections.

When Vancouver Island was united politically with the mainland to form the present province of British Columbia, Victoria was made the capital, and a pile of very imposing buildings was built to accommodate the legislature and the departments of the provincial govern-

ment. There is only one legislative chamber, and that is elected direct by the people upon what is in effect manhood suffrage. It consists now of 42 members, from whom an executive council of seven is selected in the usual way. The Governor, who is appointed by the Dominion, resides at Victoria. The city is well built, with good shops and handsome private residences. The streets are well kept, lighted by electricity, and many are planted with shade trees, and the suburban roads are well cared for. A fine park affords beautiful drives and very grand scenery. Across the water to the east and south are the mountains of the Coast Range, and the snowy peaks of the Olympian Range; and in the rear, to the west and north, are the mountains of the Island Range.

Victoria is the centre of a large business, not only in shipping, but of general supply. For the 12 months ending March 31st, 1912, imports were entered valued at \$8,668,115; and exports, \$2,019,775. There were 4914 vessels entered, and 4854 cleared during the same year. There is a large Chinese colony resident in a quarter of its own, and there are many Japanese also; for in the Pacific, China and Japan count for a great deal in trade, though, as these Asiatics, whether British subjects or not, have no votes, they do not count in the government of the country. It is the centre of the fur-sealing fleet, and the first and the last port of call for the Canadian Pacific steamers, as well as other trading lines to Asia, Australia, the Straits Settlements, and New Zealand. Steamers ply daily to Vancouver, 80 miles distant, also regularly to San Francisco, and to Alaska, Mexico, and intermediate ports. The dock at Esquimalt adds greatly to its importance, and there is also in connection with it a marine railway, which can draw out of the water in a short time vessels 320 feet long and of 22 feet draught.

New Westminster in point of age is the second city of the province. It was founded by Colonel Moody in 1858 at the outbreak of the gold fever, and it was the capital of the mainland before the union. In 1891 it had a population of 6641, and at the last census in 1911 it had 13,199 inhabitants. The city is situated on a rising ground on the north bank of the delta of the Fraser, 15 miles from the mouth of the river. The low lands at the delta are the largest single tract of farming land in the province, and are very productive. The city, however, depends chiefly on lumber and on the salmon canning industry for its trade. The Fraser saw-mills (largest in the world and of the province) are here, and the salmon-runs up the Fraser river are incredible to all who have not seen them with their own eyes. It has a good harbour and a large shipping trade.

Vancouver, the largest city of the province, the child of the Canadian Pacific Railway, does not appear in the census of 1881; for it was then in forest—the site only of prodigious Douglas firs. In 1891 the population was 13,685, in 1901 it was 27,010, at the last census it counted 100,401 inhabitants. Including suburbs, the last municipal returns gave a joint population of 160,424. It is situated on a peninsula on the south shore of Burrard Inlet, on ground 200 feet high sloping down to the sea. Burrard Inlet is one of the deep fiords previously described, and is one of the best harbours on the Pacific. It is half a mile wide at its mouth, and opens out to two miles in front of the city. The inlet extends twelve miles into the country, and is everywhere from 6 to 20 fathoms deep with excellent anchorage. It is very easily accessible to the largest ships, and is open all the year round.

Vancouver is the terminus of the Canadian Pacific

and four other railway lines connecting it in every direction. Electric cars run to New Westminster, Chilliwack, and Steveston; mail steamers to Honolulu, Japan, China, Australia, and New Zealand, giving regular communication with Victoria, Seattle, Nanaimo, Prince Rupert, and intermediate ports. Monthly steamers ply



HASTINGS STREET, VANCOUVER, BRITISH COLUMBIA.

from England *via* the Suez Canal, and there is also communication with Atlantic steamers *via* the Tehuantepec route. The opening of the Panama Canal will place Vancouver shipping 6000 miles nearer Liverpool. Shortly after its foundation it was destroyed by fire, but has been rebuilt in solid and substantial manner. It is lighted by electricity, and possesses all the conveniences of thoroughly modern cities. Chief among the hotels is that of the Canadian Pacific Railway. Industries include lumber,

salmon and halibut, flour milling, foundries, structural steel work, sugar refinery, shipbuilding. It is the home and headquarters of the Bank of Vancouver, and seventeen other chartered Canadian banks and their branches do business in this seaport and commercial centre. Customs revenue for 1911-12 gave \$7,673,480; and shipping



ENGLISH BAY BEACH, VANCOUVER, BRITISH COLUMBIA.

returns for the same year indicated 19,101 vessels of 9,134,494 tons register entered and cleared. The principal park is Stanley Park, and some of the most gigantic Douglas firs are left standing there for the inspection of travellers.

South Vancouver, with a population of 16,021, has 15 churches, 11 schools, and 2 large parks, with 158 miles of water-mains. Lumber mills and other industries give employment to many. Point Grey, the home of the Provincial University, has a population of 4320.

North Vancouver, on the north shore of Burrard Inlet, is connected with the main city by a twenty-minute

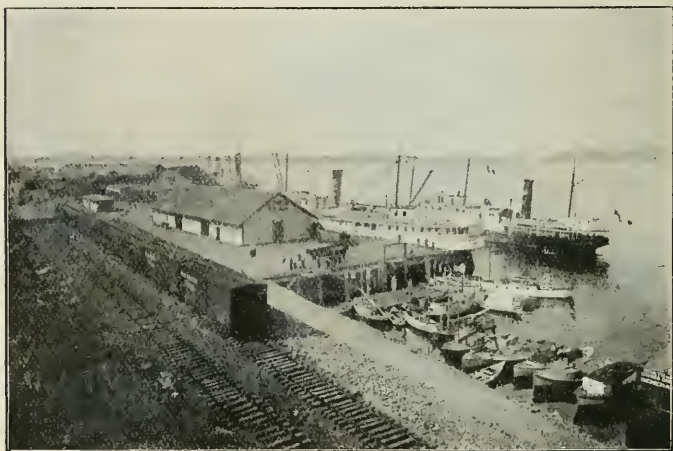


THE CATHEDRAL, STANLEY PARK, VANCOUVER, BRITISH COLUMBIA.

ferry. It has 12 churches, 10 schools, 8 parks, two of which are devoted to athletics, also a wide boulevard

round the city. It is a single-tax municipality and has fine cañon scenery near. It has also several industries.

Prince Rupert, situated on the island of Kaien, south of Port Simpson, is the western terminus of the Grand Trunk Pacific, or new transcontinental railway. It has an excellent non-tidal harbour, a growing population, and is the distributing centre for several industries,



PRINCE RUPERT DOCK, BRITISH COLUMBIA.

including fisheries, lumber, and mining. The last census returns (1911) gave Prince Rupert a population of 4184 inhabitants; and the Customs receipts for the year ending March 31st, 1912, were \$111,896.24. Prince Rupert harbour possesses some of the greatest advantages to ocean shipping that can be found along the entire Pacific coast. It has a direct channel passage leading into it more than half a mile in width, and is sufficient to accommodate enormous shipping. To the north-west of Prince Rupert lies the famous Tsimshian village of Metla-

katla, known on the coast as "The Holy City." Prince Rupert is 550 miles north of the city of Vancouver, and the new transcontinental railway forms the shortest route from Liverpool to Asiatic ports by at least two days' sail. From Prince Rupert to Yokohama, Japan, the distance is only 3800 miles.

The other chief towns in British Columbia include, (1) Nanaimo, an important harbour and the centre of the coaling trade; (2) Kamloops in the interior plateau, at the junction of the North and the South Thompson rivers, is the distributing centre for a thriving community dependent upon mining and ranching for livelihood.

Other mining towns in British Columbia are Rossland, Nelson, Sandon, Phoenix, Fernie, Grand Forks, Kaslo, Trail, and Cranbrook; whilst the following well-known towns are worthy of mention: Yale, Ashcroft, Vernon, Armstrong, Golden, Donald, Nakusp, Field, Revelstoke, Sicamous, Duncan, Princeton, Penticton, Salmon Arm, and Summerland.

Communications

The great avenue of communication by land is the Canadian Pacific Railway. The main line is 519 miles long within the province, and it opens up all the southern territory. At Revelstoke a branch leads south to the head of the Arrow Lakes, and, by means of well-appointed steamers and short connecting links of railway, the Columbia and Kootenay valleys are opened up throughout, and connection is made with Spokane on the Northern Pacific Railway and other systems of United States railways. The Columbia river is navigated all winter, and although ice sometimes forms, the steamers of the Canadian Pacific Company never intermit their trips from Arrowhead. At Sicamous a branch leads to

the head of Okanagan Lake, and connects with steamers plying upon the whole length of the lake. The Canadian Pacific Railway Company has twenty steamers on the lake and river service of the province. At Mission Junction the most important southern connection is made for Seattle, Tacoma, and San Francisco, opening up also the transcontinental systems of the Northern Pacific and Union Pacific routes. Eighteen miles east of Vancouver a short branch leads to New Westminster, at the mouth of the Fraser. All these communications are to the south of the Canadian Pacific Railway, which counted 1223 miles of railway in the whole province in 1911. The region to the north has to be reached by stages from Ashcroft, which is the avenue to the Cariboo country, or from Kamloops and a few other points. There are good farms at intervals along the road, and at Chilcotin and Quesnel; but travelling through the north country is still chiefly along the trails.

RAILWAYS OF BRITISH COLUMBIA, 1911.

	Miles.
Bedlington and Nelson	15.30
British Yukon	31.22
Canadian Pacific	1,223.00
Crowsnest Southern	74.18
Eastern British Columbia	16.00
Esquimalt and Nanaimo	78.00
Kaslo and Slocan	23.37
Kettle Valley	22.20
Morrissey, Fernie, and Michel	10.85
Nelson and Fort Sheppard	55.42
New Westminster Southern	23.73
Red Mountain	9.59
Vancouver, Copper Company	12.00
Vancouver, Victoria, and Eastern	219.40
Victoria Terminal Railway and Ferry Co.	0.91
Victoria and Sydney	15.97
Wellington Colliery Company's railways	10.75
Total	1,841.89

It is by sea that the communications of the province are most important and far reaching, for they stretch out over the whole Pacific Ocean to China, Japan, and Australasia, as well as to San Francisco and the other United States ports to the south. Some of the chief steamship lines are mentioned to show the numerous connections these have with the Pacific Ocean ports. The four magnificent steamships of the Canadian Pacific line sail from Vancouver and Victoria for Yokohama, Kobe, Nagasaki, and Shanghai, through the far-famed inland sea of Japan, connecting with steamers for North China, Korea, Dalny, and Vladivostok. Those of the Australian line sail for Sydney, New South Wales, touching at Honolulu, Suva (Fiji), and Auckland (New Zealand), connecting with steamers for Samoa, Tahiti, Rarotonga, and the Friendly Islands; at Sydney are connections by rail and steamship for all parts of Australia and Tasmania. By these the most direct communication is made with all points in Eastern Asia and Australasia. The Canadian Pacific Railway Company is now maturing plans for a reduction in time for the trans-Pacific passage. It is hoped that within three years it will be possible to travel from Vancouver to Yokohama in *eight* days, or two-thirds the average time taken at present. This, taken in conjunction with the rail journey across Canada of four days by the Imperial limited express, and the voyage from Montreal to London in seven days, would complete the journey from London to Japan in 19 days along an all-red line, forming a truly international and Imperial highway. The Pacific coast steamship line touches at all the ports on the west coast from San Francisco on the south to Sitka in Alaska. The Canadian Pacific Navigation Company's line keeps up communication with all the ports of the province—

Victoria, New Westminster, Vancouver, Port Simpson, Alberni, and the Queen Charlotte Islands. This is a far-reaching system of connections, and there are from Victoria and New Westminster many routes to nearer ports. The Grand Trunk Pacific steamships have also a west coast service connecting Vancouver and Victoria, as well as points south, with Nanaimo, Campbell River, Alert Bay, Namu, Bella Bella, Swanson Bay, Port Essington, Prince Rupert, Nass Bay, and points on the Queen Charlotte Islands and far north to Treadwell, Juneau, Haines, and Skagway.

Trade and Commerce

From the statistics of industries and manufactures of British Columbia prepared by the Federal Government, there was in 1900 a total capital of \$13,000,000, invested in the different establishments of the province, and the yearly output was \$20,000,000. In 1906 there were 459 establishments, manufactures, etc., with an invested capital of \$53,022,033, in which 22,287 persons were engaged, earning \$9,798,814. The value of the articles produced was \$38,288,378. The three industries producing most during that year were:—

Lumber products	\$10,945,229
Smelting	10,073,189
Preserved fish	4,342,674

In 1910 there were \$122,000,000 of invested capital in this province, giving an annual output of \$85,000,000.

British Columbia had 204 branches of Canadian chartered banks doing business in the province in 1911. Clearing-house returns for Vancouver for the fiscal year 1911-12 gave \$567,541,458; and for Victoria the figures were \$134,929,816.

Exports at Vancouver for year 1910 . . .	\$7,464,709
„ New Westminster for year 1910 . . .	5,272,608
„ Nanaimo for year 1910 . . .	4,198,664
„ Rossland for year 1910 . . .	360,712
Exports for the four ports totalled . . .	<u>\$17,296,693</u>

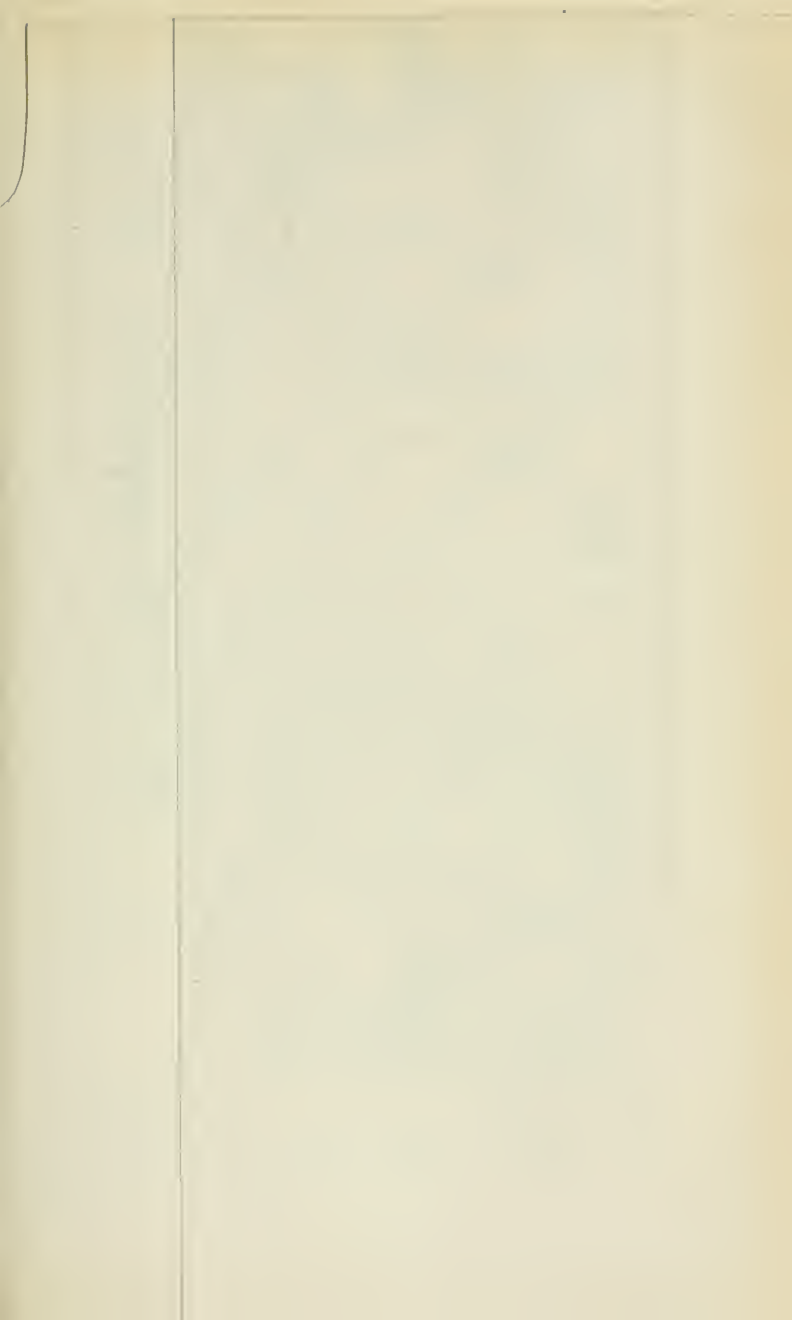
Wireless stations are erected, and communication established along the coast and islands of British Columbia at the following points:—Victoria, Vancouver, Union Bay, Banfield, Nootka, Triangle Island, Collison Bay, Skidegate, and Prince Rupert. The province has four elevators located at Armstrong, 27,000 bushels; Enderby, 50,000 bushels; New Westminster, 12,000 bushels; Vancouver, 350,000 bushels.

Education

There exists a complete system of free education in British Columbia, which was established by Act No. 16 of the Legislature of the province in 1872. The Council of Public Instruction is a body vested with the central control, and is composed of members of the Executive Council. The Minister of Education directs the management of schools through the Superintendent of Education. During the fiscal year 1909-1910, there were 433 public schools maintained by the provincial government with 1037 teachers, and 39,882 pupils in attendance. There are also, *six* inspectors. These schools are non-sectarian, but the highest morality must be inculcated, and no religious dogma or creed is permitted to be taught. School districts are founded wherever there are *twenty* children between the ages of 6 and 16 available for school purposes.

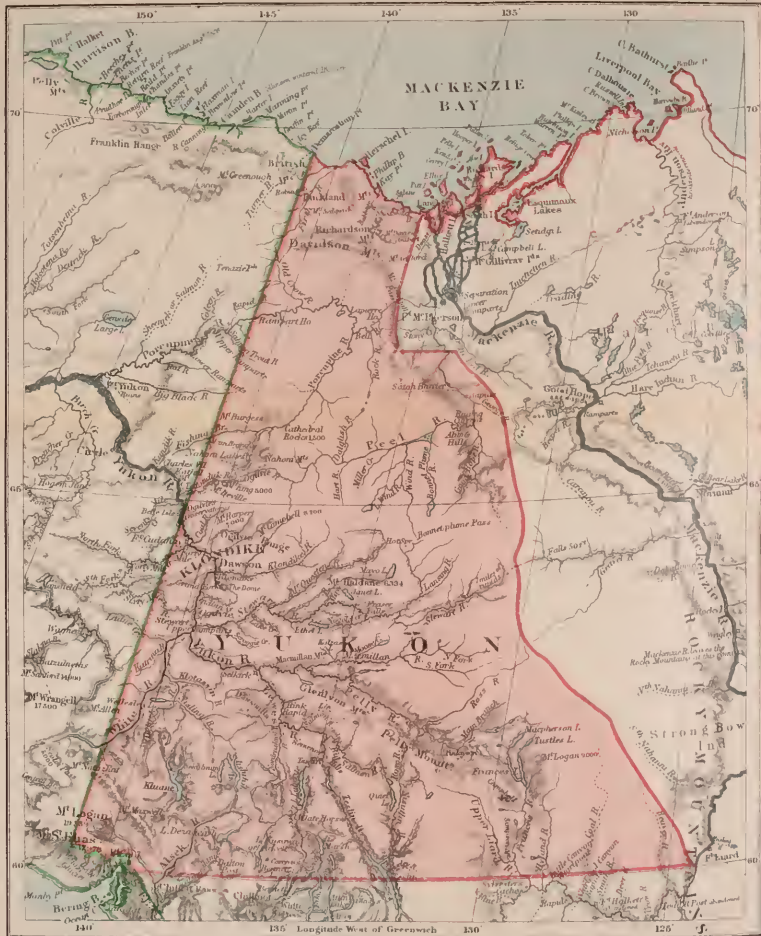
The University of British Columbia, affiliated with McGill University, Montreal, has been recently established

by an Act of the Legislature, and supplies a much needed element in the higher, professional, and academic training of the youth of that province. Two million acres of the public lands of the province have been set apart for purposes of revenue for the University. There are high schools at Victoria (Victoria College), Vancouver (Vancouver College), New Westminster, Nanaimo, Nelson, Rossland, Cumberland, Vernon, Kaslo, Chilliwack, Grand Forks, Kamloops, and Revelstoke.



YUKON TERRITORY

T. 1892. 25



Scale of English Miles
 0 50 100 150
 London: Edward Stanford, Ltd. 12, 13 & 14 Long Acre W.C.
 Stanford's Geog. Dept. London

CHAPTER XVIII

THE YUKON TERRITORY

IN the uttermost north-west of the Dominion is the Yukon Territory, extending over an area of 207,076 square miles, of which 206,427 square miles are land, and 649 square miles, water. It lies between the northern limit of British Columbia and the Arctic Ocean, and between the Rocky Mountain chain on the east, and Alaska on the west. The eastern boundary of the Yukon includes the Liard and its affluents west of $124^{\circ} 16'$ west longitude, and the Peel river with its affluents, up to 67° north latitude, then follows the Rocky Mountains, and forms a medley of natural and artificial lines. It is somewhat the shape of a right-angled triangle. The base is the parallel of 60° N., separating it from British Columbia at the south; the perpendicular is the meridian of 141° W., striking the Arctic coast at Demarcation Point, and the hypotenuse is the summit of the mountain range which borders the valley of the Mackenzie and about 145 miles of coast west of the delta of that river. While this description is sufficiently accurate for practical purposes it must be observed that the boundary of 141° does not come down quite into contact with the parallel of 60° ; it comes down to the summit of the range of mountains on the coast some 15

or 20 miles short of lat. 60° N., and it just encloses Mount St. Elias within British territory; so that large mountain mass is the uttermost western point, within one or two miles, of British dominion. The height of this mountain is variously given, but the most accurate figure is probably 17,978 feet, as determined by the Canadian Commissioner and surveyors of the Astronomical Branch of the Department of the Interior. It had been supposed to be the highest mountain in North America, but Mount Logan, within 20 miles of it in long. $140^{\circ} 30'$, has been ascertained to attain a height of 19,539 feet. These, together with Mount M'Kinley in Alaska, are the highest peaks on the North American continent. There is another Mount Logan, 9000 feet high, near Lake Frances at the source of the Liard, which must not be confounded with this one in the south-westerly corner of the territory.

The precise boundary between Canadian and United States territory is now being ascertained with scientific precision, and marked by monuments and posts. From the summit of Mount St. Elias, in a south-easterly direction to the Portland Canal, the boundary is that contained in the terms of the award of the Convention of October 20, 1903, when the dispute as to the divers boundaries claimed by Great Britain and Canada on the one hand, and the United States on the other, was definitely settled. Since that date the International Commission appointed to delimit the new boundary line have been actively engaged in the work entrusted to them, and much progress has been made, notwithstanding the rugged character of the country.

The boundary line between the Russian and British possessions had been drawn in 1825. It started from the southernmost point of Prince of Wales Island, and ran thence to the north along Portland Channel, up

to that point of the continent where it intersected the 56th degree of north latitude. From this point it followed the summit of the mountains parallel to the coast until it intersected the 141st degree of west longitude, and was carried along that meridian to the Arctic Ocean. Thus the whole of Prince of Wales Island became Russian territory, and wherever the summit of the mountains parallel to the coast proved to be at a distance of more than ten marine leagues from the ocean, the line should be drawn parallel to the windings of the coast at a distance from it never exceeding ten marine leagues. Free navigation of the rivers which flowed into the Pacific Ocean was conceded to British subjects, and by the Treaty of Washington the navigation of the rivers Yukon, Porcupine, and Stikine was for ever to remain free and open to both British and American citizens.

The discovery of gold in the Klondike region of the North-West Territories led to the more precise delimitation and settlement of the boundary problem between Alaska (United States territory) and the Dominion of Canada. The matter was discussed and arbitrated in England in 1903. The Court agreed in deciding that the boundary line began at Cape Muzon, the southernmost point of Dall Island on the western side of Prince of Wales Island; and that the Portland Channel was the channel which ran from about $55^{\circ} 56'$ and passed seawards to the north of Pearse and Wales Islands. It was further decided by a majority of 4 to 2 that the outlet of Portland Channel to the sea was the strait known as Tongas Channel, and that the boundary should run along that channel and pass to the south of two islands known as Sitklan and Khannaghunut, giving the ownership of these islands to the United States. It was also decided that the line from the 56th parallel of north latitude to

the point of intersection with the 141st degree of longitude should run round the heads of inlets and not cross them. This took away from Canada the command of the sea approaches to the Klondike mining districts, besides giving to the United States two islands lying near to the terminus of the Grand Trunk Pacific Railway.

This district received its name from the fact that all the large rivers which combine to form the Yukon rise in it. The river was not called the Yukon by its discoverers higher up than the junction of the Pelly and Porcupine rivers for the reason that the upper rivers were all named and mapped before they were known to connect with the lower river. The name Yukon was given by James Bell of the Hudson Bay Company in 1842. It is an Indian name which signifies "great river." At the junction, the Hudson Bay Company founded Fort Yukon in 1847; but in 1867 it was discovered to be 110 miles west of the boundary of 141° W. and, upon an abrupt notice to quit by a United States officer, the fort was abandoned. This point is almost exactly upon the Arctic Circle. The name Yukon was extended in the course of a few years to the Lower Pelly as far as the junction of the Lewes. This part of the river is called the Upper Yukon.

The Contour of the Land

General Remarks.—The Yukon is a country of mountain ranges and rolling hills, penetrated everywhere by large navigable rivers and smaller streams. The most continuous range is that nearest the coast, which is 84 miles broad with a general height of about 6000 feet; but there are many high peaks rising from 8000 to 10,000 feet, and even more than 18,000 feet.

The Cordilleran ranges spread throughout the territory in many parallels, running in a general direction to the coast, and even exhibiting the curve to the west in conformity with the latter.

The margins of the territory are mountainous, including part of the magnificent St. Elias Range with the highest peaks in Canada at the south-westerly corner (Mount Logan and Mount St. Elias), and the northern extension of the Rocky Mountains along the south and north-east sides, here, however, not very lofty. The interior of the territory is high toward the dissected peneplane, with low mountains to the south.

In going northward from Skagway over the White Pass and Yukon Railway, the traveller crosses the Coast Range, consisting of an irregular series of peaks and ridges with little symmetry, and a rough alignment parallel to a north-westerly trending axis, presenting a precipitous and jagged aspect, bearing knife-edged crests and rugged, even needle-like summits with sharply incised valleys. The summits along this railway rise to altitudes of from 5000 to 6000 feet above the sea.

Beyond the reports of the Hudson Bay Company's officers, what is definitely known of the character of the country is chiefly derived from reports of explorations by Dr. G. M. Dawson, R. G. McConnell, William Ogilvie, C. Camsell, D. D. Cairnes, J. Keele, J. B. Tyrrell, and other members of the Government Surveys at Ottawa.

Physiography.—The *Coastal System* of British Columbia, forming such a conspicuous feature both of structure and of topographic forms from about the 50th to nearly the 60th parallel of north latitude, embraces only the Coast Range, but near the head of the Lynn Canal, and northward as well as north-westward within Yukon Territory, this system comprises different ranges separated by wide

valleys and subordinate mountain masses. The Coast Range consists of an irregular series of peaks and ridges with comparatively little symmetry except the general north-westerly-trending axis or alignment. Rugged and precipitous in aspect, it presents needle-like summits and knife-edged crests with sharply incised valleys. The summits along the White Pass and Yukon Railway rise



LOOKING UP THE PELLY RIVER, YUKON.

to 5000 and 6000 feet above sea-level. The *Coastal System* forms the most south-westerly physiographic province of the Yukon Territory, a spur of the Coast Range extending northward, and lurking behind the Coastal system, merges into the Interior system, and its northward expression in the "Yukon Plateau." Bordering the Coastal system along its inland edge, and stretching thence eastward, north-eastward, and northward to the Rocky Mountain system or physiographic province, is the great Interior system of plateaus and mountains, the

most northerly member of which, the "Yukon Plateau," has a breadth in Yukon Territory and in British Columbia of 250 to 300 miles. In Southern Yukon the main drainage courses have incised channels varying from 3000 to 4000 feet, these producing a very irregular topography. The uplift of the Yukon plateau and adjacent areas was of a differential character, and so conditioned that the resultant topography had the contour of a broad shallow trough with its main axis marked by the present position of the Yukon river and its main tributaries, the Lewes and the Pelly rivers. Along the most northerly coast of Yukon Territory lies the "Arctic Slope" or physiographic province with its face to the open waters of the Arctic Ocean. Another type of country is found in the topographical features characterising the valley of the Peel river, appertaining to the Mackenzie basin. These Mackenzie lowlands constitute a physiographic province of their own and find a full development east of the Rocky Mountain system or physiographic province where they merge into the great plains with their characteristic foothill topography along their contact with the Rocky Mountain system.

Mountains

The Yukon mountains excel all others in Canada, not only as regards height and extent of glaciers and glacier materials they carry, but also in scenic grandeur, majesty, and imposing nature. Beginning north are the Buckland and Richardson mountains, east and south-east of the Malcolm river, discharging its waters into the Arctic Ocean, together with the Davidson mountains (north of 68° latitude, and between 137° and 141° west longitude) which form the high land separating the waters flowing into Beau-

fort Sea from those flowing into the Pacific Ocean (Norton Sound) by way of the Poreupine and Yukon rivers. They have a general north-west to south-east trend, and rise to a height of over 5000 feet. The Ogilvie Range—nearly east and west axis—and the Selwyn Range, with a decided north-west and south-east trend, both rising to a height of over 5000 feet, are part of the Rocky Mountain system, and here divide the waters flowing into the Mackenzie basin from those flowing into the Yukon basin. The Ogilvie Range is wholly within Yukon Territory, whilst the Selwyn Range extends into the North-West Territories. Other ranges include the Dawson Range and the Semenof Hills south of the Lewes river, the former near Fort Selkirk, the latter near Hootalinkwa. The Glenlyon and Pelly mountains skirt the left bank of the Pelly river from the col near the head-waters of the Upper Liard river (west of the Campbell and Simpson mountains in the south-eastern portion of the Yukon) to a point near the junction of the Pelly and Lewes rivers. The Campbell mountains are situated between the Finlayson and Frances rivers; the Macmillan mountains lie north of the river of the same name, in the vicinity of which is Mount M'Arthur (7000 feet altitude). The Cassiar mountains, situated in the southern part of Yukon Territory, and extending into British Columbia, have their faces carved by the streams feeding the head-waters of the Dease, Upper Liard, Upper Pelly, Nisutlin, Jennings, and upper waters of the Teslin river. The main axis of the Cassiar mountains runs in a north-north-westerly and south-south-easterly direction. The Miners Range lies south-west of Lake Bennett, whilst the Nutzotin mountains and the St. Elias Range occupy the most south-westerly corner of Yukon Territory. The former lie west of the Donjek and Kluane rivers and

other head-water streams and tributaries of the White river, being partly within Yukon and partly within Alaska Territory. The Mount St. Elias Range is the most conspicuous and highest range of Yukon Territory, with Mount St. Elias one of the highest peaks, and Mount Logan the highest known peak in Canada, reaching a height of 19,539 feet. Various peaks and summits along the international boundary include Mount St. Elias, Mount Augusta, Mount Owen, Mount Irwin, Mount Vancouver, Mount Cook, Mount Hubbard. From the crest of Haenke Island a magnificent view of Hubbard glacier may be obtained, likewise of peaks marking the summit of the St. Elias Range varying in height from 10,000 to 16,000 feet above sea-level forming part of the foreground.

The principal peaks and ranges of the Yukon Territory, together with their height above sea-level, are tabulated as follows:—

Name.	Height in feet above sea-level.
Mount Logan	19,539
Logan Peak	9,000
Mount Vancouver	15,617
Mount Hubbard	16,400
Mount Augusta	14,900
Mount Newton	13,860
Mount St. Elias	17,978
Jubilee Mountains	6,380
White Mount	5,000
Lansdowne Mount	6,140
Lorne Mount	6,400
M'Clintock Peak	6,000
Sifton Mountain	7,500
Billings Mount	7,950
Simpson Tower	5,230
Campbell Mountains	5,500
Semenof Hills	3,500 to 4,000
Laurier Mount	5,265
Dawson Range	7,000
Pelly Mountains	7,000

Name.	Height in feet above sea-level.
Mount Cook	13,758
Macmillan Mountains	3,500 to 4,000
Glenlyon Mountains	5,100 to 5,300
Mount Ingram	8,000
The Three Guardsmen	7,300

Other altitudes in Yukon Territory, obtained from White's "Atlas," include:—

Locality.	Elevation.
Yukon river (Dawson City)	1,200 feet
Tagish lake	2,161 "
Marsh ,,	2,160 "
Laberge ,,	2,100 "
Teslin ,,	2,400 "
Atlin ,,	2,200 "
Finlayson ,,	3,105 "
Frances ,,	2,577 "
Kusawa ,,	2,565 "

The elevation of the general surface of the territory at the head of the Upper Pelly is 2965 feet, while at the confluence of the Pelly and Lewes it falls to 1555 feet above the sea. The average level of the whole territory is estimated at about 2500 feet.

Hydrography.—The Yukon Territory is a region of many watersheds and head-waters of streams which foregather together and drain a much diversified and intensely dissected plateau or series of plateaus in divers directions. The most important feature amongst the water-ways of the Yukon is the Yukon river itself. Its affluents are exceedingly numerous and their tributaries are legion. The former include the Klondike, Scroggie, M'Questen, Stewart, Macmillan, Pelly, Lewes, Big Salmon, Teslin, and other branches from the north and east and south-east, the Forty-mile, Sixty-mile, Ladue, White, Donjek, Nisling, and the Nordenskiöld from the south. The Peel river and its numerous tributaries drain into

the Mackenzie river basin, which discharges into the Arctic Ocean, and occupies that V-shaped area in north-eastern Yukon lying between the two arms of the Rocky Mountains, so deflected as to form two sharp elbows, one of which is situated at the western extremity of the Ogilvie Range, and the other north of the Arctic Circle.

The Yukon river, the fifth largest river of North America, is unique among rivers in that it rises within 15 miles of the tidal waters of Dyea Inlet on the Pacific Coast, whence it flows in a north-westerly direction nearly 1000 miles, just crossing the Arctic Circle, where it turns south-west through the middle of Alaska, and then flows more than 1200 miles until it reaches the same ocean within sight of which it rose. This grand stream is also surprising in the length of navigation it affords in proportion to its length, for, less than 15 miles from where its tiniest streamlets trickle from the summit of Dyea Pass lies beautiful Lake Bennett, whose head is the beginning of steamboat navigation on this noble stream, which is navigable right down to Bering Sea with the exception of $3\frac{1}{2}$ miles at the Canyon and Rapids—95 miles from the head of navigation, where a fall of 35 feet occurs—which, however, did not prevent small steamers running down during the early days of the Klondike gold rush. The Yukon river, 2300 miles in length, is about one-third within the Dominion of Canada; it and its affluent streams, the Takhina, Teslin (or Hootalinkwa), Pelly, Stewart, are all navigable for greater or less distances (all of them are hundreds of miles in length), and together with other streams not navigable, go to make up within Yukon Territory a nearly equal amount of water-ways as in Alaska. Forming a great are as it flows from its source in Canada, this mighty

river has a catchment of some 330,000 square miles, of which nearly 180,000 are within British territory.

The Yukon valley comprises *four* sub-provinces or divisions which, in order, from the head-waters of the river, have been called—(a) the Upper Yukon Province; (b) the Yukon Flats; (c) the “Ramparts” Region; (d) the Lower Yukon. The Upper Yukon province, about 430 miles long, varies in width from *one* to *three* miles, with walls rising from 1500 to 3000 feet above the stream. Here, the Yukon receives the Selwyn river from the south, about 40 miles below the junction of the Lewes and Pelly rivers; from the west the White river, about 60 miles below the Selwyn river; from the north the Stewart river, some 10 miles below the mouth of the White river, one of its largest tributaries; from the east the Klondike river, and from the west the Forty-mile Creek along the Alaska-Canada line. The Yukon flats flank the river for about 200 miles, and are from 40 to 100 miles wide. Here a confused network of constantly changing channels occurs and the river makes its great bend to the south-west. The “flats” are monotonous areas of sand-bars and low islands thickly wooded with spruce.

