CANADIAN PACIFIC RAILWAY.

DESCRIPTION

OF THE COUNTRY

BETWEEN LAKE SUPERIOR

AND THE

PACIFIC OCEAN,

ON THE LINE OF THE CANADIAN PACIFIC RAILWAY.

Compiled from the best Authorities, and Published by Order of the Canadian Government.

OTTAWA, NOVEMBER, 1876.

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INTRODUCTION.

The following pages are designed to furnish a concise and, as far as can be compiled from independent sources, complete description of the physical features of the country lying in the Territory of the Dominion of Canada between Thunder Bay, at the head of Lake Superior, and the Pacific Ocean, through which it is proposed to continue the construction of the Canadian Pacific Railway, already partially built between Lake Superior and Red River.

The compilation is principally meant to be a supplement to the more exact and technical reports of the Engineer, for the information of intending contractors who may desire a knowledge of the general features of the country.

Papers laid before the Imperial and Canadian Parliaments, reports of Government Engineers, observations made by residents, and accounts published by trustworthy travellers form the substance of the compilation.

Authorities are given in every instance, and copious Indices furnish a ready means of access to the facts. The Government do not guarantee the absolute accuracy of any statement, but there is no reason to believe that the extracts contain anything that is not reliable.

CLASSIFICATION.

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ALTITUDES.

On the Line of the Canada Pacific Railway from Thunder Bay to the Pacific Ocean.

At Fort William	603.00 feet
" Linkoping	1,534.00 "
" English River	1,515.00 "
" Wabigoon Lake	1,204.00 "
" Vermillion Lake	1,170.00 "
" Keewatin	1,081.00 "
" Darwin	939.00 "
" Selkirk	720.00 "
" Cartier	827.00 "
" Poutraincourt	830.00 "
" Northcote	1,158.00 "
" Livingstone	1,490.00 "
" Thackeray	1,784.00 "
" Saskatchewan	1,623.00 "
" Caerlaverock	1,520.00 "
" Battleford	1,593.00 "
" Four Blackfoot Hills	2,143.00 "
" Edmonton	2,391.00 "
" Pombina River	2,385.00 "
" McLeod's River	2,797.00 "
" Jasper House	3,350.00 "
" Summit Yellow Head Pass	3,746.00 "
" Tête Jaune Cache	2,400.00 "
" Fort George	1,960.00 "
" Valleys in Central Plateau, B.C.	3,000.00 "
" Yeltesse, above Salmon River	1,000.00 "

Note.—See pages 117 and 122 for tables of gradients of the lines surveyed through the Cascade Mountains, where they are fully given mile by mile.

ELEVATIONS AT PROMINENT POINTS.

COMPILED FROM AUTHORS QUOTED IN THE FOREGOING PAGES.

Lake Superior	above the ocean	600 feet
Height of Land between Lake Superior and Winnipeg	" "	1,500 "
Watershed	above Lake Superior	902 "
Lake Winnipeg	above the ocean	600 "
First Prairie Steppe	" "	900 "
Second " "	" "	1,600 "
Third " "	" "	2,700 "
Sources of Qu'Appelle River	above Red River	500 "
Summit altitude of Riding and Duck Mountains	above the ocean	1,600 "
Heart Hill	above the plains	700 "
Porcupine Mountain	above Swan Lake	800 "
Rise from Fort Garry to Edmonton, by trail		1,400 "
" from Edmonton to base of Mountains		900 "
Mount Carmel, (Big Hill)	above the plains	160 "
Lumpy Hill	" "	400 "
Height of the banks of Red River	above the stream	80 to 50 "
Jasper House	above the sea	3,372 "
Highest point of Plateau in British Territory at base of Rocky Mountains, on 49th parallel	above the ocean	4,300 "
Great Table-land of Mexico		7,000 "
Bow River, at foot of Mountains		3,900 "
Athabasca River, at foot of Mountains		3,300 "
Rocky Mountains	above eastern plain	2,000 to 3,000 "
Terraces east of Rocky Mountains	above the ocean	3,500 to 4,000 "
Mounts Brown and Hooker	above the plains	16,000 "
Roche Miette, from its base		6,000 "
Mountains south of Moose Lake	above the lake	2,000 "
Average height of Rocky Mountains		9,000 "
Lake Stuart	above the ocean	1,800 "
Howse Pass	" "	4,500 "
Athabasca Pass	" "	6,025 "
Yellow Head Pass	" "	3,746 "
Pine River "	" "	2,000 "
Peace " "	under "	2,000 "
Cascade Mountains at Kemano River	above the sea	8,000 feet
" " at Skagit "	" "	5,600 "
Skagit River	" "	1,900 "
Allison's Pass	above the sea (Cascades)	4,400 "
Princeton	" " "	2,300 "
Tea River	" " "	1,500 "
Okanigan Mountain	above the lake	3,000 "
" Lake	" sea	1,120 "
Valleys in Central Plateau, B.C.,	" "	3,000 "

Hills " "	above the sea	4,000 to 5,000 "
Blackwater Bridge, B.C.,	above the sea	2,110 "
Crown of Table-land, B.C.,	" "	3,500 "
Blackwater River (camp 8) B.C.,	" "	3,145 "
Kluskus Lake, B.C.,	" "	3,500 "
Thracha Lake, B.C.,	" "	3,310 "
Eliguck Lake, B.C.,	" "	3,610 "
Divide on Central Plateau, B.C.,	" "	4,050 "
Lake N'ghaco, B.C.,	" "	3,500 "
" Qualcho, "	" "	2,820 "
" Tschick, "	" "	3,100 "
" Tetachuck, B.C.,	" "	2,770 "
" Tchutazely, "	" "	2,680 "
" Enz, B.C.,	" "	3,050 "
" Tchestatta, B.C.,	" "	2,800 "
" Kthluthsly, "	" "	2,900 "
Head of Lake Fraser, B.C.,	" "	2,460 "
Hills on Central Plateau, B.C.,	" "	4,000 "
Foot of Lake Francois, "	" "	2,540 "
Chilacoh Valley, (above Canyon)	above the sea	2,000 to 2,300 "
Salmon House	above river	160 "
Yeltesse	" "	1,000 "
Chisicut Lake		3,290 "
Chilacoh Valley	above the sea	2,225 "
Stewart Valley	" "	2,055 "
" River	" "	1,950 "
Basalt Lake, divide near	" "	3,700 "
Euchinico Lake crossing	" "	1,335 "
Summit between Blackwater and Nazco	" "	3,228 "
Lake Francois, North shore	" "	2,790 "
Dunvegan	" "	1,000 "

DEPTH OF RIVER VALLEYS.

On First Prairie Steppe.....	30 feet
" Second " ".....	150 to 200 "
" Third " ".....	150 to 400 "
South Saskatchewan below prairie, third level.	300 "
" " at the crossing.....	170 "
North " below prairie level.....	100 to 300 "
Battle River, below prairie level.....	50 to 270 "
Red River " " ".....	30 to 50 "
Wignatinon River, below prairie level.....	200 "
Valleys in Central Plateau, B.C.,.....	110 "

CHAPTER I.
FROM THUNDER BAY TO RED RIVER.

Elevation of Lake Superior.

Canadian Exploring Expedition, by Henry Yule Hind. Vol. 1, p. 17.

"The elevation of Lake Superior above the Ocean has been variously estimated by different observers. Captain Bayfield considered it to be 627 feet above the level of the sea, which altitude is adopted by the narrators of Agassiz's tour in that region, and by Messrs. Foster and Whitney, in their report on the geology of the Lake Superior Land District. Sir Wm. Logan, in his Geological Report for 1846-7, states that its surface is 597 feet above the Ocean; in Professor Hall's Geology of the Fourth District, N. Y., 596 feet is its assigned elevation. Sir John Richardson assumed its level to be 641 feet above the Ocean. The altitude deduced by Mr. Keefer for the map prepared for the Canadian Commissioners at the Paris Exhibition in 1855, with the advantages and information derived from the levels obtained in the construction of various railways and canals from the Ocean to Lake Superior, established a difference of only three feet in excess of that obtained by Sir Wm. Logan in 1847. The occasional fluctuations in the level of the waters of Lake Superior certainly exceed three feet, so that an elevation of 600 feet is probably a correct estimate of the mean height of the waters of this 'Kitchi-gum-mi,' or Great Lake of the Ojibways above the Ocean."

Thunder Bay.

Canadian Pacific Railway. Report of Progress, 1874, pp. 208-209.

"This Bay is on the north-west shore of Lake Superior, and has an area of about 200 square miles. It lies in a direction generally from north-east to south-west, and is bound on the west and north by the mainland; on the east by the promontory of Thunder Cape, which divides it from Black Bay; and on the south it is divided from Lake Superior by a number of islands, of which Pie Island is the principal. * * * With the exception of a small group, (the Welcome Islands,) which lie about four miles east from the mouth of the Kaministiquia River, there are not many islands in Thunder Bay.

"The principal entrance to Thunder Bay, and the one generally used, lies between Thunder Cape and Pie Island; it is about five miles wide and has a depth of water ranging from 100 feet to 237 feet. The general depth of the Bay is given on the chart as 60 feet. * * * The navigation is good for either steamboats or sailing vessels; the opening and closing of the Bay is about the 8th May and 30th December."

Report on Line of Route between Lake Superior and Red River Settlement, by S. J. Dawson, C.E., 1868, p. 12.

"Thunder Bay is itself a harbour, although of somewhat large dimensions, completely land-locked and sheltered from every wind; any swell, therefore, which can be felt must arise within the bay itself. The huge surges of Lake Superior do not roll into it at all, and it may be regarded, to all practical purposes, as an inland lake. * * * It is safe from winds blowing west, south-west, north and north-west, and, I may add, that a wind blowing from a direction fifteen or twenty points to the east of north would not affect it. East or south-easterly winds alone would blow in upon the harbour, but the extent of their sweep would be limited to the width of Thunder Bay, and the surge which could arise in that distance may easily be guarded against."

(It may be observed that the railway terminus is fixed on the Kaministiquia River, which flows into the Bay and is itself a good harbour, and into which a deep outer passage is dredged through the Bar.)

Kaministiquia Valley.

Appendix No. 3 to XVI Vol. Journals of Legislative Assembly of Canada, 1858.

"The Kaministiquia for the first ten miles or so is smooth, and the navigation is unimpeded. * * * In regard to its general features, the country is varied. The valley of the lower part of the Kaministiquia is well adapted for settlement. On ascending, however, the land becomes very rough and broken, although the hills are of no very great elevation. Dog Lake is a large sheet of water. The land rises to a considerable elevation around it, but the hills are not steep or in continuous ridges, but swell up gradually as it were in isolated mounds. At the Lake of the Thousand Lakes, although the country appears to be considerably elevated, there are, properly speaking, no hills. The land rises gradually from the Lake presenting a smoothly-swelling outline against the distant horizon.

"No part of the country is more than 1000 feet above the lake level, or 1600 feet above sea level, which height is reached

about 50 miles inland."

Captain Palliser's Exploration in B. N. America, folio, p. 237. Dr. Hector's Geological report.

* * * "The whole of this district is occupied by a primitive axis, the intermediate primitive belt of Sir J. Richardson, which is composed of gneiss, mica, schist, limestones and other metamorphic rocks, with intrusions of granite, probably of very different ages, the whole formation being the Laurentian of Logan, corresponding, it is thought, to the fundamental gneiss recently described by Sir R. Murchison, as underlying the most ancient rocks in Scotland. * * *

"On the River Kaministiquia, above the fall at Friars' Portage, the strata have an almost vertical position, and a little further on, at Lower Island Portage, are found to be dipping at an angle of 40° to south-south-east, and to be changed in character, having mica developed in them, and also a great abundance of quartz veins. Immediately afterwards, in the course of the ascent, true granite occurs; and after several alterations, schistose flags re-appear at Upper Island Portage, but now dipping at a high angle to the north-west.