The Lewes river takes its rise within Yukon Territory in Lake Bennett, on the northern slope of the Coast Range, about 25 miles inland from the Lynn Canal, at the head of Chatham Strait, and flows north through a chain of lakes. Its confluence with the Pelly river at Fort Selkirk, about 120 miles due east of the Alaskan boundary, forms one of the head-waters of the Yukon. Flowing thence north-westerly, the Yukon turns sharply to the south-west at Fort Yukon in Alaska on the Arctic Circle, and continues nearly at right angles to its former course to a point south of the head of Norton Sound.

The Porcupine river is an important affluent from the north which enters the main stream at the great bend and site of old Fort Yukon. The Porcupine is navigable for light steamers for 100 miles, and an easy canal route exists from its upper waters at the great bend in its course, by way of Lapierre House to Fort Macpherson on the Peel, which falls into the delta of the Mackenzie river, so that communication is easy from the Yukon to



HILL'S LANDING, PORCUPINE RIVER, YUKON.

the Mackenzie within the Arctic Circle. The Pelly is a large river, navigable for small steamers to within 50 miles of old Fort Pelly on the Upper Pelly, within 20 miles of Finlayson lake. From there the waters flow by the Liard into the Mackenzie river.

All these rivers run in the general direction of the mountain ranges, but there are two streams which cut the ranges and give access to the interior—the Stikine in British Columbia, and the Liard in the extreme south-east, which rises in the Yukon district and flows eastward into the Mackenzie basin, cutting through the Rockies

on its way. It was by the Liard that the first white man, Robert Campbell, entered the country, and there is no doubt that before very long a railway will be constructed which will connect stations in British Columbia with the various mining camps of the Yukon, the best entrance to it on the south being along the Stikine river valley.

The principal lakes of the Yukon and their areas are as follows:—

Lakes.	Area in acres.
Aishihik	68,400
Atlin (part)	7,840
Kluane	117,600
Kusawa	36,540
Laberge	55,300
Marsh	20,480
Tagish (part)	30,720
Teslin (part)	78,400

Yukon Territory has a coast-line in the Arctic Ocean less than 200 miles in length, which is at present ice-bound for nearly nine months of the year. On the south this territory has no coast-line or harbour, according to the terms of the Alaska-Canada Boundary Treaty, but the gradual and fairly rapid recession of the glaciers and ice on the Pacific slopes may soon give the Yukon a port of its own on the Pacific Ocean, as was the case for a few months in the year 1913. The sudden advance of the ice, however, blocked the head of one of those numerous inlets which characterise that portion of the north-west coast of North America.

Climate.—Barred by the high Pacific Coast ranges on the west, the Yukon Territory has a rigorous continental climate with very cold winters of seven months' duration, but with delightfully sunny and pleasant summers. Owing to these lofty mountains the amount of rain and

snow is rather small, and the line of perpetual snow is more than 4000 feet above sea-level. Much of the ground is frozen deeply, at times to a depth of 100 or 200 feet. Vegetation is abundant in the river valleys and flats, where fine forests of spruce and poplar are to be found, and where the hardier grain varieties and vegetables can be successfully cultivated. While the winter season, for a few weeks at most, presents a climate with intense cold when, at times, the thermometer registers -60° Fahrenheit, the climate of the Yukon Territory is not at all unpleasant nor prohibitory, but is, on the contrary, a very wholesome, vigorous, and healthy one. From those who have resided many years in the Klondike, either at Dawson or in the mining camps, much has been said in favour and praise of the weather conditions prevailing most of the year. It is a well-known fact that, owing to the dryness of the atmosphere, and the occurrence of the great northern "loop" of the summer isotherm of 55° , together with other influences, the cultivation of cereals and vegetables of the hardier type is possible in this most north-westerly territory of the Dominion of Canada.

The average possible hours of sunshine during the summer months give the vicinity of Whitehorse, in Southern Yukon, between 17 and 18 hours, whereas Dawson City and Selkirk have between 18 and 19 hours, while the country about the head-waters of the Porcupine river count between 20 and 21 hours, and the northernmost strip of the Territory 23 and 24 hours of sunshine during the day. It will thus be seen that, given practically continuous sunshine—sunlight—all day, and an isotherm of 55° Fahrenheit, crops will grow and mature very rapidly.

The average number of days in the year when the

thermometer registers above 40° Fahrenheit at Dawson is 175; when it registers above 32° Fahrenheit 200 days. Above 50° Fahrenheit during the year is registered 140 days, whilst there is an average of 95 days when above 60° Fahrenheit, and 42 days in the year when a temperature above 70° Fahrenheit is registered.

Geology and Resources

The Klondike gold district, Kluane gold district, the Atlin gold district, besides the gold occurrences on Big Salmon and the Frances rivers comprise the *five* areas of the Yukon Territory where the precious metal has been found.

Klondike District.—The Klondike Mining District is a rather indefinite portion of the Yukon Territory with Dawson City as its chief distributing and gathering centre, and the Klondike, Stewart, and Yukon rivers, together with Forty-mile, Sixty-mile, Bonanza, Dominion, and Hunker Creeks flowing throughout its length and breadth. It extends even to the Indian river, another branch of the Yukon flowing into it some distance above the Klondike. The richer gold-bearing gravels of the Yukon are found along the creeks tributary to these two rivers within an area of some 800 square miles. The Klondike district is best described as a dissected peneplane with low rounded ridges rising to 4250 feet at the Dome.

The geology of the Klondike Mining District, according to McConnell, consists of *three* types, including—(1) unaltered sedimentary rocks appertaining to the early Tertiary, late Tertiary, and recent alluvial gravels; (2) older schistose rocks, appertaining to the *Klondike* series and *Moosehide* group where (*a*) deformed quartz-

porphyry and porphyrites, as well as (b) deformed granite porphyry (Pelly gneisses) cut into altered diabase and serpentine, and also affect the *Nasina* series consisting of earlier quartz-mica schists, quartzite, and limestone of clastic origin; (3) *Igneous* rocks, comprising granite, peridotite, diabase, and andesites with rhyolites occurring as masses distributed throughout the *Nasina* series which they penetrate.

Bonanza Creek is the most important of the gold-bearing creeks of the Klondike district, and is the one on which gold in large quantities was first discovered. It heads in the Dome ridge with branches of Quartz and Hunker Creeks, and empties into the Klondike river $\frac{3}{4}$ ths of a mile above Dawson, after a course in a north-west by north direction of a little over 17 miles, draining an area of about 113 square miles. Its principal tributaries are: Eldorado Creek, Adams Creek, Boulder Creek, Forty-mile Creek, Sourdough Gulch on the left, and Carmacks Fork, Homestake Creek, Gauvin Creek, Queen Gulch, and Mosquito Creek on the right.

Gravels.—The *valley* gravels are the most important from an economic standpoint, followed by the *white* gravels, and *terrace* gravels. The high-level river gravels and the yellow gravels have not proved productive. These gravels when classified give the following normal section:—

High Level Gravels	$\left\{ \begin{array}{l} \text{"White Channel" Gravels} \\ \text{River Gravels.} \end{array} \right.$	$\left\{ \begin{array}{l} \text{Yellow Gravels.} \\ \text{White Gravels.} \end{array} \right.$
Gravels at Intermediate Levels		
Low Level Gravels	$\left\{ \begin{array}{l} \text{Terrace Gravels.} \\ \text{River Gravels.} \\ \text{Creek Gravels.} \\ \text{Gulch Gravels.} \end{array} \right.$	

The creek gravels frequently enclose leaves, roots,

and other vegetable remains, also bones of various extinct and still existing northern animals, such as the mammoth, the bison, the bear, the musk ox, the mountain sheep, the mountain goat.

The succession of geological formations is as follows :—

TABLE OF FORMATIONS.

Quaternary . . .	Superficial deposits . . .	Gravels, sands, silts, clays, volcanic ash, etc.
Pleistocene and late Tertiary	Wheaton River volcanics	Rhyolites, trachytes, tuff, breccias, etc.
	Carmack basalt . . .	Basalt and basalt tuffs.
	Klusha intrusives . . .	Granite and syenite porphyries.
	Chieftain Hill volcanics	Andesites, tuffs, and breccias.
Jura-Cretaceous	Tantalus conglomerate	Chiefly conglomerates with some sandstones, shales, and coal seams.
	Laberge series . . .	Conglomerates, greywackes, sandstones, shales, etc.
Jurassic . . .	Coast Range intrusives	Granites, granodiorite, and diorites.
	Perkins volcanics . . .	Andesites and andesitic tuffs.
Lower Palæozoic or older	Mt. Stevens series	{ Schists, gneisses, and limestones.

The explorations of Cairnes in 1911 along a portion of the 141st meridian (the Yukon-Alaska boundary), between Yukon and Porcupine rivers, show that this region forms part of the Yukon plateau consisting of extensive upland tracts, over 3000 feet above the sea, strikingly even and plain-like, even where the prevailing bed-rock is limestone or dolomite; but, where slates, phyllites, quartzites, and related rocks occur, the plateau surface has been almost entirely destroyed, and well-rounded hills and ridges appear irregularly distributed. Palæozoic, Mesozoic, and Quaternary deposits occur,

besides a few small exposures of intrusive igneous rocks cover the area.

The climate appears to vary greatly from year to year. In 1911 the summer season was warm, "frequently uncomfortably so," writes Cairnes, "from June 1 to September 15, during which time but few showers occurred, and these were generally light and seldom of more than 3 or 4 hours' duration. The rivers and creeks generally open about May 1, but on some of the lakes the ice remains until the first week in June." Other seasons are reported to be "wet and cold." Moose, caribou, and sheep are somewhat plentiful in many localities, whilst black, brown, and grizzly bears are also plentiful, besides wolves, wolverine, marten, lynx, ermine, rabbits, and fox, which constitute the chief fur-bearing animals. Birds are also plentiful: the Alaska jay, Swainson hawk, northern varied thrush, fox sparrow, grey-checked thrush, besides Hutchin geese, partridge, ptarmigan, and ducks of many varieties. The flora is varied: wild fruits such as bilberry, bearberry, crowberry, bog apple, comandra, currant, raspberry, foxberry, and high-bush cranberry were noted, besides numerous species of phanerogams. Spruce is the most important tree, reaching an elevation of 2400 feet above the sea; specimens having 21-inch stumps were noted, but the average diameter ranged from 12 to 16 inches. Poplar (2 varieties) and canoe birch also occur here besides willows, alders, juniper, and other shrubs constituting thickets and dense undergrowth on the upland surfaces. The Black river, with a valley 5 miles wide, drains a considerable portion of Yukon Territory into the Porcupine river, main streams having all a westerly trend. Ordovician, Silurian, Carboniferous, Cretaceous, and Quaternary deposits characterise the rock formations

of this recently explored region, indicating a long period of shallow and clear coral-sea conditions followed by shallow seas, cold-water currents, and later phases.

Gold Production.

All of the gold-bearing creeks rise not far from the "Dome" and radiate in various directions towards the



ELDORADO CREEK, YUKON.

Klondike and Indian rivers, the most productive being Bonanza and its tributaries Eldorado, Hunker, Dominion, and Gold Run. Of these, Eldorado, for the *two* or *three* miles in which it was gold-bearing, was much the richest, and for its length probably surpassed any other known placer deposit. Rich gravel was discovered on Bonanza in 1896 when a wild rush followed, until a population of some 30,000 souls had gathered within three or four years, with a rapidly increasing output of gold, which

reached its climax in 1900, when the "wash-up" gave \$22,000,000. Since then the production steadily decreased until in 1907 it fell to \$3,150,000. As the *tundra* or ground was frozen, the mines were worked by a thawing process involving heated stones, fires, and later steam.

TABLE SHOWING GOLD PRODUCTION OF THE YUKON SINCE 1896

Year.	Output.	Year.	Output.
1896	\$300,000	1905	\$7,876,000
1897	2,500,000	1906	5,600,000
1898	10,000,000	1907	3,150,000
1899	16,000,000	1908	3,600,000
1900	22,275,000	1909	3,960,000
1901	18,000,000	1910	4,570,362
1902	14,500,000	1911	4,634,574
1903	12,250,000	1912	5,549,296
1904	10,500,000	1913	5,846,780

The goldfields are included in an area of about 800 square miles, bounded on the west by the Yukon river, on the north by the Klondike river, on the east by Flat Creek—a tributary of the Klondike, and Dominion Creek—and a tributary of the Indian river; and on the south it is bounded by the Indian river itself.

Topographically speaking, the district is a series of long branching ridges, having an average elevation above the valley bottoms of 1500 feet, and above the sea of 3200 feet. The region is underlaid by rock formations which range in age through the greater part of the geological scale and present great variety in composition and structure.

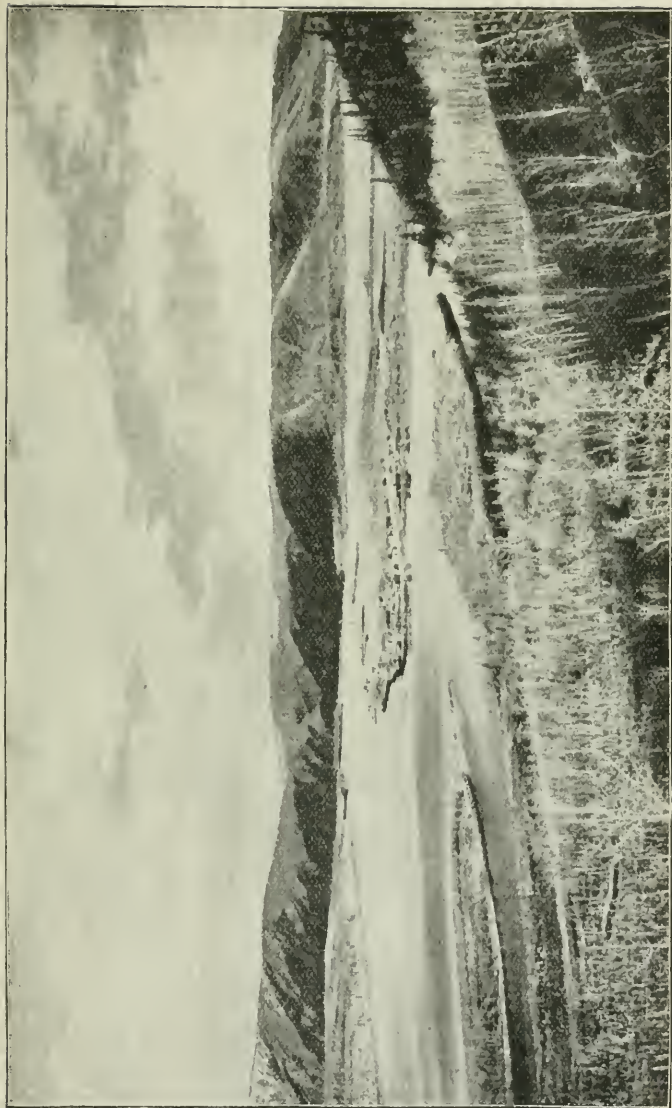
The estimated production from various creeks is summarised as follows by Mr. R. G. McConnell of the Geological Survey:—

Eldorado Creek	\$25,000,000
Upper Bonanza Creek	15,500,000
Lower Bonanza Creek	11,000,000
Klondike River Flats	1,000,000
Bear Creek	1,000,000
Hunker Creek	14,000,000
Total	<u>\$67,500,000</u>
Upper Bonanza and Eldorado Hills	24,000,000
Lower Bonanza Hills	750,000
Klondike River hill gravels	(small production)
Hunker Creek Hills	2,500,000
Grand Total	<u><u>\$94,750,000</u></u>

Tyrrell has calculated that \$150,000,000 worth of gold has already been extracted from the Klondike region, and that an equal amount still remains. Rock formations 900 feet in thickness have been removed by denudation to form the 130 cubic miles of gravel scattered over the 800 square miles of placer deposits—making only a hundredth of a pennyworth of gold per ton of original rock concentrated by nature.

The first mention of *gold* in the Yukon appears to be in Whymper's *Travels in Alaska and on the Yukon*, published in London in 1869. It was in 1881, however, that the *first* discovery of paying placers was made by a party of four miners who ascended the Big Salmon river for about 200 miles and found gold along its course and in the river bars. Subsequent explorations revealed gold on Forty-mile Creek, the Lewes, and the Upper Pelly rivers. In 1886 miners were earning \$100 a day on the Stewart river, and, according to Dr. George Dawson, over \$100,000 worth of gold had already been obtained along this stream, while it is estimated that \$120,000 worth had been won from Forty-mile Creek.

In 1887 some 250 miners were engaged in working claims or prospecting in the Upper Yukon.



FORTY-MILE CREEK AND TOWN, YUKON.

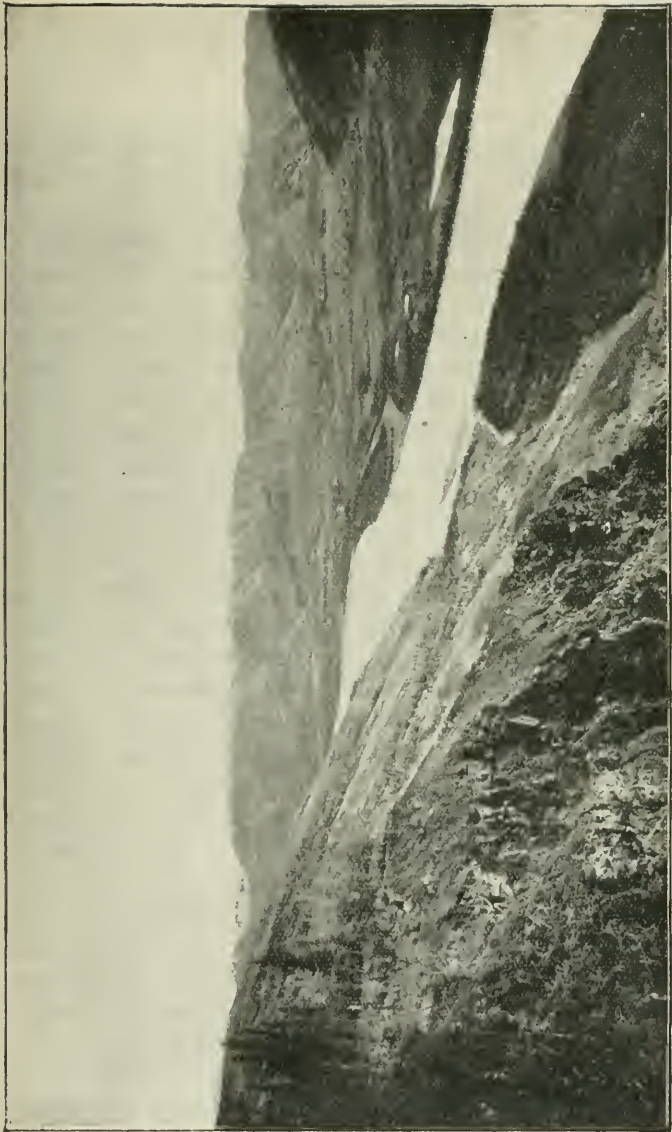
It was in 1894 that the Klondike district was discovered by the finding of gold on Quartz Creek. Later discoveries in Gold Bottom, Eldorado, and Bonanza Creeks led to a stream of adventurers and prospectors entering this district, especially in the years 1897 and 1898.

Notwithstanding the mad rush of gold-seekers, adventurers, and prospectors from all parts of the world, it must not be forgotten that the Dominion Government, with its strong idea of British justice and fair play, made life and property in the Klondike district as safe as anywhere in the Dominion.

For a long time no serious attempt to establish lode-mining in this northern section of Canada's goldfield was made; but in the Carcross area of the central district some 3000 feet of development work was begun in 1909 with a 600 foot cross-cut tunnel and drifts on the vein 500 feet long on each side of the cross-cut. In the Atlin district lode discoveries embracing gold, silver, copper, and lead, were recently made.

Big Salmon goldfields, described by McConnell in 1901, yields the precious metal in old creek or pre-glacial channels. In 1907 over \$100,000 was taken out. Silver-bearing veins occur on Windy Arm, Tagish Lake in the porphyrite area, and also in granite and in slate. The silver minerals include native silver, argentite, stephanite, freibergite, and pyrargyrite. *Lead* is present as galena, and *copper* as tetrahedrite. On the Whitehorse, bornite (copper) was discovered. *Coal*, as lignite, occurs in the Dawson district some 12 miles from the mouth of Coal Creek, 58 miles below Dawson. Seams vary from 4 to 20 feet in thickness. On the right bank of Lewes river, five miles above Five-finger Rapids, at an altitude of 1720 feet, a bituminous coal occurs.

The silver production of the Yukon in 1899 was



COAL CREEK (58 MILES BELOW DAWSON CITY).

230,000 ounces valued at \$137,034; in 1900, 290,000 ounces valued at \$177,857; and in 1901 the returns fell in value and \$114,953 worth of silver was produced that year. In 1909 and 1910 silver values in the Yukon had greatly diminished, being \$23,176 and \$46,756 respectively. The silver of the Yukon represents the silver alloyed with the placer gold, together with a small amount from the lode mines of the district. On an average about one ounce of silver is contained in each five ounces of crude bullion from the alluvial workings. In 1908, when the value of the silver production in this territory was \$33,304, about 41,000 ounces were credited to the placers, and 22,000 ounces to the concentrates shipped from the Windy Arm district. In 1910 there were 50,000 ounces from placer deposits, and 37,418 ounces from lode production—in all 87,418 fine ounces.

Economic Geology.—In the Lewes river region between Tantalus and Whitehorse, forming part of the Yukon plateau province, porphyrites, tuffs, tuffaceous sandstones, shales, underlain by Carboniferous (marine) limestones—similar to the formations of the Windy Arm and associated series, are in turn overlain by coal-bearing Jurasso-Cretaceous strata that are buried under recent sediments and Tertiary lava flows. Dikes of granite-syenite-porphyrates and porphyry, also prevail within this district.

The Wheaton river district, in the western portion of the Yukon plateau, with a general level of 5750 feet above sea-level, according to Cairnes (1910), shows the presence of volcanic, plutonic, metamorphic, and sedimentary rocks which form a complex overlain by Jurasso-Cretaceous strata, in part buried in andesites and andesitic tuffs, eruptive breccias, granite and syenite porphyries

and basalts, together with newer trachytes, rhyolites, tuffs, and breccias, which are covered in turn by superficial deposits in many places.

The walls of the main valleys are generally steep, forming almost perpendicular declivities at numerous points. This feature of the topography has been accentuated and produced, in some instances, by glacial action. The main ice masses occupied these depressions and were effectual in straightening them and planing the slopes, and in widening and lowering their floors, causing the valleys to be wide, deep, and steep-sided. The smaller tributary streams flow with gentle gradient in the wide, shallow depressions, over the upland surfaces, but generally plunge suddenly over the edges, by a succession of falls, through ravine-shaped incisions, to join the main streams below.

Numerous well-defined terraces, at various elevations up to 700 or 800 feet above the stream beds, extend along the Wheaton valley and along Partridge Pass, Becker Creek, and others of its main tributaries.

Below the Big Bend of the Wheaton, the river valley has an average breadth of about one mile. Above the Big Bend, however, it is generally only one-quarter to half a mile broad.

The Windy Arm district, with its rugged mountains rising 4000 to 5000 feet above the valleys clad with black pine, fir, spruce, aspen and balsam poplar to an elevation of about 2000 feet, is very similar in structure to that of the Atlin district. Limestone hills in the eastern section overlain by schists, slates, and altered sediments of the Tagish series, are followed in the west by later granites which become porphyritic, which in their eastern outcrop are flanked by older schists—corresponding to the Nasine and Klondike series of

McConnell in his studies of Klondike geology. The mines of the Windy Arm district occur in a complex porphyry, resembling a conglomerate, called the *Windy Arm* series, in which the gold- and silver-bearing veins of quartz occur as true fissures. Besides gold and silver, lead (as galena and lead carbonate), arsenopyrite, free gold, telluride minerals, sylvanite, hessite, telluric ochre, native copper, ruby silver, argentiferous galena, lead carbonate, chalcopyrite, malachite, ruby silver, argentite, zinc-blende and antimony ochre are the chief ores found in the veins of the district.

The Nordenskiöld river basin, forming part of the Interior Plateau region of the Yukon Territory, once eroded to peneplane conditions, subsequently subjected to a rather rapid uplift and dissected, consists of low rounded hills with an occasional higher and more rugged peak or ridge, relieving the otherwise monotonous landscape. Some of these reach 1700 feet above the valley with schistose rocks as a basal series, and disturbed slates and shales of Carboniferous or Devonian age are followed by limestones of Carboniferous sandrock. These in turn are overlaid by newer Cretaceous formations in which conglomerates occur some 1500 feet in thickness carrying coal seams. Newer than the above series of sediments and volcanics is a very extensive group of andesites, dacites, tuffs, etc., different members of which respectively cut or overlie the older formations. It is this volcanic group which is found overlying the conglomerate containing the coal horizon in so many places, and which renders the exploration of the coals very difficult. There are two coal-bearing horizons of economic interest in this portion of the Yukon Territory. An upper horizon occurs near the top of the thick assemblage of conglomerate beds forming the upper half of the group of Cretaceous sedi-

ments, and to this higher zone belong the seams at the Tantalus mine and on Tantalus Bluff. A second, lower coal-bearing horizon lies towards the base of the Cretaceous column as seen at the Five-finger mine, also at a point west of the 69-mile post from Whitehorse on the Whitehorse-Dawson road and elsewhere. The Tantalus, Tantalus Butte, and Five-finger mines, and the coal areas along the Lewes river between Teslin and the Big Salmon river at a point a short distance from the Tantalus mine, include all the places north of Whitehorse and south of Tantalus at which the upper coal horizon is known to occur.

The Tantalus coal-mine occurs about midway between Dawson and Whitehorse near the Lewes river, half a mile above Tantalus. Two seams of bituminous coal are worked, and the output in 1906 and 1907 was 5173 and 10,000 tons respectively. From the Tantalus mine 9000 tons of coal were shipped in 1907.

Metallic copper associated with copper ores occurs in the White River district of the Yukon near the international boundary line, in amygdaloidal portions of Carboniferous basalts. One slab of native copper, described by Moffit and Knoff (1908), averaging 8 ft. \times 4 ft. \times 4 ins. thick, weighing some 6000 pounds, has been uncovered in the slide rock of the prospect known as "Discovery" on the same stream. McConnell in 1906 also recorded copper ores from this area from his researches of the previous year.

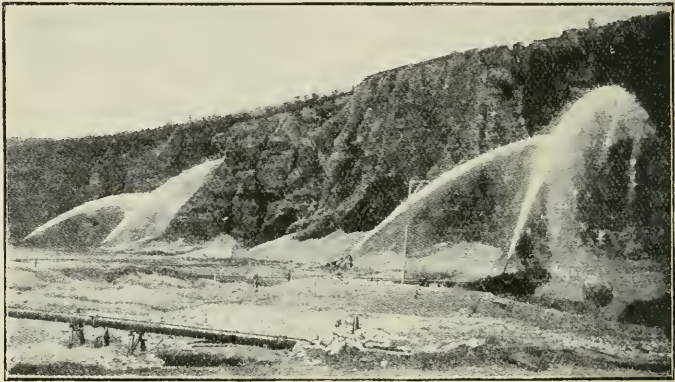
Tin ore has been recovered in the form of nuggets of cassiterite occurring in placer deposits.

Lignite coal has been mined on a small scale on Coal Creek in the vicinity of Dawson.

The source of the gold in the Klondike has been traced to small stringers of quartz in the siliceous and

sericitic schists forming the bed-rock of the region. More modern and approved methods are now being employed in this remote goldfield.

The Guggenheims are actively engaged in mining operations with a view to the recovery of gold in various creeks and rivers by means of dredge and hydraulic operations. In 1912 there were 5,157,280 cubic yards mined which produced \$3,346,026, or an average of



MODERN METHODS OF HYDRAULICING ON LOVITT GULCH, YUKON.

64.88 cents per cubic yard, the cost of which amounted to 30.64 cents per cubic yard. During the same season a total of 2,967,750 cubic yards of gravel were handled in the hydraulic mines which produced \$629,043 gross gold, the average cost per cubic yard being 9.37 cents. The total operating gain for the season was \$2,721,419.15. The Klondike creeks' water system and supply, carefully studied by McConnell, included schemes for damming valleys at certain points, impounding spring floods, pumping water from the Klondike, and bringing it by gravity from the Klondike and Twelve-mile rivers or

their tributaries into the small creeks of the district. The working season for dredging extends from the first week in May to the last week in October.

The mineral production of the Yukon for the year 1910 is as follows:—

Copper	1,772,660 pounds,	valued at	\$289,670
Gold	268,447 ounces,	„	5,549,296
Silver	81,058 „	„	49,318
Coal	9,245 tons	„	44,958
Total value			<u>\$5,933,242</u>

Fisheries.—Salmon, trout, whitefish, pickerel, pike, and maskinongé, are amongst the most productive and best fish in the Territory, whilst mixed fish include catfish, tullibee, and greyling. Salmon are known to go up the Yukon from the sea, 2300 miles, to the Pelly lakes, but they are in very poor condition after their long journey. The catches of the sealing and whaling boats, and of the Eskimo along the northern coast facing the Arctic Ocean near the mouth of the Mackenzie, are not included in the yearly statement presented.

The total value of the fish caught and landed in the Yukon Territory during the year 1911 was \$111,825, a decrease of \$6540 from the figures for 1910. The quantity of salmon, however, was greater by 591 cwts., and the value also greater by \$4211.

There were 3 gasoline and 70 sail-boats, valued at \$4400, giving employment to 138 men, in the Yukon during the same year, the total value of the outfits amounting to about \$12,000.

Fauna.—Among the wild animals from the Yukon now in the Victoria Memorial Museum at Ottawa, are the following:—

Fannin's mountain sheep (*Ovis Fannini*), from Carcross;

Osborn's caribou (*Rangifer Osborni*), from Lake Arkell; Dall's mountain sheep (*Ovis Dalli*), from Arkell; the Columbia mountain goat (*Oreamnos montanus Columbianus*), from Kusawa; and the flying squirrel (*Sciuropterus, Yukonensis*), from Mayo lake. A bull moose (*Alces Americanus*), shot near Kusawa lake in the Yukon, and a porcupine from near Whitehorse are also in the Museum.

Forests.—There are three zones of forest in the Yukon:—(1) a very narrow strip in the extreme south-western corner between Lake Bennett and Mount St. Elias, where the dense Cordilleran forest obtains; (2) a broad belt of the "northern forest densely wooded," from Kluane lake to the Yukon river, about 300 miles across the western boundary, to a point where the Yukon river enters Alaskan territory, which belt stretches over the valleys of the White, Yukon, Pelly, Lewes, and Teslin rivers, in a general south-east and north-west direction, and extending beyond the south-eastern limits of the territory near Fort Liard, where its breadth within the territory has narrowed to a few miles only; (3) the "northern forest not densely wooded," occupying practically one-half of Yukon Territory, and covering 100,000 square miles.

There is also a treeless area along the "Arctic slope," where lower families and orders of plants and shrubs grow, but owing to the severity of the climate and unprotected character of the coast-line facing the north no forest has been able to get a foothold.

The Yukon Territory is well wooded with timber of fair size, mostly white and black spruce. The best timber is often found growing along the summits of the hills, where the greater amount of sunlight and heat occurs.

Agriculture.—While the hardier crops, such as oats, barley, rye, flax, turnips, potatoes, and other garden

vegetables, are grown successfully in many portions of the Yukon, it is nevertheless a fact that wheat is not a staple crop, and as a general rule the Yukon Territory is not an agricultural country. There is sufficient rainfall, and the country is protected by the Coast Range from the intense precipitation of the Alaskan strip along the coast. It has been estimated that some 30,000 square miles of country are available for boreal agriculture.

Communications

Skagway, a port at the head of the Lynn Canal, on Taiya inlet, is also the Pacific Ocean terminus of the "White Pass and Yukon Railway," 101.12 miles in length. It is situated within Alaskan territory, according to the terms of the Alaska-Canada Boundary Award of 1903 settled in London. Other divisional points on this the most northerly railway in North America, built with British capital by the Dominion Government in 1899, include Bennett, at the southern extremity of Lake Bennett; Caribou, at the northern extremity of the same lake; and Whitehorse, the northern terminus of the railway, and the point where navigation begins and steamers ply to Dawson City. There are twenty stations along the railway from Skagway to Whitehorse—four in Alaska, five in British Columbia, and eleven in Yukon Territory. These stations include the following:—

In Alaska	{	1. Skagway.	{	10. Dundalk.
		2. Clifton.		11. Watson.
		3. Glacier.		12. Caribou.
		4. White Pass.		13. Lansdowne.
In British Columbia	{	5. Meadows.	In Yukon	14. Lorne.
		6. Log Cabin.		15. De Wette.
		7. Bennett.		16. Robinson.
		8. Pavy.		17. Cowley.
		9. Bennington.		18. M'Clintock.
	19. Dugdale.			
	20. Whitehorse.			

Transportation facilities throughout the district were at first difficult, but the building of good waggon roads has since removed obstacles, and all the important mining centres can be reached without difficulty to-day. Dog-teams are still extensively used for winter travel, except along the stage and mail route to Whitehorse where horses are used.

A telegraph line connects Dawson City with British Columbia by way of the Lewes river, Lake Laberge, Lake Marsh, and Tagish, all within Yukon Territory, to Atlin lake, Taku, Telegraph Creek on the Stikine, along the head-waters of the Iskut and Nass rivers to Hazelton on the Skeena river (now a station on the Grand Trunk Pacific Railway), up that stream and over a divide to Fort Fraser, over the Telegraph Range, across the Blackwater river to Quesnel and Soda Creek on the Fraser river, then across country to Ashcroft on the Thompson river, a town and station on the Canadian Pacific Railway, and connecting at this point with all the wires of the continent and other parts of the world. A railway is projected from Dawson City to Hazelton with a view to connecting the Grand Trunk Pacific Railway system with the gold, silver, and copper mining regions of northern British Columbia and the Yukon Territory. Starting from Hazelton, at the junction of the Skeena and Bulkley rivers in British Columbia, the railway is to follow the telegraph line and ascend the river Skeena in a direction due north, thence to the head-waters of the Klappan river, down its valley to the southern extremity of Dease lake, and on to Teslin lake, skirting the edge of this beautiful basin. The line will then proceed along the Teslin river valley to the town of Teslin on the Lewes river at the point where this river cuts the Semenof hills, thence northward to Dawson City, following the valley of the Upper Yukon.

As stated before, many streams of the Yukon Territory are navigable for good distances. The Stewart river, seldom less than 150 yards wide, is navigable by light-draught steamers to Fraser Falls, a distance of nearly 200 miles.

The Porcupine river is navigable in high water to about the Alaska-Yukon boundary, a distance of some 90 miles.

The Whitehorse river is navigable from the northern terminus of the White Pass Railway to the Yukon, whilst even the dangerous Whitehorse Rapids may be run by a skilful pilot in a small boat, as was done repeatedly by the gold-seekers of 1896 to 1897.

As far back as 1881 gold prospectors used the natives' trail to the headwaters of the Yukon, by way of the Lewes river.

Travel.—The Klondike gold mines are best reached by the White Pass Railway from Skagway on the Lynn Canal to Whitehorse. The Whitehorse route is now used almost exclusively. Comparatively little snow is seen crossing the White Pass in summer. As the voyage up the Pacific coast from Vancouver or Victoria in Southern British Columbia is almost continuously through sheltered waters and wondrous scenery, the journey to the Klondike is very attractive in summer.

Discovery and Settlement

It is to the officers of the Hudson Bay Company that the credit is due of discovering and opening up this region. The estuary of the river was explored by the Russians in the years 1835–38, but the whole interior remained an absolute blank on the map. In the spring of 1840 Mr. Robert Campbell was sent up the Liard to

seek for some stream flowing west to the Pacific. He reached its source in two lakes. The first he named Frances, and the second Finlayson lake. He then crossed to the Pelly river, which he named. In 1843 he went down the Pelly to the junction of another river, which he named the Lewes; and, in 1847, Fort Selkirk was built at the confluence. While Campbell was establishing posts on these rivers, Mr. James Bell had discovered and was exploring the Porcupine. In 1847 he descended it to its mouth, and came upon the great river which he named the Yukon. He built in that year Fort Yukon at the confluence; and three years later, Campbell went down the Pelly to its junction with the Yukon. He named the White river from its colour, and the Stewart river from a friend. Most of these names are the names of people well known in Canada at the time. Hudson Bay traders then followed down the main river from Fort Yukon past the Tanana river many years before any Russian trader ascended it. The information thus obtained was communicated and embodied in published maps. It will therefore appear that Messrs. Campbell and Bell not only discovered but named and published the names of all these streams, and conducted business on their banks long before the Russians had gone any considerable distance beyond the estuary.