"From the Falls to the Dog Lake, the ascent of the river pursues a northerly course, crossing the beds obliquely by a succession of minor falls, giving rise to scenery of unequalled beauty. * * * The ascent which is made after leaving the upper end of Dog Lake, is through a swampy country covered with drift. In fact, after leaving Dog Lake, until a considerable descent has been made to the west, no rock is exposed, the whole summit level being covered with a thick deposit of drift. * *

"From the Lake of the Thousand Isles, where the rocky flooring of the country is again uncovered, until Sturgeon Lake is reached, the descent is very slight. * * * In many cases the lakes are at exactly the same level at each end of the portage; and the greatest difference between the two ends of any of these portages is only about 35 feet, so that the total descent in this part of the route cannot amount to very much. * * *

"Between Rainy Lake and Lake of the Woods the superficial deposits again cover all rocks from view, and when the north end of the latter lake is reached, and they are again exposed, their general strike is now changed to almost north and south, agreeing with the greater axis of the lake, just as Rainy Lake agrees with the strike of the eastern District."

Geological Survey of Canada, 1872-73, p. 106.

"In going north-westward from Thunder Bay to Lake Winnipeg, six apparently distinct belts of Huronian rocks are crossed. They appear to occupy long V shaped basins in the folds of the Laurentian strata, and their aggregate breadth is about half that of the Laurentian bands between them. The first, or Thunder Bay band, has a breadth of about 15 miles behind Thunder Bay, but appears to spread out to a greater width west of the Kaministiquia River."

Geology of Canada, p. 74.

"In addition to dykes, a great many mineral veins intersect these rocks. A very large number of these contain a greater or smaller amount of various metalliferous ores; and the indications which they present are such as to render it certain that many parts of the country characterized by them, will, sooner or later, rise into importance as a mining region. The metals whose ores are met with are copper, lead, zinc and silver, with more rarely nickel, cobalt, arsenic, uranium and molybdenum."

Terraces of Lake Superior Basin.

Captain Palliser's Exploration in B. N. America, folio, p. 219.

"In ascending the Kaministiquia for a considerable distance above the Kakabeka Falls, the country is covered by a deposit of red marl earth, which forms the high terraces of the river. Thus, opposite the mouth of White Fish River, there are three distinct terrace levels of 20, 60 and 90 feet. At some distance back from the river still higher terraces occur, belonging to this class of deposits, which must be considered as of more recent age than the true drift. Sir William Logan describes one at the height of 331 feet above Lake Superior. The great deposits of sand and gravel which rest on the highest levels of the axis and are first met with at Dog Portage, belong, I think, to the period of the drift."

Ibid, p. 27.

"The country in the neighborhood of the Kakabeka Falls at a little distance from the river rises to an elevation of 100 feet, a steep bank on either side of the stream forming an additional terrace."

Ibid, p. 24.

* * * "Terrace structure commences about 20 miles from the month of Kaministiquia River, rising to the height of from 60 to 80 feet above the level of the broad alluvial flat. These terraced banks are composed of a red, sandy marl, from the

summit of which the country is level, with little or no swamp. * * * The country presents great irregularities in every direction, and, as a rule, is densely wooded."

Geological Survey of Canada, 1866 to 1869, p. 330.

"In the hills on the left side of the Kaministiquia River, a finely banded rock made up of jasper and magnetic iron, occurs. * * * These strata are considerably contorted, and dip at high angles, but their general course appears to be north-westward. On higher ground, overlooking the river at this locality, are thick beds of finely grained greenish-gray diorite coarsely porphyritic from the presence of numerous crystals of greenish feldspar. The beds vary from one foot in thickness up to 15 or 20 feet and strike N. 65° W. (mag.)"

Canadian Exploring Expedition, by H. Y. Hind. Vol. 1, pp. 34-38.

"Opposite this magnificent exposure of trap (McKay's Mountain), the clay banks of this river are about 14 feet high, and continue to rise on one side or the other until they attain an elevation of nearly 60 feet, often, however, retiring from the present bed of the river, and giving place to an alluvial terrace, some 8 or 10 feet in altitude, and clothed with the richest profusion of grasses and twining flowering plants. * * * The alluvial valley of the river from about 3 miles below the mountain portage to Fort William, varies in breadth from a few hundred yards to one mile; the breadth occupied by land of a quality which might fit it for agricultural purposes extends to near the summit of the flank of a low table land which marks the true limit of the river valley, and the average breadth of this may be double that of the strictly alluvial portion. * * * Occasionally the flanks of the low table land approach the river, contract the valley, and give an unfavorable aspect of the country. * * * The area available for agricultural purposes below the Grand Falls, probably exceeds 20,000 acres, but if the flanks of McKay's Mountain be included in the estimate, a large addition may with propriety be assumed. The Grand Falls mark the limits of a tract of country differing in many important physical aspects from the valley of the river lower down. From black argillaceous slates of Huronian (Cambrian) age we pass to a region in which granite, gneiss and chloritic schist prevail, and where the vegetation is often scanty and poor."

Geological Survey of Canada, 1866-9, p. 326. Report of Mr. R. Bell.

* * * "Between the Grand Falls of the Kaministiquia and the head of Thunder Bay, the country is occupied partly by Laurentian and partly by Huronian rocks, to a distance of about eight miles from the former, and about sixteen from the latter. The distribution of the two formations is represented as accurately as possible according to present data. North of this area is the country around Dog Lake, which is all Laurentian so far as known."

Height of Land.

Mr. Sandford Fleming in Report of Progress, Canadian Pacific Railway, 1874, p. 8.

* * * "Between the Province of Manitoba and Lake Superior, the drainage of the country is mainly westward, passing into Lake Winnipeg. The watershed between the two lakes is quite close to Lake Superior, and maintains a nearly uniform elevation of from 1400 to 1500 feet above the sea. The descent from the watershed westward is very gradual, and the country for the whole distance is remarkable for the innumerable streams and lakes with which it is intersected. These consist of long winding sheets of water, separated by rocky ridges; and so numerous are they, that an Indian in his canoe can travel in almost any required direction by making an occasional portage."

Canadian Pacific Railway, Report of Progress, 1874, pp. 201-202. Appendix I. Jas. H. Rowan, C. E.

"There is a peculiarity which has an important bearing on the location of a railway; it is that about 30 miles east of Rat Portage a "divide" is crossed, which has a course generally easterly until it strikes the height of land. This "divide" which has at some points a greater elevation than the height of land throws some of the waters, which flow through the Winnipeg River, to the south; forming the line of water communication known as the Dawson Route. From the northern slope of the "divide" the waters flow into English River, the outfall of Lonely Lake or *Lac Seul*, and enter the Winnipeg fifty miles below Rat Portage. The country differs greatly on either side of this "divide," that on the south being extremely rocky and rugged, while that on the north is more level with extensive tracts of light sandy soil."

Captain Palliser's Exploration in B. N. America, folio, p. 6.

* * * "Around Thunder Bay, and extending for some distance up the valley of the Kaministiquia, there is a considerable extent of rich alluvial land, heavily timbered. * * *

"The country which succeeds to the west and north is wild and rocky, but with no hill more than 300 feet above the general

level, so that it cannot be called a mountainous region. It is intersected by long, narrow lakes and innumerable watercourses broken by ridges of rock. The extent of the continuous water communication improves considerably as we descend to the west, and there are some large lakes which would be available for steam navigation in the event of the country ever becoming settled."

Appendix No. 36 to the XVII Vol. of the Journals, Legislative Assembly, Province of Canada, 1869. Report of S. J. Dawson on the Country between Lake Superior and Red River Settlement.

"The regions through which the explorations have extended embraces two sections of country widely different in physical character. The first extending from Lake Superior to Lake Winnipeg is of the primitive or crystalline formation. In its general aspect it is a hilly and broken country, intersected by rapid rivers and wide-spread lakes. The mountains, however, do not rise to any great elevation, except on the immediate borders of Lake Superior, and there are several fine alluvial valleys."

From Keewatin to Selkirk.

Geological Survey. Report of Progress, 1872-3, Alfred R. C. Selwyn, pp. 13-14.

* * * "The most important and interesting point which has been ascertained is the occurrence of a series of great parallel bands of schistose and slaty strata traversing this region, which hitherto was supposed to be almost exclusively occupied by Laurentian gneiss. * * * Whatever their age may be, their presence exerts a marked beneficial influence on the physical character and on the general fertility of the country where they occupy the surface. This fact in relation to a portion of two of the bands which we observed west of Lake Superior, was noticed by Prof. Keating in 1823, who writes respecting these as follows:—"Previous to our arrival at Rat Portage, we observed that the rocks changed to a slate of which the stratification was very distinctly directed from east-north-east to west-south-west. The inclination was nearly a vertical one; the color of the slate is a dark green; it is very decidedly a micaceous slate, at least on Rat Portage.

"Apart from the geological interest which attaches to the determination of the distribution of these rocks and of their precise relations to the underlying Laurentian gneiss, the foregoing facts show that it is economically important that the extent of these bands should be defined; and that their mineral characters should be closely investigated is equally so, inasmuch as the gold, the copper, and the iron of the region, as far as known, are associated with similar strata, and thus, not only the best land, but likewise valuable mineral deposits are to be looked for within the limits which they occupy."

Dr. Hector's Geological Report in Captain Palliser's Exploration in British North America, p. 219.

"The steppes of this great slope may be naturally divided into three groups, having different ages and circumstances of deposition, and boldly marking three distinct levels. To the most recent of these belong the low prairies which surround Lake Winnipeg and the lakes of that group, including the marshy country west of Manitoba Lake. This forms the first prairie level. In the vicinity of the Red River Settlement its composition is of argillaceous marl, with a deficiency of sandy matter, and it is invariably stratified in their layers. Underlying this, at various depths from the surface, is a bed of stiff clay, which forms the immediate margin of the river at many places. The upper layers of this deposit contain leaves, and fragments of wood and reeds, and the whole is, undoubtedly, a fresh water deposit, indicating the time when the Winnipeg group of lakes covered a much more extended area than at present, the gradual deepening of the rock channels through the eastern axes having increased the drainage in modern times. The surface of this deposit is about 75 to 100 feet above Lake Winnipeg, but it slopes gradually from the west, and at Pembina Mount, near St. Joseph, is at least 100 feet high. To the east of Red River, in descending the Winnipeg River, two well marked levels were observed, which belong to this group of extended lake deposits. Thus below the seven portages that river flows through a smooth channel, and the banks are composed of a white marl earth, the river being at first only slightly depressed, but soon, from its rapid descent, while the level of the deposit remains the same, the banks become high. At the Rat Portage this terrace, which is 150 feet above Lake Winning, retires from the river on each side, and is replaced by another at an altitude of only 75 feet, through a cutting in which the river flows to its mouth at Fort Alexander."

Report on Line of Route between Lake Superior and Red River Settlement, by S. J. Dawson, 1868, pp. 18-19.

"This section of country presents to the eye, in its general character, the appearance of an undeviating flat. From the Lake of the Woods, for a distance of twenty-five or thirty miles westward, swamps of great extent, covered with moss and stunted evergreens, are of frequent occurrence. In other sections, considerable areas are occupied by marshes or shallow lakes, with bull-rushes and other acquatic plants standing out of the water. In the latter cases, the bottom, after a certain depth is attained, is generally firm, while, in the swamps, in some instances, the surface covering is itself afloat, and heaves and undulates beneath the feet, presenting a quagmire or peat bog on an extensive scale. This description applies more particularly to the section

nearest to the Lake of the Woods. On approaching the prairie, the swamps are less extensive and the ground in general more favorable. In the swampy sections, however, there are some areas of dry ground and good soil, and, where the bogs are deepest, they are intersected by low gravelly ridges which rise but a few feet over the general level. These ridges are firm, and their direction can be traced by the heavy growth of wood which they carry. Flat and level as the country appears to be, it is susceptible of being drained. The section most swampy, although but slightly higher than the Lake of the Woods, is at an elevation of over three hundred feet above the valley of Red River, and wherever a run of water is met with, except in the lake-like swamps, it is seen gliding on with a speed which indicates a sufficient fall for drainage. * * *

"The principal streams in this region are the Broken Head River and the White Mouth River. The Broken Head runs north to Lake Winnipeg, while the White Mouth falls into the Winnipeg River, just above the Seven Portgages. The section which I have just been describing, except in the swamps and marshes, is densely wooded. Westward of this is the prairie, having a depth of thirty miles to the eastward of Red River. This prairie does not meet the wooded region, as might be supposed, gradually merging from prairie to woodland, but abruptly and at once. It seems to be an ancient lake bottom, still nearly as level as a lake, and generally without wood. Bordering on this is the wooded region, with points stretching into the plain, like the headlands of a lake. Just where the prairie and woodland meet, there are, in some places, banks of gravel which will eventually become of importance, as material for forming roadways over the soft and yielding soil of the plains.

"From Fort Garry to the north-west angle of the Lake of the Woods, a road line has been laid out, and its practicability proved by the fact that, for several years, it was used as a post road and the mails carried over it on horseback. Wheeled vehicles, except in very wet weather, can already travel over the prairie, and, taking the line altogether, its average cost, to form a first-class country road, will be rather under than over the general average of such works."

Report of Progress, C. P. Railway, 1874, p. 201.

* * * "For 80 miles immediately east of Red River, the general characteristics are, a level and in some parts swampy country, with ridges of sand and gravel more or less thickly covered with timber; the next 70 miles are rough, broken and rocky, especially in the neighborhood of Winnipeg River, which at the outlet of Lake of the Woods (Rat Portage) where we cross it, is a stream of considerable magnitude, draining an area of country of about 10,000 square miles; an area which is largely increased below the point where, we cross it. * * * Rat Portage, or the Dalles (Keewatin) a few miles further down are the two most favorable points for a railway crossing. * * * The country from this point to the Height of Land or eastern boundary of this (the Winnipeg) subdivision, has a gradual ascent, the total rise being between 400 and 500 feet in a distance of 230 miles. * * * There is a great extent of water surface, consisting of lakes and lacustrine streams of every conceivable shape and size; the former lying, for the most part, in the direction of the strike of the rocks; the latter occasionally cutting across it. The hills which almost universally follow a general direction from N.E. to S.W., consist for the most part of rock of the Laurentian formation."

Appendix No. 36 to Journals Legislative Assembly, Canada, 1859. Report by S. J. Dawson on the Country between Lake Superior and Red River.

"The tongue of land immediately to the eastward of Red River, within the boundary line, and between it and the Lake of the Woods, on the River Winnipeg, is remarkable, inasmuch as it divides the wooded from the prairie region, partaking to some extent of the character of both. The eastern border, on the Lake of the Woods and the Winnipeg, is of the crystalline formation, of an uneven surface and densely wooded. Its western, on the Red River, presents wide prairie openings, and for a distance of about 30 miles back is of an alluvial soil. Immediately to the westward of Lake of the Woods, and but slightly elevated above it, there is a marshy plateau, scantily wooded, from which the Roseau River flows westward to Red River, the White Mouth River northward to the Winnipeg, and several inconsiderable streams eastward to Lac Plat, and the Lake of the Woods itself. Westward of this plateau the land descends evenly to the prairie bordering on Red River, and to the northward it declines very gently to Lake Winnipeg; another river, the Broken Head, taking its rise on the slope between White Mouth River and Red River, about six miles to the eastward of which latter it flows into Lake Winnipeg in a reedy marsh."

Winnipeg River.

Red River Exploring Expedition, H. Y. Hind. Vol. 1, p. 106.

"Issuing from the Lake of the Woods through several gaps in the northern rim of the lake, the River Winnipeg flows through numerous tortuous channels for many miles of its course in a north-easterly direction. Some of the channels unite with the main stream ten to fifteen miles below Rat Portage, and one pursues nearly a straight course for a distance of 65 miles, and joins the Winnipeg below the Barriere Falls. The windings of this immense river are very abrupt and opposite, suddenly changing from north-west to south-west, and from south-west to north-west for distances exceeding 20 miles. In its course of 163 miles, it descends 349 feet by a succession of magnificent cataracts. Some of the falls and rapids present the wildest and most

picturesque scenery, displaying every variety of tumultuous cascade, with foaming rapids, treacherous eddies, and huge swelling waves, rising massive and green over hidden rocks. * * The river frequently expands into large deep lakes full of islands, bounded by precipitous cliffs or rounded hills of granite. The fort at Rat Portage is beautifully situated on an island at one outlet of the Lake of the Woods. It is surrounded with hills about 200 feet high, and near it some tall white and red pine, the remains of an ancient forest, are standing amidst a vigorous second growth. The rock about Rat Portage is a chloritic slate, which soon gives place to granite, without any covering of drift, so that no area capable of cultivation was seen until we arrived at Islington Mission."

The Great Lone Land, by Capt. W. F. Butler, F.R.G S., p. 144.

* * * "A man may journey very far through the lone spaces of the earth without meeting with another Winnipeg River. In it nature has contrived to place her two great units of earth and water in strange and wild combinations. To say that the Winnipeg River has an immense volume of water, that it descends 360 feet in a distance of 160 miles, that it is full of eddies and whirlpools, of every variation of waterfall from chutes to cataracts, that it expands into lonely pine-cliffed lakes and far-reaching island-studded bays, that its bed is cumbered with immense wave polished rocks, that its vast solitudes are silent and its cascades ceaselessly active—to say all this is but to tell in bare items of fact the narrative of its beauty."

Soil and Vegetation, Timber, &c.

Appendix No. 3 to Journals of the Legislative Assembly, Canada, 1858.

* * * "Opposite McKay's Mountain the clay banks of the River (Kaministiquia) were about 15 feet high, and continued to rise on one side or the other until they attained an elevation of nearly 60 feet, often, however, retiring from the present bed of the river, and giving place to an alluvial terrace, some eight or ten feet in altitude.

"The low table land is thinly wooded with small pine and the soil is poor and dry; the alluvial valley sustains elm, aspen, balsam, poplar, ash, butternut, and a very luxuriant profusion of grasses, vetches, and climbing plants; among which the wild hop, honeysuckle and convolvulus, are the most conspicuous. The rear portion of the valley, with an admixture of the trees just named, contains birch, balsam, white and black spruce and some heavy aspens. The underbrush embraces hazelnut, cherries of two varieties, &c. * * * [1] The banks of Dog River are altogether alluvial, for some distance up the valley, with the occasional exception of the abrupt sand cliffs, noticed, which come upon the river and seen to form the termination of ridges, which traverse the valley at nearly right angles to the course of the stream. * * * The banks of Savanne River are altogether alluvial, and diminish gradually from ten feet in altitude, near its source, to the level of Mille Lacs, at its entrance into that extensive and beautiful sheet of water. The immediate banks of Savanne River are clothed with alder, willow, and dogwood; behind these are seen tamarac, pine, spruce and aspen. Near its mouth much marshy land prevails, and, at its confluence with Mille Lacs, is characterized by a large expanse of rushes and other plants common in such situations."

[1] The words in these extracts are exactly the same as in Mr. Hind's Exploration, *vide* Red River Exploring Expedition, pp. 47-8, &c.

Red River Exploring Expedition, by H. Y. Hind. Vol. 1, p. 65.

* * * "If, in the course of time, mineral wealth should be found to exist in profitable distribution about Mille Lacs, there would be no scarcity of arable soil between the low hill ranges of that beautiful but desolate lake to supply the wants of a mining population. * * * Among the trees remarkable for their size, cedar, ash, white and red pine, with birch of two kinds may be mentioned."

Ibid, p. 104.

"Much good pine timber was seen on the islands, near the northern part of Lake of the Woods, and, if conclusions may be drawn, from the accounts which Indians gave us of their gardens, it is very probable that extensive areas of excellent land exist."

Ibid, p. 110.

"Wheat sown (at Islington Mission) on the 20th May was reaped on the 26th August; in general it requires but 93 days to mature. Potatoes have not been attacked by spring or fall frosts during a period of five years; Indian corn ripens well, and may become a valuable crop on the Lower Winnipeg. Spring opens and vegetation commences at Islington about the 10th May, and winter sets in generally about the 1st November. These facts are noticed, in connection with the small cultivable tract at the Mission, on account of the occurrence of other available areas, varying from 50 to 300 acres in extent between the Mission and Silver Falls, about 18 miles from the mouth of the river. From Silver Falls to where the river flows into Lake Winnipeg,

poor and rocky land is the exception, alluvial and fertile tracts, bearing groves of heavy aspens and other trees, prevailing."

Ibid, p. 62.

"The hills surrounding Mille Lacs here and there bear pine of fair dimensions, while in the narrow and shallow valleys between them there is every indication of hardwood over large areas."

Appendix No. 36 to Journals Legislative Assembly, 1859. Report by S. J. Dawson on the Country between Lake Superior and Red River.

"Dense forests cover the whole of this region, and the most valuable kinds of wood are seen in various places and in considerable quantities. Elm is to be found on Rainy River, and white pine of a fair size and good quality, abounds on the eastern slope to Lake Superior; but it is still more abundant on the western slope, on the waters which flow towards Rainy Lake. On the Sageinaga River, and on the Seine and the Maligne, there are extensive forests of red and white pine."

"Ocean to Ocean," by the Rev. Geo. Grant, pp. 28-31.

* * * "Drove in three hours (from Thunder Bay) to '15 mile shanty,' through a rolling country with a steady upward incline, lightly wooded for the first half and more heavily for the latter half of the distance. The flora is much the same as in our eastern provinces; the soil light, with a surface covering of peaty or sandy loam, and a subsoil of clay, fairly fertile and capable of being easily cleared. The vegetation is varied, wild fruits being especially abundant, raspberries, currants, gooseberries, and tomatoes; flowers like the convolvulus, roses, a great profusion of asters, wild kallas, waterlilies on the ponds, wild chives on the rocks in the streams, and generally a rich vegetation. It is a good country for emigrants of the farmer class. The road, too, is first-rate, a great point for the settler; and a market is near. Whatever a settler raises he can easily transport to the ready market that there always is near mines. * * * For the next three or four miles the soil become richer, the timber heavier, and the whole vegetation more luxuriant. * * * The valley of the river (Kaministiquia) is acknowledged to be a splendid farming country. * * * Timothy grass was growing, to the height of four feet, on every vacant spot, from chance seeds. A bushel and a half of barley, which was all a squatter had sown, was looking as if it could take the prize at an Ontario Exhibition. * * * Everything about this part of the country astonished us. Our former ideas concerning it had been that it was a barren desert; that there was only a horse trail, and not always that, to travel by; that the mosquitoes were as big as grasshoppers and bit through everything, whereas, it is a fair and fertile land, undulating from the intervals of the rivers up to hills and rocks 800 feet high. The road through it is good enough for a King's highway, and the mosquitoes are not more vicious than in the woods and by the streams of the lower provinces."

Overland Journey Round the World, by Sir Geo. Simpson, 1841-2. Vol. 1, pp. 36-37.

"The River, (Kaministiquia) during the day's march, passed through forests of elm, oak, pine, birch, &c., being studded with isles not less fertile and lovely than its banks; and many spots reminded us of the rich and quiet scenery of England. The paths of the portages were spangled with violets, roses and many other wild flowers, while the currant, the gooseberry, raspberry, the plum, the cherry, and even the vine, were abundant. All this bounty of nature was imbued, as it were with life by the cheerful notes of a variety of birds. Compared with the adamantine deserts of Lake Superior, the Kaministiquia presented a perfect paradise. * * *

"The mines of Lake Superior, besides establishing a continuity of route between the east and the west, will find their nearest and cheapest supply of agricultural produce in the valley of the Kaministiquia."

Appendix No. 36 to Journals Legislative Assembly, Canada, 1859. Report by S. J. Dawson on the Country between Lake Superior and Red River.

"Lake of the Woods, like all the other lakes on the line of route, is interspersed with islands, and in some of these the Indians have grown maize from time immemorial and have never known it to fail, so that the climate cannot be unfavorable for agricultural operations."

Report of Progress C. P. Ry., 1874. Appendix C, by J. Macoun, p. 58.