In 1861 Robert Kennicott made his way overland by the Hudson Bay route from the Mackenzie river down the Yukon to Fort Yukon, and in 1865 he and Captain Bulkley led the expedition sent out by the Western Union Telegraph Company to survey a route for a land telegraph line to Europe by way of British Columbia, Alaska, and Siberia.

It was in 1880 that a man called Holt, of the Alaska Commercial Company, obtained *two* small nuggets of gold

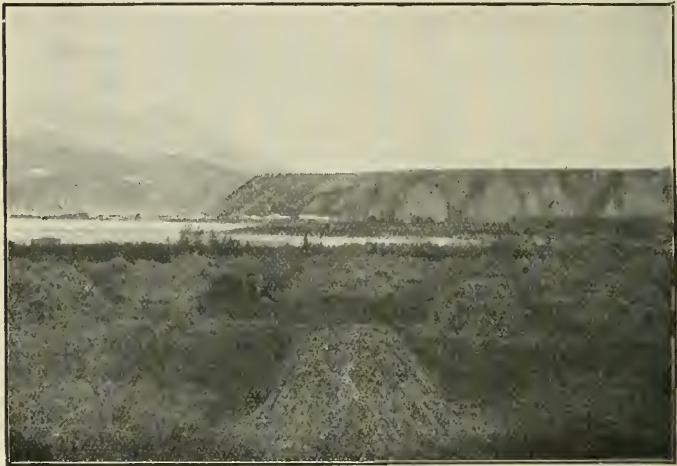
from a Tanana river "Indian" native. These he sent to St. Michael. Later, Joseph Ladue (1883) prospected in Forty-mile and Sixty-mile Creeks. In 1886 the two Madisons discovered "coarse gold in the bed-rock" on Forty-mile Creek. This discovery caused great excitement. William Ogilvie arrived in 1887, and ascertained that some \$200,000 worth of gold was taken out that season. In 1894 there were *nine* paying creeks discovered. The "clean-up" of 1895 amounted to \$400,000. In 1883 Lieutenant Schwatka crossed the Chilkoot Pass, called by him Perrier Pass, descended the Lewes to Fort Selkirk and down the Yukon river to its mouth. It was Homan, accompanying Schwatka, who made the first sketch survey of the great Yukon river system. In 1887 Ogilvie and King made the first attempt to fix the 141st meridian on the Yukon river.

The Klondike.—It was in August 1896 that the world-startling discovery of the Klondike was made, which, for a year or two, put a stop to all exploration and prospecting except in the immediate vicinity of the stream which was first named by Harper and M'Questen as "Tron Deg" or "Tron-Duick," signifying "hammer-water," from the fact that the stream was a famous salmon-run, and barriers of stakes were driven or hammered down into the gravel of the river across its mouth to compel the fish to enter the traps set for them. It was in 1895 that, while looking for good timber on Bonanza Creek which joins the Klondike less than a mile above its mouth, gold colours were found by them. This creek gave the most phenomenal returns of any stream known to date.

Sir John Franklin in 1826, M'Leod in 1834, Simpson in 1837, M'Clure in 1850, were among the explorers

who sailed along the northern coast of Yukon Territory. In 1905 Roald Amundsen touched Herschell Island off the northern coast of the Yukon in the Beaufort Sea, when he made his famous North-West passage during the years 1903–1905.

Settlement.—Before the discovery of gold this portion of Canada was inhabited only by a few aborigines or



HAY-FIELD NEAR DAWSON, YUKON.

“Indians” occupied in hunting and fishing for means of livelihood, as well as for trade with the great fur company.

Towns, etc.—Dawson, named in honour of the late Director of the Geological Survey of Canada—Dr. George M. Dawson, C.M.G.—rose to a place of importance immediately after the Klondike discoveries were made. Its population rose to nearly 30,000 souls, but has since greatly diminished, there being at present, according to the last census, only 3015, whilst in 1901 there were

9142. Other towns include Whitehorse, Carcross, Teslin, Tantalus, Dalton Post, Selkirk, and Tagish.

There are *three* branches of Canadian chartered banks doing business in the Yukon.

The tales and hardships of those pioneer days in the Yukon, as well as the tricks played by the "Checkakos" or new-comers on the "Sourdoughs" or old-timers, are brimful of human interest as revealed in the poetry, romance, or history already available concerning this remote portion of His Majesty's dominions.

Government

The Yukon Territory is, to-day, governed by a "Governor" and "Council," in part elective—seated at Dawson—and has a representative in the Parliament of the Dominion at Ottawa.

In 1894 a North-West Mounted Police officer, Captain Constantine with Sergeant Brown from the force, took formal possession of Forty-mile mining camp in the name of Canada. The following year twenty officers and men of the above troop were sent to the Yukon Territory, and a mail service was organised by them in 1896. Colonel Steele and Major Walsh were two of the Canadian Government officers on whom fell the administration of law and order—fundamental principles in British countries. They did their duty nobly. The name of the late William Ogilvie, at one time surveyor, explorer, and geographer, at another Governor and Administrator of the Yukon, will ever remain associated with this territory. The cost of administration of government in the Yukon in the year 1912 amounted to \$324,242.

Now that the gold-mining fever is abated and a more

rational and economical as well as effective method of recovering the gold still remaining as placer deposits is being employed, there is hope that further discovery of lodes in the great mineral-bearing zone of geological formations crossing the Yukon Territory will mark an era of steady progress in the utilisation and development of the natural resources of this most north-westerly corner of the Dominion of Canada.

CHAPTER XIX

THE NORTH-WEST TERRITORIES

The Hudson Bay Basin

The Bay.—One of the most striking features of the map of British North America is Hudson Bay and its extension, or arm, James Bay, an immense navigable inland sea, extending half-way across the continent at its widest part, and enclosed within three great provinces of the Dominion of Canada and the North-West Territories, having Quebec on the east, with Ontario and Manitoba to the south and west, embracing thirty degrees of longitude from east to west, a distance as great as from London to St. Petersburg. Although Hudson Bay has been known and continuously navigated since 1610, two years only after the foundation of Quebec, and although for two hundred and forty-five years Europeans have resided at points far within its recesses, comparatively little was known of the nature of the climate and the duration of the season of navigation until recently, and divergent views are still advocated concerning the same. Hudson Bay and *all* the islands therein form part and parcel of the North-West Territories.

Hudson Bay and Strait extend from 65° to 95° west longitude, a width of 1038 miles, and from the extreme head of James Bay on the south to the Fury and Hecla

Strait on the north is a distance of 1300 miles, or nineteen degrees of latitude. It is not then a bay of the Atlantic Ocean alone, because through Fox Channel and Fury and Hecla Strait it opens into the Arctic Sea, and, in considering the physical conditions of the bay, it is always necessary to bear in mind that there is an opening on the north in latitude 70° down which the polar ice may pass to find an outlet into the Atlantic in latitude 60° through Hudson Strait. If, however, the name be taken in its narrowest sense, and James Bay, Fox Channel, and Hudson Strait be excluded, Hudson Bay is almost square, being 600 miles from north to south, by 590 miles from east to west. In most books James Bay (350 miles long) is taken into the calculation, and in round numbers the dimensions of Hudson Bay are stated to be 1000 miles from north to south and 600 miles from east to west. The area is approximately given as 567,000 square miles. In the bay proper the depth of water is very uniform, averaging 70 fathoms, excepting near the strait, where it deepens to 100 fathoms. James Bay is, however, very shallow throughout, and even small vessels cannot approach the shore. There is a wide channel down the centre leading to Moose Factory, but beyond the central channel, in many places out of sight of land, the bottom may be touched by an oar from a small boat, and even the main bay along the southern shore is also shallow for a long distance out; so that, from Cape Jones around the whole southern sweep of the shore, there is not a harbour worthy of the name until Port Nelson and the excellent harbour of Churchill are reached upon the western coast. The water of James Bay is brackish, for a number of important rivers converge into it from the east and south and west, and the bottom is muddy, whereas in Hudson Bay proper

the water is as bright and as salt as in the main ocean. An elevation of a few hundred feet would convert the whole area into an immense level plain. The tidal wave enters at the strait and first strikes the western shore. It rises 11 to 12 feet at Churchill, and in the converging shores of the estuary of the Nelson river it rises 15 feet, but as the tide passes round the coast to the south and east it becomes lower. It is only 9 feet at Moose Factory, and lower still on the East Main.

The Coast.—At Cape Wolstenholme, the inner point of the south shore of the strait, the land is very high and steep, rising to nearly 2000 feet; but, turning southwards, it quickly falls to a low and level coast, and so continues as far as Cape Dufferin. There the character of the land changes and becomes high and bold, rising often as high as 1000 feet, until Great Whale river is reached—almost as far south as Cape Jones. This portion of the coast is known by the general name of the East Main. From Cape Jones all round James Bay the coast is very low and the land level, sloping upwards very gradually to the water-parting which bounds on the north the basin of the St. Lawrence system. The coast continues low and the land level all along the south and south-west side of Hudson Bay. On the western coast it becomes rocky and bolder at Churchill, but though not so low as on the south, the coast cannot be called high as far north as Chesterfield Inlet. The whole area round the bay may thus be generally described as an immense shallow basin, in the centre of which is a sea with a uniform depth not exceeding 70 to 100 fathoms. Hudson Bay itself, like Ungava Bay and James Bay, is underlaid by flat-lying formations of palaeozoic age, resembling those of the Lake Ontario and Lake Huron basins.

The centre and west of the main bay is singularly

free from islands, rocks, or shoals. From the inner termination of the strait to Churchill, navigation is clear and unimpeded by any nautical danger. The whole stretch of the eastern coast is, however, fringed with innumerable islets close to the shore; and farther out, at a distance varying from 70 to 100 miles, is a chain of small islands in groups under various names—the Ottawa Islands, the Sleepers, the Belchers—extending from the strait to the southernmost point of the whole bay. Among these islands fringing the bolder coast of the East Main there is shelter, but otherwise, excepting Churchill and Port Nelson, there are few harbours in the bay. Though the centre and west is thus clear, the prolongations of the bay contain many islands. The north side of the bay is marked by an archipelago; and there are a number of islands in the strait and also in James Bay.

The Hudson Bay Company have posts at the mouths of all the chief rivers, but Churchill and Nelson are the two ports which may be connected by rail with the settled parts of Canada and are available for large ships. There the Churchill river empties by a deep estuary into the bay with a narrow opening seawards and bold rocky shores. It is an easy harbour for ships to make, being well marked, and is sheltered from all winds. The anchorage is good and there is a depth of 30 feet of water within, so that it may be considered in all respects as admirably suited for the largest vessels. The Canadian Northern Railway have built a line from Winnipeg to Pas. Towards the construction of the Hudson Bay Railway from Pas to the bay a considerable sum of money has already been spent during the past few years, and contracts have been let for the bridge to span the Saskatchewan river along the 150-mile stretch to Split lake, which is the western section of the proposed

railway line to Port Nelson on the bay. Port Nelson, close to York Factory, has been selected as the joint port for both the provinces of Manitoba and Ontario. More dredging has to be done at Port Nelson than at Churchill, but the former is open for a greater length of time. Hudson Bay Company records covering seventy years indicate that on an average Nelson is open two months longer than Churchill. The Canadian Government is building a line from Pas to Port Nelson 397 miles, which route will shorten the distance from the Western wheatfields to the Atlantic seaboard by 970 miles. The distance of Liverpool from Port Nelson is 2966 miles; from Churchill to Liverpool it is 2946 miles. The Hudson Bay Steamship Company, with headquarters in Montreal, has inaugurated a transportation line between Montreal and Nelson; the service is scheduled at sixteen days. Other harbours there no doubt are, at Marble Island, where the whalers winter, and in Chesterfield Inlet, but they are too far north to be of practical commercial use.

The most important post of the Hudson Bay Company is, and has always been, at York Factory, on the Hayes river, near the mouth of the Nelson river, the largest river which falls into the bay. At this point the Winnipeg basin discharges into Hudson Bay, and it is the point of communication with the whole network of waterways to the Rocky Mountains and the valley of the Mackenzie river. There is no natural harbour at York, but a roadstead exists. About seven miles from the fort there is good anchorage at a place called Five Fathom Hole, where large ships may safely lie; but vessels drawing more than twelve feet cannot go up to the fort, for at low tide there is not more than twelve feet in the channel of the Hayes river. Other chief posts of the company are Fort Albany, Moose Factory, and Rupert

House, at the mouths of the rivers of the same name. These are very large rivers, and they drain a territory extending from Labrador on the east to Lake Superior on the west, but as they converge into the shallow James Bay, no vessels of any size can approach them. Charlton Island is the only roadstead in James Bay, and all ships go there; thence the navigation is very intricate to Moose Factory, and goods are transhipped into smaller vessels or boats.



Geological Survey Photo.

NORWAY HOUSE, A TYPICAL HUDSON BAY COMPANY POST.

Drainage Basin.—This enormous inland sea is the basin into which an area of three millions of square miles is drained, for besides its own immediate tributaries the whole system of Lake Winnipeg finds its outlet by the Nelson river into Hudson Bay. The Red river, rising in Minnesota south of the source of the Mississippi, flows directly north into Lake Winnipeg, and the Saskatchewan, rising on the eastern slope of the Rocky Mountains, flows eastwards into the same lake, so that the drainage basin of Hudson Bay extends 2100 miles from east to west, and

1500 miles from north to south. This Winnipeg sub-basin is more conveniently considered in connection with the North-West provinces; it is only necessary to allude to it here to show the immense territory drained by this inland sea. The basin of the bay contracts towards the north. The rivers on the east or Quebec side grow longer and longer towards the south, and the same condition obtains on the west coast. All this dependent territory slopes down gently and gradually to the bay, for the water-partings are not highlands, but are low and inconspicuous, and the upper streams of the contiguous watersheds interlace at their sources.

Of the many important rivers flowing into the bay it will be possible to notice only the chief, and, in noticing them, to indicate the wonderful system of water communication which covers as with a network even the remotest recesses of the Dominion of Canada, and which has rendered possible the extensive operations of the Hudson Bay Company and its continuous successful existence from the year 1670 down to the present day.

The first important river on the west is the Churchill or English river, sometimes called by its Indian name the Missinipi river, which after a course of 1100 miles falls into the bay to form the harbour of Churchill. It is a beautiful clear stream of great volume, expanding throughout its course into numerous lakes. It rises in Methye Lake, and from the lake, by a portage (Methye or La Loche) of $12\frac{1}{4}$ miles, the Clearwater river, a tributary of the Athabaska, is reached. This portage opens up the whole valley of the Mackenzie. At Frog Portage, a distance of only 380 yards separates the Churchill from the headwaters of the Grass river, flowing into the Saskatchewan at Cumberland House and opening up that large river system. Not far from Frog Portage the Deer river

falls in from the north, by which Reindeer lake and the head of Athabaska lake may be reached. The Churchill is not navigable from the bay, as there are rapids at the head of tide-water. The upper valley of the Churchill is well wooded, but its lower course is through a rocky and barren country.

South from the Churchill is the Nelson river, named



Geological Survey Photo.

FOOT OF GULL RAPID, NELSON RIVER.

after the master of one of Sir Thomas Button's ships who died and was buried there in 1612. It is the largest and most important river of Hudson Bay, for it is the outlet of the whole Winnipeg and Saskatchewan systems. It is a muddy stream of immense volume flowing in a course of about 360 miles through a flat clay-covered country. In its upper course it divides into many channels and expands into many lakes; in its lower course it is navigable for river steamers for 40 miles from its mouth. It falls into the bay by an estuary which is flat and muddy. At high tide the estuary is

seven miles wide. At low tide the mud-flats and boulders are uncovered and the river shrinks into its own channel. The water of the bay is shallow, and there is no shelter for vessels in the open roadstead which answers for a harbour, so that vessels lying there prefer to put to sea at the appearance of bad weather. There is 10 feet of water on the bar at low tide, but above that point the depth is 20 feet. The width of the river varies from half a mile to a mile and a half, until within ten miles of the tide-water, where it widens to three miles. It is the purpose of the Dominion Government at Ottawa, as well as the object of special interest to the provinces of Manitoba and Ontario, to make of Nelson a safe and desirable port.

Eight miles farther south is Hayes river; and York Factory, the chief Hudson Bay post, upon its western bank. This river, and not the Nelson, is the ordinary boat route to Winnipeg, for the Nelson is too large a stream to be convenient for boat and canoe navigation. The route passes up Hayes river and by Hill river into Kuee lake, and thence by way of Oxford House to Norway House, and by Sea river into Lake Winnipeg. The Hayes river with two of its tributaries is navigable for 140 miles for light-draught steamers.

The Severn is the next considerable river southwards. It is a shallow stream, difficult for canoes, passing through a well-wooded country. Continuing to the south-east are many small streams until the Albany river is reached, a very important stream which, like the Severn, is now within the province of Ontario. By the Albany there is a much-frequented route to Lake Nipigon and Lake Superior. The distance is 468 miles, and of this 270 miles are available for light-draught steamers.

Moose river, falling in at the extreme south of James

Bay, is navigable for 100 miles, and is the channel of a very much used route to Michipicoten on Lake Superior. Since the Canadian Pacific Railway was built, Missinaibi station is the point of departure for the bay. At this point the water-parting of the Hudson Bay system is within 30 miles of Lake Superior. The whole distance from the bay to the lake at this point is only about 281 miles. The Abitibi, a tributary of the Moose river, is the route by which canoes pass into the Montreal river, which falls into Lake Timiskaming along the valley of the Ottawa river. All this country between Lake Superior and James Bay is low and flat, sloping gradually down until about a distance of 100 miles from the bay, when it makes a sudden drop of 100 feet. This fall marks a change in the character of the rocks, which pass from the more rugged Laurentian into the flat-lying Ordovician and Silurian, and at some places into the Devonian system. As far up as this drop many of the rivers might be available for light steamboats.

The rivers which, as far as Moose Factory, flow from the west and south-west, thenceforth flow into the bay from the south-east and east, radiating from the southern shore like the spokes of a wheel; so that Rupert House, at the mouth of Rupert river, the next important stream, and only 100 miles from Moose Factory, is the point of departure for the Saguenay, lower St. Lawrence, and Labrador. Rupert river flows out of Lake Mistassini, whence a portage over the height of land leads into waters flowing into Lake St. John. On the western side of the estuary of Rupert river the Nottaway river falls in, which is a shallow but important stream draining a wide area.

Many large rivers flow into the bay on the eastern side. The Eastmain river approaches by one branch close to the waters flowing into Lake Mistassini, but

another branch reaches far into the heart of Labrador and approaches the sources of the Koksoak, flowing into Hudson Strait, and of the Hamilton, flowing into the Atlantic; or a canoe may even pass into the Manikuagan, flowing into the lower St. Lawrence. Great and Little Whale rivers are also important from their size, but north of these the rivers grow shorter as the water-parting of the central basin of the Labrador peninsula in Quebec gradually approaches the coast.

Geology.—Hudson Bay lies within a trough of the Laurentian nucleus, on the inside of the great V-shaped mass of crystalline rocks which forms the framework of the continent, and which from the earliest formative period has dominated its shape. One arm of this mass of primitive rock stretches to a point near the delta of the Mackenzie on the Arctic Sea on the west, and the other to northernmost Quebec on the east. The Laurentian rocks come to the surface on the northern shores of the bay, both on the eastern and western side; but on the southern shore there is a border of palæozoic formations including representatives of the Ordovician, Silurian, and Devonian systems of varying extent. South and west of James Bay this border of later formations is from 100 to 200 miles across. The bay itself is probably for the most part underlaid by palæozoics. On the south, from near the water-parting of the St. Lawrence system, the limestone formation slopes gradually down to the bay, and consists for the most part of Devonian strata. On the eastern coast, north of Cape Jones, there is a narrow strip of rocks ascribed to the late pre-Cambrian or Cambrian, and the islands which cluster along on that side of the bay are also referred to that system.

Minerals.—The country around the bay possesses considerable mineral wealth, especially upon the eastern

coast, where masses occur, chiefly manganiferous carbonate of iron. Upon the islands on that coast copper ore is abundant. Galena is found in several places, and mica is plentiful, and occurs in sheets a foot square. Plumbago is frequently met with. Lignite coal occurs on the Moose and Abitibi rivers, but no deposit of importance is known. Gypsum occurs on Moose river; and the limestones on Lake Abitibi have been reported to carry petroleum. Further notes on the geological resources of this region are embodied in the chapters on the various provinces around the bay.

The Strait.—Hudson Strait, lying as it does between 60° and 65° north latitude, may be considered as being in a sub-Arctic region. The shores are high and bold; the water is from 100 to 200 fathoms deep, and until the opening out of the bay is reached, the course of vessels is clear of islands. There are no rocks or shoals in all its length. It is about 450 miles long, with an average width of 100 miles; at the narrowest part the width is 45 miles. The shore on the north side is bold, but sloping; on the south, bluff and precipitous. For the greater part of its length both shores are visible from mid-channel because of their height, which is seldom less than 1000 feet. Cape Chidley, at the southern entrance, is 1500 feet, and Cape Wolstenholme, at the southern point where the strait opens into the bay, is nearly 2000 feet high. This does not, however, apply to Ungava Bay, a deep and broad indentation of the southern shore. The coasts of this bay are low and flat, and here the Koksoak or Ungava river, which drains the central basin of the Labrador peninsula, discharges into Ungava Bay and the strait. This is a large river, with a course of 350 miles, and with an average width of a mile for 60 miles from its mouth. It runs in a parallel direction, north-east and

south-west, to the Leaf river, which also discharges into the same bay. Thirty miles up the river is Fort Chimo, a post of the Hudson Bay Company, and the river is navigable for ships four miles farther up. Akpatok island at the mouth of the bay has outcrops of palaeozoic formations referable to the Ordovician system.

The tides in Hudson Strait rise to a height of 30 feet or 40 feet in spring tides, and flow with great swiftness. This prevents the strait from freezing over, notwithstanding its high latitude, and, in conjunction with the drifting ice, seriously complicates the question of navigation. At the mouth of the Koksoak river the rise and fall of the tide is stated in evidence before Parliament to be 64 feet, and at Fort Chimo it is 30 feet, or $38\frac{1}{2}$ feet at spring tides. The tide flows with a velocity of 3 to 6 miles an hour, and when there is much ice in the strait, vessels not specially prepared for northern waters are in danger of being crushed.

With regard to the bay itself, it is known that it does not freeze in winter. Ice forms on the shores to a varying distance out. In James Bay, where the water is shallow and brackish, the ice extends far out; but it is proved that there is always open water in the body of the bay, and that what ice is there is loose, and of one season's formation. There may be field ice, collected in the centre of the bay from the circular progress of the tidal wave; but all through the winter the vapour of the open water may be seen from the shore.

Navigation.—The chief difficulty of navigation is in the strait which is at the north end of the bay. The bay ice is not heavy, but in the early summer the disadvantage of the northern inlet from the Arctic regions becomes manifest, for heavy ice comes down Fox Channel driven by the north-westerly winds, and for an uncertain period, until

it gets an outlet to the ocean, it floats up and down the strait with the ebb and flow of the tide. This is the ice reported by Lieutenant Gordon as 40 feet thick. Few bergs are met, and those which occur are small, excepting, as sometimes happens on the north shore, those which are carried in by an indraught of the Arctic current to pass out along the southern shore. This ice sometimes forms into a pack in the strait, and then a vessel must wait until it opens out with the wind into leads. It may for a while completely block the strait at its narrowest part, or may become entangled in the land or among the islands at the inner end. Neither bergs nor heavy ice are encountered in the bay west of Fox Channel.

The subject is one of great importance to Canada, and diverse opinions are expressed respecting it. Port Churchill is almost at the centre of the continent of North America, and it is on the northern edge of the greatest food-producing region in the world, the illimitable wheat area and the cattle ranches of the Canadian North-West. A far northern course like this is almost a great circle, and therefore the distance from Winnipeg *via* Hudson Bay is very much shorter than *via* Montreal. Stated in geographical miles, the distances are as follows:—

	Miles.
From Winnipeg to Liverpool <i>via</i> Hudson Bay . . .	3507 or 3527
From Winnipeg to Montreal, Canadian Pacific Railway	f 1234
From Montreal to Liverpool, St. Lawrence route . . .	(2790 4024
	<hr style="width: 100px; margin-left: auto; margin-right: 0;"/>
Difference in favour of Hudson Bay in miles . . .	497

The following distances are given by Admiral Markham:—

Liverpool to Churchill . . .	2930 nautical miles
„ Quebec . . .	2650 „ „ by Belle Isle.
„ „ . . .	2820 „ „ by Cape Race.
„ Halifax . . .	2490 „ „
„ New York . . .	3040 „ „

That the navigation of the bay is safe enough at certain seasons is clear from the fact that for 220 years the Hudson Bay Company have annually despatched one or two ships to ports on the bay with an unusual freedom from accident or loss. That one fact is sufficient to demonstrate the safety of the route, the only question is the length of the period of safety. The depth of the water, the freedom from shoal or reef, and the boldness of the land on both sides of the strait are favourable circumstances, and if the dip of the needle in consequence of the proximity of the magnetic pole is so great as to render the compass unserviceable, the fact that during midsummer the light in such high latitudes extends over almost all the twenty-four hours is a largely compensating advantage.

Not the least difficult part of the problem is the stream of ice in the Atlantic carried past the mouth of the strait by the Arctic current. This may be 100 or 200 miles wide, and for that reason the invariable rule of the Hudson Bay Company's captains, based on the experience of 200 years, is to time their departure from England so as not to reach the outer stream of ice flowing down from the north before July 15, and to leave the bay on the return voyage not later than the end of September, making a period of safe navigation of two and a half months. Many diverging statements are made; but, for sailing ships, the weight of evidence goes to show that the average period of safe navigation lies between these two dates.

While this period is not strongly combated, so far as regards sailing ships, it is warmly urged that the employment of steamships completely alters the question. It is maintained that vessels, specially built for such a trade, and for contact with ice, and provided with powerful

engines, could enter the ice at a much earlier period and remain much later in the bay. Sealing steamers from Dundee and Newfoundland carry on their regular business amongst the ice in early spring, and it is claimed that freight steamers could be built in a similar manner to encounter the ice with equal impunity. Such vessels, it is argued, could enter the pack as early as June 15



VIEW OF MARBLE ISLAND, FROM DEADMAN'S ISLAND.

The good ship *Neptune* in the harbour.

and remain in the bay to November 1—that is, four and a half months. Between these extreme periods of two and a half and four and a half months the controversy is waged.

The Canadian Government has attempted to solve the problem in a practical way, and in 1884, 1885, and 1886 sent a steamship into the bay under Lieutenant Gordon, R.N., with a staff of observers, who were distributed at six stations on the shores of the strait, to remain through the winter and report upon the move-

ments of the ice and all other occurrences of interest. In 1884 the *Neptune*—a Newfoundland sealing steamer—was employed, and in 1885 and 1886, H.M.S. *Alert*, a steamer which had been with the Arctic expedition under Sir George Nares, was lent by the Admiralty. In 1886 the observing parties were brought back. They had passed a pleasant winter, for game had been plentiful. The sum of Lieutenant Gordon's report was that the first half of July was the earliest date at which the straits may be considered as navigable for the purposes of commerce by steamships fitted for ice navigation, and at the same time capable of being used profitably as freight carriers; and that the middle of October was the latest. He was of opinion that while it might, under exceptionally favourable circumstances, be possible to extend the time from July 1 to November 1, a period of three months, namely, from July 15 to October 15, was for all practical purposes the extreme time during which it would be safe for steamships to navigate the straits.

It happened that the former commander of the *Alert* on the Nares expedition, Captain (now Admiral) Markham, went as a passenger on the expedition of 1886. His opinions are recorded in the *Proceedings of the Royal Geographical Society* for 1888, and he states that "a well-found steamer is able to make her way with ease through the ice in Hudson Strait in June and July, when a sailing ship would be hopelessly beset"; and he reports, on the authority of the observers at Ashe Inlet, that the ice did not form in the strait before December, and that the channel was perfectly *free for navigation during the entire month of November*. He thinks that the vessels should be specially constructed to resist ice pressure, should be of considerable steam-power, and strengthened at the bows to repel the severe blows

caused by striking the floes when threading their way through a stream of ice. The reports of the observers farther up the strait were not so favourable. In the subsequent discussion Dr. Rae, the celebrated Arctic explorer, who as an officer of the Hudson Bay Company had resided on the bay, stated that the bay itself was navigable for five months, but he differed strongly from Admiral Markham's conclusions and supported Lieutenant Gordon's report.

The geographical facts are therefore plain enough, and the question has become one for naval architects and merchants. Can steamers be built, economical as freight carriers, and at the same time suitable for forcing their way through field ice? The ice which comes down Fox Channel is from 12 to 20 feet thick, and, even if much of the ice be brashy in June or July, the blades of a propeller are apt to be broken by quite small pieces of ice. No one disputes the presence of the ice,—whether loose or packed, brashy, honey-combed, or heavy, the ice is there; and if the steam vessels are built to encounter it, will they carry sufficient cargo for profit, and what will be done with them during the long season of winter; for with such a build they cannot compete with the vessels built as carriers for more southern ports? Lieutenant Gordon records the fact that towards the western end of the strait the compass will not work owing to the proximity of the magnetic pole. In the long days of June and July that might be unimportant, but in the late fall the nights would be long and dark with snow and storm. The question is one of such prime importance to the wheat-growers of the Canadian North-West, that the federal government has carried on further investigations, and is satisfied that the bay is navigable, and, as stated before, sums of money have been voted and

are now being spent in establishing through communications and transportation facilities between the wheat-growing provinces of Canada and Liverpool or other European ports and markets.

Climate.—The climate of Hudson Bay has also been a subject of controversy, and when it is considered that the bay extends from lat. 51° N. to lat. 70° N., it will be seen that in any statement concerning climate there is much need to indicate precisely what part of the bay is meant. This stretch of latitude corresponds with the stretch from Land's End in Cornwall to the North Cape in Norway—the most northerly part of Europe, and well within the Arctic circle. Except in the fertile and productive “clay-belt” of the James Bay basin in the provinces of Ontario and Quebec, the country around Hudson Bay can never be an agricultural country.

Churchill is the northern limit of the cultivated grasses on the west coast of the bay. The line drops on the east side to the northern point of James Bay. The line which marks the northern limit of cultivation of barley, rye, oats, and the root crops, crosses James Bay from east to west about half-way up. The northern limit of the growth of wheat passes altogether south of the bay without touching any part of it. At Abitibi wheat ripens early in August, and in the clay-belt its cultivation can no doubt be carried on successfully over a very extensive territory. In the same way the northern limit of deciduous trees barely touches the extreme south of James Bay. Some of the coniferous trees are found on the west coast considerably to the north of Churchill and almost as far north as Chesterfield Inlet. On the east coast the tree line drops to Cape Dufferin, but the growth is stunted at the extreme northern limit. North of that is the region of mosses and lichens, the food of

the caribou and musk-oxen. All around the bay the trees are small when they come down to the coast, and the ground is covered with sphagnum moss ; but a little way back the level land is well wooded, and much valuable timber of large size grows along the upper waters of the many large rivers which empty into James Bay.

The resources of the bay as to fisheries are important. Far to the north, up Rowe's Welcome and Fox Channel, is the favourite resort of British and other whalers, who winter at Marble Island, inside the gulf near Chesterfield Inlet, so as to commence operations as soon as the ice breaks up. In the northern seas of Canada is the last retreat of the whale, and it is gratifying to note that the Canadian Government is controlling the whale fishery and will prevent any destructive methods being employed in these waters. Officers of the Royal North-West Mounted Police, whose experience in the Yukon and Mackenzie and North-West provinces have qualified them for efficient service along this new and important route to Europe, have established several posts where the wishes and orders of the Ottawa Government are executed. The seal and porpoise fisheries are productive, and salmon abound in the rivers. The cod fishery extends round from the Atlantic into the strait as far as Ungava Bay. The territories surrounding the whole bay are productive in fur-bearing animals. Caribou (reindeer) are abundant, and in the barren grounds of the North-West as far as the Arctic Ocean are the haunts of musk-oxen. They are met also north of the strait, but not south of it. South of the strait throughout Quebec-Labrador there roam large herds of the barren-ground caribou or reindeer. There is abundance of feathered game in its season : ducks, geese, loons, ptarmigan. Far in the north,

at Repulse Bay and on the Arctic coast, the Hudson Bay officers could always maintain themselves. Eskimo live in bands all round the bay. Some of their settlements have existed for 100 years in the same place, and all the Canadian parties of observation which entered the bay were abundantly supplied with fresh meat during the winter by the Eskimo.

History.—There is much interesting history and even romance clustering round this remote and solitary inland sea of the north. It was explored very early. On Ruysch's map in the "Ptolemy" published in 1508 is a legend which reveals personal experiences inside the strait. "Here a surging sea commences, here ships' compasses lose their properties." Ruysch had probably been with the Cabots in the second voyage in 1498, and they had evidently penetrated for some distance within the strait. It is often stated that Cabot in 1517 discovered the bay, but there is no ground for the assertion. The maps about 1540 and onwards showed, in an indefinite way, an ocean north of the land. Michael Lok's map in Hakluyt's *Divers Voyages*, 1582, showed a long inland reach of sea extending to the south-west towards the southern ocean, but that was only conjecture, as is proved by the rare and celebrated Molyneux Map in the Hakluyt of 1600, where Hudson Strait is indicated by the words "a furious overfall" marked against a long inlet, but the passage is closed. Frobisher in 1576 and Davis in 1588 had looked into the strait, and Cape Chidley had been named by Davis after Sir John Chidley (not Chudleigh), a worthy of Queen Elizabeth's time who took an interest in north-west explorations. It was not until 1610 that Hudson first of all worked through into the bay. It was early in July that he got in by coasting along the southern shore of the strait. He named the inner cape

after Sir John Wolstenholme, one of the contributors to the expedition, and with surprising courage pushed on to the southernmost recesses of James Bay, where he was frozen in on November 10. He wintered there, and had no difficulty in providing for the ship's company, as game and fish were abundant. On the 18th of June 1611 he sailed for home; but a mutiny broke out among the crew, and shortly after he and five sick men with two others of the crew were put into a boat and abandoned and were never more heard of. So perished this chief among great navigators in the great bay which bears his name—a name written larger on the map of the Dominion than any other. For 170 years no navigator was able to approach the North Pole nearer than his record in 1607. The Hudson River still bears his name, and justly so, for he first explored it in his search for a passage to the south sea, and sailed up to the site of Albany. The miserable wretches who abandoned him for the most part perished at the hands of the Eskimo, and others died of starvation on their passage home.

The news was brought to England by the few surviving mutineers, and in 1612 Sir Thomas Button was sent out to rescue Hudson, if perchance he had survived. Button wintered at the site of the present York Factory. The great river near is called Nelson river from his sailing-master, whom he buried there, and that part of the bay is known as "Button's Bay" on many old maps. In 1615 Baffin and Bylot explored the north of the bay about Southampton Island. A Danish captain, Munk, was the next adventurer to explore for the North-West passage. He wintered near Churchill, but not knowing how to take care of his crew, only he himself with two of his company got away alive. On some old maps that part of the coast is named New Denmark. Then in

1631 followed Captain Fox, "North-West Fox," as he called himself, who discovered and named Fox Channel, and the same year Captain James sailed into the bay and wintered there, near the mouth of Rupert river, at the head of the bay still called after him. The North-West passage still remained hidden, and for a hundred years the perilous quest was abandoned.

In 1608 Champlain founded Quebec, and, as the colony of New France grew strong, enterprising spirits among them began to reach out west and north in their trading expeditions. But the priest often preceded the trader, and Father Albanel was sent overland by Talon to the bay in 1672. He went by way of the Saguenay, Lake Mistassini, and Rupert river, and found a small vessel of ten tons with an English flag and two empty houses. The English had, in fact, resumed their voyages to the bay, and Captain L. Gilham had been at the mouth of Rupert river in 1667. The charter of the Hudson Bay Company had been granted in 1670, and it was the report through the Indians of the English trading-posts on the bay which suggested the expedition of Father Albanel to Talon—then Intendant of New France.