* * * "I could see nothing in the flora to lead me to doubt the feasibility of raising all the cereals in the valley of the Kaministiquia. * * * The soil is apparently of excellent quality, and has much the appearance of the river bottom of the west. After passing the Matawin, the soil changes to a reddish clay, but there is no change in the vegetation. The flora of the whole region indicates a moist climate with a sufficiency of warmth to bring seeds in all cases to perfection."

Climate.

Captain Palliser's Explorations, B. N. America, p. 6.

"The summer temperature is high, but does not reach the same extreme as in Canada; its duration is, however, prolonged by the alternations caused by the influence of large land-locked sheets of water, which do not tend to produce an equalized climate like that on a sea coast, but merely prolong the effects of the two half-yearly extremes of heat and cold."

Appendix No. 3 to Journals of the Legislative Assembly, Canada, 1858.

"The average period of the River (Kaministiquia) freezing, is from the 3rd to the 15th of November, and it becomes free from ice between the 20th and 23rd April."

Appendix No. 36 to Journals Legislative Assembly, Canada, 1859.

"Blodget in his isothermal chart, showing the mean distribution of heat for the summer, places the line of 60° to the north of Lake of the Woods, and that of 65° at Fort Garry. * * * That a great precipitation of rain takes place at and near the highlands, which separate the waters flowing to Lake Winnipeg from those that run towards Lake Superior, is evinced by the magnitude of the rivers, as compared with the area they drain. The climate, however, seems to be milder on the western slope of these highlands than on the eastern."

Arctic Exploring Expedition, by Sir John Richardson, vol. II, pp. 227-8.

"Phenomena indicating the progress of the seasons at Fort William:—

Feb.	29	Thermometer at noon 39° F.
March	1	Temperature 61° in middle of the day.
April	2	The sap of the sugar maple began to run.
"	9	First wild ducks seen.
"	10	Butterflies, blue flies and gulls noticed.
"	20	General thaw commences. Ground frozen to a depth of 3 ft. 9 in
"	30	River (Kaministiquia) partially open.
May	2	River free of ice.
May	10	The birch tree and maple budding.
June	15	Swallows building.
July	15	Barley just coming into ear. Potatoes in flower.
"	31	Raspberries ripening.
Aug.	8	Red currants and blueberries perfectly ripe.
"	19	Barley ripening.
"	29	Peas quite ripe.
"	31	Swallows have disappeared.
Sept.	7	Leaves of birch and aspen change color.
"	13	Potatoes, cabbage, turnips and cauliflowers nipped by frost.
Oct.	7	Leaves of the birch and aspen falling.
Nov.	3	Small lakes frozen over.
"	9	River (Kaministiquia) covered by sheet of ice which broke up a
Dec.	1	Ice driving about by wind.
"	17	Thunder Bay frozen across to Welcome Islands."

Capabilities for Settlement.

Appendix No. 3 to Journals Legislative Assembly, Canada, 1858. Report by Mr. Dawson.

* * * "The country about Thunder Bay, and the lower part of the Kaministiquia, may be regarded as in every way suited for a considerable settlement. The high region again, across which the route lies for about 100 miles, from Dog Lake to the western end of the Lake of a Thousand Lakes, may be cold, but there is nothing in the growth of the wood, or in the appearance of the soil, to indicate that it is not also, in many places, suitable for settlement. However, the climate is better on the western slope of these high lands between the Lake of a Thousand Lakes and Rainy Lake.

"About Rainy Lake, and from thence to Rainy River and the Lake of the Woods, following from the latter the proposed route across to Red River, the country is as well adapted for settlement as any other part of North America. The climate is good, the soil, in general, fertile, water power is to be had in abundance, and in the woods there are many kinds of valuable timber."

Building Material.

Mr. S. Fleming in Report of Progress, C. P. Railway Survey, 1874, p. 33.

"With regard to material for building purposes, I have every reason to believe that no great difficulty will be experienced on this score. The woodland region fortunately possesses an abundant supply of timber, suitable for railway work, and will be able to furnish all that may be required in the prairie region."

Appendix No. 36 to Journals, Legislative Assembly, Canada, 1859. Report by S. J. Dawson, C. E.

"Stone of all kinds, fit for building purposes, is to be found on Lake Winnipeg; limestone appears on Red River, and is very abundant on the Manitoba and Winnipegoosis Lakes; sandstone and limestone occur on the Assiniboine, about 150 miles west of Fort Garry."

Second Report of the Select Committee on Immigration and Colonization. House of Commons, 1869. Evidence by Mr. S. J. Dawson, pp. 14-15.

"*13th Question.*—What are the mineral resources of the country other than coal, already referred to? *Answer.*—Its mineral resources are as yet but very imperfectly known. In the part I have myself explored, near Rainy Lake and other places, there are good indications of gold and silver, and the former is now being worked in that vicinity in the United States. The vicinity of the Lake of the Woods, the Winnipeg River, and generally the east side of Lake Winnipeg, abound in indications of mineral wealth, including iron, lead, plumbago, &c. The great chain of the Rocky Mountains, forming a prolongation of the Cordilleras of the south, and which seems to be the greatest auriferous and argentiferous belt in the world, continues its richness throughout the Central States and territories of the Union, and Montana (bounding us to the south along the 49th parallel, a yet undeveloped territory except as regards the gold and silver a few miners and 'prospectors' have been working of late years), seems even to surpass in richness any of the previously discovered mining regions; and although its mines were only discovered a very few years ago, it is already yielding about $12,000,000 (twelve million dollars) annually. The miners and explorers of that region have penetrated to the north of the boundary, and they declare that our territory on both the eastern and western slopes of the mountains is equally rich. If this be so, and there seems no reason to doubt it, the mining interest will soon become a very large one after access to the country has been opened up; and the fact that the very portal to the country, at Thunder Bay, on Lake Superior, has silver mines of most extraordinary surface promise, which are now being developed will, if successful, which there seems every reason to hope, given great impetus to enterprises of that kind. In the North-West there are also large quantities of petroleum, and salt, (which exists also near Lake Winnipegoosis) is there found almost in a state of purity.

"*14th Question.*—Having spent some time in the country at all different seasons of the year, you can perhaps give the Committee your views on the climate, comparing your personal observations with general report? *Answer.*—During the time I spent at Fort Garry the months of October and November presented the finest fall weather, Indian summer like, I had ever seen. There were some severe frosts during the winter, as may be seen by the register kept by me and given in my report of 1859, but the average was not colder than here, and the snow never exceeded 17 inches, and averaged less than a foot in depth. On the 9th of April ploughing commenced. Vegetation progressed very rapidly soon after, and by the middle of May we were fairly into summer. My impression at the time was that we had upon the whole about the same climate as Kingston, Ontario, perhaps a little colder in winter, but with finer weather in the spring and fall—which is, of course, highly favorable to agricultural pursuits. Further to the west the climate becomes still milder. The climatology of the country and the influences bearing thereon, and a comparison between different parts of it and their counterparts in Europe, seems to me to be very fairly put in the following extract from the examination of Mr. Wm. McD. Dawson before a Committee of Parliament in Toronto in 1867. After shewing the effect of an approach to the Pacific across this continent from the east as being of the same general character as an approach to the Atlantic to the east across Asia and Europe, in its ameliorating influence upon climate, which is not therefore solely governed by latitude, he proceeds to say—other conditions being equal—that as "The 49th parallel of North Latitude (which is the southern boundary of our Western territories), passes nearly a degree south of the southernmost point of England, through the environs of Paris, through the Southern Provinces of Germany, and less than a degree north of Vienna, there is therefore no reason, as regards climate, why the lower course of the Fraser River, or the upper course of the Columbia, in British territory and in the same latitudes, should not rival the banks of the Rhine, the Meuse or the Moselle. There is no such reason why the valleys of the Nujiga, the Elk, the Saskatchewan, the Red River and the Assiniboine, should not yield their golden harvests as rich as those of the Weser, the Elbe, the Oder or the Vistula.

"The geographical difficulties between these localities, in relation to those influences by which climate is affected, are indeed such that it would require some very strong facts, sustained by a concurrence of all the most credible testimony to prove that the above comparison is too favorable to the places I have named on this continent. The facts established, however, by all

disinterested authorities, prove the reverse."

Thunder Bay Mines.

Report of the Commissioner of Crown Lands, Ontario, 1870. Appendix No. 22, by E. B. Borron, Mining Inspector, pp. 31-2.

"Silver bearing veins have been discovered in ten or twelve different localities between Thunder Cape and Pigeon River, indicating a field sufficiently extensive to constitute a very important silver mining region, should the lodes or veins turn out well in depth. None of the veins have been sunk upon to a greater depth than sixty feet or ten fathoms, a depth very inconsiderable in a mining point of view. We have beyond doubt veins containing very rich bunches or pockets of silver at or near the surface. That near Silver Islet, Thunder Cape, has produced this fall, a quantity of ore which if nearly so rich as reported, places it in the meantime in the foremost rank of silver producing mines, and although the depth yet attained does not exceed ten or twelve feet, it is said to be as rich if not richer in the bottom of the slope than it was at the surface. Whether any considerable number of these silver veins will sustain profitable mining operations carried on by a large force of miners and extended over a long term of years, like many such in Europe, remains to be seen."

Altitude of Watershed.

Captain Palliser's Exploration of B. N. America, p. 29.

"Extreme observed altitude of watershed above Lake Superior 902 feet."

Gradients.

Mr. Sandford Fleming in Report of Progress C. P. R. Survey, 1874, p. 32.

"In passing through to Lake Superior from the west, a rise of 817 feet has to be overcome in 300 miles, and a descent of 976 feet in about 116 miles. The Grand Trunk Railway, between Montreal and Portland, running easterly from Montreal, makes an ascent of 1,360 feet in 144 miles, and a corresponding descent in 153 miles. Comparisons of this nature do not take into account intermediate undulations in either case; they are presented simply for the purpose of bringing out the salient features of the route found for the Canadian Pacific Railway. They suggest that the works of construction for this line will not be heavy, and that it will be quite possible to secure remarkably easy ascending gradients, in the direction of the heavy traffic. * * * The information obtained suggests that it will be possible to secure maximum easterly ascending gradients, between Manitoba and Lake Superior, within the limit of 26 feet to the mile, a maximum not half so great as that which obtains on the majority of the railways of the Continent."

CHAPTER II.
FROM RED RIVER TO SOUTH SASKATCHEWAN RIVER.

Physical Characteristics.

Captain Palliser's Exploration in B. N. America, folio, pp. 6-7.

"Immediately to the west of the rocky district already referred to, succeeds a chain of lakes, the principal of which is Lake Winnipeg, which has the same altitude above the sea level as Lake Superior, viz: 600 feet. From these lakes to the Rocky Mountains the central region may be considered as a plain, gradually rising until it gains an altitude of 3,000 feet at the base of the mountain chain. The surface of this slope is marked by steppes, by which successive and decided increases of elevation are effected, accompanied by important changes in the composition of the soil, and consequently in the character of the vegetation. Those steppes are three in number. The first may be said to spring from the southern shore of Lake of the Woods, and trending to the S.W., crosses Red River considerably south of the boundary line; thence it runs irregularly in a north-westerly direction towards Swan River to meet the North Saskatchewan below Fort a la Corne. The general altitude of this first or most easterly prairie steppe may be estimated at 800 to 900 feet above the sea level.

"The second or middle steppe, conterminous with the limit of the first just described, extends westward to the base of the third steppe, which may be defined by a line crossing the United States frontier, not far from the 'Roche Percée,' in longitude 104° west; thence passing in a north-westerly direction to near the elbow of the South Saskatchewan, and northward to the Eagle Hills, west of Fort Carlton. The mean altitude of this second steppe is about 1,600 feet above the sea level. The third and highest steppe extends to the base of the Rocky Mountains, and has a mean altitude of 2,700 feet. (The highest level being at the boundary line, thence northward, then a continuous fall.)

"The composition of the plains being, to a great depth, of soft materials, these steppes do not influence the river channels, so that the rivers rising in the Rocky Mountains traverse the plains with an uniform current, uncontrolled by the superficial features of the country. These rivers have, generally speaking, formed deep rather than wide valleys. * * * The central (American) desert extends but a short way into the British territory, forming a triangle, having for its base the 49th parallel from longitude 100° to 114° W.; with its apex reaching to the 52nd parallel of latitude. The northern forest, which in former times descended more nearly to the frontier of this central desert, have been greatly encroached upon, and, as it were, pushed backwards to the north through the effect of frequent fires. Thus a large portion of fertile country, denuded of timber, separates the arid region from the forest lands to the north. * *

"All the rivers which intersect the plains east of the Rocky Mountains, (and south of latitude 54) with the exception of the Athabasca, flow into Lake Winnipeg and thence into Hudson Bay. * * *

"Lake Winnipeg, which is the principal reservoir in which the waters of these rivers collect, has its outlet by Nelson River to Hudson Bay. It extends from latitude 50½° to 54½° N., but from lying somewhat obliquely, it is about 290 miles in length. Lake Winnipeg communicates with several other sheets of water, of which Manitoba and Winnipegoosis Lakes are the most considerable. None of these lakes are deep, and many parts of them are extremely shallow, but still they present fine stretches for future steam navigation, and from the facility of access which they give to the timbered districts, they will doubtless prove of great value in opening up and settling the country."

Superficial Geology.

Geological Survey of Canada, 1874-75. Report of Mr. R. Bell, pp. 40 to 55.

"In the prairie regions of the North-West territory, loose deposits of Post-Tertiary age cover the surface of the country almost universally, and they are usually of considerable depth. There are immense areas having the same general elevation, or without very great or sudden changes of level, yet, with the exception of the first prairie steppe, there is a remarkable scarcity, or perhaps absence, of extensive stratified deposits of sands and clays, such as occur in the Provinces of Ontario and Quebec. The bulk of the superficial deposits is of the nature of boulder clay or unmodified drift, which is spread alike over the older rocks from the lowest to the highest levels. In those portions of the territory which have come under my own observation, the materials of the drift appear to be made up of the debris of the rocks existing *in situ* immediately beneath or a short distance to the north-eastward, together with a greater or less proportion derived from those lying further off in the same direction. As a rule the softer or more clayey part has come from the underlying strata, while the harder pebbles and boulders are the furtherest transported, still, in washing out the finer ingredients it is always found that much of the incorporated sand and gravel is of foreign origin. * * * In reference to the composition of the drift, more than half of its bulk, on an average, consists of local material. On the first and second prairie steppes, the most abundant constituent of the transported portion is Laurentian

gneiss, while the remainder is made up of light-colored unfossiliferous limestones, supposed to be Silurian and Devonian, together with a proportion of Huronian schists, which varies in different localities. On the third steppe, however, smooth pebbles of finely granular quartzite predominate. * * * There are also pebbles of dark fine-grained diorite, light-colored limestone, and some of dark fine-grained mica schist, and of white translucent quartz. * * * While the composition of the boulder clay of the first and second prairie steppes, and also to some extent, that of the third steppe, as well as the course of the glacial striæ on the hard rocks on the east side of the prairies, would indicate that the drift had been mainly from the north-eastward, the above evidence shows that a large proportion of the transported material on the highest levels has come from the north or west. A part of what now is found in some localities may have been moved first in one direction and afterwards in another, whilst the bulk of the older drift, including, perhaps, even that on the third steppe, has probably come from points between north and east. The quartzite pebbles of the third steppe were all thoroughly waterworn and appeared to be most abundant on and near the surface. The upper 200 feet, or thereabouts, of the south bank of the South Saskatchewan at the Red Ochre Hills, consist of clayey drift, in which boulders of Laurentian gneiss occur, while the surfaces of these hills are strewn with smooth quartzite gravel and cobble stones. At the distance of 150 miles to the south-eastward, between the Dirt Hills and Woody Mountain, the proportion of quartzite gravel on the third steppe has diminished considerably, and Laurentian boulders have become very numerous on the surface.

"Between Fort Garry and Fort Ellice, Huronian boulders are scarce. * * * Both boulders and pebbles from rocks of this formation are, however, conspicuous for their abundance in the drift in the banks of the Assiniboine for some miles above and below the junction of the Shell River, and in the banks of the Calling River, in the neighborhood of the Fishing Lakes. They are also noticeable on the surface all the way from these lakes to the Touchwood Hills. * * * In the three prairie steppes there is a marked difference in the general aspect of the surface of the country and in the character of the river-valleys. On the first steppe, the surface is usually level or undulating in long gentle sweeps, and the beds of the principal streams do not probably average more than thirty feet below the level of the surrounding country. On the second steppe the surface is rolling, and the river valleys are usually from 150 to 200 feet in depth, while on the third, the hills are on a larger scale, and either closely crowded together, or they rise here and there to considerable heights overlooking less rugged tracts. The principal river-valleys on this steppe are from 200 to 500 feet deep. The 'Coulees,' as they are termed, form a curious feature of the third steppe. These are ravines or valleys with steep sides, often 100 feet or more in depth, which terminate or close in rather abruptly, often at both ends, forming a long trough-like depression; or one of the extremities of the 'Coulee' may open into the valley of a regular watercourse. The Coulees sometimes run for miles, and are either quite dry or hold ponds of bitter water, which evaporate in the summer and leave thin incrustations of snow-white alkaline salts.

"The average depth of the river-valleys of the first and second prairie steppes is not affected by the general descent of the country through which they run. From Little Boggy Creek to the Arrow River the Assiniboine must fall four or five hundred feet, yet the banks of the valley maintain the same general height and the same character throughout the whole distance. Similarly, the fall in the Calling River from the Sand Hills Lake to its junction with the Assiniboine, cannot be far from 500 feet, and still its valley banks have the same average height throughout. The fall in the Red River from Moorhead to Fort Garry, is upwards of 200 feet; but in the whole distance the banks of the river have a nearly uniform height of 20 or 30 feet. * * *

"The great valleys of the third steppe cut entirely through the drift and far down into the underlying Tertiary and Cretaceous rocks; those of the second steppe appear to correspond in a general way with the depth of the drift, while on the lowest steppe, the streams have merely cut through the modified deposits resting on the drift, which latter is occasionally exposed at low water at the foot of the banks, or in the bed of the stream at swift places and rapids.

* * * "The stratified clay, silt, sand and gravel of the Red River and the lower Assiniboine vary in thickness from almost nothing to 80 or 90 feet so far as known; and a variable thickness of boulder-clay is interposed between these deposits and the older rocks, which lie beneath them all. * * * During the past summer a number of new wells have been dug or bored through these deposits in various parts of Manitoba. After passing through the black loam at the surface, which varies from 1 to 6 feet in depth, light grey, drab, and more frequently yellowish, somewhat sandy clays were passed through, when hard pebbly and bouldery clay, or, in some cases, probably solid rock was reached. * * * Some of the superficial clays around the City of Winnipeg have been found, within the last two years, to make, under proper skill, 'white' brick of an excellent quality, resembling those of Toronto. The principal buildings in the city are now being constructed of these bricks. In other places around Winnipeg, red bricks have been made from clay dug near the surface. In the district between the south end of Manitoba Lake and the Assiniboine River (east of a line drawn from Prairie Portage to Westbourne,) all the wells have passed through sand; none of them required to be dug to a greater depth than about 20 feet to find good water." * *

Geological Survey of Canada, 1873-4. Observations by Mr. Selwyn, p. 21.

"Extensive exposures of palæozoic rocks, which are supposed to underlie the superficial deposits of the first prairie steppe, occur on many of the islands and along the whole of the western shore of Lake Winnipeg. They form the Grand Rapid of the Saskatchewan, and crop out at intervals along the river as far up as Cumberland or Pine Island Lake. * * * In the

comparatively few localities where the rocks composing it have been examined they appear to be characterized, like the formations of the same age in Western Canada, by deposits of salt and petroleum giving rise to copious springs of these valuable materials. And there seems but little doubt that Canada has her salt and oil bearing regions, surpassing in extent and productive capacity any hitherto developed on the American Continent. * * *

"Westward from the summit of the ascent to the second prairie steppe, which is marked by the long range of low hills already mentioned extending north-westerly from Pembina Mountain to Basquia Hills, and which attains an average elevation of 1,600 feet, the country, on the route which we travelled, especially after crossing the Assiniboine River at Fort Ellice, is generally undulating or rolling and often hilly. Some of the hills rise to from 200 to 300 feet and occasionally to as much as 400 feet above the general level of the prairie, and afford from their summits extensive views of the surrounding country, which everywhere presents a park-like aspect; belts, patches and clumps of woodland with intervening richly grassed meadows or wide stretches of open undulating prairie, interspersed with countless lakes and pools are seen on all sides, while the wonderful variety and beauty of the flowering plants, roses, lilies, gentians, sunflowers, larkspur, a beautiful purple aromatic mint-like plant, and a host of others lend an additional charm to the beauties of this picturesquely lovely landscape."

Assiniboine and Saskatchewan Exploring Expedition, by H. Y. Hind. Appendix No. 36, Journals Legislative Assembly, Canada, 1859.

"The most striking peculiarity in the arrangement of the different formations, from Red River to the South Branch, and from the 49th parallel to the main (north) Saskatchewan, is their undisturbed and horizontal condition. With two or three exceptions, no appearance of local disturbance was observed throughout the whole region traversed. The rocks dip, generally, with a very gentle inclination from the north-east to the south-west. Sometimes it is not only impossible to detect any dip by the eye, but the level fails to show the smallest deviation from perfect horizontality. * * * From the Saskatchewan at Grand Rapids to Red River, exposures of Silurian rocks are everywhere numerous on the west shores of the great lake. * * * Salts springs occur on the east flank of Dauphin Lake, within ten miles of the outcrop of the cretaceous rocks on the flanks of the Riding Mountain, which leads to the inference that the carboniferous group is totally wanting in the region where it might be supposed to exist, between Lakes Manitoba and Winnipegoosis and the range of high land forming the eastern watershed of the Assiniboine."

Appendix No. 36, Journals Legislative Assembly, Canada. Report of Mr. S. J. Dawson, 1859.

"The country westward of Red River, as far as we have explored it, presents three divisions, which, although presenting many features in common, are yet of a character in some respects distinctly different.

"Of these the great alluvial flat, extending from the 49th parallel to the Saskatchewan, rounded to the eastward and north-eastward by Lake Winnipeg and the wooded region between Red River and the Lake of the Woods, and on the west by the high lands which extend from the boundary line to the Basquia Mountain, on the Saskatchewan, may be regarded as the first. It has a length of 340 miles and an average width of 60 or 70, and may embrace an area of 20,400 square miles. About one-third of this extent is chiefly open prairie land, and the remaining two-thirds mostly wooded. From Pembina to Lake Winnipeg the prairie land vastly predominates, but, from thence north-westward to the Saskatchewan, the forests gradually become more dense until they cover the entire face of the country. The whole of this region is very level, and, if exception is made of the lands immediately bordering on Lake Winnipeg and the Saskatchewan, the soil is of an alluvial description, and so rich, that, as experience has shown, wheat may be grown for 20 successive years without exhausting it. A considerable portion of the area is occupied by swamps and lakes, but the swamps, so far as I had an opportunity of observing them, are mere marshes with a bottom of alluvial soil, similar to that of the dry prairie, and so firm that horses and cattle can wade through them in almost any direction. They seem to owe their existence solely to the extreme flatness of the country, and as they are at a much higher level than the streams, which all run in deep channels, they might be very easily drained; indeed, with a proper system of drainage, the whole of this great alluvial flat, might be brought under cultivation, except, of course, where it is periodically overflowed, and the extent to which it is subject to be so is quite insignificant as compared to the whole area. Of the lakes, the Manitoba, the Winnipegoosis and Shoal Lake are the principal, and these may occupy an area of about 2,700 square miles.

"The streams which flow through the prairie are all bordered more or less by forests, in which oak and elm of fair size are to be met with, although not in very great quantities. In the wooded, of which, however, less is known, poplar predominates, but on the borders of the lakes and streams, larch, spruce, birch and oak are to be found, of a size and quality available for economic purposes.