The French traders then extended their operations to the bay, and soon commenced that struggle between the two nations for its possession, of which the obscure and contradictory accounts fill a large number of state documents. The Hudson Bay Company, in 1686, had five forts on the bay at the mouths of the five largest rivers, when, in a time of profound peace, the governor of New France sent an expedition overland from Montreal and captured them. The expedition was commanded by the Chevalier de Troyes, and went by way of the Ottawa and Abitibi rivers. The English people resented this

raid, and recovered the forts. At this time, after the bay had been neglected for so long, it is difficult to realise the importance then attached to it; but, in fact, then, and even down to Parry's second expedition, it was the current belief that the North-West passage lay hidden in some unknown corner of it. So the struggle went on until in 1697 Iberville—a French-Canadian Nelson, born in Montreal—was sent in command of a squadron of four vessels to destroy the English power completely in the north. One of his vessels was crushed in the ice, and Iberville, when he got through in his ship, the *Pelican*, found himself alone, his consorts having been separated by the ice. Three ships hove in sight, which he at first took to be his own ships, but they proved to be three English armed vessels—the *Hampshire*, 52 guns, the *Daring*, 36 guns, and the *Hudson's Bay*, 32 guns. Iberville's vessel, the *Pelican*, had only 44 guns, but he was a consummate sailor and a daring captain, and he boldly attacked the *Hampshire*. It was a unique sea-fight. The weather was very heavy at the time, and the situation was complicated by the masses of ice; but the fight continued for four hours—all one July morning—until the *Hampshire* went down with all on board. Iberville then attacked and captured the *Hudson's Bay* ship, but the *Daring* escaped by flight. Iberville's consorts joined him after the battle, and he proceeded to reduce all the forts on the bay—to little permanent effect, for, by the treaty of Utrecht, Hudson Bay was restored to the English Crown, and for seventy years the bay was at peace, until, in 1782, La Perouse, with a squadron of frigates, seized the forts again, and carried away the traders as prisoners of war.

Once more at peace, the quest for the North-West passage was revived, and the spell which Sebastian

Cabot, that arch schemer among navigators, had laid upon the English people, began again to work. Somewhere hidden in the bay was the opening of the Strait of Anian of the old maps, opening into the Mar del Zur; and in 1719 James Knight, who had been governor on the bay, set out with two ships to find that mythical passage. The whole expedition utterly disappeared; nor could its fate be conjectured, until, in 1759, forty years later, remains were found on Marble Island, which proved that the whole party—two ships' crews—had miserably perished of cold and famine during two terrible years of struggle and agony.

In 1741 Captain Middleton was sent to the north-west corner of the bay on a voyage of discovery. He discovered Wager inlet and Wager river, and Repulse Bay and the strait north of Southampton Island called by him, and still known as Frozen Strait, for it was packed with ice. His report was vehemently discredited by Sir Arthur Dobbs, and he, in 1746, fitted out an expedition to demonstrate that Wager inlet was in very truth the longed-for opening to the great southern ocean. This attempt led to no result.

The search by land then commenced. The company had built a fort at the mouth of Churchill river—Prince of Wales fort—and the officers, having heard from the Indians marvellous stories of mountains of copper, sent off Samuel Hearne to discover them. This persevering explorer succeeded at his third attempt, discovered the Coppermine river, and followed it down to the Arctic Ocean, upon whose gloomy and desolate shore he was the first white man to tread.

Hearne's expedition had shown that there was no passage to the South Sea; but the passion of the English people for the North-West passage returned with increased

vehemence in 1818, when Parry, the prince of Arctic navigators, made on his first expedition the brilliant discovery of the archipelago which now bears his name. At the end of Melville Sound he encountered an impassable barrier of ancient ice. On his second voyage in 1821 with the *Hecla* and *Fury* he followed up the north-west angle of Hudson Bay, if, perchance, there might lurk a passage into the Arctic Sea round the southern edge of the impervious Arctic pack at the north. The result of his voyage justified the slandered Captain Middleton. He passed up by Fox Channel and sailed through Middleton's Frozen Strait, and tried to find a passage through at Repulse Bay. He then followed up north the eastern shore of Melville peninsula and wintered at Winter Island. The next summer he pushed on farther and discovered the outlet of the bay at the north, and called it Fury and Hecla Strait. This he supposed to be the long-sought passage, but it was solidly blocked with ice, and after passing a winter close to the strait and exploring the adjacent region by sledging parties, he returned without getting through. The search was continued in 1824 by Captain Lyon who had been with Parry. His orders were to establish himself at Repulse Bay and explore across the narrow isthmus by sledging parties. He, unfortunately, went south of Southampton Island, and his ship was so damaged by heavy storms and ice that he got no farther than Wager inlet. Thus closed the record of the search for the North-West passage by Hudson Bay, nevertheless it was from the key-point of Repulse Bay that the Arctic problem was eventually solved. It was reserved for Roald Amundsen, the crafty, cautious, daring, persevering Arctic explorer, to make the North-West passage in the summer of 1905. Dr. A. P. Low, who was in command

of the good ship *Neptune* with Captain Comer, reports that he could have made the same passage in the following year, but his commission did not cover that point.

Arctic exploration with ships by way of Hudson Bay having ceased with Captain Lyon's expedition in 1824, it was taken up in other directions—by way of Bering Strait, by land along the shores of the Arctic Ocean, and by way of Lancaster Sound. Sir John Franklin sailed in 1845 with the *Erebus* and *Terror* and 129 souls, and no news of him came back. The search commenced in 1848. England could not rest while the fate of her sailor-hero was unknown, and the interest and sympathy of her colonies and the United States were warmly enlisted in the search. Dr. Rae, an officer of the Company, had been for several years engaged in searching the Arctic coast, and at last, in 1853, he was again sent out by the Hudson Bay Company and went up the west coast to Repulse Bay. He established his headquarters there at a place he called Fort Hope, on the isthmus now called Rae Isthmus. He supported himself and his little party of four men all the winter by his skill with his rifle, and in the summer of 1854 he explored westwards and northwards until at Cape Porter, on the west coast of Boothia peninsula, he met the Eskimo from whom he learned the sad details of the fate of the Franklin expedition, and won the reward of £10,000 promised by the British Government to the person who should bring home the first definite and certain news.

So closed the romantic annals of this solitary sea. Cold and forbidding though it may be to the outward eye, the heart warms at the thought of the deeds of heroism and of patient endurance which its silent wastes

have witnessed. The names along the coasts are mostly the names of old worthies of far-off days, suggesting memories which stir the blood and quicken the pulse. Despite all hardships and memories thereof, the bay and strait of Hudson will become an important factor in the development of the Canadian North-West.

The Barren Grounds

This is the region west of Hudson Bay, of which the northern portion was formerly a part of the provisional territory of Keewatin, concerning which very little is actually known. It is in the main a treeless wilderness, a region of rock and swamp permeated by lakes and streams, upon whose barren shores nature assumes her most unattractive aspect, and where winter seems almost permanently enthroned. It is not an inviting region to the traveller, for in winter it is probably colder than anywhere else on the continent, and in summer the flies, mosquitoes, black flies, and "bull dogs" make up in activity for the shortness of their season.

If a line be drawn westwards from the western shore of Hudson Bay, north of Fort Churchill, along the 60th parallel of latitude, curving to the north-west to cut off the eastern arm of Great Slave lake; if it be continued northwards through Great Bear lake, and thence down the Lockhart and Anderson rivers to the Polar Sea, such a line will approximately enclose the Barren Grounds, for the other boundaries will be the Arctic Ocean to the north and Hudson Bay to the east. It includes, in general terms, the river valleys east of the Mackenzie which discharge direct into the Arctic Ocean, and those north of the Churchill which discharge into Hudson Bay. It is the true Arctic basin of Canada,

and is vaguely reputed to cover 200,000 square miles in area.

It should not, however, be supposed that the entire region so marked off is absolutely bare of trees, for in places where there may be shelter, or where the soil may be drier, trees will be found in groves and clumps. On the shores of the larger lakes there may also be trees, and the tree line will advance or retreat from the limits above described according to varying local circumstances. Thus, in the Tyrrell expedition of 1893, a grove of white spruce, composed of trees eight feet in circumference, was met in the heart of the Barren Grounds in lat. $62^{\circ} 15'$, and the same expedition records an undulating grassy plain as observed on the Dubawnt river about 64° north latitude. Clumps of willows were met on the Dubawnt, and the rivers to the west brought down trunks of spruce trees one foot in diameter, proving that the interior is not so treeless as is supposed. But, on the other hand, Dubawnt lake was found on August 7 covered with an immense sheet of ice seven feet thick. The explorers paddled between the ice and the shore save at one spot where the ice was firm, and they had to portage over it.

The Barren Grounds drain mostly to the north by the Coppermine and the Great Fish (Baek's) rivers, both difficult to navigate even in canoes, consisting of strings of lakes connected by violent rapids, and flowing for the most part in rocky channels. There are other rivers flowing into the Arctic Ocean and into Hudson Bay. Of the latter the Dubawnt is the largest, falling into Baker lake—a continuation of Chesterfield Inlet. Little is known of the land away from the main watercourses, for Samuel Hearne is the only white man who traversed it on foot. He saw a range of mountains—the Copper mountains—and they have been described by Dr.

Richardson, who found scales of copper disseminated generally throughout the rock, and picked up plates of native copper, and malachite, copper glance, and native copper and copper ore in many other forms. The Indians report that every part of this range, over an extent of 40 miles, abounds in copper, and Richardson found ice chisels of pure copper 12 and 14 inches long and half an inch in diameter in the possession of the Eskimo.

The area of the Barren Grounds for the most part consists, as is supposed, of Laurentian rocks; but even with our present knowledge important reservations must be made. The Coppermine river flows through Cambrian rocks for a large part of its course, and on the shore of the Arctic Ocean the Cambrian extends in a belt westwards from the mouth of that river to meet the Devonian and Cretaceous of the Mackenzie valley, and eastwards along Coronation Gulf. Red sandstone and conglomerates, with various trappean rocks referred to the Cambrian (and doubtless representing, like the last mentioned, the Keweenawan of the great lakes), have also been found by Mr. Tyrrell along the course of the Dubawnt river, and on Baker lake and Chesterfield Inlet. Huronian schists and quartzites also occur in some places, and appear to be highly charged with copper ores.

Tyrrell found a stretch of 225 miles of these rocks along his route, and observed their line of contact with the Laurentian gneiss along the Dubawnt river, where it turns east almost as far as Baker lake, and he observed, moreover, the same contact on Baker lake and Chesterfield Inlet. These rocks are doubtless a repetition of the copper-bearing rocks of the Coppermine river, and indicate a very wide extent of metalliferous rocks in this region, otherwise so scantily favoured by nature. From

Chesterfield Inlet to Churchill he found, however, that the low shores of the bay consisted of Laurentian gneiss ; but it is evident that large areas of other formations exist in the interior.

Very little shelter can be found in this region from the winds which sweep across it ; nevertheless it is by no means destitute of animal life ; immense herds of



Photo : J. B. Tyrrell.

HERD OF CARIBOU, BARREN GROUNDS.

caribou roam over it, migrating from the shores of the Arctic Ocean in summer to the winter shelter of the woods on the south and west. These are the Barren Ground caribou, practically identical with the Lapland reindeer, and like them they find abundant food in moss and lichens. Tyrrell met some of these immense herds and was able to get several photographs of them, so unsuspecting were they of the destructive nature of white men. The fawns would approach within a few yards of the party. Geese and ducks breed in immense numbers

on these solitary lakes, partridges are found there, and the waters abound in trout and whitefish. The Hudson Bay officers in their expeditions do not seem to have suffered such privations as the explorers from Europe. Dr. Rae and Simpson and Dease provided food for their parties from the resources of these regions. On the



Geological Survey Photo.

MUSK-OX (*OVIPOS MOSCHIATUS*).

northern part of the Barren Grounds is the home of the musk-ox, a harmless, inoffensive creature which, as its name *Ovibos* indicates, partakes of the nature of both the sheep and the ox. It has the teeth of a sheep and the disposition and mental development of a sheep, but the feet of an ox and the horns of an ox. The hide partakes of the same double nature, for there is a thick, fleecy undergrowth in winter with a long permanent coat

of hair. The picture given is taken from an excellent preserved specimen in the Victoria Memorial Museum at Ottawa.

The first white man to enter the Barren Grounds was Samuel Hearne, who in 1770-71 crossed them to the Coppermine. He was unskilful in scientific observation and did not correctly estimate distances, so there is some difficulty in tracing his route. Franklin, in his first expedition in 1819-21, entered the country from Great Slave lake. He went up one of its tributaries, the Yellowknife river, and built Fort Enterprise of timber growing around. The following year, with his companions Back and Richardson, he crossed the divide and went down the Coppermine through the Barren Grounds. He returned by Hood river to the Coppermine, experiencing extreme privations and disasters. The next to pass through was Captain Back in 1833-34 in the search for Ross. He also entered by Great Slave lake, built Fort Reliance at its extreme eastern end, and went down by the Great Fish (or Back's) river to the sea, thus passing through the heart of the Barren Grounds. Simpson and Dease in 1837 built Fort Confidence at the north-east corner of Great Bear lake, and, from that point in the north of the Barren Grounds as a centre, made most successful explorations. They found abundance of game and fish; but they were Hudson Bay officers and used to the country. They also went down to the sea by the lower Coppermine. The same point, Fort Confidence, was in 1848-49 made the starting-point of Richardson and Rae's expedition in search of Sir John Franklin, and again the Coppermine was followed to the sea. In 1850-51 Dr. Rae again wintered at Fort Enterprise, and went down on foot to the sea in carrying out a further search under the orders of the Hudson Bay Company.

The next traverse of the Barren Grounds was made by James Anderson, a Hudson Bay officer; he went down by the Great Fish river. The Abbé Petitot, who spent many years as a missionary on the lower Mackenzie, has visited that part of the Barren Grounds between Great Bear lake and the sea. It was on an island at the mouth of the Great Fish river that the last of Franklin's crew perished in 1848.

Of recent years renewed interest has arisen concerning the Barren Grounds; not in the cause of science, but because of an insatiable longing to shoot the harmless musk-oxen which are one of the few means of support of the aborigines of that region. Mr. Warburton Pike has written a very good book giving an account of his experiences in 1889. He was on the headwaters both of the Coppermine and Great Fish rivers in the heart of the Barren Grounds. It is worthy of note that he found the edge of the woods to be at Lake Mackay, north of Great Slave lake, about longitude 112° west, on the height of land between the lake and the ocean.

In 1893 the Geological Survey of Canada sent Mr. J. B. Tyrrell to explore this region. He entered by way of Lake Athabaska, and from its eastern extremity to Black lake, and from there north-eastward across the divide to Hudson Bay. It was at the height of land that he also left the forest; for there he saw poplar for the last time, but he did not finally leave behind the scattered and intermittent clumps of spruce until he was 50 miles beyond the water-parting. Daly lake at the divide is 1290 feet above the sea, and the portage across is only $1\frac{1}{4}$ miles. Following, to the north-east, a chain of lakes and streams, he came, on August 7, to the great lake before mentioned covered with a field of heavy ice, and he paddled for 117 miles between it and the shore. Very

near there he met Eskimos, and he followed down the outlet of the lake to Baker lake at the head of Chesterfield Inlet. This route passed through the centre of the Barren Grounds. He describes the open country as consisting in many places of mossy plains where the ground is not thawed on the surface in July, and the ice is protected by the moss from the influence of the sun. Trees cannot grow under such circumstances. In 1894 he entered from the south by Reindeer lake, and again left the forest near the water-parting of the Churchill. Mr. Caspar Whitney has also followed the musk-oxen to their homes, and has given his experience in a recent volume.

This region at the south and south-west is the hunting ground of the Yellowknives and Dogribs, tribes of Chipewyan stock, and the Eskimo wander into the interior from the Hudson Bay and Arctic coasts almost up to the height of land. These tribes live by fishing, and upon the caribou, and by hunting the musk-oxen for their skins.

The Canadian Parliament has passed very stringent laws to protect the game in these far northern regions from the incursions of those who go there for mere destruction. The Indians depend solely for existence on these wild creatures, and must perish by starvation if civilised men are allowed to go into the country to kill and exterminate the game.

This portion of Canada, of which the Barren Grounds form the north part, is practically unsettled excepting the few persons at the Hudson Bay posts, while it is roamed over by Eskimo, Chipewyans, and, at the extreme south, by Algonquins. The main fact concerning the Barren Grounds at the north seems to be that east of the Mackenzie basin and north of the drainage of the

Churchill the water-parting is elevated, and the land facing the Arctic Ocean and the northern part of Hudson Bay is exposed to the full sweep of the winds from the north.

The Mackenzie Basin

Next to the Mississippi the Mackenzie is the largest river in North America. It drains portions of the North-West Territories, Yukon, British Columbia, Alberta, and Saskatchewan, covering an area of some 677,000 square miles, and flows through nearly 17 degrees of latitude in a course, from its ultimate source, of nearly 2500 miles. Its sources, on the south, are the head-waters of the Athabaska, which originate on the eastern slopes of the Rocky Mountains, in the Yellowhead and Athabaska passes. Its waters, in the Athabaska Pass, rise close to waters flowing into the Columbia at the Boat Encampment. The sources of the Peace river, one of its great tributaries, almost touch those of the Fraser; and the source of another great tributary, the Liard, is within a few miles of the source of the Yukon. On the east it receives the waters gathered up in the Athabaska, Great Slave, and Great Bear lakes, and it is separated from the basins of the Churchill and Saskatchewan by narrow and low water-partings. It rises in the south at lat. $52^{\circ} 20'$, and it falls into the Arctic Ocean in lat. 69° . In its northern course it is known first as the Athabaska; from Lake Athabaska to Great Slave lake it is the Slave river, and from Great Slave lake to the sea it is called the Mackenzie, and is continuously navigable by steamers to the sea for a distance of 1120 miles. The Mackenzie river is nowhere less than half a mile wide; where the Liard falls in it is a mile and a quarter wide, and in its widest part it expands to three and four miles. It is

nowhere less than 7 or 8 feet deep in its length of over 1000 miles from Great Slave lake to the sea.

The valley of the Mackenzie is an alluvial plain bounded on the east by a more or less wooded region sloping down to the Barren Grounds and drained by the Coppermine and Great Fish rivers falling into the Arctic Ocean, and, south of them, by the Dubawnt and by the Churchill with its extensive tributary system flowing into Hudson Bay; on the west it is bounded by the Rocky Mountains, and on the south by the water-parting of the North Saskatchewan. The southern part of the Mackenzie basin is in Alberta, and is more naturally considered in this chapter than with the territories of the Winnipeg sub-basin. The Mackenzie has the drawback, in common with all rivers flowing north in these latitudes, that the upper waters thaw in spring before the lower reaches of the river are clear of ice. This is the frequent cause of floods, which, with the action of the ice, erode the banks where the rocks are soft, and carry down to the sea trees and other waste of the land to increase the area of the delta at its mouth.

Geology.—The valley of the Mackenzie is a continuation to the Arctic Ocean of that great interior plain of Manitoba, Saskatchewan, and Alberta, covered for the most part by practically undisturbed sedimentary formations of Palæozoic, Mesozoic, and Tertiary Age. The line of crystalline rocks, on its eastern border, starts from the western end of Lake Athabaska, and follows along the bank of the Slave river to Fort Resolution, midway on the southern shore of Great Slave lake. Crossing the centre of the lake, these rocks leave the Mackenzie far on the west, and are seen no more on its banks. The river issues from the western end of Great Slave lake, and inclines more to the westward; while the line of

Archæan rocks passes directly north, touches the extreme east of Great Bear lake, and stretches north where they are overlain by Cretaceous, Devonian, and the Keweenawan of the Arctic coast. The Northern Alberta portion of this basin is characterised by an extensive development of Devonian and Cretaceous formations superimposed one upon the other with a long interval or gap between. Both geological systems carry numerous materials of economic value, such as coal, petroleum, salt, natural gas, besides excellent building stones and clay materials for pottery and other industries. From Northern Alberta the Devonian enters the North-West Territories and spreads from the long northerly arm of Great Slave lake west as far as Fort Liard near the Yukon boundary, and northward to Great Bear lake (391 feet above tide) and along the Mackenzie valley to a point on the river 190 miles below Fort Good Hope near the Arctic Circle.

On the western slopes of this basin, along the Gravel river, Mr. Keele obtained a section of geological formations in which Cambrian, Ordovician, and Silurian formations were distinctly recognisable from the fossil evidence presented. Speaking generally, the same geological conditions exist as on the plains to the south. The soil is deep and well suited to the growth of crops wherever the climate permits, but as the region is for the most part covered with forest, it requires to be cleared and the lower land drained to prepare it for cultivation. The elevation of the valley is very slight. Lake Athabaska is 690 feet, Great Slave lake is 520 feet, Great Bear lake is 391 feet, Fort Simpson is 241 feet, and Fort Norman is 150 feet above the sea.

Physiography. — The water-parting between the Mackenzie and the North Saskatchewan runs diagonally to the south-west from the north-east corner of Alberta,

and thus one-third of the territory of Alberta is drained northwards by the head-streams of the Athabaska and Peace rivers. These two rivers, however, flow for the most part of their courses in Northern Alberta, and together with the Hay river form its main features; for all practical purposes it may be said that Northern Alberta is the Mackenzie basin continued as far south as 60° north latitude.

The southern part of the Mackenzie basin is for the most part an undulating plain. Immediately south and west of Lake Athabaska the large rivers flow in and out of the lake through wide deltas, and form a very low alluvial tract, often flooded by the rise of the rivers. Throughout the southern part, between the Peace and Athabaska rivers, it is a rolling plain thickly wooded and studded with numerous shallow lakes which, as they fill up with moss, become muskegs and marshes. Everywhere the rivers have cut deep valleys through the soft rocks. There are some ridges of higher elevation. The Birch mountains are a range or plateau 1000 feet above the plain, or 2300 feet above sea-level, extending for 100 miles between the lower reaches of the Peace and Athabaska rivers. The Buffalo Head hills, about 40 miles south of Fort Vermilion, on the Peace river, are a plateau elevated 1000 feet above the plain, and about 50 miles long by 25 miles wide. The hills near Lesser Slave lake are of the same height, and there are other detached ridges of similar elevation. Lesser Slave lake is 1890 feet above the sea, and the land falls with a gradual descent to the head of Athabaska lake. Athabaska Landing, close to the divide, is 1650 feet above the sea. North of the Peace river the land is higher and has more of the character of a plateau. Clark mountain, 3500 feet above the sea, is reputed to be the highest

land in the district of Mackenzie or western portion of the North-West Territories.

Hydrography.—The Athabaska, on the eastern and southern edge of the district, and the Peace, flowing diagonally through the southern portion of the Mackenzie basin from south-west to north-east, with their tributaries, make a network of streams which open out into lakes of all sizes, for the most part shallow. The largest is Lesser Slave lake, 61 miles long, with an average width of 8 miles, draining by the Lesser Slave into the Athabaska river. It covers an area of 484 square miles, and is seldom more than ten feet deep. The Wabiskaw river and lakes, draining northwards into the Peace, collect the waters of the south-east, and in the south-west the Hay river, a tributary of Great Slave lake, takes its rise.

The Peace river is a stream remarkable for many reasons, and especially because, taking its rise far within British Columbia and on the west of the Rocky Mountains, it flows eastwards, with a breadth of 300 to 500 yards, through that range by the lowest and most practicable pass—a veritable gateway of nature, a valley a mile wide between mountains rising 2000 to 4500 feet above it, or 4000 to 6500 feet above sea-level—through which, as seems fitting, Alexander Mackenzie first crossed to the Pacific. The Peace river is 905 miles long from the rise of one of its chief tributaries in Summit lake, at the crown of the Pacific-Arctic water-parting. There is a portage road there of only $7\frac{1}{2}$ miles long to the Fraser. It is there called the Parsnip river, and, flowing northward, meets the Finlay river at the “Forks.” The Finlay is 310 miles long. It is the larger stream, and the true Peace river. Its head-waters interlock with the sources of the Liard and of the Skeena and Stikine rivers. Calculated from its farthest source, the Peace is 1067

miles long. From the Forks it is called the Peace river, and flows in a general eastward direction for 757 miles to its discharge into Lake Athabaska. It is remarkable, also, because it flows through a rich agricultural country, and with a quiet, untroubled current, navigable up to Rocky Mountain Cañon beyond Dunvegan, save for one short break of two miles; this is at the Vermilion Falls, 220 miles from its mouth, where the river, at that point a mile wide, falls over a low limestone ledge in a drop of ten to fifteen feet at lowest water, but at high water the fall becomes much less. In its upper course the Peace flows through a broad valley 600 feet below the general surface of the country, but in its lower stretches the valley almost disappears.

The Athabaska (often called in old maps the Elk) river is considered to be the upper Mackenzie on account mainly of its general direction from its source. It is 776 miles long—not so long as the Peace. Like the Peace, it flows in a valley cut deeply into the land surface. In its upper course the valley is over 300 feet deep and two miles broad. For the first sixty miles it flows through the mountains, and a very heavily wooded country. Many mountain streams contribute to swell its volume, among which are the M'Leod and the Pembina. This latter stream skirts the water-parting of the North Saskatchewan, and at the Roman Catholic Mission of Lake St. Anne the two streams approach very closely. Below the Pembina the Lesser Slave river brings in the waters of Lesser Slave lake, and the Athabaska then becomes navigable by stern-wheel steamers drawing $2\frac{1}{2}$ to 3 feet of water.

Athabaska Landing is an important point on the great bend of the river, where it assumes its direct northerly course, and this is, at the present day, the entrance to

the Mackenzie basin; for there the road, 90 miles long, from Edmonton is connected by rail with Calgary. It is a Hudson Bay post and a busy station, as all supplies for the great northland pass through there. The steamer *Athabaska* plies throughout the stretch of navigable water accessible from this point. There are 166 miles to Grand Rapids, on the north and east, of unimpeded navigation. Up to Grand Rapids the river is from 250 to 400 yards wide, and flows in a valley from 300 to 400 feet below the general level of the plain.

At Grand Rapids commences a series of rapids and falls which render the river unnavigable for about 85 miles to Fort M'Murray, in which distance the river drops 360 feet, running between sandstone cliffs of a general height varying from 200 to 300 feet, and in one place 500 to 600 feet high.

Fort M'Murray is another important point in the Mackenzie valley, for it is not only the head of a long stretch of steamboat navigation, but it is at the junction of the Clearwater river, the main avenue of the canoe navigation of former days. Up the Clearwater is the Methye portage, $12\frac{1}{4}$ miles across to the Churchill, and down the Churchill is the Frog portage, 380 yards, to waters falling into the North Saskatchewan. In the old fur-trading days, when the brigades of voyageurs met on these key portages of the great western wilderness, and the wild scenery was lit up by the great camp fires, the arduous labours of the day were often forgotten in the merriment of the reunion of acquaintances; for, to be a voyageur, a cheerful disposition was the prime requisite, and a good canoe man had usually a good store of voyageur songs, and, whenever he had an opportunity, could show very wonderful steps in dancing.

Fort M'Murray is the starting-point of the Peace

river steamers, and navigable waters, 717 miles in aggregate length, are available from that point. There is a stretch of water to Fort Chipewyan on Lake Athabaska, 200 miles, and thence to Fort Smith on the Slave river, 102 miles long. In addition, the Peace river is navigable for 220 miles as far as Vermilion Falls, and Athabaska lake is 195 miles long; there are besides 40 miles of navigable water on the Clearwater. From Fort M'Murray the banks of the river continually decrease in height, until at Lake Athabaska they are only 3 feet high. The river expands to a width of from 400 to 800 yards, and deepens to permit of vessels drawing from 7 to 8 feet of water. The current runs steadily at about four miles an hour. The country is all level alluvial land, well wooded, and the soil is good, but there is much swampy land. It is a loamy clay suited for agriculture as far as Fort Chipewyan, where the hard Archæan rocks come out upon the right bank. As the river approaches the lake, it divides into many arms, embracing low marshy islands, and forming a wide delta of low land. It falls in at the extreme western end of the lake, and there also is the outflow of the Slave river; and, at a short distance down, the flood of the Peace river joins the Slave river, and the water flows into or out of the lake, according to the varying conditions of the seasons, through an extensive maze of lakes and channels.

Lake Athabaska is 690 feet above the sea. According to the geological survey reports of Messrs. J. B. Tyrrell and D. B. Dowling, published in 1897, this lake is 195 miles long; its breadth varies from 5 to 35 miles, and it covers an area of 2850 miles. At the west end it is shallow, but it is deep elsewhere, and it is navigable in its whole extent. The soil around it is generally rocky, and unfit for agriculture. On the north shore the

Archæan crystalline rocks come to the surface, and on the south shore are hard non-fossiliferous sandstones referable to the Keweenawan (a pre-Cambrian and probably Algonkian formation). Some land, however, near the fort has been cleared, and wheat, as well as all garden crops, has been raised with success.

Fort Chipewyan is on the north side of the lake, near its outlet, and is built on bare Archæan rock. This post, before and after its removal from the south shore, has always been a central and a favourite spot in the wilderness, and in the old days the chief traders who sojourned there took trouble to supply it with books and other things of the same nature to lend a little of the refinement of civilisation to this distant wilderness home. There is no want of food, for the lake abounds in fish and the country with game. In the fall of 1888, William Ogilvie records that the Hudson Bay people required 36,000 whitefish for winter use, the Roman Catholic Mission required 12,000, and the other residents required 30,000. He reports that nearly all of these were caught during the three weeks he was there. From 30,000 to 40,000 wild geese are killed every fall for winter use.

The Mackenzie River.—It is under the name of the Slave river that the Mackenzie flows out of Lake Athabaska. Its course is northwards, and about 20 miles from the lake it receives the waters of the Peace river. If that river be in flood, it flows over also into the lake by the Quatre Fourches river, but under ordinary circumstances the Quatre Fourches discharges into the Peace. At Grahame Landing, 102 miles down from the lake, the river drops 240 feet through a series of rapids which interrupt navigation for 14 miles to Fort Smith; from that point navigation is uninterrupted for over 1100 miles to the Arctic Ocean. A cart-road has been con-

structed on the west side of the river, and all supplies in transport for the lower river must be reshipped there. The Archæan rocks, which come out at the western end of Lake Athabaska, follow down on the east bank of the river as far as Fort Smith, where they finally strike away directly to the north. From Fort Smith the river flows with a slow current for 190 miles between low banks, and through a flat, wooded, alluvial country, until it falls into Great Slave lake, midway on the southern shore, near Fort Resolution. Fort Smith is a place to remember as the head of navigation from the sea, and it is as near as possible on the parallel of 60° north, on the boundary between these territories and the province of Alberta. About 20 miles down the Slave river the Salt river falls in—a stream with water rendered brackish by three or four salt-springs 20 miles from its mouth. The springs have formed evaporating basins, and the salt crystallises out perfectly pure, and is shovelled into bags and used all over the North-West without further preparation. Near the inflow of the Slave river into Great Slave lake is Fort Resolution, an important Hudson Bay post, where are missions of the Anglican and Roman Churches. The spring is later than at places farther north on the main river; for, as there is no current, the ice lingers in the lake until the end of June, and the country is rocky around it; yet garden vegetables are grown. The lake is about 300 miles long, with an average width of 46 miles. Its waters are very clear and very deep. It covers an area of about 10,100 square miles, and it is only 391 feet above the sea. Much interest attaches to this lake, for Back built Fort Reliance on the extreme eastern arm, and started thence on his expedition down the Great Fish river to the sea. Fort Rae, at its extreme northern point, was the English and Canadian inter-

national Polar station, and a Roman Catholic mission is established there. The western shore of the lake, marked by Devonian limestones, is well wooded with good spruce, with belts of Banksian pine, poplar, and birch, but the eastern and northern arms are practically wholly in an Archæan basin, and project into a tundra-like area connected with the Barren Grounds farther east. The Hay river is the most important tributary, and is 400 miles long, flowing in from the south.

From the western end of Great Slave lake, the river, thenceforth the Mackenzie, flows northward in a broad and deep stream. The banks are low and the country is level, covered with spruce and broken by many lakes and marshes. About 50 miles down is Fort Providence, where the Hudson Bay Company has a post, and the Roman Catholic Church a mission, with a church, orphan asylum, hospital, and school. The Grey Nuns, from Montreal, have the care of these latter institutions. Barley is grown here, and even wheat usually escapes frost, and many garden vegetables are raised, for the ice moves away earlier than from the lake.

Fort Simpson is the next post on the Mackenzie. It is 324 miles from Fort Resolution, on an island in the river, close to the junction of the Liard, and very nearly on the parallel of 62° . This is said to be the most northern point at which wheat will ripen, but it is not a very certain crop. Barley and garden vegetables are grown, and with good success. Cattle are kept, and are fed on the native grasses. The potatoes grown here are as large as those raised 1000 miles farther south. The timber is large, and consists of poplar, spruce, birch, and hemlock. The ice breaks up between the 1st and 15th of May, and the river does not close again until the beginning of November. In 1850 Lieutenant Pullen

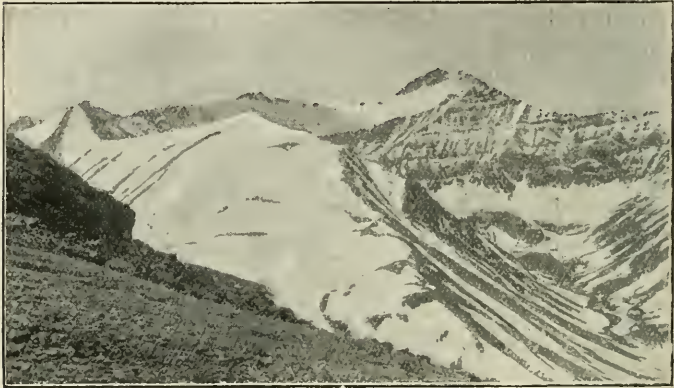
with two boats from H.M.S. *Plover*, which had entered the Arctic Sea by Bering Strait, went up the river and wintered at Fort Simpson, returning to his ship in the spring.

The Liard river is a very large stream. It rises in a number of lakes flowing into Frances lake, close to the source of the Pelly (Upper Yukon), and flows east, through the Rocky Mountains, in a course almost as long as that of the Peace. It is a turbulent and dangerous stream, but in its lower course it is navigable to Fort Liard, and flows through a densely wooded country, with good soil. Its name, Rivière aux Liards (Cottonwood or Poplar river), indicates the quality of land on its banks. At Fort Liard, 162 miles from its mouth, it is a mile wide. There the soil is a black loam. Wheat may be grown, and barley is a regular crop, and is used as feed for cattle.

Below Fort Simpson, as the Mackenzie approaches within 25 miles of Fort Wrigley, one of the flanking ranges of the Rocky Mountains rises to the east of it, and for several hundred miles its course is in a valley between two mountain ranges 3000 to 4000 feet high. The banks of the river are low, and the country is low to the mountains on both sides. The distance from Fort Simpson to Fort Wrigley is 134 miles, and thence it is 180 miles to Fort Norman. At times the mountains close in, and again they spread out and form a broad valley. At Fort Norman there are missions of the Roman and Anglican Churches. It is in lat. $64^{\circ} 41'$, and barley is grown here, whilst native grass is luxuriant. The Grand river enters the Mackenzie on the left before it reaches Fort Norman.

Near Fort Norman, Great Bear lake discharges by Great Bear river into the Mackenzie. The lake is irregular in shape: its length is 175 miles, and its

breadth varies from 25 to 45 miles; but if it were measured across by its opposite northern and southern arms, the distance would be 180 miles. It is underlain by rock-formations including Laurentian, Huronian, Algonkian, Devonian, and Cretaceous age. The area of the lake is 11,200 square miles, and its average depth exceeds 270 feet. It is open for only three months in the year. In 1873 Dease and Simpson built Fort Con-



GRAVEL RIVER, HIGH PEAK, MACKENZIE BASIN.

fidence at the extreme north-eastern point of the lake, and made it the headquarters from whence they carried on their remarkable explorations during three years. It was in lat. $66^{\circ} 53'$ and inside the Arctic Circle, but they found abundance of game. The lake was, and still is, full of fish; wild fowl were plentiful in their season, and caribou and musk-oxen were numerous. It was an admirably selected point, for they could readily reach the Coppermine river below most of the heavy rapids, and the Arctic coast was more accessible from there than from any of the points selected by Franklin or Back.