"The second natural division embraces the hilly region which forms the south-western boundary or embankment of the great alluvial flat which has just been described; it extends from the 40th parallel to the Saskatchewan, a distance in a north-westerly direction of 360 miles, and may have an average width of 40 miles.

"This region is of a character more varied, and, perhaps, on that account more interesting than any other part of the country. High rolling banks and elevated plateaux, covered with dense forests, alternate with wide spread valleys of unsurpassed fertility. Numerous streams, taking their rise among the hills, run with a rapid course towards the Assiniboine on

the one side, and to the Manitoba and Winnipegoosis Lakes on the other. Of these the principal are the Dauphin River, Duck River, Swan River, Red Deer River, and the Wauketsequapawoo, or Floating Ice River, which flow into the Winnipegoosis Lake; and Shell River, Birdtail Creek, Arrow River, Rapid River and Oak River which run into the Assiniboine. The hills are known as the Riding Mountain, Duck Mountain, Porcupine Hill, Thunder Mountain, &c., of these the Porcupine Hill and Thunder Mountain alone deserve the name of hills, the Duck and Riding Mountains being nothing more than elevated plateaux of great extent, penetrated by deep glens. As seen from the Winnipegoosis Lake, the Duck Mountain presents a perfectly even outline, rising to a height, perhaps, of 500 or 600 feet above the lake. Porcupine Hill, or range rather, may have an altitude of 1,500 feet above the surrounding country, while Thunder Mountain is but a higher swell in the undulating ridge which connects this range with the Duck Mountain. When first seen on ascending the valley of Swan River, Thunder Mountain has a very striking resemblance to the Montreal Mountain, and it acquires additional interest from the fact that the Indians report coal on its eastern declivity.

"Throughout the whole of this region wood is in sufficient abundance to supply the wants of settlers for generations to come. The high lands are in general densely wooded, and the valleys present about an equal extent of woodland and prairie. Salt springs occur in various places on the shore of Winnipegoosis Lake, and in the lower part of Swan River. * * * The banks of the river near Swan Lake are of an alluvial soil, but so low that they must occasionally be overflowed. As we ascend they become higher, and the growth of timber indicates a soil of unsurpassed fertility. * * * The flats give way to high rolling banks, and wide prairie openings appear among the forests. As we proceed the country becomes still more open; and to judge by the progress of vegetation, and the black mould thrown up in countless hillocks by the moles, the soil must be very rich. Where landslips occur in the immediate banks of the river, they exhibit a face of yellow loam, or stiff clay, curiously stratified, and showing the presence of minerals in the water which oozes from between the strata.

* * * "We pass through a beautiful country, presenting about an equal extent of woodland and prairie. As we proceed the openings become larger, and the wood less frequent. The valley seems to be about 30 or 40 miles in width. * *

"I shall consider as the third grand division the vast prairie region, extending from the broken ground just described, westward to the sources of the Assiniboine, bounded on the south by the 49th parallel, and on the north by the Saskatchewan.

"Regarding this region in its general aspect, it is apparently level or but slightly undulating, with an inclination to the eastward. It is, however, at a great elevation above the valley of the Red River, even on the borders of the hilly tract, and gradually increases in altitude on proceeding to the westward, the sources of the Qu'Appelle taking their rise in a country probably 500 or 600 feet above the level of Red River. Through this high plain the streams run in valleys varying from 150 to 200 and even 300 feet below its general level. These valleys vary in width from a quarter of a mile to two or three miles, and have commonly a pretty uniform direction, but the streams wind through them in an exceedingly tortuous course. The plains, although at such an elevation above the streams, are much the same in appearance as those in the low alluvial valley of Red River, and present a soil apparently of as great fertility. Wood is not, however, so abundant, but on the immediate borders of the Assiniboine, it is sufficiently plentiful to supply the wants of a new settlement."

Appendix No. 36, Journal of the Legislative Assembly, Canada, 1859. Report of Mr. S. J. Dawson.

"A range of highlands, it will be seen, extends south-eastward from the Basquia Mountain on the Saskatchewan, in latitude 35° 30′ north, to the United States boundary line. This range has, in all probability, at some period, formed the south-western embankment of a great inland sea, which covered the valley of Red River, and comprised within its mass Lakes Winnipeg, Winnipegoosis, Manitoba and the numerous smaller lakes which are spread over the great alluvial flat in which they lie. The country, bounded on one side by this range, and on the other by Lake Winnipeg, and the highlands to the eastward of Red River, is an almost unbroken level, sloping very slightly to the Red River and Lake Winnipeg.

"Part of this extensive tract is open prairie land, but by far the greater portion is densely wooded. A line drawn north 75° west from the confluence of Red River with Lake Winnipeg to Lac Dauphins would pass through about an equal extent of woodland and prairie. From thence northward, a forest but rarely broken by prairie openings, extends to the Saskatchewan. To the south the country becomes more open, until on nearing the Assiniboine, the woods entirely disappear, and an apparently boundless prairie spreads out on either side. The streams, however, are all bordered more or less with wood; a heavy growth of oak, elm, basswood, &c., extends in many places for a mile or two from the banks of the Assiniboine.

"Proceeding by the road from Red River to Manitoba Lake the country for the first 22 miles or so presents the appearance of an unbroken level, with clumps of trees rising here and there, like islands in an otherwise boundless ocean. Further on, the wood becomes more frequent, and sometimes the prospect seems bounded by forests; on approaching these, however, other prairies open up and other woods appear, and in this way prairie and woodland alternate all the way to Manitoba Lake; although the ground seems level it is not precisely so, but slightly rolling or undulating."

Canadian Exploring Expedition, by H. Y. Hind. Vol. 1. Chap. XI, p. 233.

"The prairies of Red River at Fort Garry are about 80 feet above the level of Lake Winnipeg. They form the southern

portion of a vast region of lake, swamp and marsh, which is bounded in a very well defined manner by the Pembina Mountain and its continuation to the Saskatchewan, which river it crosses a few miles below the Nepowewin Mission, opposite Fort a la Corne. Pembina Mountain forms the western limit of an ancient sea or lake coast; its direction is partly shown on the map as far as the Assiniboine. On the precipitous eastern flank, of the Riding and Duck Mountains, it occurs in the form of a ridge. * * * The whole of the country east of Pembina Mountain, and its continuation, as described above, with the exception of the Assiniboine and Red River prairies, is low, swampy, and in great part occupied by Lakes Winning, Winnipegoosis, Manitoba, and other bodies of water of less magnitude, having an area exceeding in the aggregate 13,000 square miles. Rising above Pembina Mountain in the form of steps, are two other terraces, best seen on the east and west flanks of Riding and Duck Mountains, but obliterated in the valley of the Saskatchewan and Assiniboine by the denuding forces which have swept over the whole of this region. * * *

"Surveying the country in the direction in which the great rivers flow, those vast plains slope gently from a low height of land near the south branch of the Saskatchewan with an easterly trend to the Assiniboine. * * * North-east of the Assiniboine the country rises almost imperceptibly for a distance of 15 to 35 miles, as far as the base of a series of hill ranges lying parallel to the general direction of the river valley, before it makes its easterly bend; it then rises by successive steps and sloping plateaux to a summit altitude of about 1,000 feet above Lake Winnipeg, or 1,600 feet above the sea.

"These hill ranges are known by the names of the Riding and Duck Mountains. On their eastern and south-eastern flanks they show an abrupt and broken escarpment and within the space of five miles the country sinks from 1,600 to 680 feet above the sea, or within 80 feet of the level of Lake Winnipeg.

"At the foot of those hill ranges, and east of them, lie the great lakes Winnipegoosis and Manitoba, which are separated from Lake Winnipeg by a low, marshy, and nearly level tract, having an elevation rarely exceeding 80 feet above it. * * *

"The outcrop of the different formations in the valley of Lake Winnipeg, as far as are known, follows the general direction of the rim of the basin in which they are deposited with remarkable uniformity. Conforming to the direction of the Laurentian system exposed on the east side of Lake Winnipeg, and constituting the Laurentide mountains, the Silurian series stretch from Pembina on the 49th parallel, to the Saskatchewan on the 54th and thence towards the Arctic Sea. Following its outcrop, the Devonian series is symmetrically developed within the same distant boundaries; but the most singular feature of this region is, that the soft cretaceous shales should also conform, with tolerable exactness, to the exposed edges of the unfossiliferous rim of the great basin in which they lie. * * *

"Besides the imposing Riding and Duck Mountains the Touchwood Hills may be enumerated as very important and striking in a region whose marked characteristic is that of a gently sloping plain. These hills lie between the head waters of the Assiniboine and the South Branch; the elevation of the highest peak, the Heart Hill, probably does not exceed 700 feet above the general level of the great plain. The course of this range is from north-east to south-west, and it forms the most prominent of several ranges which lie parallel to one another."

The Great Lone Land, by Capt. W. F. Butler, F.R.G.S., p. 217.

"About midway between Fort Ellice and Carlton a sudden and well-defined change occurs in the character of the country; the light soil disappears, and its place is succeeded by a rich dark loam covered deep in grass and vetches. Beautiful hills swell in slopes more or less abrupt on all sides, while lakes fringed with thickets and clumps of good sized poplar balsam lie lapped in their fertile hollows.

"This region bears the name of the Touchwood Hills. Around it, far into endless space, stretch immense plains of bare and scanty vegetation, plains seared with the tracks of countless buffalo which, until a few years ago, were wont to roam in vast herds between the Assiniboine and Saskatchewan. * * * There is something unspeakably melancholy in the aspect of this portion of the North-west. From one of the westward jutting spurs of the Touchwood Hills the eye sees far away over an immense plain; the sun goes down, and as he sinks upon the earth the straight line of the horizon becomes visible for a moment across his blood-red disc, but so distant, so far away, that it seems dream-like in its immensity."

Geological Survey of Canada, 1874-5. Report of Mr. J. W. Spenser, p. 60.

"Porcupine Mountain forms as a continuation of the chain of high ground which marks the eastern limit of the second of the three great prairie steppes of the North-west Territory. It rises to the height of about 800 feet above Swan Lake. Between the base of the mountain and the lake is a belt of about 12 miles of low ground, consisting of open marshes, or 'muskegs,' tamarac swamps, &c., while the remainder of the interval is densely wooded with aspen, balsam-poplar, spruce and willow. On the slope of the mountain I saw balsam-poplar six feet in diameter, while, in some cases, the spruces reached a thickness of nearly four feet.

* * * "In many exposures along Swan River there is but a thin covering of drift over the underlying cretaceous rocks. Between the foot of the eastern slopes of the Duck and Porcupine Mountains and the lakes, the Devonian limestones are covered by only a few feet of drift. The following is a section, in descending order, of these deposits, as they occur in Swan

River, opposite Thunder Hill:—

	ft.	in.
Surface soil	3	0
Bed of Laurentian boulders and pebbles	2	0
Stratified coarse sand	0	6
Bed of Laurentian boulders and pebbles	2	0
Stratified coarse sand	0	6
Laminated clay	1	0
Homogenious clay with pebbles	3	0
	12	0

"Near this section, below Thunder Hills, are springs depositing yellow ochre. A little further down I observed other springs at which the process of petrifying wood, moss and leaves was going on. Here there were blocks of calcareous tufa, sometimes measuring several cubic yards, which had been formed, at the place where they are found. The thickest vertical section of limestone beds on the river amounted to about 15 feet."

Sketch of the North-west of America, by Archbishop Tache, p. 13.

"The great expanse of the prairies tells plainly that their geological formations must vary. The prairie, which touches the desert, includes, like the neighboring country, secondary formation, while towards its extremity it has transition rocks, for example, the calcareous strata of Red River and coal fields of the Saskatchewan. The Silurian system occurs in its neighborhood and sometimes runs into old red sandstone. Extensive deposits of sulphate of soda are found in the neighborhood of the calcareous strata and elsewhere. The valleys of rivers and the drying up in the forests, everywhere multiply recent formations. There are thick alluvial beds there, and these become covered with vegetable deposit, sometimes also of great depth."

Appendix No. 36 to Journals of the Legislative Assembly, Canada, 1859. Report by Mr. A. W. Wells.

"The western shores of Lake Winnipegoosis, in common with the other lakes through which I passed, is much better adapted for settlement than the eastern one, inasmuch as the land is higher, and the climate, if anything, a little better. In crossing Lake Winnipegoosis from east to west, a distance of only about 12 miles, I found vegetation somewhat farther advanced than on the side I had just left, the soil is also better, inasmuch as that it is higher. Timber, such as maple, elm, oak and poplar covers the country to the water's edge. I visited several places where sugar had been made and saw specimens of that article equal to any that I had ever seen in Eastern Canada.

"The Duck Mountain, which occupies almost the entire background, commences to rise not far from the lake shore, keeping a gentle ascent for 15 or 20 miles back, where it attains its greatest elevation, a height of 600 or 700 feet above the level of the lake. The entire face of the mountain is a succession of gentle slopes and flat table lands, and the summit itself is an extensive plateau of alluvial soil covered with a fine growth of timber." * * *

Topographical Characteristics.

Canadian Exploring Expedition, by H. Y. Hind. Vol. 1, p. 244.

"The western and south-western slopes of Riding and Duck Mountains support heavy forests of white spruce, birch, aspen and poplar. The trees are of large size and often exceed 1½ to 2 feet in diameter, with an available length of 30 to 50 feet. On the summit plateau of the Riding Mountains the white spruce is the largest tree; here it attains vast dimensions, and is found in quantities sufficient to give to this region a great economic value. The wooded area over which timber of the four kind of trees enumerated, is found on the Riding and Duck Mountains, has a length of 120 miles, with a breadth of 30 miles. In the valley of the Assiniboine is an extensive and valuable forest of oak, elm, ash, maple, poplar and aspen, with an average breadth of four miles; its length is about 30 miles. * * * All the affluents of the Assiniboine flow through deep ravines, which they have cut in the great plain they drain; these narrow valleys are well clothed with timber, consisting chiefly of aspen and balsam-poplar, but often varied with bottoms of oak, elm, ash and the ash-leaved maple."

Ibid, p. 245.

"The Touchwood Hill range, together with small parallel ranges, such as the Pheasant Mountain and File Hill, averaging twenty miles in length by ten in breadth, are in great part covered with aspen forests, but the trees are generally small. At the Moose Woods, on the South Saskatchewan, forests of aspen begin to appear; they continue with occasional admixtures of

birch and oak, more rarely of oak and elm, as far as the Grand Forks; here the spruce becomes common, and with aspen, occupies the excavated valley of the Saskatchewan for many miles. The hill banks and the plateau on the south side of the river, for a distance of three or four miles south, sustain the Banksian pine, which disappears as the soil changes from a light sand to a rich and deep vegetable mould, supporting detached groves of aspen and clumps of willow. * * * The south branch, from the Elbow to the Moose Woods, flows through a treeless region as far as relates to the prairie on either side; but in the ravines leading to the river detached groves of small timber occur. The boundary of the prairie country, properly so called, may be roughly shown by a line drawn from the great bend of the Little Souris, or Mouse River, to Qu'Appelle Mission, and from the Mission to the Moose Woods, on the South Branch."

Ibid, p. 246.

"Issuing from the Duck Mountain are numerous streams which meander through a beautiful and fertile country. This area may be said to commence at the two creeks, ten miles from Fort Pelly, thence on to Pine Creek, fifteen miles further. The vegetation is everywhere luxuriant and beautiful, from the great abundance of rose bushes, vetches, and gaudy wildflowers of many species. After passing Pine Creek the trail to Shell River pursues a circutuous route through a country of equal richness and fertility."

Ibid, p. 249.

"Valley of the Saskatchewan.—1. The country between the Lumpy Hill of the Woods and Fort a la Corne, or the Nepowewin Mission, including the valley of Long Creek and the region west of it, bounded by the south branch of the Main Saskatchewan. This area may contain 600,000 acres of land of the first quality.

"2. The valley of Carrot River and the country included between it and the Main Saskatchewan bounded on the south side by the Birch Hill range. There is a narrow strip on the great river, about 5 miles broad, where the soil is light and of an indifferent quality. The area of available land probably does not exceed 3,000,000 acres.

"3. The country about the Moose Woods on the South Saskatchewan.

"4. The Touchwood Hills.

"5. The Pheasant Hill and the File Hill. The aggregate area of these fertile districts may be stated to extend over 500,000 acres.

"Assuming that the prairies of Red River, and the Assiniboine east of Prairie Portage contain an available area of 1,500,000 acres of fertile soil, the total quantity of arable land included between Red River and the Moose Woods on the south branch of the Saskatchewan will be 11,100,000 acres. Of land for grazing purposes, the area is much more considerable, and may be assumed equal in extent to the above estimate of arable land."

Report of Progress, Canadian Pacific Railway, 1874, p. 37.

"Proceeding towards the Touchwood Hills, we met gentle slopes covered with the aspen, with occasional small lakes, fringed by willows, many of them saline.

"Much of the land has been devastated by fire, and it is thought that this cause, repeated frequently, has, after a series of years, resulted in the entire destruction of the heavy wood which, it is believed, once covered the surface of these prairies. The aspens, however, quickly grow up, five or six years' life making them sufficiently large for fencing purposes.

"About 110 miles to the north-west of Fort Ellice, the Touchwood Hills are met. These are mere undulating eminences, partly wooded, with remarkably good soil and apparently well adapted for settlement; they gradually descend on the western side. Some difficulty was found in this neighborhood in obtaining water. * * *

"Scarcely any rivers are met; it is observable, however, that several running streams are found further north.

"The route, on which we were travelling, explains this feature of physical geography, for we were on the watershed between the Assiniboine and the South Saskatchewan. We found that this part of the route is generally without timber, but it contains spots where slight wooded knolls are met. Apparently level, in reality there is a considerable ascent, as the country is travelled westward.

"From Fort Garry to Fort Edmonton, there is a rise of 1,400 feet in a distance of 900 miles by trail, while a farther rise of 900 is experienced before the base of the mountain chain is met. Thus the total additional elevation of 2,300 is spread over 1,000 miles. * * * In some portions of this, heavy rolling ground is found, and the soil varies in richness. Gravel is present in some of the higher ridges, and it is confidently believed that there would be ballasting obtainable for railway purposes without great difficulty.

"Before reaching the south branch of the Saskatchewan, the country is an agreeable mixture of woodland and prairie with several lakes of moderate dimensions and with a rolling succession of knolls. The landscape was usually pleasing, the soil excellent, and we saw abundant wild flowers. Very many of the lakes are brackish, yet they often adjoin fresh water lakes; the

latter we found invariably at a higher level. At the foot of a ridge they are more frequently saline; on mounting the slope they prove to be fresh."

Assiniboine and Saskatchewan Exploring Expedition, by Henry Youle Hind. Report of Progress IV.

"The south branch of the Saskatchewan is a noble river, varying in width from half a mile to 300 yards, for a distance of 100 miles from the Elbow; it then gradually contracts its channel and changes its character from a river full of sandbars and mud-flats pursuing a comparatively straight course, to a rapid and uniform torrent of water, sweeping down the narrow but deep valley which it has excavated, from one bank to the other in magnificent curves, until it joins the North Branch. * * * The Main Saskatchewan is a river of very imposing magnitude. Like the South Branch it occupies a narrow, deep valley, varying in width from one and a half to three miles, extending a few miles below the Nepowewin Mission. It flows in grand curves from side to side, and its general level is about 300 feet below the country through which it has excavated its channel, after which it enters the low region.

* * * "In the large expanse of country, over which our explorations have extended, the area of land of the first quality, namely, of black vegetable mould, reposing on gravel or clay is far more extensive and important than we anticipated. It is distributed as follows:—

"1. On the South Branch of the Saskatchewan, from the Moose Woods to the Nepowewin Mission, and according to the description of half-breeds familiar with the country, a soil of equal excellence extends to the valley of the Swan River. The immediate banks of the Saskatchewan are of a poor, sandy or gravelly soil, but on the prairie plateau three miles from the river, the rich soil commences, and in the part over which I passed has a breadth of 60 miles.

"2. The Touchwood Hill range, having an area exceeding 1,000,000 acres; for beauty of scenery, richness of soil, and adaptation for settlement, this is by far the most attractive area west of the Assiniboine.

"3. The soil is of first quality in the valley of Swan River, and over the whole of the east watershed of the Assiniboine, with the exception of the country near its banks.

"4. The valley of White Mud River is generally fertile and inviting.

* * * "The ratio which land of excellent quality bears to land of indifferent or worthless quality in the regions just referred to, is largely in favor of the former.

* * * "Riding Mountain is timbered with heavy aspen. On the level country drained by the Saskatchewan, from the Moose Woods to the Nepowewin Mission, the timber is small, but on the Touchwood Hill range there are some fine aspen forests."

Geological Survey of Canada, 1873-4. Observations by Mr. Selwyn, p. 28.

* * * "The beauties of Touchwood Hills have been so graphically described by Professor Hind, that I cannot do better than reproduce what he says of this really lovely tract of country. Professor Hind says, under date 15th August, 1858:—'In the afternoon we began the ascent of a gently rolling slope at the foot of the Touchwood Hills; patches of willow appear here fringing small areas of good pasturage. At 6 p.m. we reached the summit plateau and then passed through a very beautiful undulating country diversified with many picturesque lakes and aspen groves possessing soil of the best quality and covered with the most luxuriant herbage. There is no timber visible on the west side of the range with the exception of small aspen and burnt willow bushes. All the wild flowers, so beautiful and numerous in the valley of the Long Creek, are met with on the summit plateau of the Touchwood Hills, of even larger growth and greater profusion. Little prairie openings fringed with aspen, occur here and there through which the trail passes. We then come suddenly on the banks of a romantic lakelet, on which ducks with their young broods are swimming, and white cranes start from their secluded haunts at the unexpected intrusion. The breadth of this beautiful plateau is about four miles, its level above the salt prairie to the west may be about 500 feet. The range appears to consist of a series of drift hills, many of which rise in rounded dome-shaped forms from the summit plateau.'

"The above description is applicable to nearly the whole of the country between the old post and the Little Touchwood Hills Fort. On the flanks and summits of most of the ridges and rounded dome-shaped hills there are many large angular, evidently ice-borne, blocks and masses of buff-colored Silurian limestone, with others of gneiss, mica schists, diorite and other crystalline rocks.

* * * "Travelling all day over the 'Great Salt Plain,' (alluded to before as a projection of the United States barren lands), a treeless prairie. In the depressions for the last six miles dwarfed poplars and willow bushes from three to five feet high prevail. The soil is a blackish loam, rather sandy, on a subsoil of rather white looking gravel. Limestone and gneiss in large and small blocks are pretty thickly distributed over the surface.

"This district contains some saline lakes and brackish water, described as follows by Mr. Selwyn:—

"Rapid evaporation during summer and probably a considerable amount of percolation through the sandy drifts removes the remainder, and these causes are quite sufficient to account for the generally saline character of the numerous lakes and pools. Many of these saline lakes are as much as three, four and five miles in length, and occasionally from one to two miles

wide. They occur either in isolated irregular basin-shaped hollows or forming chains of lakes in rather broad valley-like depressions extending many miles, but closed in on all sides by rounded drift-formed hills with grassy slopes. When occurring this way the lowest lake in the chain receives the drainage of the others, and I observed in all such cases that while the waters of the uppermost was either quite fresh or only slightly brackish, that in the lowest lake would be intensely salt and bitter.

* * * "Mount Carmel (Big Hill) rises about 140 or 160 feet above the road at its base, and from its summit an extensive view is obtained of the surrounding country, especially to the westward, in which there is a general fall towards the valley of the South Saskatchewan. Mount Carmel seems to be entirely composed of drift, and on its flanks and summit, which are partially covered with aspen and willow copse-wood, there are numbers of large angular boulders of buff-colored limestone holding fossils, garnetiferous gneiss and mica schist and slaty diorite. In some directions as far as the eye can reach similar hills and ridges follow each other in endless succession, and apparently without definite arrangement or parallelism. From the lowest depressions to the summit of the highest ridge is often not less than 300 feet, and from Mount Carmel I counted fifteen distinct lakes and pools, while many more were only concealed from view by intervening ridges. * * * Rainy Hills are low drift hills interspersed with many lakes, pools and clumps and patches of copse-wood, with intervening open grassy plains." * * *

Canadian Exploring Expedition, by H. Y. Hind. Vol. 1, p. 407.