From Fort Norman to Fort Good Hope is 170 miles. This post is nearly on the Arctic Circle. Besides a Roman Catholic church and mission, there has been a convent of Sisters of Charity established there for nearly fifty years. Here are what are called the Ramparts of the Mackenzie. The river flows for 7 miles through a cañon of steep, overhanging rocks, 150 feet high. The broad stream narrows to half a mile, and flows with an even current and with



NEAR THE MOUTH OF THE MACKENZIE RIVER.

a depth of 350 feet. In 1887 a whale came up to this point from the Arctic Ocean, from which fact the depth of water in the delta may be surmised.

After passing Fort Good Hope, the river flows between banks sometimes 200 and 300 feet high. The country is still wooded on both sides of the river. On the east the trees are small, but on the west side the white spruce is from 6 to 18 inches in diameter. Black spruce, balsam, poplar, aspen, and tamarack grow to a fair size as far as Fort MacPherson.

Fort MacPherson is in lat. $67^{\circ} 26'$, and is the most

northern abode of civilised man on the Mackenzie. There is an Anglican and a Roman mission there. It is on the Peel river, 14 miles above the forks, where one branch flows towards the delta of the Mackenzie and the other into the Arctic Sea. The Hudson Bay steamer *Wrigley* makes this her last stopping-place.

The delta of the Mackenzie has not been accurately surveyed. The great river spreads out in many arms, and flows for 70 or 80 miles between very low banks through an alluvial plain. On the east branch the depth of water is 12 feet. Even here the forest follows the river, and the spruce is 12 to 15 inches in diameter. At Fort MacPherson may be seen the wonderful effect of the long solar day. A recent traveller reports that on 20th June the buds on the trees appeared, and on the 22nd they were out in leaf. Throughout July the temperature was 64° Fahrenheit through a 24-hour day of sunlight. At Fort MacPherson the territory of the Eskimo commences, and about 350 frequent the fort.

On the Arctic Ocean, 80 miles west of the westernmost mouth of the delta, is Herschell Island, the best shelter harbour on the coast. It is in lat. 69° 40'. Twelve United States whaling ships wintered there in 1895–96 with crews of about 1000 men. Supplies were sent to them via Bering Strait from San Francisco. It is a small island seven miles long by four wide. The tide rises there two or three feet, flowing from the east.

Resources.—The larger part of the area occupied by the head-waters of the Mackenzie basin is underlaid by Cretaceous rocks. At Isle à la Biche, 20 miles above Fort M'Murray, Devonian limestones first appear in the bottom of the valley of the Athabaska, and they are seen on both sides of the river, at the base of the bluffs on the banks, down to Lake Athabaska, about latitude

56° 50', thence northward to beyond the Arctic Circle. From Isle à la Biche the river begins to pass between banks of sand impregnated and consolidated by tar or pitch supposed to have originated in the underlying rock formations below. The tar exists in such quantity that it is drawn out by the sun and flows down the banks in viscous streams, forming pools of tar and tar wells 11 to 12 feet deep, whence it may be ladled up for tarring boats or roofs of buildings. These tar sands are 150 to 200 feet thick, and they extend at intervals for 53 miles below Fort M'Murray, or through a total distance of 73 miles. Similar tar springs are met with in places far down the Mackenzie, almost to the sea, and on the shore of Lesser Slave lake. For a long distance on the Athabaska a black petroleum-bearing sandstone underlies these banks of tarry sands.

What these tar sands may yet mean does not clearly appear, but several borings have been made to a depth of over 2000 feet, whilst experiments have been made with a view to utilise the "tar" or the sands where they are thoroughly impregnated. It can hardly be supposed that all the petroleum has escaped to the surface, but all that is now known is that everywhere, over an area of probably 150,000 square miles, are indications of petroleum-bearing rocks, in which the amount of crude petroleum sufficient to saturate the area examined would be at least 6.5 cubic miles.

Similar indications are found, over the whole area, of the existence of coal. Beds of lignite four feet thick occur at the great bend of the Athabaska, and may be seen for miles 150 feet up in the cliffs along the river. From Buffalo river down past Fort M'Murray seams of lignite also occur. Lignite is reported at many places in the interior, on the Peace river and on Lesser Slave lake,

and, as in Alberta, these lignites change into true coal as the mountains on the west are approached.

At Grand Rapids, on the Athabaska, natural gas is found, and the water is disturbed by water bubbling up, or, as the voyageurs say, "boiling." On the banks the men light it to cook their food. This is of importance chiefly as a possible indication of petroleum, for the gas cannot as yet be utilised in so remote a locality. On the Clearwater river mineral springs have been found, and also at a place on the Athabaska called La Saline, where the bank is encrusted with saline deposits. On the Peace river and some of its tributaries gold has been found on the bars. Mr. R. G. McConnell, of the Geological Survey, found "colours" of gold on most of the streams by washing a few handfuls of sand in a frying-pan.

Although the country is timbered throughout, the trees are not large over much of the territory under review. They are all trees of the great northern forest, not densely wooded, described elsewhere, and vary in size, according to local circumstances, from one foot to two feet in diameter.

The resources of the lower Mackenzie valley are similar to those of the territories farther upstream. The Cretaceous and Tertiary strata contain coal seams, whilst the Devonian and other Palæozoic formations have salt, petroleum, natural gas, and many other materials of economic value. Nearly all the waters and lakes are stocked abundantly with fish, whitefish and trout, the latter of very large size, and in the river a species of fish concerning which there is so much uncertainty that it is called the *inconnu*. The following account of it, contributed by Professor Prince, may be relied upon as accurate:—

"The *Inconnu* (*Stenodus Mackenzii*), sometimes called

the Mackenzie river salmon, is found in most of the large rivers of the north-eastern portions of the continent bordering on the Arctic circle. It is neither a salmon nor a whitefish, though in general outline it resembles the latter. The projecting lower jaw, in contrast to the shortened lower jaw of the whitefish, and its great size, twenty to fifty pounds weight, are characteristic. The tail is deeply forked, the scales somewhat diminutive for so large a fish, while the glittering silvery coloration adds to its imposing appearance. Its flesh is superior, and it spawns in the late fall. In certain rivers in northern Russia a closely allied species occurs."

Coal has been found in localities at distances from each other all over the valley, but so far as it has been examined along the rivers it is lignite. Other seams have been reported at various places in the interior, and it is more than probable that bituminous and anthracite coal will be discovered in the region nearer the mountains. Near Fort Norman two seams are exposed. The upper one has been burning for more than 125 years. Sir Alexander Mackenzie saw it when he passed down in 1789 on his famous voyage of discovery. Tar springs are met with on Great Slave lake, and bituminous limestones occur in many places, indicating the existence of petroleum. The extensive deposits of *salt* have already been noted, and also the fact that the whole country is wooded. Moose and caribou are plentiful, and a few wood bison have taken refuge in these forests.

Agriculture.—Amongst the samples of wheat grown in the Mackenzie river valley and exhibited in the collections of the Central Experimental Farm Museum at Ottawa, one is labelled by Dr. William Saunders, Director, as follows: "*Ladoga Wheat, grown at Fort Simpson on the Mackenzie river, 62 pounds to the bushel.*"

The country on the Peace river, at the southern extremity of the Mackenzie basin, has awakened the enthusiasm of all who have seen it. In his evidence before a committee of Parliament, Mr. Christie, formerly a chief factor of the Hudson Bay Company, described it as "the finest country he had ever seen," and he was then



PEACE RIVER.

living on the St. Lawrence. The soil, he said, was a beautiful dark loam. Crops have been raised there for 100 years, and wheat is as certain as in Manitoba. It is an open, park-like country, and horses winter on the open prairie, and the Chinook winds keep the wild grasses clear of snow for them as in Central Alberta, 500 miles to the south. Wheat is grown not only at Dunvegan, but at Fort Vermilion on the Peace, farther north in lat. 58° , and the country is productive farming land along the valley for hundreds of miles.

This is beyond question, for large farms are worked there.

Mr. Elihu Stewart, formerly Superintendent of Forestry for Canada, informed the writer that on July 15, 1908, at Fort Providence, near Great Slave lake on the Mackenzie river, where the sun in summer was visible for twenty hours out of the twenty-four, he saw wheat in the milk, potatoes in flower, peas fit to use, tomatoes, turnips, rhubarb, beets, cabbage, onions, and other garden vegetables, whilst strawberries had been ripe there some time, and the people had currants and gooseberries. Along the Mackenzie river, spruce grew clear to the shores of the Arctic Ocean, and other trees, aspen, white poplar, balm of Gilead, and birch, grew as far north as Fort MacPherson. Mr. Conroy, in his evidence before a committee of Parliament sitting at Ottawa, made the statement that he had "seen just as good vegetables growing at Fort Good Hope, fourteen miles outside the Arctic Circle, as he had seen in the province of Ontario." Before a similar committee on agriculture and immigration, R. E. Young, D.L.S., indicated a number of definite localities north of 62° north latitude, north of the Saskatchewan watershed and within the Mackenzie basin, where wheat and other cereals, besides vegetables, were successfully raised. "Canada's Fertile Northland" contains evidence regarding the agricultural capabilities of the country around Forts Simpson, Vermilion, Providence, Liard, Dunvegan, and Chipewyan, on the Athabaska, Peace, and other rivers, besides Stanley Mission (150 miles north of Prince Albert), Cumberland House, Ile à la Crosse, and other localities. He had calculated that there was in the northern country quite as much land available for successful agricultural pursuits as there was now settled west of Winnipeg. He also

saw the bank of burning coal on Slave river, near Fort Norman, reported burning in 1789 by Mackenzie who discovered that region.

Climate.—It has been pointed out elsewhere that the isothermal line of summer heat sweeps very far northward along the Mackenzie valley, and this fact, taken with the long days of summer, draws the limit of growth of cultivated crops very far to the north. The line of grasses and of forest stretches through the valley north into the delta of the Mackenzie and close to the shore of the Arctic Ocean. The causes of this have been pointed out elsewhere, and are briefly: the low elevation of the land, combined with the influence of the Chinook winds from the Pacific, and the presence of large bodies of water. Very little can be predicated generally concerning the climate and productions of a region extending northward through fifteen degrees of latitude. The subject has been incidentally treated in connection with the description of successive stretches of the river to the sea. The records of the growth of crops at different points afford important indications of climate. The winters are decidedly severe, but, as explained in a previous chapter, spring seems to open simultaneously over an immense reach of territory to the north-west, and there is sufficient heat in summer to ripen wheat up to latitude 60° north. There does not seem to be any great difference in the severity of the winter frost or the heat of the summer; such differences as exist are in the direction of shorter summers and earlier frosts.

Fort Chipewyan, in lat. $58^{\circ} 43'$, may be taken as a central point, and Mr. Stupart, the Director of the Magnetic and Meteorological Observatory at Toronto, has supplied the following meteorological table:—

FORT CHIPEWYAN METEOROLOGICAL TABLE

For a Period of 10 Years.	Average Mean Temperature.	Absolute Maximum, 10 years.	Absolute Minimum, 10 years.	Total Precipitation in inches.
January . . .	-14·9	45	-49	0·68
February . . .	-10·6	46	-50	0·68
March . . .	4·5	47	-41	0·81
April . . .	24·7	56	-22	0·67
May . . .	41·9	79	5	0·41
June . . .	55·6	90	24	1·51
July . . .	61·4	84	26	3·19
August . . .	57·9	89	25	1·16
September . . .	45·1	79	13	1·58
October . . .	30·0	65	-9	0·96
November . . .	13·0	56	-33	0·73
December . . .	-2·3	49	-41	0·73
The Total Precipitation				13·11

Some indications may also be gathered from the dates of the opening and closing of navigation at various points as follows in the records of eleven years:—

Locality.	Latitude.	Navigation	
		Opens.	Closes.
Fort M'Murray . .	56° 40'	April 18 to May 18	Oct. 24 to Nov. 14
Fort Simpson . .	62°	May 1 to May 14	Nov. 7 to Nov. 30
Fort Norman . .	64° 54'	May 9 to May 28	Nov. 7 to Nov. 18

There being no current on Great Slave lake to carry away the ice, it lingers there until the middle of June.

Settlements.—The settlements in this region are all collected around Hudson Bay posts or mission stations. Fort Chipewyan is a large post. It is the seat of an Anglican bishop and of a Roman Catholic bishop, and there is a convent of Grey Nuns. At Fort M'Murray is another Roman Catholic mission. At Little Slave lake,

beside the Hudson Bay post, there are missions of the Anglican and Roman Churches, with schools. On the Peace river, at Vermilion, there are missions of both churches, besides the Hudson Bay post. At Dunvegan there is an important Hudson Bay post, and missions of both churches. This post is the garden of the North-West. Every kind of grain and garden vegetable is grown there. Mr. Ogilvie, in his visit in 1891, saw the crops, and describes the large size of the vegetables grown. As a note of the conditions existing, he remarked two sun-flowers which measured fourteen inches across the seed disc. All along the Peace these favourable conditions exist. Isotherms for summer temperatures in Canada, from many years' records of the Meteorological service, show "the great northern 'loop' of the summer isotherm of 55° , which with other influences makes cultivation of cereals even in the Mackenzie river valley possible." Ploughing at Dunvegan commences about 14th April, and potatoes are planted at the end of April.

Communications.—A sated globe-trotter in search of new fields may be interested to know that the land of the midnight sun in northern Canada is now within twenty-three days of comfortable travel from Ottawa. There are steamers on the Mackenzie down to Fort MacPherson on the delta; and the *Wrigley*, plying upon the last stretch of the river, is a propeller with 80 feet keel and 14 feet beam and draws 6 feet.

	Days.
Ottawa to Calgary—Canadian Pacific Railway	4
Calgary to Edmonton—Canadian Pacific Railway	1
Edmonton to Athabaska Landing, 90 miles by waggon	3
Athabaska Landing to Grand Rapids by steamer <i>Athabaska</i>	1
Grand Rapids to Fort M'Murray by horses	3
Fort M'Murray to Fort Chipewyan by steamer <i>Grahame</i>	1
Fort Chipewyan to Grahame Landing by steamer <i>Grahame</i>	1
Grahame Landing to Fort Smith, 14 miles by horses	1
Fort Smith to Fort MacPherson by steamer <i>Wrigley</i>	8

History.—French fur-traders had established posts throughout the region now known as Manitoba and Saskatchewan, and had even pushed on as far as the foot of the Rocky Mountains. After the cession of Canada to England, adventurous merchants of Montreal took up the enterprises interrupted by the war, first individually and then in concert as the North-West Company, and extended their operations into regions far beyond the French explorations. The English on Hudson Bay were sitting quiet at their posts waiting for the natives to come; but the Montrealers pushed their enterprises with such vigour that the Hudson Bay Company were stirred to extend their posts into the interior.

The French followed the Saskatchewan and its southern branch, for they were aiming towards the Missouri, whilst the Montrealers reached out towards the north. Fort Cumberland was established in 1772 by Joseph Frobisher, and he intercepted at Frog Portage a large band of natives going to Fort Churchill to trade. He bought all their furs, and made such a successful trade that he called the place "Portage la Traite." He was the first white man on that portage and on the Upper Churchill river. His brother, Thomas Frobisher, built a post at Isle à la Crosse in 1775, and Peter Pond, another Montrealer, pushed farther west and crossed Methye Portage in 1777, and the following year established a post on the Athabaska river (*Rivière à la Biche* or Elk river) about twenty miles from the lake. From there he sent Leroux and Grant to Great Slave lake and river, where they established the posts now called Fort Resolution and Fort Providence. On the formation of the North-West Company what is now the south-western part of the North-West Territories and northern Alberta, was allotted to the care of Alexander

Mackenzie, who sent Boyer, a French Canadian, to establish a post on Peace river and one on Lake la Martre, north-west of Great Slave lake. He had formed the design of following the great river to the Arctic Ocean, and he left his friend Roderick Mackenzie in charge. It was this latter Mackenzie who built the first Fort Chipewyan on Lake Athabaska. It was on the south side of the lake, and was finished during Alexander Mackenzie's absence in 1789. In 1820 the post was moved to its present site. It will be seen, therefore, that some of these posts have a history far more ancient than most of the cities of Canada, and that the discovering and opening up of the Mackenzie basin was effected by merchants from Montreal under the English régime, though many French Canadians were associated in these enterprises.

Arctic Canada (Franklin)

Arctic Canada, also known as the district of Franklin, though not officially, comprises all the islands and lands of the Arctic Archipelago lying east of the 141st meridian, marking the most westerly boundary of the Dominion of Canada in the Yukon, and west of the meridian marking the most westerly boundary of Greenland, under the control and jurisdiction of Denmark. Theoretically, it ought to include all the lands and territories within the Arctic Circle, and whilst portions of these have already been described, further descriptions will be specially devoted to the archipelago itself. These islands were the possession and property of Great Britain until September 1, 1880, when, with and by the advice of Her Ministers, and Lord Peel, Her late Majesty Queen Victoria (whose memory is so deeply and sacredly

cherished throughout Canada) by an Imperial Order-in-Council, they were transferred to the Parliament of Canada to legislate for and control.

The Arctic Circle is that imaginary line drawn across the face of the northern hemisphere about latitude $66^{\circ} 30'$ north. Its course across Canada is from the western boundary of Yukon Territory, some 220 miles south of Demarcation Point on the 141st meridian, to a point along the eastern shore of Baffin Island, where the 62nd degree of west longitude crosses $66^{\circ} 30'$ north latitude, and thus stretches nearly 80 degrees from east to west, all within Canadian territory. The circle enters Yukon Territory, crosses the head-waters of the "Big Black" and "Porcupine" rivers, divides the Peel river into two sub-equal parts, crosses the Arctic Red river, the Mackenzie (a little below Fort Good Hope), runs north of and parallel to Hare Indian river, traverses the northern portion of Great Bear lake some 200 miles south of Franklin Bay, thence south of the site of Fort Confidence. The Arctic Circle then crosses the Coppermine river about 140 miles from its mouth, and for the first time strikes the waters of the Arctic Ocean (from the west) at the head of Bathurst Inlet, near longitude 108° west, then to Back's river some 30 miles from its entrance into Franklin lake, and crosses the northernmost corner of Repulse Bay, south of Rae's Isthmus, crosses Lyon Inlet and the southern portion of Melville peninsula where it leaves the mainland of Canada, crosses Fox Channel north of Winter Island and runs across Baffin Island, over Nettilling lake to the head of Cumberland Sound, and leaves the eastern shores of the island to enter the waters of Davis Strait and reaches the coast of Greenland.

Within Canada, the Arctic Circle stretches for 2210

miles, of which 2060 is land and some fresh water, and 150 miles are salt waters.

Thus across Canada, the Arctic Circle passes over the Yukon, 220 miles; across the district of Mackenzie, 700 miles; and across Keewatin, 700 miles; in all 1620 miles across the northernmost mainland of the Dominion. Besides this course the circle crosses Fox Channel, where it measures 150 miles, and Baffin Island 440 miles—thus covering, all told, 2210 miles of Canadian territory.

GENERAL COURSE OF THE ARCTIC CIRCLE IN CANADA

Across Yukon	200 miles	} mainland
„ Mackenzie	700 „	
„ Keewatin	700 „	
„ Fox Channel	150 „		salt water
„ Baffin Land	440 „	land and fresh-water
„ Canada	<hr/> 2210 miles.	

FRIDTJOF NANSEN has furnished excellent data on the Arctic regions. The Arctic Ocean is a branch of the Atlantic Ocean, forming a large gulf or deep depression northwards between Norway and Greenland. It has a quite narrow communication with the Pacific ocean through Bering Strait, 49 miles broad and only 27 fathoms deep. The Polar Sea is quite shallow along its whole margin, a shallow submarine plateau extending some distance northwards from the North American continent in Canada, as well as from the Eurasian continent. Along the whole Canadian coast, its depth is less than 100 fathoms. Its northern limit is not known on the Alaskan side. West of Greenland there is a gulf extending from the Atlantic Ocean for 1170 miles northward into the Arctic region, in its southern part called Davis Strait, in its northern, Baffin Bay. Like the Arctic Sea it has a submarine

ridge or barrier in the south, whilst it is very deep farther north. Davis Strait is in its narrowest part, between Holstenborg, in Greenland, and Cumberland Peninsula (Baffin Land) 160 miles wide, and only about 120 fathoms deep. Baffin Bay, somewhat broader and very deep, is in communication with the Polar Sea by the narrow channels of Smith, Jones, and Lancaster Sounds. Due to the rotation of the earth a comparatively warm current runs into the Arctic Ocean on the right or eastern side, whilst on the left a cold current runs out. The northern branch of the Gulf Stream keeps the same depth even far north in the Polar Sea, and the temperatures of the water are between 32° and 38° Fahrenheit. The Polar Ocean receives another, though comparatively insignificant, contribution of warm water through Bering Strait, where the temperatures are from 37° to 48° Fahrenheit. In Davis Strait a current runs north on its east side along the west coast of Greenland, consisting partly of warm Atlantic water, partly of water from the East Greenland Polar current, which rounds Cape Farewell and runs west and north-west along the western coast, carrying drift-ice with it for some distance, until the floes are broken up and melted, exposed to the warmer Atlantic water, and they seldom come farther north than Godthaab, in about 64° N. On the west side of Davis Strait a cold Polar current flows out from Baffin Bay southward along the east coast of Baffin Island, carrying much drift-ice as well as Greenland icebergs, out past Newfoundland. This Polar current is not only formed by the water running north on the east side of Davis Strait, but it receives also contributions through Smith Sound, Jones Sound, and Lancaster Sound, where the currents run into Baffin Bay. In Davis Strait and Baffin Bay ice conditions in this arctic sea are usually bad, but in good seasons the west

coast of Greenland is nearly free of ice as far north as Smith Sound. Along the east coast of Baffin Island and Labrador, masses of floe-ice are carried far south. The distribution of ice varies during the year, due to the melting powers and variation of solar heat, both in summer and winter, but also to a great extent on account of seasonal changes of winds and currents. Further observations on this subject are needed. The interior Polar Sea is mostly covered with floating ice, which does not form a continuous or unbroken ice-sheet, as it is always broken up into floes by the winds and tidal currents. The ice is in constant motion, mainly on account of the winds. Changing tide-currents, principally at spring-tide, together with changes in direction of wind, give rise to pressures, the breaking up of the ice-field, piling up of the ice in ridges and hummocks. The average direction of the winds during the year is from the Siberian and Bering Strait side towards the Greenland side of the Polar Basin. The drift-ice is consequently yearly being carried across the Polar Sea in this direction, and is either carried southwards along the east coast of Greenland, or is choked up against the north-east coast of Greenland, Grinnell Land, and other portions of the Canadian-Arctic Archipelago, perhaps at last to find its way out through some of the channels.

Icebergs.—These are quite different in origin from the sea-ice or floe-ice. They come from the land and are formed from glaciers. Most of those affecting Atlantic shipping are formed in the glacier fjords of West Greenland. On the west coast of Greenland, icebergs drift northward until they are all carried across Davis Strait or Baffin Bay into the Labrador current, which floats them southward into the Atlantic Ocean, where they form a well-known danger.

Climate.—Our knowledge of the climatic conditions of the Arctic regions is so deficient that it is useless to make generalisations. Atmospheric pressure and winds regulate movements of currents and drift-ice, also the temperatures and precipitation, which in turn regulate ice formation and accumulation. At the same time the temperature, the currents, and the distribution of ice affect the winds.

Arctic Winds taken as a whole cannot be said to be very strong, and accordingly the Arctic regions cannot be described as very windy. On the outskirts of Greenland and other land with ice-cap and land on one side and open sea on the other, strong gales may be frequent, especially in winter. Such gales bring sudden changes of temperature, and rises of more than 35° Fahrenheit in less than a day are not uncommon. Fogs and precipitation are frequent. Over the Polar Basin, in the interior, the climate is very different. Over these extensive plains of ice-covered sea, the climatic conditions are very uniform and have great stability. Gales are comparatively rare and never strong. The same clear weather, especially in the winter, with comparatively little wind, may last almost continuously for weeks or even months. The temperature varies very little, though a strong wind nearly always brings a rise of temperature. Fogs are only formed in the late summer, when there is much fresh water in ponds on the top of the ice, and many open channels between the floes.

Arctic Temperatures.—Whilst the coldest temperature ever experienced on the earth was -90° Fahr. (-68° Centigr.) in Verkhoyansk, in eastern Siberia, only some 50 miles north of the Arctic Circle, the lowest temperatures recorded in the Polar Basin as far north as 85°

and 86° N. was only -63° Fahr. Instead of *one* pole of cold there are *three*, one of which is in Canada, namely, north of the Parry Islands. The other two are: one in the interior of Greenland, the other in north-eastern Siberia (north of Yakutsk).

Arctic Flora.—The distribution of vegetation in the Arctic region is greatly influenced by the temperature of the summer. The temperature of the winter is not of much importance. Thus the line of forest can be said nearly to follow the July isotherm of 50° Fahr. In arctic Canada, north of the line of forest, there are dwarf birches, willows, and other low shrubs, besides a quantity of Arctic flower grasses, mosses, and lichens.

Arctic Fauna.—Animals are perhaps less influenced by the climate than plants. In the Arctic seas there is an abundance of lower animal life on the bottom as well as at intermediate depths even in very high latitudes, though it decidedly decreases with the latitude or perhaps rather with the distance from the open sea. Fishes are not very numerous and birds do not occur in a large variety of species in the Arctic regions, but there is often a great abundance of individuals. In summer straggling birds may probably be found everywhere inside the Polar Basin.

Mammalian life is found on most of the Arctic lands, as well as in the sea. Of land animals, the polar bear and the polar fox are most widely distributed. The reindeer has also a circumpolar distribution. The reindeer does not go so far north as the musk ox, which now, however, only occurs on the north-east coast and the north coast of Greenland and in Arctic Canada, though in earlier periods it had a circumpolar distribution.

In the Arctic seas there is more mammal life than in

any other part of the ocean, and here we even find some of the largest animals which ever lived, the whales. The best-known whale by name is the Greenland whale or the "right whale," which is very valuable on account of its long whalebone. It was once abundant and had a wide distribution, but is now nearly extinct. The most Arctic of all whales is the narwhal or sea-unicorn, which goes far into the ice-covered sea, and occurs in the Polar Basin as far north as 85° N., and probably much farther. The walrus (*Odobænos rosmarus*) is a circumpolar Arctic animal, but is now nearly extinct in many places. There are several more or less Arctic species of seals: the hooded seal, the saddle back or harp seal, the bearded seal, and others. The most Arctic species is the ringed seal (*Phoco fetida* or *hispida*), which straggles far north into the Polar Basin at least north of 85° N.

Arctic People.—The human race is distributed along the whole fringe of land within the Arctic Circle. The most polar of all people are without doubt the Eskimo.

Exploration.—Dr. A. P. Low, explorer and geologist, whose work in Labrador has been described, made a cruise to Hudson Bay and northward during the years 1903–4 in the steamship *Neptune*. The results are embodied in a volume addressed to the Honourable Minister of Marine at Ottawa and published in 1906. Following the coast of Labrador, Low visited Dominoe Bay, Port Burwell (free of ice early and late in the season), entered Ungava Bay, where the heaving tides of the bay exhaust themselves in the passages between the Button islands. The shores of Cumberland Gulf consist of high hills of gneiss and granite, 500 to 1000 feet elevation, with mainland mountains some 2000 feet high, showing less marked glaciation than in Labrador to the south. Blacklead Island is the successful central mission station for 500

Eskimos under the Rev. J. Peck, and dependent on the whaling stations of Blacklead, Kekertan, and Cape Haven. Seal, bear, wolf, fox, and walrus, besides white whale hunting, form the chief occupation. Frobisher Bay, Resolution, Monumental, and Lady Franklin Islands, and the south shore of Baffin Island were passed, and Grinnell



CAPE HAVEN WHALING STATION, BAFFIN ISLAND.

glacier sighted. On the north side of Charles Island hundreds of walruses were seen sporting in groups. Cape Wolstenholme and Erik Cove, an excellent harbour, were then visited, after which the *Neptune* steamed westward along the north side of Digges Island, and then northward to Fox Channel and Seahorse Point on Southampton Island, at the junction of the Archæan granites and gneisses with the Palæozoic limestones. Winchester Inlet proved to be a good harbour, and the surrounding country is very typical of that bounding the whole of

the north-western part of Hudson Bay. Archæan crystalline rocks in long, low, and gently rounded hills with wide shallow valleys between, exhibited intense glaciation, the abrasion of the great ice-cap having reduced the general surface to as near a level surface as is possible.



CONTORTED GNEISSES, FULLERTON.

Fullerton, the winter harbour of this region for whalers, Chesterfield Inlet, Bowell Island, were reached. The ship navigated Chesterfield Inlet on October 8, 1903, and went into winter quarters at Fullerton.

During 1911-12 exploratory work within the Arctic Circle was in progress by V. Stefansson's expedition. It resulted in a more precise location of Horton river and its mouth. This river enters Franklin Bay in the same latitude as Cape Parry (70° N.), and not at the

head of the bay near Langton Bay. A second expedition under the same explorer set out in July 1913 and ended disastrously in January 1914. The *Karluuk*, working in conjunction with two other vessels, was to have explored the region west of Parry Islands, sailing north about the 141st meridian until checked by ice or the discovery of land. She had on board a staff of scientists and equipment for routine work in the departments of zoology, botany, meteorology, oceanography, etc. The ship, however, was frozen in at an unexpectedly early date 15 miles north of the Colville river. She subsequently drifted for 110 days in a westerly direction, and, encountering heavy gales, sank near Herald Island on January 11, 1914, after drifting about 800 miles. This misfortune resulted in the loss of several of the members.

Terrestrial Magnetism.—The rotation of the earth is probably the cause of its acting as a huge magnet with two poles, one near the north pole and the other near the south pole. The north magnetic pole lies beneath the earth's surface on Boothia Peninsula in Canada. Magnetic variations, east and west or in right line with a certain practically neutral, though narrow zone, north and south of Lake Superior at present, are ascertained by experiment coupled with astronomic observations as a check.

Magnetic Pole.—Magnetic observations were first made in northern Canada by British Naval officers. In 1819–20 Colonel Sabine accompanied Parry in search of the north-west passage, and set up a magnetic observatory on the south coast of Melville Island where he determined the values of the magnetic elements. He ascertained that the compass was pointing $127^{\circ} 48'$ east of north in his determination of *declination*. He further ascertained that

the *inclination* was $88^{\circ} 42'$, and the total force was 0.5644 units. It was Ross who in 1831 located the "magnetic pole" on Boothia Peninsula, not far from where the ill-fated expedition of Sir John Franklin met its tragic end in 1845. From 1847 to 1859 magnetic data were gathered by Sir John Richardson during his expeditions in search for Franklin, and, though a north-west passage was discovered, it was fully demonstrated how futile would be any attempt to commercialise it.

It remained for Roald Amundsen to make his successful north-west passage in the *Gjøa* in 1905-1906, when he again located the "magnetic pole" not far from where Ross had placed it in 1831, and further indicated that it was continually changing in position.

The great Archæan plateau of Ellesmere Island, about 3000 feet elevation, appears to have had sedimentary formations planed off its surface. Great dislocations occur in strata on Hayes and Jones Sounds; also at Vendomfjord and Bayfjord with Eureka Sound as centre. A "rising in the land" appears to be in progress during the present geological epoch. Silurian, Devonian, Triassic, and probably younger formations, are all involved in the dislocations and faulting, besides earth movements, throughout Ellesmere Island. Terraces are common in Hayes Island, Fort Juliana, to a height of 570 feet. Bedford Pim Island has evidence of a terrace to a height of 344 feet.

Fjords occur in northern Canada, along the east coast of Ellesmere Island, along Smith Sound, in Kane Bay, and Robeson Channel, also on the west coast of Ellesmere Island, at Greeley Fjord, as well as on the north side of Bathurst Island. Besides these are the numerous fjords of the Labrador Peninsula, along the north shore of the St. Lawrence; whilst the coast of British Columbia is

greatly cut up by bays, gulfs, inlets, and fjords penetrating inland to great depths.

North-West Passage.—To Amundsen is due the credit of having been the first Arctic explorer to make the North-West passage. From June 16, 1903, when he left Christiania aboard the *Gjøa* in his memorable journey, to August 31, 1907, when his good ship reached Cape Nome, south of Cape Prince of Wales in Alaska, the calm, collected, and persevering Arctic explorer and geographer wended his way through the maze of islands in the frozen and open waters of the north, taking copious notes of incalculable value to mariners, geographers, and astronomers, including observations on the magnetic pole and related subjects. Steaming in a westerly direction about latitude 60° north, Amundsen reached Cape Farvel on July 9, and proceeded round the west coast of Greenland, passed Zukkertoppen, Godhavn, and Wolstenholme Sound about lat. 77° N. Thence, in a south-westerly direction across Baffin Bay in its extreme northerly expression to Lancaster Sound, he passed Cape Horsburgh (August 19) and Cape Warrender, in North Devon, entered the Sound and Barrow Strait; then he proceeded in a due southerly course along Peel and Franklin Straits between North Somerset and Prince of Wales Island (August 29), and entered James Ross Strait between Boothia Felix Peninsula and King William Land (September 2, 1903). Here is the location of the "magnetic pole," on the eastern shore of this strait in Boothia Felix Peninsula, and of Gjøahavn in a small bay near the south-eastern corner of King William Land. The route followed by Amundsen and his staff during the three summers spent in making the North-West passage was continued round King William Land, between it and the continent, by way of Simpson Strait, across Queen

Maud Sea, through Dease Strait, south of Victoria Land and Coronation Gulf; and along Dolphin and Union Strait south-west of Wollaston Land, he passed Cape Parry on the mainland, Nelson Head in Baring (Banks) Land, reached Franklin Bay, Cape Bathurst, crossed Mackenzie Bay, reached the delta of the Maekenzie river, the journey lasting from the 13th day of August to the 2nd day of September. He thus accomplished the task of making the North-West passage with a ship. Amundsen proceeded to King Point and Herschell Island, whence he undertook an overland journey to Eagle City on the Yukon river below Dawson City, the capital of the Yukon territory.

Arctic Canada is in character much like Siberia, but somewhat more mountainous, consisting of low, barren, undulating plains, with tundra intervening between the northern forest limit and the desolate Polar shores, the whole region being intersected by great rivers, fjords, sounds, and islands. These islands are comparatively low and have generally more or less rounded mountain forms. There is nowhere sufficient precipitation to form an inland ice, though on some islands, especially in the east, there are great local glaciers, *e.g.* Baffin Land, North Devon, Ellesmere Land, and Grinnell Land. The last named, the northern part of which is also called Grant Land, is, besides Greenland, the most northern land visited by man. It rises to elevations of 2000 and 3000 feet. In this land (in Lady Franklin Bay, $81^{\circ} 45' N.$) is found the most northern deposit of coal, with a fossil tertiary flora, including 30 species of plants, pines, birch, poplar, elm, and hazel, indicating a fairly warm climate.

The Bruce Mountains, in the Arctic archipelago, from 4000 to 5000 feet elevation, form the highest land known in Arctic Canada, also styled, district of Franklin.

The Coast-Line.—Demarcation Point, on the 141st meridian of west longitude, is the most westerly point of Canada on the Arctic Ocean. The boundary separating it from Alaska runs south along that meridian until it strikes the summit of the Coast Range. Demarcation Point is 145 miles west of the mouth of the Mackenzie river. Thirty miles west of the general course of the lower Mackenzie the last spurs of the Rocky Mountains close in the valley. East of these mountains the whole interior of the continent slopes with a gentle incline down to the Arctic Ocean, so that there is an uninterrupted stretch of steamboat navigation, from the mouth of the Mackenzie river, of 1118 miles to Great Slave lake, which is 520 feet above the sea.

The continental coast-line of Canada on the Arctic Ocean follows approximately the parallel of 70° north latitude; Bellot Strait, in lat. 72°, at the end of the projecting peninsula of Boothia, marks the most northerly point of the mainland. The coast is uniformly low, and is bordered by low cliffs of frozen clay and sand, or eastwards as far as Coronation Gulf by flat limestones. It may be a melancholy coast, but it is not a storm-beaten one, for the masses of ice to the north, never very far distant, and always ready to close down with a strong wind, protect the coast from such tremendous surges as batter Labrador with the gathered momentum of 2000 miles of ocean.

North of the continent is the immense Arctic archipelago, forming part of the Dominion and included in the provisional district of Franklin, laid down on the maps under various names—the more northern islands as the Parry Islands, and those nearest the coast as Banks Land, Prince Albert Land, Wollaston Land, Victoria Land, King William Land, Prince of Wales Land, North Somerset.

These two groups of islands are separated by a continuous broad passage called, in succession from the west, M'Clure Strait, Melville Sound, Barrow Strait, and Lancaster Sound, which last opens into Baffin Bay. South from Barrow Strait, Prince Regent Inlet leads into the far-reaching Gulf of Boothia down to Rae's Isthmus, only 40 miles across to Hudson Bay. An almost continuous chain of lakes extends across this isthmus and barely fails to cut off Melville Peninsula from the mainland. Half way down the Gulf of Boothia, and precisely at 70° north latitude, Fury and Hecla Strait leads into Fox Channel of Hudson Bay. An immense unexplored territory lies north of Hudson Strait, undefined on its western coast upon the Gulf of Boothia and Fox Channel. It extends on the north to Lancaster Sound, and is bounded on the east by Davis Strait and Baffin Bay. Although of late years the name Baffin Land has been extended over the whole region, it is laid down on the maps under various names, as Meta Incognita, Fox Land, Baffin Land, Cockburn Land. North of all these, and stretching up toward the North Pole, are the lands upon the western shores of Smith Sound, Kennedy Channel, Hall Basin, and Robeson Channel, leading to the Palæocrystic sea of Nares's expedition. These lands are named Ellesmere Land and Grinnell Land. In their rear is the almost unknown. In Nares's expedition of 1875-76 Lieutenant Aldrich conducted a sledging party along the northern edge of this awful desolation as far as long. 86° W. and lat. $82^{\circ} 16'$. The point he reached he called Cape Alfred Ernest; it is 220 miles farther than any previous explorer had attained. Near the coast he saw a range of mountains 1000 to 5000 feet high, which are called the Challenger Mountains. These mountains, then, constitute the northernmost part of Canada.

A glance at the map will show that only along the eastern half of the northern coast of the mainland have islands or lands to the north been discovered. From long. 125° , near Cape Bathurst, westward to the longitude of Bering Strait no land has been seen. An impenetrable ice pack has prevented all discovery. This region is called on the Admiralty charts Beaufort Sea, and it is as impenetrable from the east, by way of Lancaster Sound, as it is from the south, by way of Bering Strait. Parry in 1819 found the western end of Banks (M'Clure) Strait blocked up with ice of far greater thickness than he had ever met before. It was from 40 to 100 feet thick, and, after narrowly escaping the loss of his ships, he was compelled to return.

The ice of the Polar Sea north of America is more formidable than that in the Spitzbergen Sea. It is probably entangled in an archipelago extending far to the north. It does not consist of bergs, the product of glaciers, but of immense fields of hard blue ice, sometimes four miles in diameter, with hummocks twenty to forty feet high and welded by the winds into packs of immense extent. In this way the polar ice pack probably extends over all the Arctic Sea, opening out in summer more or less into lanes or areas of open water as the detached packs are separated or closed up by the influences of winds or currents.

A current of warmer water, corresponding to the extreme northern branch of the Gulf Stream of the Atlantic, flows northwards through Bering Strait at the rate of two miles an hour. The influence of the earth's rotation gives it also an eastern direction, so that while Kotzebue and Norton Sounds on the American coast are full of drift wood there is none on the Asiatic side, and while the water at Prince of Wales Cape in America may be

53° that on East Cape in Asia will be 35°. Although this north-easterly current is impeded by the long chain of the Aleutian Islands and the narrowness of the strait, it curves into Bering Sea by the wider opening on the west and follows the trend of the American coast, and is the cause of a well-ascertained current eastward in the Arctic Sea.

The outlets for the heavy ice in the Polar Sea—the Pakeocrystic sea of Nares, and the dense pack encountered by Parry—the sea of ancient ice as it is sometimes called, are small on both sides of the American continent. Bering Strait is very shallow. Over its whole extent there is an even depth of only $19\frac{1}{2}$ fathoms. On the east, Robeson Channel and Lancaster Sound are insufficient outlets for so wide an area of ice, and the strait into Hudson Bay is very narrow, so that the portion of the Arctic Ocean under consideration is a basin for the accumulation of ice which does not drift away to warmer latitudes but decreases chiefly by melting in summer and by evaporation. There are doubtless many local conditions affecting the tides of the Polar Sea. Parry records a tide of 2 feet 7 inches at Winter Harbour on Melville Island, but at Point Barrow it is only 0·7 feet. Franklin observed 2 feet at the mouth of the Mackenzie, but only 10 inches at Cape Simpson. Dease noticed 15 inches and, at the mouth of Back river, 12 inches. At the mouth of the Coppermine river it was 20 inches. In other places it was scarcely noticeable. The influence of the tide in breaking up large masses of ice is enormous, and where the movement of the tides is so feeble it is not surprising that the ice presents such an impenetrable barrier to a North-West passage. There is, however, a tide, impeded though it be by the shape of the coast, from each ocean, and the tidal waves from east and west

would seem to meet about the end of M'Clure Strait, which may explain the impenetrable pack found there by all explorers from Parry down. The general set of the currents is eastward, for the *Resolute* drifted east from this region out of Lancaster Sound. It would therefore seem to be the fact that this current eastward from Bering Sea controls the movement of the permanent pack north of the American continent, and packs the ice in the Beaufort Sea, so that while $83^{\circ} 24' N.$ has been reached by way of Smith Sound, and $86^{\circ} 14' N.$ lat. by the Spitzbergen Sea, the parallel of $74^{\circ} N.$ has not been attained north of the western part of the American continent.

In the summer, when the long Arctic day loosens the grip of the ice-pack upon the coast, the influence of the warmer water of the Pacific current prevails along the shore, and this is aided by the flush of the melting ice in the great Mackenzie river, and by the drainage of the whole Arctic watershed. These influences combine with prevailing southerly winds to move the ice-pack away from the coast and create a passage of navigable water for a greater or lesser breadth along the shore. Captain Collinson sailed along this in 1852 as far as Cambridge Bay at $105^{\circ} W.$, and Sir John Franklin, in his last expedition, brought the *Erebus* and *Terror* as far as $98^{\circ} 41' W.$, both points being close to the latitude of $69^{\circ} N.$, so that, on that parallel, the North-West passage had been made by sea excepting a gap of about 150 miles. The ice to the west of Melville Sound on the parallel of 75° is reported by Parry and all subsequent explorers to be compact and immovable, and unaffected by the east wind. The North-West passage, therefore, is doubtless possible only along the coast of the continent as accomplished by Amundsen.

The width of the open lane of water off the coast is

very uncertain and depends upon the wind. The pack may be out of sight to the north, and on a change of wind might close down on the shore, or the wind might clear away one prominent headland and block another. The pack is seldom far away, and for the most part of the year the southern edge extends in an arch from Point Barrow to Cape North in Siberia. The season for navigating the Polar Sea off the mouth of the Mackenzie is from the beginning of July to the middle of September, at which time the young ice begins to form.

The Polar Ocean has been shown to be very shallow, so far as known on the Alaskan coast side. In 1850 the *Enterprise* followed up a lead in the pack for 100 miles north of Point Barrow, and found only 45 fathoms. The most frequent depths recorded range from 15 to 30 fathoms, and although places have been reported where no bottom was found at 60 and even at 140 fathoms, the soundings indicate a very shallow sea with a muddy bottom.

Robeson Channel also, leading into Smith Sound, is very shallow, so that a fall in the ocean level of 100 fathoms would certainly make an enclosed basin of the Arctic Ocean, or rather a basin opening only on the Spitzbergen side upon a very deep ocean.

The soundings off the Siberian coast as far as known are also shallow. The drainage of half of North America and Asia pours into the Arctic basin on that side, and the main overflow from the circumpolar ocean is into the deep Spitzbergen Sea, and thence by the current to the south-west on the eastern side of Greenland. Nansen's and the Duke of Abruzzi's observations confirm this, and tend to establish the belief that the permanent ice-pack which is entangled among islands north of the American continent in a comparatively shallow ocean breaks away

into Spitzbergen Sea and flows south by the Greenland current. The current which carried Nansen to the north-west would be the return of the Gulf Stream, which becomes a south-west current along the Greenland coast.

It was observed by Beechey, in the *Blossom*, as early as 1826, and was laid down by Parry as a canon in Arctic navigation, that the margins of ice-packs between America and Asia, and Europe and Greenland, lie as nearly as possible in the same direction, viz. south-west and north-east, and that therefore navigation on the western shore is impeded by ice to a much lower latitude than on the eastern. This seems to be only another illustration of the effect of the earth's rotation upon floating matter passing from a zone of slower to one of swifter rotation, and it has been already noticed in a preceding chapter on the Arctic current. Hence it has now become a maxim of Arctic navigation to creep up north along the eastern side of an ice-pack.

Returning now to the continental shore at the westernmost point of Canada—the coast of Alaska west of 141° W. (Demarcation Point) has been described also as low, with low cliffs of frozen clay and sand. Point Barrow in Alaska is low, and the northern ice-pack rests against it for the greater part of the year. Not far inland a chain of mountains of moderate height follows the outline of the coast. Eastwards of Point Barrow the coast is also low. At Herschell Island, where the coast commences to trend to the south-east to form Mackenzie Bay, is an excellent harbour with good anchorage suitable for a winter harbour, and the best shelter harbour along the whole extent of the Arctic coast.

Mackenzie Bay is 160 miles across from headland to headland, with an average depth of 25 fathoms. Into it the river Mackenzie discharges with a great volume

through an immense and complex delta. This river with its valley has been described in a separate chapter. It is not an Arctic river, for under different names its navigable waters extend for 2000 miles southwards into the heart of the continent.

Eastwards along the Arctic shore from the mouth of the river the coast is still low, consisting of soft rocks of the Cretaceous formation. At Cape Parry is an interruption of Devonian limestone, whence a long stretch of Cambrian rocks follows along the coast to the eastern end of Coronation Gulf, and Dease's Strait, excepting Cape Barrow, which is Laurentian. This part of the coast is bold and high. The Coppermine river falls into Coronation Gulf, and in the interior are the Copper mountains, which abound in ores of green malachite and in native copper. This region was discovered by Hearne in 1771, who was led thither by the reports of the Eskimo and the specimens of native copper they showed. Cape Barrow is the apex of a Laurentian area projecting into the Cambrian, and is a cliff 1500 feet high.

The Tundras.—Behind all these coast areas of later formations lies the mass of crystalline rock forming the core of the continent. From the eastern end of Dease's Strait and eastwards to the Atlantic the Laurentian comes out upon the coast. The great promontories of Boothia and of Melville Peninsula are, so far as known, of this formation, excepting a few small detached areas of Silurian or Devonian. The coast along the Polar Ocean is nearly in its whole length low and rocky. It is the northern shore of the Barren Grounds or Tundras, a region sacred to the musk-ox and reindeer. Back's, or the Great Fish, river flows through it. Like the Coppermine, the only other large river of this part of Canada, it flows through a region of low tumbled hills and of morasses and lakes,

with rapids and rocks which render it unnavigable. On Montreal Island, at the mouth of this river of desolation, the tragedy of the last Franklin expedition closed—the last survivors of the retreating party, led by Crozier and Fitzjames, dropped dead of hunger one by one in their tracks, and the ice and darkness concealed their fate during many weary years of heroic effort for their relief and of search for their traces.

In an account of his journey of 2000 miles north of Aylmer lake, Ernest Thompson Seton describes the people of the far north-west whom he met as of a decidedly entertaining character, especially those he met in the Cañon of the Athabaska on returning. He discusses "the Arctic Prairies," their biological and physical characteristics, beasts, birds, rivers, lakes, and other phenomena.

Arctic fauna and flora proper range from the 70th degree of north latitude northward to the pole, whilst the subarctic fauna and flora are best defined as those occurring between 60° and 70° north latitude.

The "right whale" (*Beluga catodon*) or "hvid fisk" of the Danes; "narwhal," or sea unicorn (*Monodon monoceros*); walrus (*Trichechus rosmarus*); Arctic seals: (1) sea dog (*Phoca vitulina*), (2) floe rat (*Phoca foetida*), (3) saddle-back (*Phoca Groenlandica*), (4) bearded seal (*Phoca barbata*), (5) grey seal (*Phoca gryphus*), (6) bladder-nose seal (*Phoca cristata*); polar bear (*Ursus maritimus*); Arctic foxes (*Canis lagopus*); wolves (*Lupus arcticus*); eskimo dog, Lemmings (*Myodes Hudsonicus*, *M. torquatus* and *M. Groenlandicus*); Arctic hare (*Lepus glacialis*); musk ox (*Ovibos moschatus*). This large sheep (resembling a central Asiatic form) belongs to Arctic Canada, and inhabits the Parry Islands and Ellesmere Island to its extreme north-most coast. *Rangifer tarandus* (reindeer) occur in all Arctic islands.

Fisheries.—The whale fisheries of the Arctic archipelago in Franklin, and along the shores of northern Canada have been the source of great wealth for some 200 years. The undeveloped salmon and other fisheries of the same coasts have been reported by Dr. Low to be of enormous value.

Occurring in abundance in Arctic waters, medusæ, actiniae, cliones, pteropods, cancri, and helices, which are able to pass between the laminae of the whalebone, form the food of whales in the Arctic regions. Whales penetrate to every navigable part of the Arctic regions, and formerly they wintered and produced their young along the broken water off the coasts of Davis Strait, Hudson Strait, and Labrador. The remorseless pursuit of these animals for centuries has greatly diminished their numbers. At the present time whales are truly scarce, and threatened with extinction, so that something drastic in the way of legislation should be enacted to prevent further slaughter, and to replenish the northern waters with these giant forms.

The Archipelago.—As before observed, north of the continental mass lies a great archipelago, the most northern range of which is called after Parry, who discovered it. All these islands consist geologically of late formations from Silurian to Carboniferous, and on the western sides of Banks Land and Prince Patrick Island, Miocene fossils have been found. All along the coasts of Melville Sound and M'Clure Strait, at the very knot of the North-West passage, are abundant deposits of bituminous coal close to the great barrier of immovable ice which shut out the adventurous Parry from farther progress. Fragments of coal may be picked up along the continental coast westwards as far as Icy Cape, and the Eskimo often use it for making lip ornaments as well as for making fires.

On the Atlantic side Baffin Island is for the most part Laurentian, and Laurentian rocks continue from Hudson Strait along the coast of Baffin Bay and Smith Sound. In Grinnell Land there is a large mass of Cambrian rocks stretching up along Robeson Channel to the Palæocrystic sea.

The coasts of these far-northern islands are high and often precipitous. Parry wintered on Melville Island and kept his crews in good health. He describes the soil as rich, and, in the short summer, vegetation was abundant. Game was plentiful—musk-ox, reindeer, hares, grouse, geese, ducks, and ptarmigan were abundant. Collinson found ptarmigan plentiful at Cambridge Bay, where he wintered in 1852-53, and there were deer in large herds crossing on the ice to the mainland. From the records of Arctic voyages it would seem that the cold is not so great on the islands as on the mainland.

Stern and repellent though nature may be in these far-northern latitudes, the Arctic seas have yet a life of their own. There the great marine animals can increase and multiply when unmolested—whales, walruses, and seals. Trout and salmon are in the streams and lakes, on the land are musk-oxen and reindeer, and on the bays and inland waters ducks and geese innumerable in their season find their breeding-places. The seal is to the Eskimo what the bison was to the aborigines of the prairies, and upon its fat and flesh he is abundantly nourished.

It would seem, however, that these creatures are uncertain in their migrations, for in the region where Crozier perished of hunger Simpson had found abundance of game. Whaling-ships are now pressing in from Bering Strait on the west and up into Fox Channel from Hudson Bay on the east, and with bomb-lances are

destroying and frightening away the timid monsters into the farthest north. Nothing can escape the wasteful activity of civilised man with his scientific weapons of destruction.

The Eskimo

Nor are these regions without human inhabitants. From Arctic Siberia to Labrador and Greenland, along 5000 miles of coast wander that interesting race known in the language of their Indian enemies as Eskimo, or raw-meat eaters, but in their own tongue as Innuits or human beings. This people speaks but one language over all its wide extent of dispersion, so that a Greenland Eskimo will serve as interpreter to his people on Hudson Bay or the Siberian coast. From lat. 60° N. to the farthest north land, scattered families have been met, clinging with affection to their icy coasts, and living in apparent plenty, as their sturdy and podgy figures testify, in spite of the terrible cold. Parry found their huts on Melville Island and on Byam Martin's Island, and speaks well of the peaceful disposition of those he met. He says their voices are soft, and they are fond of singing and drawing. They have generally been ready to assist rather than molest Arctic expeditions. They have excellent notions of geography, and when pencil and paper were supplied they would draw maps which have been of great use to explorers. Where the Moravian missionaries on the Labrador coast have gathered them in communities, they delight to sing hymns translated into their own tongue by the devoted brethren. A brave and kindly people, they wrest their subsistence from nature in her most stern and cruel moods, navigating in skin canoes the stormiest seas, and overcoming, with their primitive weapons of bone, the great monsters: whales, polar bears, walruses, and

seals, on which they live. They have learned to support themselves under circumstances which have compelled many explorers to succumb though aided by all the resources of civilisation. They are not cleanly, and washing is unknown, for the intense cold burns the exposed skin like fire; but people who can flourish in such a climate cannot want for intelligence, and as for morality they have not much to learn from civilisation. In stature they are not over middle height, they are strong and active, their hands and feet are small, their noses are flat, and their cheeks are fat and projecting. They are tremendous eaters, and delight in whale blubber and the fatty flesh of seals, which they do not require to cook. Altogether, then, though their habits with regard to cooking and cleanliness are not by any means worthy of commendation, in intellect, morals, good nature, and courage these Eskimo are not to be despised.

The discovery of a tribe of White Eskimos, supposed to be descendants of the colony which set out from Norway to Greenland about the year 1000 A.D., has been related by Vilhjalmar Stefansson. He found these fair-complexioned and white-eyebrowed folk living in the neighbourhood of Coronation Gulf and Victoria Island.

Not less than thirteen tribes are recorded, ten of which had never heard of white people—other than themselves.

Arctic Exploration

The Arctic archipelago with the projecting peninsulas and all the regions of the uttermost north were named *Franklin*, in memory of the gallant and gentle sailor who perished in its wastes. Those uninviting and dreary regions of Arctic Canada will ever be classic for the deeds of devotion and heroism which have been wrought there.

Three distinct problems have been attempted in that perilous land—the search for the North-West passage, the quest to learn the fate of Sir John Franklin, and the struggle to reach the uttermost pole. All of them have now been solved. The last was, until the voyages of Nansen, the Duke of Abruzzi, and Peary, the passion of the nations of the English, Scandinavian, and German



A SMALL GLACIER, BYLOT ISLAND, BAFFIN BAY.

racess—the knight-errantry of practical mercantile people. The efforts to solve these problems by way of Hudson Bay are noticed in another chapter, and a short sketch of the chief attempts made in other directions along the northern coast is necessary in any account of Arctic Canada.

The search for the north-west passage was resumed in 1818, when the Admiralty sent an expedition under Captain John Ross with the *Isabella* and *Alexander*. His highest point was $76^{\circ} 54'$, not so far as Baffin had attained

($77^{\circ} 45'$) in 1616; but he hastily concluded there was no opening to the north, and, turning, he coasted along the west side of Baffin Bay past Bylot Island to Lancaster Sound, which he attempted to penetrate. There he was on the threshold of the North-West passage; but on sailing up for fifty miles his farther progress was arrested by ice, and he fancied he saw a range of mountains closing in round the head of what he rashly assumed to be a bay. He named these cloud mountains the Croker mountains, and returned home, to the great disappointment of the Admiralty and of Lieutenant Parry in charge of the *Alexander*, his second in command. The next year Parry was sent with the *Hecla* and *Griper*. He sailed through Lancaster Sound, through Barrow Strait, through Melville Sound, into M'Clure Strait, and discovered the islands on the north, since called the Parry Islands, and Cockburn, Prince of Wales, and Banks Lands on the south. He wintered at Winter Harbour, on the south-east coast of Melville Island, whence he explored the adjacent country by sledging parties. The following summer he vainly endeavoured to penetrate the barrier of immovable ice which closed in M'Clure Strait, but the farthest point attained was 114° west longitude. After narrowly escaping the loss of both ships in the ice, he returned to England, where he was received with enthusiasm.

Parry's second expedition in 1821 was an attempt to flank the impenetrable ice-pack by the south. He made the attempt by Hudson Bay, as related earlier in this chapter. In 1824 he sailed again with the *Hecla* and *Fury*, and he entered by Lancaster Sound and sought to turn the flank of the ice-pack by passing to the south through Prince Regent Inlet, but the conditions of the season were against him. He wintered at Port Bowen, not as far west as he had sailed on his first voyage, and the following

summer, after protracted struggles with storm and ice, he lost the *Fury* on Fury Point in Prince Regent Inlet and returned home in the *Hecla* in 1825. This closed Parry's efforts on the American side of the Arctic sea.

Ross, who chafed under his failure of 1819, again took up the quest, and, in 1829, he led an expedition in a paddle-steamship—the *Victory*—despatched at the expense of the Sheriff of London, Felix Booth. He passed five years in the Arctic regions, and was most successful, not only in keeping his crew in health, but in making important discoveries. He lost his vessel, and, after unparalleled experiences, he fell in with the whaling ship *Isabella* and returned home. He, with his nephew James Ross, by sledging parties discovered the Magnetic Pole on the west coast of Boothia, he also discovered Franklin Strait and King William Land, and followed round the whole coast of Boothia and North Somerset but failed to notice Bellot Strait. Ross's operations were in fact around a spot close to the very key of the North-West passage, at the termination of Simpson's discoveries by land, and not far from the point where the crew of the last Franklin expedition abandoned their ships. He explored at the abrupt elbow where the long series of straits and sounds after following the coast eastwards impinge upon the peninsula of Boothia, which projects at a right angle northwards. Ross found the temperature ranging from -31° to -40° , and occasionally as low as -44° and -55° . This was lower than anything recorded by Parry.

In the meanwhile the Admiralty resolved upon connecting the discoveries of Samuel Hearne and Alexander Mackenzie upon the Arctic coast, if haply the desired passage might be found along the shore of the ocean they had seen. In 1819 Franklin was despatched on his first

expedition, and then commenced the series of explorations which delimited the northern coast of the continent and the Arctic shores of the Canadian territories recently called Mackenzie and Keewatin. It will be remembered that Hearne was the first to reach the Polar Ocean at the mouth of the Coppermine in 1771, and Mackenzie had subsequently reached it in 1798 at the mouth of the Mackenzie. Captain Cook had in 1778 passed through Bering Strait and coasted as far eastwards as Icy Cape, and now these three points on the Arctic coast were to be connected link by link with the Atlantic.

Under orders from the Admiralty, Franklin left England in May, 1819, and went by way of Hudson Bay, York Factory, and Norway House to Cumberland House on the North Saskatchewan. From there he went in January, 1820, by snow-shoes and sledges to Fort Chipewyan on Lake Athabaska. In July he went on to Great Slave lake, to old Fort Providence, a post of the North-West Company, and thence he went up the Yellowknife river 156 miles, where he built a house at Winter lake and called it Fort Enterprise, and there he had to remain nine months to collect provisions and procure guides. In June 1821 the expedition started for the Polar Sea, Dr. Richardson in charge of the first party, and Franklin a week later with the rest. They followed down the Coppermine river, 450 miles, to its mouth, and coasted along the shore of the Arctic Sea for 638 miles eastwards. He traced the coast of Coronation Gulf and of Bathurst Inlet to Point Turnagain, near Cape Flinders, in $109^{\circ} 25' W.$, returning by way of Hood river to Fort Enterprise, which he reached after great privations. In July 1822 he reached York Factory on his return.

In 1825 Franklin led a second expedition, but by way of Lake Superior and Lake Winnipeg to Cumberland House.

Thence he proceeded to Lake Athabaska and down the Mackenzie river to the Polar Sea. Returning thence, he established his headquarters at Fort Franklin, which he built at the outlet of Great Bear lake. During the summer Dr. Richardson surveyed Great Bear lake. In June of 1826 Franklin went down the Mackenzie through the most westerly channel to the sea, and turning west surveyed the coast for 374 miles as far as Return Reef. The plan of the western expedition was that Franklin was to push on westward to Bering Strait, where Captain Beechey in H.M.S. *Blossom* was to await him. Beechey, remaining in the *Blossom* in Kotzebue Sound, sent Elson in a barge along the coast, who succeeded in reaching Point Barrow at the very time Franklin was at Return Reef. Only 160 miles then remained to be discovered west of the Mackenzie.

While Franklin was thus coasting to the west, Richardson started eastwards with two boats down the eastern branch of the Mackenzie delta. He coasted 863 miles to the mouth of the Coppermine river, and thus connected his survey with that of Franklin's first voyage. He passed through a strait named after his boats Dolphin and Union Strait, and discovered a land to the north which he called Wollaston Land. The strait was packed with ice. He returned by a shorter way overland to the north-east angle of Great Bear lake, and thence to headquarters at Fort Franklin at its outlet, a distance of 433 miles. This closed the second Franklin expedition.

In the meanwhile Ross had been immured in the Polar regions since 1829 and nothing had been heard of him. Captain Back, R.N., was despatched, by public subscription, in the winter of 1832-33 to relieve him or ascertain his fate. He went by way of Montreal along the usual north-west route to Great Slave lake, and starting from Fort

Resolution traced his way to Great Fish river, which he heard of from Richardson, who had heard of it from Eskimo and Indian reports. This river he discovered, and it is sometimes called Back's river. It was too late in the season to proceed, so he returned to Fort Reliance, which he had built at the extreme north-east point of Great Slave lake. Although he heard here of the safe return of Ross, he was anxious to bring back some fruits of his expedition, and he went down the Great Fish river and reached Montreal Island at its mouth. Back discovered the land across the ice-encumbered strait and named it King William Land. He returned in 1834.

To the west, then, only 163 miles, from Return Reef to Point Barrow, remained unknown; but east of the Mackenzie were two long gaps—one from Point Turnagain of Franklin's first expedition to the mouth of Back's river, and the other from the discoveries of Ross at the southern angle of Boothia and the main coast, to the explorations of Parry from Repulse Bay in Hudson Bay. A small extent of coast, between Cape Britannia, at the mouth of Back's river, and Ross's sledging explorations to King William Land, also remained undiscovered. These points were connected by officers of the Hudson Bay Company.

It should be stated once for all that on these expeditions officers of the Hudson Bay Company had co-operated with the commanders whose names are given; but now the company took the matter up, and P. W. Dease and Thomas Simpson, two of its officers, completed the discovery of the Arctic coast. They started from Fort Chipewyan, at the outlet of Athabaska lake, and on July 9, 1837, reached the mouth of the Mackenzie. They proceeded westwards in boats; but about 50 miles east of Point Barrow they found the

ice-pack hard down on the coast. There Dease remained with the boats, and Simpson and five men went forward on foot on August 1; and on August 4, 1837, some 77 years ago, the discovery of the north coast of America west of the Mackenzie was accomplished. Simpson reached Point Barrow, which Elson of the *Blossom* had reached from Bering Strait in 1826.

These intrepid and skilful explorers on their return established themselves at Fort Confidence, which they built at the discharge of Dease river into the north-west angle of Great Bear lake, where, by hunting and fishing, they supported their party and collected food for their journeys eastward during the two following years.

In 1823 they started, on June 7, with boats up the Dease river, and hauling them on sledges, passed the height of land into the Coppermine, and arrived at the sea on July 1. They found Coronation Gulf full of ice, and, with great difficulty, reached Cape Flinders on August 9. Finding that the boats could go no farther, Simpson landed and proceeded eastwards as far as Cape Alexander, where he discovered land to the north, which he named Victoria Land, but which was a continuation of Wollaston Land, previously discovered by Richardson. Returning, they coasted King William Land and Victoria Land, and named Wellington and Cambridge Bays, then crossed to the south, ascended the Coppermine, and reached Fort Confidence on September 24. This was the most remarkable series of discoveries made on the Arctic coast.

Little now remained to be discovered, and that was completed by Dr. Rae of the Hudson Bay Company in 1846, from Repulse Bay in Hudson Bay as a base. That remarkable explorer was commander, astronomer, and naturalist in one; added to which, his skill as a

hunter and fisherman was the main support of his small party. Guided by maps drawn by Eskimos, he crossed the isthmus of Melville Peninsula (a distance of only 40 miles, covered by an almost continuous chain of lakes, with only twelve miles of portages) and reached the tide water at Committee Bay of the Gulf of Boothia. After explorations on both sides of Committee Bay, he returned to Fort Hope on Repulse Bay, where he wintered. In April 1847 he started with dogs and sledges, and on April 16 he completed the survey of the northern coast of the continent by reaching Lord Mayor's Bay (discovered by Sir James Ross), and surveying the lower part of the Gulf of Boothia up to Fury and Hecla Strait of Parry.

Thus was North America finally discovered along its northern shores. It does not fall within these pages to recount the weary search for Sir John Franklin, a long Odyssey of heroism and endurance. The North-West passage was in truth found. Dease and Simpson found it; Rae found it; and Crozier had found it, when he dropped dead in his tracks at the mouth of Back's river. Very nearly was it achieved by sea, for Collinson, in his wonderful voyage in the *Enterprise*, followed the northern coast from Bering Strait as far as Cambridge Bay, at the eastern end of Dease's Strait, within 150 miles of the place where the *Erebus* and *Terror* were abandoned. One party alone made the passage—M'Clure and his crew of the *Investigator*, abandoning their ship in the ice-pack in Bay of Mercy, near the western end of Melville Sound, crossed over the ice to Captain Kellet's vessel, the *Resolute*, in the ice-pack at the western end; both ships had to be abandoned, and the crews of five vessels reached England in the *North Star* in 1853.

And now a few words must be given to Sir John

Franklin's last expedition, the tragedy which will ever add interest to the northern coasts of Canada. On May 26, 1845, he sailed with the *Erebus* and *Terror*. It had been ascertained by Dease and Simpson that continuous water communication existed along the coast of America. Franklin entered by Lancaster Sound, and finding Barrow Strait blocked, passed up Wellington Channel to Grinnell Island, and south between Bathurst and Cornwallis Island. The following year he sailed south for the water along the coast, and on September 12, 1845, both ships were beset in Victoria Strait, twelve miles north of King William Land. On June 11, 1847, Franklin died, and the command devolved on Captain Crozier. The ice-pack did not relax, and on April 22, 1848, the ships were deserted, and Crozier with 104 men landed at Victory Point on King William Land to go to the mouth of the Great Fish river, 250 miles distant. Every mile of their course was traced by the pious zeal of search parties. Worn by disease and starvation, they followed down the west coast of King William Land, dropping by the way until at Montreal Island, at the mouth of the river, the last trace disappears. Some forty men were reported by the Eskimo to have reached that far, and the traces of their having a boat were seen. There they must have died of starvation, but the secret of their last sufferings and death will ever remain unrevealed.

Northernmost Canada.—Under the title, "Explorations in Northern Canada and adjacent portions of Greenland and Alaska," J. White, F.R.G.S., geographer, issued an Arctic map of special value and interest which marks out in clear fashion not only the "tracks of expeditions" but also the "Explorations of Coasts" from which the following summary is taken :—

EXPLORATIONS OF COASTS

Explorers and Dates.	Country.	Explorers and Dates.	Country.
Rae: 1846-47, and 1853-54 . . .	British	Franklin: 1821 .	British
Penny: 1850-51 .	British	Franklin: 1825-26 .	British
M'Clintock: 1857-59	British	Belcher: 1852-54 .	British
Peary: 1886, 1891- 92, 1893-95, and 1898-1902 . . .	United States	Greely: 1881-1884.	United States
Fox: 1631 . . .	British	J. Ross: 1829-33 .	British
Inglefield: 1852 .	British	Parry: 1819-20, 1821-24, and 1824-25 . . .	British
Dease and Simpson: 1837-39 . . .	British	Nares: 1875-76 .	British
M'Clure: 1850-53 .	British	Collinson: 1851-54.	British
Hall: 1871 . . .	United States	Cook: 1778 . . .	British
Austin: 1850-51 .	British	Back: 1833-35 . .	British
Kane and Hayes: 1853-55 and 1860- 61 . . .	British	J. Ross: 1818 . . .	British
Kennedy: 1851-52.	British	J. C. Ross: 1848-49	British
		Beechey: 1826 . .	British
		Richardson: 1826 .	British
		Sverdrup: 1898- 1902 . . .	Norwegian

The tracks of the following *Expeditions* are also carefully delineated:—

Explorers.	Country.	Explorers.	Country.
Parry: 1819-24 .	British	Fox: 1631 . . .	British
Collinson: 1851-53	British	Hayes: 1860-61 .	United States
A. E. Nordenskiöld: 1883 . . .	Swedish	M'Clure: 1850-54 .	British
Nares: 1875-76 .	British	Hall: 1871-72 . .	United States
Hudson: 1610-11 .	British	Hawkbridge: 1617	British
James: 1631-32 .	British	Munk: 1619-20 . .	Danish
Rae: 1846-47 and 1854 . . .	British	Gibbons: 1614 . .	British
M'Clintock: 1858- 59 . . .	British	Greely: 1881 . . .	United States
Peary: 1892-95, 1900-1902 . . .	United States	Kane and Morton: 1853-55 . . .	United States
Inglefield: 1852 .	British	Bylot and Baffin: 1615 . . .	British
		Button: 1612, 1613	British

These records were previous to Peary's "dash to the Pole" from Grant Land in 1909, as a result of which the Pole was reached on the 6th of April in that year.

While the feat was spectacular, it added but little information to our knowledge of the conditions of the drifting Polar Sea which both Nansen and the Duke of Abruzzi had crossed in their famous explorations. On behalf of the Canadian Government, Stefansson undertook the second expedition into unexplored territory north of the mainland of Canada referred to on page 940, taking with him a staff of Canadian students with scientific knowledge, under the auspices of the Geological Survey. Among many who have studied carefully the character, origin, and movements of ice, icebergs, etc., along the Atlantic coast may be mentioned Dr. Howard Barnes, F.R.S., of M'Gill University, Montreal. The following is taken briefly from his results:—

Movement of Ice from Arctic Regions.—The Labrador current flows southward along the coasts of Baffin Land and Labrador. Its average rate is from 10 to 35 miles per day, whilst at times it ceases altogether. These rates are influenced by the wind, especially near the coast. As soon as free, the icebergs find their way into the Arctic current and float gradually southward. The journey is by no means an easy one, and few bergs survive. There are many mishaps, such as grounding in the Arctic basin with ultimate breaking up, stranding along the Labrador coast, where destruction takes place, and falling to pieces entirely in the open sea. Only a small percentage ever reach the "Grand Bank" and the routes of the trans-Atlantic liners, so many delays attend their journey. It is well known, however, that many bergs seen in any one season may have been produced several seasons before. Taking the Labrador current as 10 miles per day, a berg once formed and drifting freely would make the journey southward in from 4 to 5 months. Under-currents affect the largest icebergs, and

frequently they are seen to move backward against the wind and surface waters. The number met with from one season to another must depend on the mildness or severity of the previous summer in the north.

Icebergs, Arctic.—Icebergs often form long streams opposite to their fjords, which are instantly reinforced by fresh additions. The icebergs which float out to sea are eventually taken into the Atlantic by the current either to ground on the Newfoundland bank, or to float southward until they are melted or broken up by the waves. They have been met with as far south as $38^{\circ} 40'$ North latitude.

An "ice foot," such as is met with up Smith Sound, occurs when autumn snowfall accumulates as it drifts to the beach, where it meets sea-water with a temperature just below the freezing-point of fresh-water, is converted into ice and forms a solid wall from the bottom of the sea, constantly maintained.

Greenland and Iceland are, by nature, part and parcel of British North America. The continental platform or shelf from Newfoundland to Davis Strait is continued round Cape Farewell, broadens out to and around Iceland, but narrows considerably before it reaches the European continental shelf or submerged platform at the Wyville-Thomson ridge, north of Scotland, where this ridge separates the waters of the deeper Arctic basin from those of the North Atlantic basin.

Rockall, a lonely isle in the Atlantic east of Labrador and west of Ireland, has reefs in its vicinity. This island might well rise farther out of water and the shoals become islands. This rock, which is Atlantian in character and granitic in structure, might become an important station.

Hudson Bay Route and Earl Grey.—Canada has truly

been fortunate in its governors-general, each one having brought to its shores, and to the heart of its peoples, new messages, greater light, timely aspirations, and practical ideas. So it was with Earl Grey, who, fired with the keen desire to secure first-hand information regarding Canada and its resources, visited not only the distant and Pacific province of British Columbia, and the Yukon Territory in the extreme north-west corner of British dominions in North America, but also undertook in 1910 the interesting trip along the new Hudson Bay and Strait route to disprove "the theory of the frozen north" which has made up so much of recent history. On August 3, 1910, Earl Grey left Winnipeg, and on the 4th embarked at Selkirk on the steamer *Wolverine*, descended the Red river to its mouth, entered Lake Winnipeg, traversed this lake, and on the evening of the 5th made a stop at the mouth of the Saskatchewan river. Warren Landing, at the outlet of Lake Winnipeg, was reached on the morning of the 6th, in latitude 54° north. Thence, down the Nelson river into Playgreen lake to Norway House, where the canoe journey was commenced, the route followed being the regular Hudson Bay Company boat-route *via* Hayes river to York Factory. Off York, the party, led by Professor R. W. Brock (late of the Geological Survey), embarked on the Canadian Government steamer *Earl Grey*, and proceeded to Churchill, about 180 miles distant. From Churchill the *Earl Grey* traversed the 600 miles across Hudson Bay to Hudson Strait, sighting Coats Island and Mansel Island on the way. The cruise was continued north of Charles Island, along the coast of Baffin Island and Resolution Island, then across the Strait, at the entrance, to Port Burwell, a Moravian missionary settlement west of McLelan Strait connecting the waters of Ungava Bay with those

of the Atlantic. Leaving Port Burwell, the *Earl Grey* rounded the Button Islands, in latitude $61^{\circ} 50'$, followed the coasts of Labrador to Newfoundland, Cape Breton, and Prince Edward Island, finishing the cruise at Pictou, Nova Scotia, on the Intercolonial Railway of Canada, connected by rail with Ottawa, the Canadian capital, whence Earl Grey had started on his memorable tour.



PORT BURWELL, MORAVIAN MISSIONARY SETTLEMENT.

Stops were made along the way from the strait, on the homeward journey—(1) at Okkak and Indian Harbour on the Labrador Coast; (2) at Port Anthony (the headquarters of Dr. W. T. Grenfell) and Bay of Islands in Newfoundland; (3) at Sydney, Cape Breton; and (4) at Charlottetown, the capital city of Prince Edward Island. The trip covered fully 5000 miles, and showed clearly the open character of Hudson Bay and the strait. Besides giving a succinct account of the localities visited, facts observed, and points of interest noted by Earl Grey and

by himself, Professor Brock, in a report addressed to the Minister of Mines, describes the climate and varied resources of the country traversed, including its minerals, forests, fisheries, game, scenery, and navigation.

The total population of the North-West Territories, according to the last census returns of 1911, corrected to 1913, is given as 18,481.

Unexplored Areas in Northern Canada

There are still many unexplored regions in Canada throughout the North-West Territories and the northernmost portions of Alberta, Saskatchewan, and Manitoba. Besides vast areas in the northern and south-western portions of the Arctic Archipelago, and throughout the treeless areas of the barren lands north-west of Hudson Bay above the latitude of Churchill, there are a dozen districts of which but little is known of their geography or resources. Of these the Rocky Mountain ranges north and south of the Gravel river (explored by Joseph Keele in 1908) for several hundred miles cover a vast extent of *terra incognita*. Another area is that south of Fort Simpson and Fort Providence, and north of Hay river and Hay lake, and also south and west of Lake la Martre, north of the Horn mountains, besides a belt of territory north-west and north-east of Great Bear lake, along that axis or water-shed separating the short streams flowing south into the lake from those important rivers flowing hundreds of miles northward into the Arctic Ocean, including the Anderson, Macfarlane, and La Roncière. Other areas of unexplored country include one which lies east of Point Separation and the Lower Ramparts on the Mackenzie river as far as Anderson river; one north-and-south area between the site of Fort

Confidence (Dease Bay, Great Bear lake) and the North Arm of Great Slave lake, west of the Coppermine river; a smaller area south-west of the North Arm just mentioned; a larger one between the eastern waters of Great Slave lake and Lake Mackay in latitude 64° ; and a vast area between the site of Fort Reliance at the eastern extremity of Great Slave lake and Lake Athabaska; east and west of that sinuous axis or watershed separating the waters of the Dnbawnt and Thelon rivers flowing into Hudson Bay from those of the Great Slave basin flowing into the Arctic Ocean; also that area south of Lake Athabaska to Cree lake and Island lake in northern Saskatchewan. There is also a large unknown area in extreme northern and north-western Manitoba north of the valley of the Churchill river; besides these there is one of considerable importance west of the Beaver river valley in Saskatchewan (108th meridian) stretching as far as the valley of the Athabaska river (longitude $112^{\circ} 30'$ west) north of the northernmost surveyed townships and sections of that province. A rough estimate of the aggregate area of these various unexplored districts of northernmost Canada would place it at nearly 400,000 square miles. Though more or less remote from the principal centres of population and activity in the Dominion, these areas are receiving the attention of the various governments, federal and provincial, besides that of brave explorers, geographers, and students of geography, encouraged by learned societies or by private munificence.



CHAPTER XX

NEWFOUNDLAND

NEWFOUNDLAND is an island, one-third larger than Ireland, situated at the mouth of the Gulf of St. Lawrence, which it protects from the full sweep of the North Atlantic Ocean. It is the easternmost part of North America, and reaches one-third of the distance across to Great Britain. It is described with approximate accuracy as being shaped like an equilateral triangle, but the north-eastern side of this imagined triangle is so profoundly indented by deep and wide bays that the line on that side would inclose a large extent of water. Newfoundland extends from $46^{\circ} 35'$ to $51^{\circ} 40'$ north latitude, and from $52^{\circ} 35'$ to $59^{\circ} 25'$ west longitude. St. John's, the capital city and easternmost port of the island, is 1675 miles distant from Cape Clear in Ireland; it is about as far distant westwards from Cape Clear as Moscow is distant eastwards. From Cape Race to Montreal, at the head of navigation on the river St. Lawrence, the distance is 1013 miles. The island from Cape Anguille to Cape Spear—the broadest part of its base—is 316 miles wide from west to east, and on its western side the distance from Cape Ray, the south-west point, to Cape Norman, its northern apex, is 317 miles. The total area of the island has been calculated to be 42,734 square miles. The area of Ireland is 31,759 square miles, and of Wales, 7378 square miles, so that their united areas are not equal to

that of Newfoundland. The island is by nature part and parcel of Eastern North America. Geologically it is fundamentally similar to the adjacent provinces of Nova Scotia and Quebec, whilst its leading topographic features and striking tectonic lines conform to those of the Continent. The western coast of the island is comparatively straight, but the southern and eastern coasts are remarkable by profound indentations and salient peninsulas, so that few countries in the world have coast-lines so long relatively to their areas. Three peninsulas especially mark the outline of the island with a unique character—at the south-east corner the peninsula of Avalon, connected with the mainland by a neck only two miles wide; the peninsula of Burin on the south; and, on the north, the long projection from White Bay to the Strait of Belle-isle, known on the old maps, and even now, as *Le Petit Nord*. So deeply does the ocean penetrate into the land, that on many of the old maps, for nearly a hundred years after its discovery, Newfoundland was represented as an archipelago. This long coast-line is indented with numerous commodious harbours, and studded with innumerable islands, especially on the eastern and southern coasts. The general character of the coast is very rugged and bold. A rampart of steep rocky cliffs 200 to 400 feet high confronts the ocean and resists the fierce onslaught of the stormy North Atlantic. For long stretches of the coast the wall of rock appears to be unbroken, but on close approach it is seen to be cleft by fissures, which open up deep and fiord-like harbours safe and sheltered from every wind. Where the broad bays enter the land the coast may not be so forbidding, but it is still rocky and bold. Along the west coast a few miles inland the Long Range Mountains, rising in places to a

height of 2000 feet above the sea-level, run far into the peninsula of Le Petit Nord and almost the whole length of the island; and outer ranges 1900 to 2000 feet high run closer to the shore and give a stern and majestic beauty to the coast from Cape Anguille as far as Cape Gregory and Bonne Bay.

Newfoundland is separated from the main continent at Labrador on the north by the Strait of Belle-isle, which extends north-east and south-west for a length of 35 miles, with a breadth varying from 10 to 15 miles. A rocky island (Belle-isle) of granite cliffs 700 feet high guards the Atlantic entrance. The lighthouse (470 feet above the sea) is maintained by the Dominion of Canada. Through this strait is the most direct route from western Europe to the river St. Lawrence, and it was the first route known to the early sailors in these waters. By this strait, evidently then well known, Jacques Cartier sailed in and out of the Gulf of St. Lawrence on his first voyage in 1534. The expansion below the strait between Newfoundland and Labrador was known as *La Grande Baie* before the existence of a southern outlet was suspected, and that name lingered on the maps down to the commencement of the present century. Cape Ray, at the south-west apex of the triangle, is separated from Cape North, on Cape Breton Island, by a strait named comparatively recently Cabot Strait, after John Cabot, who discovered these waters in 1497. The strait is 60 miles wide, but 20 miles of that distance are cut off by the island of St. Paul, a high-wooded island, lying 20 miles off Cape North. Cape Ray is a remarkable headland, and stands out as a table-land rising 1700 feet above the sea. Cabot Strait is a noble portal to the Gulf of St. Lawrence. The lofty land is visible from passing vessels on both

sides and the passage is lighted by two lighthouses on St. Paul's Island and one on Cape Ray.

Cape Race, the south-eastern apex of the imaginary triangle, deserves very special notice as the beacon of the North Atlantic route to America—the objective point to which all westward bound ships aimed to make a landfall, and to which the great sailing routes converge. In recent years the large and powerful steamships to New York, on emerging from the English Channel, lay their course by a more southern route; but for 375 years, and during the period of sailing vessels, before the application of steam, the ocean lane outward between England and America was by Cape Race. It is the one unchanging point of the old sea charts. On the first map showing any part of the main American continent—La Cosa's in A.D. 1500—it appears under the name of Cavo de Ynglaterra, and on Ruysch's map, in the Ptolemy of 1508, it is called Cavo de Portogesi; but, with these exceptions, it is called upon every map from the (so-called) King chart of 1502 down to the present day, Cape Raso, Rasso, Ras, Raz, or, in the English corrupted form, Race. The word is practically the same in all the romance languages, being derived from the Latin "rasus," and the name was given in the very earliest times by some Portuguese sailor who knew the locality. It means "the flat cape," for it is lower and evenner than the adjacent headlands. The British Government long maintained a lighthouse there; but, in 1880, it was taken over by the Dominion of Canada. There is also an electric telegraph station from which passing vessels may be reported. Cape Race is the most important headland in North America for many reasons.

To attempt to describe, or even to mention, the bays

and harbours of Newfoundland would be a weary task. Only the great bays can be noted, and to all of them the same remark is applicable. They all contain numberless smaller bays, harbours, coves, and shelters for vessels. All are studded with islands, and in all there is deep water to the very shores. On the east coast Conception Bay runs 35 miles into the peninsula of Avalon; around it have clustered the oldest settlements. To the north of it is Trinity Bay, which bounds Avalon on the north. It runs 50 miles into the land and is 16 miles wide at its mouth. On the south-east shore of this bay is Heart's Content—the landing-place of the Atlantic submarine telegraph cables. Next northwards is Bonavista Bay, marked on the north by Cape Freels, and on the south by Cape Bonavista. The bay is 39 miles wide between these two headlands; it extends 30 miles inwards and is full of islands. The headlands are not high, but are rocky. Cape Bonavista is supposed by some authorities to be the landfall of John Cabot on his first voyage, and to have been named by him. There are many reasons why this cannot have been the case; it is sufficient to remark here that the name is not found on the earliest maps. It appears first on a map by Viegas in 1534, and as a Portuguese word, Bõavista. Notre Dame Bay, the next on the north, is 45 miles wide between its headlands Fogo Island and Cape St. John. It also is studded with islands. At Tilt Cove on the north side near Cape St. John are large copper mines. White Bay, which succeeds, cuts off the peninsula of Le Petit Nord from the main island on the east. Hare Bay, on the farthest north, is a bay with bold and lofty shores very little frequented. Cape Bauld, the extreme north point of the island, is on Kirpon Island, often mentioned by the early mariners

under the name of Quirpon or Carpunt. The so-called "French shore" extended from Cape St. John on the east side, round by Cape Bauld on the north, and down the west coast to Cape Ray, its most southern point. Following down the west coast from the north are St. John's Bay and Bonne Bay. All the coast is uninhabited down to the Bay of Islands. This bay is remarkable for its magnificent scenery, unequalled by



MOUTH OF THE HUMBER RIVER.

anything upon the whole Atlantic coast of North America. Three lofty islands guard the entrance—one of them, Guernsey Island, rises sheer up 1000 feet. The bay is encircled by mountains 2000 feet high, and it searches in among them in solemn fiord-like arms.

The river Humber falls into this bay, and near the Humber arm Blomidon cliff rises—sheer up 2125 feet—the western termination of a range of hills which follows up the river valley. The bay has safe anchorages and harbours, and settlements begin to form around it; for the valley of the Humber is rich, and

minerals abound in the hills. St. George Bay, the last important bay to the south, is 35 miles wide and extends 50 miles into the land. The most important settlement on the west coast is at the head of this bay. It is bounded on the south by Cape Anguille, one of the loftiest headlands on the coast. There is but one good harbour in this large bay, that at its head, and there are few islands in it.

At Cape Ray the "French shore" ended, and from that point, along the south shore and round by Cape Race to Cape St. John, it was quite possible for the colonists to make settlements uninterrupted, at least by French interference, their only difficulties having been with the Mother Country. About 7 miles east of Cape Ray is Port aux Basques, where, in 1866, the first Atlantic telegraph cable crossed to Cape Breton. This harbour is the terminus of the railway which was completed in June 1897. A connection is made by a first-class steamer with Sydney, Cape Breton, the eastern terminus of the Interecolonial Railway. The passage takes five or six hours, so that the port of St. John's is now in close running connection with the continental railway system. The distance from Liverpool to New York is 3563 miles, while from Cape Clear to St. John's it is only 1675 miles, and extension of the railways on both sides of the ocean would shorten the ocean portion of the passage by 1800 miles.

The south coast of Newfoundland is studded with innumerable islands; the Burgeo islands, the Ramea islands, and the islands in Fortune Bay figure in the Spanish and Portuguese maps as the 11,000 Virgins—a name which has disappeared from the coast unless it has been transferred to the Virgin Rocks. Fortune Bay is

much frequented, and has many settlements upon its shores. It penetrates 65 miles inland and is 35 miles wide at its mouth. Like the other large bays it abounds in harbours, coves, and shelters for fishing craft. The French islands of St. Pierre and Miquelon lie off its mouth. East of Fortune Bay opens up the great bay of Placentia lying between the peninsulas of Burin and Avalon. It is 40 miles wide at its mouth, and reaches 60 miles inland, abounding, as do all the other great bays, in harbours and islands. On the eastern side of the bay is the town of Placentia, in the days of French supremacy the seat of French power, but now of much reduced importance. The Atlantic telegraph cables are landed at Placentia Road, and the lines pass from there overland to Heart's Content in Trinity Bay. Six cables cluster here, passing from Sydney by way of St. Pierre Island. The town of Placentia is connected by a railway with St. John's. St. Mary's Bay, 20 miles wide, and Trepassey Bay are the other important bays to the east. Trepassey is, in winter, of some importance; for when an easterly gale may have blocked St. John's harbour with field-ice, vessels may find shelter there, and there is a good road thence 70 miles long to St. John's.

Geology.—A glance at the geological map of Newfoundland will show the prevalence of Archæan or pre-Cambrian rock formations possessing a marked north-eastern and south-westerly trend or strike. Overlying these are Palæozoic sediments occurring in troughs and basins appertaining to the Cambrian, Ordovician, Silurian, Devonian, and Carboniferous systems. Besides these are numerous eruptive masses of greater or less extent which play an important part in the structural features as well as the economic character of the rock formations on the island.

The south-eastern portion of Newfoundland consists for the most part of Huronian rocks with slates, quartzites, and slate conglomerates predominant, in which are extensive areas of Cambrian strata (designated as Primordial rocks by early writers) with the trilobite *Olenellus* and other characteristic Lower Cambrian fossils. The strata in which these ancient types occur consist of slates, sandstones, and conglomerates.

The southern portion of the island consists, in the main, of Archæan gneisses and gneissoid rocks, in which intrusive masses occur along extensive planes of shearing parallel to the general trend and strike of the hills, valleys, and bays, giving the country its peculiar character and marked topographic features. The west coast from Cape Ray to Cape Norman (except at Bonne Bay and south of the Bay of Islands, where intrusive masses occur flanked by Silurian strata) consists of Palæozoic marine sediments ranging from the Carboniferous down to the Cambrian. The north and eastern side of the island, from Cape Bauld to Cape Race, with the bold elongated axes of the main chains and rock masses jutting into the Atlantic, presents a greatly cut-up and diversified coast line, with long and narrow bays dissecting the same, where eruptive rocks (chiefly serpentines notably around the shore of Notre Dame Bay) as well as Silurian and Cambrian and Huronian formations occur.

The chain of highlands called "Long Range," on Le Petit Nord peninsula, with its pre-eminently Archæan nucleus or central massif, is typically Laurentian in scenic effect as well as in petrographical characters. Three small nuclei of Laurentian age occur in the larger Huronian areas to the south-east. The Laurentian areas of Newfoundland constitute the "barrens" of writers.

The Silurian system is well developed in many areas, notably along the central division of the Reid Railway, and north of Despair (Hermitage) Bay; besides, a very long strip along the west coast from Cape St. George to Cape Norman, where Ordovician and Cambrian strata also occur.

There are three coal-bearing areas of Carboniferous age in Newfoundland:—one on St. George Bay, only *eight* miles from the coast; one south of White Bay; and the Codroy area. Boring operations have revealed several seams of good coal; the ordinary strata referable to typical productive coal-measures on the island deserve further investigation. The French islands of St. Pierre and Miquelon consist of Huronian sandstones, slates, and conglomerates, with intrusive masses forming the northern and southern extremities of Miquelon.

While the heart of the island is thus formed of Archæan and Primordial rocks there are large areas of later formations, and upon these are the agricultural and heavily timbered lands which have of late years been opened up and made known by the officers of the Geological Survey. On the west coast the farming lands of the Codroy valley and Bay St. George are upon Carboniferous rocks. Farther north, upon the marginal belt, are Cambro-Silurian rocks which extend all around by the northern cape. A trough of Upper Silurian 20 to 25 miles in width commencing at the Bay of Exploits runs diagonally across the island and comes out in two narrow forks on the south shore. The Exploits river in its whole length flows through it, and it surrounds Indian and Victoria lakes. A similar band to the south is followed by the Gander river, and in the two valleys are large areas of good land and of merchantable timber. There is also an area of Carboniferous rocks at the head of the valley of the Humber.

Interior.—It has been the misfortune of Newfoundland that, for more than 200 years, it was the policy of the British Government to prevent its settlement, and the interest of the influential class who controlled the fisheries to deery its climate and agricultural capabilities. The forbidding rampart of barren rock which guards its eastern and southern shores, and the magnificent mountainous scenery of the western coast do not in truth suggest the existence of large tracts of arable land; but the explorations of the Geological Survey have revealed in the valleys of the streams, and at the heads of the bays, large areas suitable for settlement and cultivation. Until then the interior of the island was an unknown wilderness, and even yet large areas remain unexplored; for, although the railway is now completed across the island, and hunting parties with canoes and Indian guides may follow up the rivers and cross the portages over to the westward streams, no white man since Cormack in 1822 is reported to have crossed the main island at its widest extension on foot. So far as known the interior is an undulating plateau of no great elevation, for the most part covered by marshes, interspersed with patches of woods, and studded with countless lakes and ponds. There are also large areas known locally as "barrens," consisting of rock generally covered with lichens or caribou moss, with shallow pools, and small streams, and patches of low pines and larch (locally called juniper) where there is a little soil in sheltered hollows. Ridges, generally bare of trees, run across this plateau in a north-east and south-west direction and terminate as the headlands of bays, giving an undulating appearance to the interior of the country. From the plains rise occasional high isolated peaked hills, called locally "tolts," to a height of 1500 to 2000 feet.

The most important range of mountains is the Long Range running near the west coast and rising often into peaks 2000 feet high. A shorter range runs between this and the shore starting from Cape Anguille—not of Laurentian age but Silurian and Carboniferous. The Blomidon Range breaks off from these and borders the valley of the Humber, composed also of the later formations. Another range called the Middle Range extends across the island from Notre Dame Bay to Fortune Bay. The peninsula of Avalon is very hilly, and is traversed by two high ranges. Few peaks rise anywhere upon the island higher than 2000 feet.

Hydrography.—Newfoundland is a country abounding in waters. It has been calculated that one-third of its surface is covered with water. From any elevated point will be seen in all directions lakes, rivers, and brooks in countless numbers. The highest land is on the west and south, and all the larger rivers except the Humber flow to the north-east coast.

Of the rivers the largest is the Exploits river, 200 miles long and draining an area of some 3000 square miles. It rises at the extreme south-west point of the island within 12 miles of Cape Ray and flows north-east into the bay of Exploits, a sub-bay of the great Notre Dame Bay. The Gander river rises also near the southern coast, and flowing also in a north-east direction, falls, after draining an area of 2500 miles, into another sub-bay (Gander Bay) of the same great bay of Notre Dame. The third large river is the Humber, which flows in an opposite direction, but between the same points of the compass. It rises near the head of White Bay on the east coast and falls into Bay of Islands on the west. The head waters of the streams almost touch in the interior, and some of the lakes drain in opposite direc-

tions ; but, while these afford canoe routes for hunters, all communication before the railway was built was by vessels along the coast.

The principal lakes are : Grand Pond, with Hind's Pond, Sandy Pond, and Sheffield Pond in close proximity ; Deer Lake, also an expansion of the Humber



VIEW ON THE HUMBER RIVER.

river ; Red Indian Lake, Great Gander Lake, Lake Meelbegh, George IV. Lake, Victoria Lake, Round Pond, and Long Pond. The leading peaks and ranges of Newfoundland are : Long Range, Middle Range, Table Mountains, Peyton Mountain, Cairn Mountain, Hind's Hill, Blomidon Mountain and Cliff, Mount Silvestre, Notched Mountain, and Red Hills.

Forests.—It is estimated that there are 14,000 square miles at least of forest land in Newfoundland, valued at

about \$25,000 per square mile—a low estimate—which would place the total valuation of the wooded territory product at \$350,000,000. According to Howley, forest areas reproduce themselves rapidly on the island. Timber is chiefly found in river valleys and around shores of lakes and streams. The forest wealth is varied and extensive. The trees include white pine, yellow pine, red pine, spruce, fir, juniper (tamarack), white birch, yellow birch, witch hazel, aspen, alder, white maple, and several other species. White pine is the mainstay of the lumber industry. Trees from 10 to 36 inches at the butt go 40 feet before a limb is reached, then stretch upward 10 to 30 feet higher. In 1910 plans were adopted for the preservation and utilisation of the island's forest wealth, also for reforestation in suitable areas. *Red pine* is plentiful, and is used for household furniture, railway ties, etc. *Balsam fir* makes excellent wood for house-building, and for the manufacture of pulp and paper, whilst *spruce* is chiefly used in this latter industry, the island having enormous areas of spruce forest, locally called "pulp woods." Juniper—the local name for tamarack or American larch (*Larix Americana*)—is employed in shipbuilding, as is also birch. Pulp mills have been established at Grand Falls and Bishop's Falls, and are doing extensive business.

The principal timber belts are in the north-eastern parts of Newfoundland, along the Exploits river and its tributaries, Gander river and lake, Gambo Pond and streams, Grand lake, Deer lake, the Humber river, and the rivers flowing into St. George Bay and Bay of Islands. There were 273 saw or lumber mills in operation on the island during the fiscal year 1909–10, with an aggregate output of 44,500,000 feet (B.M.) of lumber of all kinds, valued at \$624,764, besides 35,000,000 feet of timber cut by the Harmsworth Company for use in its pulp and

paper mills. These mills employ 3900 men, five months of the year, earning \$488,750. Thus the lumber industry is worth \$750,000 per annum to the colony, and the pulp and paper industry \$1,250,000; making in all for forest products the sum of \$2,000,000, or more than ten times the amount realised ten years ago.

Climate

The climate of Newfoundland varies very much. The Arctic current running along the eastern coast lengthens out the spring and, in winter and early spring, the east winds blow masses of field-ice into the bays and harbours, the continual stream of bergs helping to retard the summer. Frequent fogs are borne in upon the east and south coasts by all the eastern and southerly winds. The climate of that portion of the island, while not so cold in winter or so warm in summer as in Canada, is apt to be raw and chilly rather than cold in winter, and foggy and cool in summer. The average minimum temperature of eight years was 7°, and the maximum 83° Fahrenheit. These are the extreme points of range. In the interior and on the west coast the climate is different and resembles that of Canada. The spring is earlier and the summer warmer. The fog does not penetrate farther than 20 miles from the south and east coasts, and so the sky is bright and the weather clear. On the elevated barrens it is very cold in winter, but the valleys are sheltered from the colder winds. The robust appearance of the population testifies to the salubrity of the climate.

Government.—The government of Newfoundland extends not only over the island of that name but over that part of Labrador extending from Blanc Sablon at the

Strait of Belle-isle northwards along the coast to Cape Chidley. The island has not yet consented to form part of the Dominion of Canada, and the British Government therefore appoints the Governor. There are two chambers—the legislative council, not exceeding 9 members, nominated for life by the governor in council, and the legislative assembly, at present consisting of 36 representatives, elected for four years by ballot under manhood suffrage. The administration is in the form known as responsible government by a ministry commanding a majority in the popular house. It was in 1855 that Queen Victoria established responsible government in Newfoundland.

Trade and Resources

Since the year 1887 accounts have been kept in dollars and cents, and, by a recent statute, the currency was assimilated to that of Canada and the United States, the par of exchange being fixed at \$4.8666 to the pound sterling, or in the language of bankers, the par is $9\frac{1}{2}$ per cent premium on old par.

The exports, marine and fishery (82.46 per cent), mines (13.17 per cent), forests (3.15 per cent), miscellaneous (1.22 per cent), are for the greater part to foreign countries, while the importations are mostly from Great Britain, Canada, and the United States.

There has been a marked upward movement in foreign trade from 1896–97, when the figures were \$4,925,789, to 1912–13, when they totalled \$14,672,887.

Imports.—Newfoundlanders, as pointed out by Rogers, are fed on meat, bread, and butter by Canada and the United States almost equally, and are clothed by England, whilst three-fourths of the coal used is obtained in Nova Scotia. This also shows to what an extent

the resources of the colony are derived from the surrounding ocean.

Imports from the United Kingdom, \$3,826,529; from British Possessions (mainly Canada), \$5,192,462, whilst imports from the United States were \$5,796,906 for the year 1912-13.

Cod-fishery.—Of the exports in the year 1912-13 dried cod-fish formed the staple, valued at \$7,987,389, as compared with 1,732,387 quintals, valued at \$7,398,536, for the corresponding period of 1909.

Medicinal cod-liver oil is one of Newfoundland's noted industries which should be promoted to a greater extent in the near future. Methods employed in Norway should be applied on the island and further loss eliminated. Newfoundland manufactured 191,403 gallons of refined cod-liver oil in one year, 1903-4. In 1908-9 the figures were 93,780 gallons, whilst Norway manufactured "steam refined" medicinal cod-liver oil to the amount of 1,429,450 gallons. The decision of the Hague Arbitration gives Newfoundlanders control of their waters, and steps are being taken to prevent destructive methods of fishing employed by outsiders, especially those employed in steam-trawling.

The following table of figures giving returns from the whale fisheries for the years 1908-13 indicates the output for Newfoundland.

Year.	Whales caught.	Gallons of oil produced.	Tons of guano.	Bone in tons.
1908	396	420,846	507	532½
1909	518	518,749	678	657¼
1910	384	416,831	618¼	559¾
1911	335	405,644	672	516
1912	289	400,552	655	417
1913	222	273,558	523	421

There are ten factories where finbacks, humpbacks, and sulphur-bottom whales are treated.

Seal-fishery.—In 1912, 272,965 seals were captured by the Newfoundland steam sealing fleet as against 175,130 in 1911, making an increase of 97,835 seals. The total net value of the 1912 seal fishery is given at \$493,846, that of 1911 at \$329,265, making an increase of \$164,581.

Values of export for 1909–10 included: fishery, \$9,578,984; mine, \$1,370,775; forest, \$713,967; and agriculture, \$10,286; whilst all exports for the same year totalled \$11,824,997.

The *exports* from the colony of Newfoundland for the year ended June 30, 1913, amounted to \$14,672,889. The chief items in the exports for the same year were as follows:—

Fisheries	\$10,242,556
Manufactures	2,434,789
Mines	1,497,879
Forests	249,671
Agriculture	24,902
Miscellaneous	223,092
	<hr/>
Total	\$14,672,889

Imports for the same period totalled \$16,012,365; making a total trade of \$30,685,254.

Imports from the United Kingdom were valued at \$4,405,103; from Canada, \$5,215,537; and from the United States at \$5,573,733. Exports to the United Kingdom totalled \$3,386,421; to Canada, \$2,144,357; to Brazil, \$2,589,605; to Portugal, \$1,251,160; to Spain, \$1,240,394; to the United States, \$1,282,672; and to Italy, \$1,158,861.

The total exports for 1910 were \$12,086,276.

Population

From the nature of their occupation it is evident that this people cannot be grouped in cities, but settled in families and small communities along the coast. There were no settlers in the interior until 1890, when the first inland village sprang into life around the saw-mill on the Exploits river, and around Reid's railway stations on the Gambo, Gander, and Exploits, where townships modelled on the Canadian system were surveyed and organised; villages grew up, forming the first examples of colonisation by township in the history of Newfoundland. There are settlements also at Codroy, St. George Bay, Bay of Islands, and Bonne Bay. The life the people lead, in continual conflict with the sea, and in presence of all the dangers of sea-faring life upon an ocean vexed with frequent storms, makes them earnest and resolute in character. They are matchless sailors, skilful and daring, such men as in the old days of wooden ships raised Great Britain to the pinnacle of her naval renown. They are daily braving its dangers, and they know well all the secrets of the sea. They, beyond all other people, "go down to the sea in ships, and do business in great waters." Newfoundland is still a great training-school for mariners. The census returns of 1891 and 1911 gave the following results:—

POPULATION OF TOWNS

	1891.	1911.
St John's	29,007	32,292
Harbour Grace	6466	4,279
Twillingate	3565	3,348
Bonavista	3551	3,911
Carbonear	4127	3,540

The population of Newfoundland during various phases of its history is given as follows:—

1654	1,750	1874	161,000
1804	20,000	1901	217,037
1832	60,000	1911	238,670
1857	124,000		

Education

The educational system adopted is denominational, and no other system seems to be possible with the strong sectarian feelings of the people. The government grant for 1911 amounted to \$337,372 for all schools and colleges. The total number attending colleges and schools is 51,569. There are four superintendents of education appointed by Government—one each for the Roman, Anglican, Methodist, and Presbyterian churches—and they act through separate boards in each district.

Industries

Farming has not been followed to any extent, nor is there a population suited for manufacturing pursuits. It has been too strongly asserted, and too frequently repeated, that there is no land on the island suitable for agriculture. Such is no doubt the case along the barrier shores which bear the brunt of the Atlantic surf. Sir Richard Bonnycastle pointed out that there is much agricultural land in the western districts and in the valleys. The following statistics (Rogers) show to what extent farming is practised, and what advance has been made since 1836, but more especially since 1870. In 1836 there were 17 square miles of “gardens” and pasture in the whole of Newfoundland, 1551 horses, 5835 cattle, and 3103 sheep. In 1901 the statistical

returns gave 60 square miles of "gardens," 55 square miles of pasture, 8851 horses, 32,767 cattle, and 78,052 sheep. The total value of crops harvested in Newfoundland in 1912, including oats, potatoes, and turnips, was estimated at \$2,000,000; and the census figures of 1911 gave returns of 13,694 horses, 39,472 cattle, 97,597 sheep, and 26,956 sheep as stock on hand by the farming community. The fact seems to be that the danger and excitement of a fisherman's life, everywhere it can be followed, are preferred to the supposed monotony of farm work, and, on the coast of Newfoundland, the treasures of the deep are too tempting, though the fishermen themselves have not profited overmuch. Should a Latin motto ever be required, none more expressive of the fortunes of the island could be chosen than *Sic vos non vobis*. It is no wonder, that the people are too apt to neglect all other pursuits, for here in all the bays and harbours, and at their very doors, nature, somewhat stern in many respects, presents them with millions in their seasons of fish and other marine creatures. Fully twenty-five per cent of the population is engaged in catching or curing fish.

The harvest of the ocean opens on the 1st of March, when the sailing vessels for the seal fishery put to sea. On the 10th or 12th the steamers leave, and all are crowded with men. There are 22 steamers from 350 to 500 tons engaged in the business, carrying from 200 to 300 men each. They are very strongly built and protected so as to force their way through the ice floes. The seals seek the field-ice carried down by the Arctic current upon which to bring forth and suckle their young. The pups are born from the 15th to the 20th of February, and are in the best condition about March 16, being fat; and they are also easy to kill while upon the ice, for

early in April they take to the water. Of late years the seals have not been so numerous and the hunting is regulated by law; so that no seal may be killed before March 16, nor after April 16, and the steamers are allowed to make only one trip. The vessels are pushed into the floating ice, and when a herd of seals is seen the crews pursue them from floe to floe and kill the young ones chiefly, for from them the best oil is obtained. They are hunted for their fat and skins only. The hunters kill them with clubs, skin them upon the ice, and drag their loads to the vessels until the cargo is complete.

As the Gulf Stream is the bearer of warmth to distant shores, the Arctic current is the bearer of that wealth of ocean-born organisms generated in the cold waters of the north which is the superabounding support immediately or mediately of the food fishes of commerce. In the overflow of these waters, and along the coasts they wash, cod, herring, salmon, and other fishes of commerce find the conditions suitable for reproduction, and there also they find food convenient for them. The Banks of Newfoundland have been described elsewhere. These highland meadows of ocean are during the summer season the resort of innumerable swarms of codfish, which, issuing from the darker recesses of their hidden deep-sea homes, throng the shallower and lighter waters, and flow over into the bays and coves of the adjacent coast in such numbers as to become the staple export of the colony and the industrial support of four-fifths of its people.

In the early days of June the capelin arrive and swarm along the coast in such numbers that, with a casting-net, a man may obtain a cart-load in an hour. They stay for about seven weeks. They are small fishes

six or seven inches long, and are the food of the cod, which follow hard upon them and drive them inshore. When the capelin disappear, about the 1st of August, immense numbers of squid arrive. These are small euttle-fish which swarm on the coast and in the harbours. Occasionally they are met with of gigantic size, more than realising Victor Hugo's description of the devil-fish in his *Toilers of the Sea*. They are, however, decapods. A piece 19 feet long of an arm of one of these creatures, cut off by a fisherman whose boat it had attacked, is in the museum of St. John's. Another of these monsters was found dead. Its two larger tentacles measured 24 feet each, the eight shorter and thicker ones 12 feet each; the body was 10 feet long. But such formidable monsters are seldom encountered. After reading Dr. Harvey's account of them Homer's vivid account of Scylla in the 12th book of the *Odyssey* becomes almost realistic. The squid become in their turn for six or seven weeks the prey of the cod, when the herring arrive, and, during September and October, the codfish feed upon them until they depart for their winter homes in the deeper waters. The prosperity of the colony has always been so bound up with the cod fishery that in the language of Newfoundland the word "fish" means only cod. There are indeed "salmon" and "herring" and "haddock," but the cod are always called "fish." Upon the early maps, which are Portuguese, Spanish, or Italian, the country is called "baeealaos," the general name for codfish in the languages of southern Europe.

Fishing on the Banks is open to all, and vessels from western Europe as well as from the United States and the Canadian provinces share in the sea harvest. There were, in 1910, 101 Newfoundland bankers aggregating 6630 tons, and carrying 1567 in crews, with a total

catch of 144,524 quintals. Very often the passenger on an ocean steamer is surprised to see small fishing schooners pursuing their business anchored apparently in mid-ocean. For four hundred years this treasury of food has been exploited apparently without signs of exhaustion. The foreign vessels carry away their cargoes salted green, but the colonists have only to take their fish to the adjacent shores to be dried and cured for export. The colonists do not rely so much upon the Bank fisheries, for the cod follow the capelin, squid, and herring close into the bays, and afford abundance of bait wherewith the cod may be caught nearer home.

The importance of the cod fishing will appear on reference to preceding tables. Out of a total value of \$14,672,887, the export of dried codfish alone amounts to \$7,987,389. The fish are split, cleaned, salted, and then dried on stages on the shore, and are exported to the tropics, to southern Europe, to the West Indies, and the Brazils. The products are entirely used up; from the livers cod-liver oil is extracted, glue is made from the skins, and the heads and entrails are utilised for the manufacture of fertilisers. The fish flakes or drying stages used in this industry are characteristic of the settlements along the whole coast.

The total value of fish products included in the exports for 1912-13 was \$9,736,089. It is no wonder, then, that the colonists have been tempted away upon the sea and have neglected the other resources of their island. The wealth earned has, however, been drawn away to other lands, and has built up the prosperity of non-resident merchants. There is a change now in progress, and other industries are beginning to be more vigorously pursued. The herring fishery is followed along the south and west shores, and

the lobster-canning industry has grown from its commencement in 1873 to an export value of \$476,940. The salmon rivers, swarming with fish in olden days, had been ruined, but are recovering under careful supervision, and in 1910 pickled salmon to the value of \$56,845 were exported.

While it may or may not be true that the Bank fisheries show no signs of exhaustion, the Government of Newfoundland has awakened to the fact that the inshore fisheries were becoming less productive. In 1889 a Fishery Commission was appointed, and under the skilful management of the superintendent scientific regulations were enacted and enforced, not only for preventing wasteful methods of fishing but for replenishing from hatcheries areas which had been exhausted. The cod fishing had ceased to be profitable in Conception Bay and was failing in Trinity Bay, but in 1894 three hundred millions of cod ova were hatched at the hatchery in Trinity Bay, and the fishermen are now reporting shoals of small fish in places where for many years they had not been seen. Floating incubators have been established for lobsters—the ova are collected at the canning factories and are hatched and liberated to replenish the waters.

Mineral Resources

It was pointed out by the officers of the Geological Survey many years ago that the similarity of some of the rock formations of Newfoundland to those of Canada and the adjacent maritime provinces gave promise of containing similar minerals. In 1857 copper was discovered at Tilt Cove and works were built. Other deposits of copper were also discovered at Hare Bay, Betts Cove, and Little Bay. In 1905–6 from these mines were

exported copper ore to the value of \$375,520. Lead was discovered on the west coast, but the French complained that the works infringed their treaty rights and work was stopped. The lead mines of La Manche, at the head of Placentia Bay, produced 1000 tons in 1858. Iron pyrites was exported in 1905-6 to the value of \$334,075. The large area of serpentine rocks gives promise of asbestos, and several mines of it have been opened. The iron ore of Bell Island, in Conception Bay, furnishes the most important mineral asset known on the island. Some 40,000,000 tons of hematite ore were described as being "in sight" some years ago; and Howley estimates the enormous total of 3,635,543,360 tons. Oil has been obtained at Parson's Pond and Bonne Bay. Immense deposits of gypsum exist on St. George Bay and along the Codroy rivers, but the most promising among the prospective mining industries are the coal areas observed first by Jukes in 1838. These may be considered as an extension of the coal-fields upon the neighbouring shores of Cape Breton. The seam he found was on the south of St. George Bay, three feet in thickness, and many other seams have been discovered of varying thickness from a few inches to six feet thick, but none have yet been worked.

The quantity and value of the principal minerals produced in Newfoundland during the years 1910 and 1911 are as follows:—

Minerals.	Tons.	Value.	Year.
Copper ore and regulus .	41,650	\$217,180	1910
" " " " " "	30,646	227,875	1911
Iron ore	1,108,762	1,253,050	1910
" " " " " "	1,171,992	2,514,900	1911
Gold (in ounces) . .	3,124 ozs.	86,350	1910
" " " " " "	2,298 ozs.	48,810	1911

In 1910 there were 2047 tons of lead and zinc produced. There were 2253 persons employed in the mines of Newfoundland in 1910. The latest estimate made of the iron resources of Bell Island place the same at 113,000,000 tons.

The output of minerals in Newfoundland has grown from \$500,999 in the year 1900 to \$1,125,000 in 1910; and upwards of \$1,319,197 in 1912.

Game

It seems strange that there should exist so near to England a country like the interior of Newfoundland abounding in large game like the caribou. They migrate in great numbers at regular seasons, spending the winter in the south and moving to the north to bring forth and rear their young. The favourite hunting-grounds are upon the "barrens" where the reindeer moss grows in abundance. Wild geese and duck are very plentiful, and the numerous lakes and streams in the interior are their favourite resorts. Ptarmigan are also abundant. The streams are full of trout, but the salmon rivers will require a long rest before they recover.

Communications.—Newfoundland was settled as a fishery, and all the settlers were fishermen along the coast. Under the evil laws described later (p. 1011) the Crown refused to grant lands until 1813, and it was not until 1825 that the first road, nine miles long, was built. Since that time roads have been extended to points in the peninsula of Avalon; but elsewhere all communication has been by vessels along the coast. At last, in 1881, the railway was projected which is opening the interior. Trains ran for some time from St. John's to Placentia and to Harbour Grace, and

in 1896 the road was completed to its terminal point. It follows the valley of the Exploits river for some distance and strikes across to the valley of the Humber, which it follows down to the head of Humber Arm, and thence in a south-west direction to the head of St. George Bay and to Port aux Basques, seven miles east of Cape Ray. It has opened up the best part of the interior of the island and the coal areas of the Humber and St. George Bay. There were 723 miles of Government railways in 1912; whilst the line to Bonavista was completed in 1911, and that to Trepassay in 1912.

Newfoundland possesses to-day the largest per capita mileage in railways of any country in the world of similar character, while its system of coast and bay steamers is excellent. Previous to 1825 all travel was over trails, and the draft animals were the famous Newfoundland dogs. In 1909 there were not three settlements in the island lacking an outlet by sea. All settlements were on the sea-coast. In 1880 a railway policy was launched, and after considerable trouble, owing to the failure of a United States Company to carry out its obligations, the English bondholders completed the section of railway from St. John's to Harbour Grace in 1884. In 1890 the Newfoundland Government undertook the building of a line from the capital to Notre Dame Bay, and in 1893 decided to extend the same to Port aux Basques, whence daily communication could be maintained with the Canadian mainland by a fast steamer. The completion of this line assured the first real and practical link uniting this Crown Colony to the Canadian Confederation. The operation of the railway and its branches by Sir R. G. Reid, a Montrealer, his purchase of the St. John's dry dock, of the colonial telegraph system (1000 miles in length), the establish-

ment of a fleet of high-class modern steamers to serve the whole seaboard, and the development of lands fit for agriculture or forest culture, removed the colony from a chronic state of financial embarrassment to a position of progress. From that time a new era of advancement in every direction dawned upon Newfoundland, and the output of its fisheries increased rapidly year by year; agriculture, forest, and other industries depending upon these grew apace.

The Reid railway is a private enterprise which cost \$16,000,000. The making of this railway has been the making of Newfoundland. Without it, the island must have remained an unknown land. This enterprise has made it possible as a romantic holiday ground, and as the seat of far more extensive fishery and industrial interests in years to come. It also opens up fine agricultural valleys. On the Great Bay of St. George, at the point where the Robinson river pours into the sea, there are a dozen cottages, and a lot of good farming land round about, both on one side, which is high, and on the meadows across the stream. The coast rises to high bluffs, as it bends away both east and west, one of which gives the place its name. The river valley behind is a wide, rolling country, bounded by blue hills far away, and, so far as the eye can reach, on every side is forest—impenetrable forest, or penetrated only, as one may find out, by a short pathway here and there. Roads, however, will soon open up the treasures of the interior.

Communication to all points along the coast is now made by lines of steamers. One route follows the east coast to the north as far as Battle Harbour in Labrador; the other goes along the south coast and up by the west as far as Bonne Bay. Regular steamship communication

is also established with Liverpool, England; Sydney, Cape Breton; Halifax, Nova Scotia; New York, and Montreal. In 1912 there were 3395 registered vessels, of which 80 were steam-vessels.

St. John's, the capital of Newfoundland, is a city of nearly 40,000, situated on the north side of one of the



ENTRANCE TO HARBOUR OF ST. JOHN'S.

most remarkable harbours in America, one mile long by half a mile wide, perfectly land-locked, deep, and accessible at all states of the tide for the largest ships afloat. The entrance is through a cleft in the wall of cliffs which abut on the ocean all along that part of the east coast. It is scarcely distinguishable at a little distance, and a stranger is surprised when suddenly the vessel turns inwards and passes through the "Narrows," a channel half a mile long and only 600

feet wide. Cliffs on the north 520 feet and on the south 700 feet high shut out all view of the city until the end of the Narrows is reached, when the city opens up suddenly, most picturesquely seated on a rocky slope.

St. John's is entirely devoted to the fishing business. When the sealing steamers arrive, and at the seasons when the people at the outposts throng in to purchase supplies, it is a very busy place; but the city does not do justice to its very striking situation. It has repeatedly suffered from great conflagrations, and its inhabitants have had to bear heavy losses and great discouragements, not the least on account of disastrous fires which repeatedly decimated the town. Following a serious commercial crisis, Canadian banks, including the Bank of Montreal, the Bank of Nova Scotia, and the Royal Bank of Canada, opened up agencies in St. John's, and business at once revived; and business transactions are now carried on on a sounder and more modern basis. Manufactures are also being introduced to diversify the interests of the people. A serious obstacle to the advancement of this colony has been the too general practice of people who have made money leaving it to live in England. No country can steadily prosper when its successful men are drained away and the realised wealth it produced is spent to enrich other lands.

St. John's is the seat of government and the public buildings are there, but its architectural adornments are the Roman and the Anglican cathedrals, two very fine buildings in the front rank of the churches of British America.

History

The history of the island of Newfoundland differs so radically from that of the other colonies of England that,

with a view to making its course plain, it becomes necessary to consider it under the following heads:—

1. Discovery, 1497.
2. Attempts at colonisation made, as in the case of other colonies, by patentees, 1583–1633.
3. Period of repression of the colonists in the interest of the mercantile houses of the west of England carrying on the fisheries, often called “the merchant adventurers,” 1633–1792.
4. Organisation of civil society, 1792–1832.
5. Constitutional government conceded, 1832.
6. The French shore question.

Discovery

“From recent researches in history it is quite clear,” writes J. D. Rogers, “that Labrador, Newfoundland, and some parts of the American continent were visited by a party of colonists between A.D. 1000 and A.D. 1006, and were described with unerring fidelity. Eric’s son Lew, Lew’s brother, Karlsevne, Bjarni, Thorwald, Thorvard, Freydis, and Thorhallr are so many names of sea-faring folk who found the new world, and who described it as Helluland (Slabland), Markland (Woodland), Kjalarnes (Keel-ness), Straumfjörd (Stream-fjord), and Hopi, where they met the Skraelings (Eskimos), primæval forests, bears, deer, and localities where the scenery was softer. The Norse discovery of Newfoundland and America was the false dawn, and many events were destined to happen before the real dawn appeared.”

In the bright family of the colonies of England, of those which have remained faithful as well as those which revolted from the motherland, Newfoundland is

the elder sister—elder not only by discovery, but by first attempt at settlement. The island was discovered in 1497 by John Cabot on his first voyage for King Henry VII., and, after having touched land at the eastern point of Cape Breton and raised there the banner of St. George, he sailed along the south coast of Newfoundland as he returned to Bristol, his port of departure. It should always be borne in mind that, at that date, Columbus had discovered the West India Islands only. He did not set foot upon, nor even see, the Western Continent until August 2, 1498, on his third voyage, when he discovered what is now Venezuela in South America. On his fourth voyage in 1502 he first saw the mainland of North America, in Honduras Bay, and sailed along the shore of Costa Rica. Meanwhile a second expedition had been fitted out at Bristol, also under the commission of Henry VII. and under the command of John Cabot and his son Sebastian. This expedition sailed early in 1498 and coasted the Continent of North America from Labrador to Cape Hatteras. There are many disputed questions concerning these two men and their voyages which will be found discussed at length in the authorities cited at the end of this volume; it is only necessary to observe here that the primary title to the inheritance of the English race in the New World is derived from the voyages of the Cabots and their first discovery, prior to Columbus, of the mainland of America.

It is almost impossible in this century to conceive to what an extent the two great maritime powers, Spain and Portugal, overshadowed all others at the commencement of the sixteenth century, and the diplomatic strife which was carried on between them is more confusing because the new land discovered by Spain in the west

was supposed to be the eastern margin of the continent of Asia, where the Portuguese discoveries in the east were incessantly extending. To settle these rival claims the celebrated bull of Pope Alexander VI. was issued in 1493; but the boundary line therein laid down was modified by the treaty of Tordesillas in 1494, and a meridian, 370 leagues west of the Cape de Verde Islands, was fixed upon as the dividing line. All lands discovered were to belong to Spain if westward, and to Portugal if eastward of this line. In the defective knowledge of that period, and owing to the impossibility of ascertaining longitudes with approximate accuracy, Newfoundland was drawn to the east of this line and fell to Portugal, while the rest of America, as discovered, was claimed by Spain. On some of the earliest maps the Portuguese "sphere of influence," to borrow a recent phrase, included even Nova Scotia.

In those days Portugal was at the zenith of her greatness, and a powerful and noble family of that kingdom, the Cortereals, were sailors and discoverers while the English and French nobility were slowly recovering from intestine wars. To one of the younger scions of this fearless and enterprising family, Gaspar Cortereal, the king of Portugal granted a commission, and in A.D. 1500 and 1501 he made two voyages in the hope of reaching Asia by the north-west. In these voyages he reached as far as Greenland, and coasted along the east coast of Newfoundland and perhaps Labrador. His own vessel, and he himself, perished on the second voyage, but upon his discoveries and the bull of Alexander VI. the Portuguese based their claim to Newfoundland.

The English neglected the Cabots and their discoveries, and, besides, they were wrapped up in their

trade with Iceland, where they got all the codfish they wanted; but the Portuguese and Basques, Spanish and French, soon heard of the amazing wealth of codfish on the coasts and banks of Newfoundland, and, with a boldness and enterprise scarcely credible now, began to throng those waters with their little fishing vessels, and they were followed by fishermen of Brittany and Normandy. This accounts for the fact that the names of the prominent localities on the east coast of Newfoundland are mostly corruptions of Portuguese, while the names on the south coast reveal the predominance of the French and Basques.

Ingenious and romantic theories have been propounded concerning discoveries of America by Basque sailors before Columbus. The whale fishery of that period and long afterwards was in the hands of the Basques, and it is asserted that, in following the whales, as they became scarce, farther and farther out in the western ocean, they came upon the coasts of Newfoundland a hundred years before Columbus and Cabot. No solid foundation can be found for these assertions. The records of the Basque maritime cities contain nothing to confirm them, and these assertions are mixed up with so much that is absurd—such as a statement that the Newfoundland Indians spoke Basque—that the whole hypothesis is incredible. There is not space in the present volume to follow out such questions, nor is it possible to discuss here the alluring and romantic legends of the islands of Antillia, of St. Brandon, of the seven cities, of Stockafixia, or of Mansatanaxio. It is, however, beyond question that, from the year 1506, the fishermen of Portugal, Brittany, and the Basque provinces resorted in far greater numbers to these coasts than the English, and the nomenclature of the coast proves it to the present day,

not only in Newfoundland, but on Labrador and in Cape Breton and Nova Scotia.

Colonisation, 1583-1633

Under the firm government of Queen Elizabeth, England became united and free from foreign entanglements, and her national energy and spirit flowed over into those channels of colonisation which have resulted in the present wide expansion of the English race. Hence in 1583 Sir Humphrey Gilbert obtained the Queen's commission as governor, and a large grant of territory in Newfoundland. "He," says Hakluyt, "was the first of our nation that carried people to erect an habitation and government in these northerly countries of America." In the harbour of St. John's he found thirty or forty sail of vessels of all nations, of which number twenty were Portuguese. He set up the royal arms and took possession of the country with the formalities customary at the time. The Portuguese were foremost and warmest in their welcome, which is explained by the fact that, three years before his arrival, their country had fallen under the yoke of Philip II. of Spain. At the height of its glory it was to cease for sixty years to be an independent kingdom, and the English were at least enemies of Spain. If any state had a right to challenge Gilbert's commission it would have been Portugal.

Sir Humphrey Gilbert was lost on the return voyage, and his attempt to colonise was a failure. But more and more the English vessels resorted to the fisheries, and perhaps, although no record of the fact exists, some permanent settlers remained behind. With the reign of James I. the overflow of the English people into the

western world commenced to run steadily and continuously, and all the brightest minds around the court and among the merchants were turned towards adventures beyond the seas. In 1610 a royal charter was issued to a company, of which Francis Bacon was the chief promoter, known as "The London and Bristol Company, usually called Guy's Association." A grant was made by James of the territory from Cape St. Mary's to Cape Bonavista, and John Guy of Bristol led out, the same year, the first colony to Newfoundland. He settled on the shore of Conception Bay, built a fort, and commenced to issue decrees as governor. That struck the first note of a conflict which was to last for 150 years, and of which the echoes may yet be heard. The fishermen, merchants, and seamen who flocked to the coast for the fishing season vehemently resented anything which might seem to threaten their turbulent lawlessness, and the great merchants in England, who were profiting by the fisheries, were jealous lest the planters should in some way interfere with their operations; but, for a time, the planters had sufficient influence through the patentees in England to maintain themselves. Captain John Mason came out as governor in 1615—an able and notable man—and, in the same year, Captain Richard Whitbourne, the worthiest of mariners, came out with a commission from the Admiralty to establish order among the fishing fleet. He reported that more than 400 sail of "French, Portugals, and Biscaines," and 250 sail of English fishermen were resorting to the coast. He urged upon the Government the importance of colonising the country with permanent settlers. He was an experienced sailor, not only to Newfoundland, but to every port in Europe, and he saw the surpassing value of the fisheries. Other companies were formed and other settlements were made

about this time, but all were confined to the peninsula of Avalon. Many distinguished names were connected with those enterprises—as Sir William Vaughan, Sir George Calvert, Lord Falkland. Sir George Calvert (afterwards Lord Baltimore) spent two years in the colony at Ferryland, where he erected large buildings. The romantic name Avalon was given by him, and that name is all which remains of his efforts. Calvert abandoned Newfoundland and afterwards obtained a charter for the colony of Maryland, whose capital, Baltimore, is named after his family title.

Period of Repression, 1633-1800

In the fairy story it is the youngest sister, but the eldest sister is the Cinderella of colonial history. If Newfoundland had experienced only the healthful neglect under which the other colonies prospered, she too would have grown into vigorous life. But a strong and influential class in England was interested in harassing the settlers, in depreciating the resources of the island, and in throwing every obstacle in the way of permanent settlement. This policy came in with Charles I. and continued down to the very commencement of the nineteenth century. Captain Mason, Sir William Vaughan, and Captain Whitbourne had written favourably of the island; but from their day down to 1842, when Sir Richard Bonnycastle wrote his book, every writer described it as barren; in summer gloomy with perpetual fog, and in winter given over to excessive cold and blinding snowstorms. The west country people of England, generation after generation, drew from the fisheries of Newfoundland enormous profits, upon which prosperous mercantile establishments and noble families were built up and

sustained—in England. They considered and called them “their” fisheries, and their interests required that there should be no resident population to compete in their monopoly, to share the best fishing rooms, and to grow up to be dangerous rivals in foreign markets. The influence of this class upon the government was incessantly exercised in framing regulations and laws to choke the growth of the colony.

The confused annals of this period can only be understood by remembering the existence of two antagonistic parties, the “planters” and inhabitants on the one hand, who, being settled there, needed the protection of a government and police, with administration of justice; and the “adventurers” or merchants on the other, who, originally carrying on the fishery from England, and visiting the island only for the season, needed no such protection for themselves, and had various reasons for preventing its being afforded to the others.

If the Mother Country had only forgotten the island it would have prospered; but in 1633 the English merchants succeeded in procuring from the “Star Chamber” rules and regulations drawn solely to advance their own private interests, and these rules were supplemented, always in the same direction, by the same oppressive agency.

It was now enacted that no settler should dwell within six miles of the sea-shore; that no planter should cut down any wood or plant within the same distance from the shore; that no inhabitant or planter should take the best places in the harbours before the arrival of the fishing-fleet in the spring. Then, in the spring, the captain of the first vessel to arrive in any harbour should be fishing admiral thereof and allot the places in the harbour. In this way the fisheries were to be reserved

for the English merchants, who sent out the vessels and fishermen for the fishing season. To prevent the growth of a resident population it was ordained that no master or owner should transport seamen or fishermen to the colony other than his own crew; that all provisions, except salt, should be purchased in England to last for the whole voyage; that every master of a vessel should give a bond for £100 to carry back to England every man he took out; that no settlers or planters should be taken to the colony. To prevent the formation of any organised administration, it was enacted that all offenders should be taken to England to be tried by the magistrates of certain specified cities in the western counties; that the fishermen were to be for ever free from the jurisdiction of any government in Newfoundland. Incredible as it may seem, attempts were made to compel the resident planters to remove to some other colony, or to return to England. Orders in council were made to that effect, and the planters had to organise and resist by force the destruction of their property which had been commenced. At last permission was sent out to continue, until further orders, the planters in possession of their houses. The planters had also asked for a resident governor to command them in case of attack, and for a clergyman to administer the ordinances of religion to them and their children, but they met with no response. The government of the fishing admirals had to suffice, and violence and disorder reigned during the fishing season.

This system of government by fishing admirals is a curiosity of administration. It had existed on the coast from the first, having originated in the necessity for some form of law among the crowds of turbulent sailors of all nations who thronged the coasts in the fishing season. But this wild system was recognised by the Star Chamber

ordinances and confirmed in 1698 by Act of Parliament. The first fishing captain to arrive at any harbour in the spring was "admiral" for the season, the second was "vice-admiral," the third was "rear-admiral!" They not only allotted the fishing rooms in the harbours, but they were magistrates of the district, not only among the fluctuating summer population, but in all questions between the fishermen and the permanent residents. Inasmuch as these fishing admirals were the hired servants of the merchant adventurers the course of justice set in one direction only. The English merchants wanted no better system, and strenuously opposed every modification of it. The only appeal was to the naval officers commanding the convoy of the king's ships, and, in the course of time, the commanding officer of the squadron on the Newfoundland station was also commissioned as governor, and his jurisdiction in appeal gradually encroached on the administration of the fishing admirals.

As if these discouragements were not sufficient, the French in 1662 seized Placentia, fortified it, and made it the seat of a resident governor. Up to that date no French subject had wintered upon the island. The French Government had taken no interest in it, and, while the supremacy of the English was not disputed, the French fishermen fished unmolested, chiefly on the south and west coast. There was room and there were fish for all; but, after the French settled at Placentia, came a period of intermittent hostilities and of injuries given and received, in the course of which St. John's, Ferryland, Harbour Grace, and Placentia were taken and retaken until, at the close of the sixteenth century, all the English settlements but two were completely ruined, and St. John's utterly destroyed and abandoned. In 1697 the island was re-conquered by an expedition sent out by

William III., forts were erected and a garrison stationed at St. John's, but the island continued to be the arena of incessant strife during the subsequent wars. To relate the vicissitudes of this warfare is foreign to the object of this book; it is sufficient to call attention to the dispersion of the colonists consequent upon the repeated destruction of the settlements as another cause of the tardy growth of the struggling colony. The English cared only for the fisheries. It was of small importance to the western adventurers that the settlers whom they were urging to have removed to the New England colonies or brought back to England, were carried off by the French.

The peace of Utrecht in 1713 settled the dispute between the English and French as to the sovereignty of the island. It was given over in full supremacy to England. But so firmly planted in the English mind was the theory that Newfoundland should be only a fishing station, whereon to dry fish in the summer and a nursery wherein to train seamen for service at need in the royal navy, that the rankling thorn of the "French shore" was planted in the side of the colony to trouble and hinder its development down to the present day. In the treaty Spain made a claim of ancient fishing rights for the Guipuzcoans (Basques), but they were never proved. As for Portugal, the domination of Spain had killed its expansion, and what energy remained after it regained independence was drawn off to the East Indies.

After the island was reconquered in 1697, some unfortunate experiments were made with garrison governors until, in 1729, Captain Osborne, R.N., was appointed. After that time, until 1825, the commanders of the fleet on the North American station were always governors of Newfoundland.

The fishing admirals had now a firm hand always over them and, by degrees, the reign of violence came to an end. The naval officers did justice in a summary off-hand way, and the colonists' position was greatly improved; still the fishing admirals ignored the justices appointed by the governors, under the pretext that they were only winter magistrates, and, in fact, the authority of the magistrates appointed by the governors did not rest on the firm basis of an Act of Parliament. Improvement was slow; for, although the governors did all in their power to ameliorate the condition of the colonists, the merchants did all in their power to thwart them, and resisted any modification of the statutes which were oppressing the colony. As late as 1799 houses erected in St. John's without licence of the governor were pulled down, and it was not until 1820 that the statutory restrictions were abolished which required licences for cultivating or enclosing ground and for building or repairing houses.

At last, in 1792, in spite of all opposition, Parliament passed a statute upon which a Supreme Court of Judicature, civil and criminal, was erected in Newfoundland. The period of confusion came to an end, and the colonists became possessed of that only stable foundation of civil society, a court of justice of unquestioned authority, to which, as is becoming, is superadded the appeal to the sovereign in council claimed by all the subjects of the British Crown.

Organisation of Civil Society, 1792-1832

The preceding history has occupied a disproportionate space because, unless somewhat fully set forth, it would be incredible that such laws should have existed. It affords an explanation why this colony—the eldest of

the Crown, with soil and climate not inferior to that of the Eastern New England States, should have remained in so backward a condition. For the teeming riches of these Newfoundland waters the great nations of Europe have fought for 200 years. Fabulous wealth has been gathered there to enrich distant countries, while the people of the colony are still poor. And yet the people are hardy, industrious, and brave. As a school for brave and skilful seamen it was so important that, for 150 years, every fishing vessel that left England was compelled, under penalty, to take out one "green man" to every five of the crew, so that braving the stormy seas of the North Atlantic in these little craft the men were formed who have carried the flag of England over all the seas. As an organised community the colony may be said to date from the erection of the Supreme Court in 1791, and from that date its history presents no points worthy of remark. It is the history of all the other colonies of England. The governor-in-council served his purpose, and in 1832 was superseded by the governor with a legislative assembly, and that did its work and was in turn replaced in 1854 by a governor assisted by a ministry holding office as in England while it enjoyed the confidence of the popular branch of the legislature. The Crown began to grant titles to land in 1813, a post-office was established, and roads commenced to be made. In 1841 the last of the naval governors gave way to Sir John Hervey who, though a soldier by profession, acted as a civil governor.

The French Shore

The preceding history has incidentally discussed the title to the island of Newfoundland; it is, however,

necessary to repeat that it was not the intention of the British Government to found a colony there. It was designed to be a great drying station for fish to be caught by English fishermen sailing in the spring and returning in the fall. During the winter it was intended to be left desolate and uninhabited. Therefore when the Treaty of Utrecht was signed, no inconvenience was expected to flow from conceding to the French the right to dry fish upon a specified extent of the coast, provided only that the sovereignty of the British Crown was established. It is also very important to remark that whatever documents, obligations, promises, or treaties may have succeeded they are all retrospective to the Treaty of Utrecht, and neither add to, nor deduct one word from, its stipulations. One exception must, however, be made. The original treaty specified an extent of coast from Cape Bonavista round by the north to *Cape Riche*, and the Treaty of Versailles in 1783 changed the locality of these rights to the extent of coast from Cape St. John round by the north to *Cape Ray*, the rights themselves remaining unchanged. The coast thus specified has been known as the "French Shore."

The treaty stipulates that the island shall belong "of right wholly to Great Britain," but the subjects of France "shall be allowed to catch fish and to dry them on land" on the extent of coast specified. It is also laid down that "it shall not be lawful for the subjects of France to erect any buildings there besides stages made of boards and huts necessary and useful for drying of fish, or to resort to the said island beyond the time necessary for fishing and drying of fish." Upon these words the French claimed an exclusive right to the French shore, and to prevent the people of Newfoundland from any use of that whole extent of coast; so that if any buildings

were erected there, or operations of any nature carried on, the French ships had a right to destroy the one and put a stop to the other. The French caught lobsters and erected permanent canning establishments there and prevented the English from doing the same; they seized all English fishing implements found there, and drove away all English fishermen. The French also erected salmon weirs up the rivers and prevented the English from doing the same. The English Government reserved the French treaty rights in all land grants, and in 1879 inhibited a railway to St. George's Bay upon the French shore, on the ground that the French would regard it as an invasion of their treaty rights. In this way the colonists were debarred from developing the fairest half of their own island lest some French fisherman should come along and want the very place where a wharf or house may have been erected. This was very unreasonable, inasmuch as the French fishing operations had, in 1895, dwindled down to seven fishing vessels, so that the whole coast might be said to have been practically abandoned. There had never been a French fishing station at St. George's Bay, so that a railway terminus there could not have interfered with their fishing operations.

The French took their ground upon the letter of the treaty. Their rights to use the shore being specified, they repudiated any concurrent right of the colonists, and French naval officers carried out the most extreme interpretation with great vigour. This was due probably to the fact that the lobster-canning business had been commenced recently, and also to pique at a somewhat extreme measure of the Newfoundland legislature aimed to prevent the sale of bait to other than Newfoundland fishermen.

On the other hand, the words of the treaty appeared

to be sufficiently clear; for when it was signed no other fishery than the cod fishery could have been contemplated. If there could be any reasonable doubt it would be removed on reference to the *Mémoires de Mons. de Torey*, who was one of the negotiators. The word "morues" is used always, and not the more general word "fish." He writes that while the king consents to cede Placentia and the island of Newfoundland, he persists in reserving to the French "the liberty of fishing and of drying codfish (morues) on the Petit Nord." In the discussion, which became warm, the question was limited to codfish (*de pêcher et de sécher les morues*), no other fish was present in their minds, since none other is mentioned; and he relates that Prior (one of the English negotiators) returned and announced that the English Government would yield this "much contested point of catching and drying 'codfish' (morues) on the coast."

That codfish alone are intended is clear from the fact that the words "fishing and drying" are always mentioned together as one expression. The canning industry was of recent date, and canned lobsters are not dried even if lobsters were fishes. Salmon weirs are neither stages nor huts for drying fish.

While the interpretation of the treaty was clear enough, the question was unfortunately complicated by a declaration of the English Government, afterwards embodied in the preamble of an Act of Parliament (28 George III. cap. 35), in which it is set forth that the king, in order to prevent quarrels among the fishermen, "was pleased to engage that he would take the most positive measures for preventing his subjects from interrupting, in any manner, by their competition, the fishing of the French, during the temporary exercise there which is granted them upon the coasts of the island of Newfoundland,

and that he would, for that purpose, cause the permanent settlements which should be formed there to be removed; and that he would give orders that the French fishermen should not be incommoded in the cutting of wood necessary for the repair of their scaffold huts and fishing-boats; and that the 13th article of the Treaty of Utrecht, and the method of carrying on the fishery which had at all times been acknowledged, should be the plan upon which the fishery should be carried on there." There was a plain contradiction in this promise of the king which goes beyond the treaty, while intending specifically only to confirm it, and the matter was further complicated by the words of the statute which empower the king's officers "to remove, or cause to be removed, any stages, stakes, train-vats, or other works whatever, for the purpose of carrying on fishery, erected by his Majesty's subjects, and also all ships, vessels, and boats which shall be found within the limits aforesaid; any law, usage, or custom to the contrary notwithstanding." It was not the Treaty of Utrecht then which embarrassed the colonists, but the unadvised and uncalled-for promise of the king, formally endorsed by an Act of Parliament.

This vexatious dispute, which had given trouble for nearly a couple of centuries, was at length settled peacefully and satisfactorily by the Lansdowne-Cambon Convention of 1904 between the British and French Governments. In return for territorial concessions to France in Africa, and monetary compensation to individuals engaged in the Newfoundland trade, the rights of French fishermen to land and dry their fish were finally abandoned.

Islands of St. Pierre and Miquelon

Ten miles west of Crew point (May point), the eastern headland of Fortune Bay, lie the islands of St. Pierre and

Miquelon, the last remaining possessions of France in North America. These islands have had more vicissitudes than have fallen to the lot of many greater and more important lands. Since the year 1713 they have been four times ceded to, or captured by, England, and four times restored to France. For fifty years, 1713–1763, St. Pierre was in the possession of the English. In 1778 it was captured by Admiral Montague, who deported all the inhabitants to France, 1932 in number; in 1783 the exiles returned, and when the Revolution broke out in France they had their Jacobin Club, and their Committee of Public Safety, and their Liberty tree; but they had not got any farther when, in 1793, the islands were again taken and the citizens deported again to France. At last, in 1816, at the general peace they were finally restored to France, and 645 of the old colonists returned.

There are two islands—St. Pierre and Miquelon. The latter is the larger, but it is practically two islands connected by a neck of sand five and a half miles long. The northern portion is called Great Miquelon, and the southern, Little Miquelon or Langlade Island. The area of Miquelon is eighty-three square miles, with a population of 443 in 1913; whilst the area of St. Pierre is only ten square miles, with a population in 1913 of 4200 souls. Both islands are high, rocky, and barren, and they are surrounded by rocky islets; so that navigation is intricate in fair weather; and as they are more subject to fog than any other part of the coast, navigation is often dangerous. The granite cliffs are from 650 to 800 feet high. The contour of Great Miquelon is irregular, and a projecting semicircular cliff forms a roadstead at the northern end, where there is also a settlement. The cliffs of Little Miquelon form a level plateau 656 feet

high. The channel between it and St. Pierre Island is three miles wide.

St. Pierre is a steep rocky island of many peaks. The town is the residence of the Governor, and is as thoroughly French in every respect as any town in Normandy. There was formerly a complete civil and military organisation, including departments of marine, of health, of education, of war, of finance, and superintendents of roads, charities, and pilots. After the satisfactory settlement of the "French shore" trouble, in 1906, there was a change effected in the administration of these islands by the French Government. Instead of a Governor there is now an Administrator, who organises and regulates the different branches of the public service. He is assisted by an Administrative Council and Municipal Councils. The total resident population of the islands is 4652, of whom 4209 live in St. Pierre, but during the fishing season the little town is crowded with fishermen, and the harbour with fishing vessels from France. The port is well regulated and orderly, the quays are massively built of stone, and the houses are generally of stone. The dress and habits of the people are French, cafés and cabarets abound, and the people are bright and gay as in any seaport of Old France.

There are 3 public schools for boys and 3 public schools for girls, where 346 children follow primary courses of instruction under 16 teachers. Besides these are infant schools (125 pupils) and 3 private schools with 385 pupils.

The harbour is good and open all the year round, and is usually full of shipping, for all the fishing fleet from France to the Grand Banks resorts here for bait and supplies. The imports to this little island amounted, in 1885, to the remarkable sum of 20,199,062 francs, or

\$4,039,812, nearly \$800 per head of the population—an amount unaccountable until the admirable position of the island for smuggling into the neighbouring British colonies is considered. French wines, brandies, and other goods are admitted free, but are subject to heavy duties in Canada, and were apt to overflow upon the neighbouring coasts until increased vigilance was exercised and a British Consul appointed. The imports consequently decreased to about half the above amount. Trade has greatly diminished during the last few years, and many of the inhabitants have settled in Cape Breton and other parts of Nova Scotia, as well as Newfoundland.

In 1912 there were 1495 vessels entered and cleared at the islands, carrying 168,789 and 168,480 tons respectively. The *imports* for the same year were valued at \$999,625, and the *exports* amounted to \$1,158,575. St. Pierre is connected with Halifax and St. John's by a regular packet service, and it is a station of the Anglo-American Cable Company, and of the "Compagnie générale des cables télégraphiques."

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