* * * "The valley through which the small tributary of the south branch flows, separates the Lumpy Hill of the Woods from the west flank of the Birch Hills; it is rich in alluvial meadows, ponds and lakes. A view from Lumpy Hill is very extensive. The altitude of this eminence is about 400 feet above the general level, and from its summit an undulating open country, dotted with lakes and flanked by the Birch Hills is visible towards the east; south and south-west is a lake region, also north and north-east. These lakes are numerous and large, often three miles long and two broad. Seventeen large lakes can be counted from the Lumpy Hill; low ranges of hills can also be discerned in several directions. The most important of these are the Bloody Hills, the Woody Hills, far in the prairie west of the South Branch, and the chain of the Birch Hills running from the Lumpy Hills easterly. The view extends to the border of the wooded land: beyond is a treeless prairie. The so-called wooded land now consists of widely separated groves of small aspens, with willows in the low places. Much of the soil on the south and east of Lumpy Hill is sandy and poor. Low hills and long ridges running north-east by east, and south-west by south, diversify the general level character of the prairies as seen from Lumpy Hill. * * *

"After traversing a very undulating country, in which are low ranges of hills and conical mounds with limestone boulders on their summits, we arrived at Big Hill, a point of some interest, for south and south-east of it lies a boundless undulating prairie. * * * The limit of the so-called 'Wooded Country,' is about 70 miles from the North Branch in an air line, and 30 miles from the South Branch.

"From the summit of the Big Hill the 'Buffalo Cart Plain,' and 'Lake where the Moose died,' are visible; both noted localities in the wild history of these regions. South-east of the Big Hill the trail winds through a dreary labyrinth of dome-shaped hills, many of them covered with boulders. * * *

"In journeying from the Lumpy Hill we crossed three 'belts of wood' before arriving at the great prairie west of the Touchwood Hills. These belts, which consist of groves of small aspen, following a low gravelly ridge about a mile broad, and having a north-east and south-west direction, are separated by prairie valleys which sustain in their lowest parts a good soil and fine pasturage. Each belt diminished to a point some ten or fifteen miles south-west of our track. The points of these belts are visible from the summit of mounds on our trail, not more than 50 feet high; beyond them is a treeless prairie, stretching away to the South Branch. The 'belts of woods' become broader in a north-easterly direction until they merge into the wooded country between the Birch Hills and the Saskatchewan. There are many delightful spots in the belts, the herbage is as clean as a well-shaven lawn, the clumps of aspen are neatly rounded as if by art, and, where little lakes alive with waterfowl abound, the scenery is very charming, and appears to be the result of taste and skill, rather than the natural features of a wild and almost uninhabited country."

Canadian Exploring Expedition, by H. Y. Hind. Vol. 1, p. 435.

* * * "Our route lay on the flanks of the Riding and Duck Mountains, and through a country admirably adapted for farming purposes. Ponds and lakes are very numerous off the flanks of the Riding Mountain, but as far as our opportunities enabled us to judge, the whole country, with the exception of narrow ridges, possesses a rich black fertile mould, supporting very luxuriant herbage, and on the mountain an ample supply of timber, consisting chiefly of aspen of large dimensions. The Riding and Duck Mountains consist of a succession of slopes and terraces on their south-western sides, the ascent being almost imperceptible to thick impenetrable forest which covers the highest plateau. On Birdstail Creek cretaceous shales, identical with those on the Assiniboine, crop out in different places."

Ibid. Vol. 1, pp. 386-393.

"At a point 53 miles from the Elbow (South Saskatchewan) we made a careful section of the river and found its breadth to be one-third of a mile (28 chains); its greatest depth was ten feet on the east side, but on the west side there is another channel with nine feet of water.

"Approaching the Moose Woods we passed for several hours between a series of low alluvial islands from ten to twelve feet above the water. They sustain some fine elm, balsam-poplar, ash, ash-leaved maple, and a vast profusion of mesaskatomina. The river valley is bounded by low hills leading to a prairie plateau four to eight miles back. The country here furnishes an excellent district for the establishment of a settlement. The spot where we camped for the night is an extensive, open, undulating meadow, with long rich grass, and on the low elevations rose-bushes grow in the greatest profusion. It is only ten feet from the water, yet it does not appear to be flooded in the spring; watermarks and ice marks are nowhere to be seen above four feet from the present level of the broad river.

"The region called the Moose Woods is a dilatation of the Saskatchewan, flowing through an extensive alluvial flat six miles in breadth, and cut into numerous islands by the changing course of the stream. This flat is bounded by sand hills, some of which are nothing more than shifting dunes. The woods are in patches, and in the low land consist of balsam-poplar, white wood and aspen. Small aspen clumps cover the hills. * * * The river continues to flow through a broad alluvial flat for about 25 miles. Its water is very turbid, like that of the Mississippi, holding much solid matter in mechanical suspension.

"Beyond the Moose Woods the banks close upon the river, and have an altitude not exceeding 60 feet. The breadth of the stream contracts to 250 yards, with a current fully three miles an hour. On the east bank the prairie is occasionally wooded with clumps of aspen, on the west side it is treeless, and shows many sand hills. Nothing but a treeless, slightly undulating prairie was visible; many large fragments of limestone not much water-worn lie on the hill banks of the river, which are about 100 feet in altitude. Frequent soundings showed a depth of ten or twelve feet. A little timber displays itself occasionally on the east bank below the level of the prairie. The banks exposed occasionally yellow drift clay with numerous boulders; the soil of the prairie appears to improve as we progress northward, and the grass is no longer stunted or withered. Little rapids occur at the bends of the river, but there is always deep water on the other side.

* * * "In many places close to the water's edge and rising from it in a slope for a space of 25 to 30 feet, the fallen boulders are packed like stones in an artificial pavement and are often ground down to a uniform level by the action of ice. This pavement is visible for many miles in aggregate length at the bends of the river. * * * Seventy-five miles from the Grand Forks the balsam-spruce begins to appear in groves. The river winds between high wooded banks with low points and wooded bottoms on one side, high cliffs also wooded with aspen and spruce groves on the opposite bank. The flats are covered with a rich profusion of vetches, grasses and rose bushes. * * * We passed swiftly through a good country, well fitted for settlement, as far as we could judge from soil and vegetation. Low islands are numerous in the river, and extensive alluvial flats spread out in an expansion of the valley."

Red River.

Overland Journey Round the World, by Sir George Simpson. Vol. 1, p. 55.

"On entering Red River from Lake Winnipeg, the shores, for the first ten miles, are low and swampy, abounding in wild fowl of every kind; but, farther up, they rise to a height varying from 30 to 50 feet. On the eastern or right bank there is an abundance of poplar, birch, elm, oak, &c., pines also being plentiful a few miles back; while the western side, generally speaking, is one vast prairie, with scarcely any timber.

"The soil of Red River settlement is a black mould of considerable depth, which, when first tilled, produces extraordinary crops, as much, on some occasions, as forty returns of wheat; and even after twenty successive years of cultivation, without the relief of manure or of fallow, or of green crop, it still yields from 15 to 25 bushels to the acre."

Captain Palliser's Exploration in B. N. America, folio, p. 8.

"Red River has its sources in the same district of marshes and lakes from which flows also the Mississippi. The course of Red River is slightly west of north to where it falls into Lake Winnipeg. At 8 or 10 miles from the lake the land on the banks of the river become sufficiently elevated to be available for agriculture; it stretches back for many miles on either hand in fine rich savannahs or lightly timbered country. Indeed, the valley of Red River being rarely confined by lofty banks in any portion of its course, is valuable for settlement the whole way up stream and for a considerable distance south of the international line."

Lake Winnipeg.

Appendix No. 3 to Journals Legislative Assembly, Canada, 1858, Cap. VII.

"The altitude of this extensive sheet of water above the level of the sea is 628 feet. * * * Lake Winnipeg is 264 miles long, by an average of 35 wide. It certainly contains an area of exceeding 9,000 square miles, and is probably one half as large

again as Lake Ontario. Connected with Lake Winnipeg by navigable channels are two other large bodies of water, Lakes Manitoba and Winnipegoosis, being together as long as Lake Winnipeg and having about half its breadth. * * * Lake Winnipeg once reached, communication with the interior becomes an easy matter. The numerous rivers which unwater the valley of this great lake, with an area of 400,000 square miles, are most of them canoe, or boat routes, for many hundred miles up their streams. Lake Winnipeg is very shallow at its southern extremity and the marshy shores abound with fresh water shells."

Lakes Manitoba and Winnipegoosis.

The Red River Country, Hudson Bay and the North-West, by A. J. Russell, C. E., Cap. XI, p. 48.

"These lakes are each 120 miles in length. The greatest breadth of Manitoba is 24 miles, and of Winnipegoosis 27. Taken together they extend 220 miles from north to south. They enclose between them and Lake Winnipeg a peninsula of 250 miles in length by 100 miles in greatest breadth, which is cut across by the Little Saskatchewan. This peninsula, though as large as the Kingdom of Denmark, counts for little in the Nor'-West. It is reported to be a low flat country, abounding in lakes and marshes. On its coast on the north-east shore of Manitoba, Mr. Dawson states that from the marsh which lies behind its high shingle beach, a rich alluvial soil rises gradually to a moderate height, not subject to be flooded. As it is a limestone country and thickly wooded, the soil must necessarily be very fertile, where there is depth enough of it; which should at least frequently be the case in a low level country. Round the south end of Lake Manitoba, for a circuit of about 50 miles, the soil is that of the richest description of prairie land. The few settlers consider it even superior to that of Red River. It is an undulating country of mingled woods and prairie.

"The White Mud River, a stream of about 80 miles in length by its course, which has its sources in the southern skirts of the Riding Mountains, and flows eastward to the south end of Lake Manitoba, is described as passing through an exceedingly beautiful and fertile country of prairies, thickly interspersed with woods, the soil of which is a rich sandy loam. This very rich prairie land stretches southwards to the Sand Hills on the Assiniboine, and eastward to Red River. Between the upper end of Lake Manitoba and the Riding Mountains, and around Lake Dauphin, there is much rich ground, and much of it is very marshy."

Navigation.

In reply to a letter requesting information concerning the capabilities of rivers in the North-West for navigation, Hon. Donald A. Smith, M.P., wrote as follows:—

"Hudson Bay House, Montreal, 28th July, 1876.

"The information I have received on this subject is to the effect that the Saskatchewan River is navigable by steamboats drawing 2½ to 3½ feet of water, from the head of the Grand Rapid, some four miles from the point where that river empties into Lake Winnipeg, to the Rocky Mountain House, a distance of eleven hundred to twelve hundred miles, from about the 1st of June till the middle of September.

"The ice on the Saskatchewan, at Edmonton, generally breaks up between the 15th and the 20th of April, and by the 1st of May the river may be said to be clear all the way down to the Grand Rapid. For three or four years back the water has been sufficiently high, as early as the 10th to the 15th of May, for the passage of steamboats; but, as already mentioned, this cannot be depended on before the beginning of June; and it is very seldom that Lake Winnipeg is sufficiently clear of ice to enable boats to reach the mouth of the Saskatchewan before the 8th to the 10th of the latter month.

"The interruptions to the navigation of the Saskatchewan, with one exception, that of Cole's Falls, are comparatively unimportant. The first occurs about two miles above the Grand Rapid, at the 'Roches Rouges,' where the current is very strong, the next being at the 'Demi Charge,' about eight miles further; again at the 'Thoburn,' or 'Nepowin Rapid,' some thirty miles below Fort a la Corne, there is a very strong current, but not such as to require the use of the warp to surmount it. The Coles' Falls immediately above the junction with the South Branch of the Saskatchewan, a chain of fourteen rapids, extending over about twelve miles, occur. Of these, three are much interrupted by boulders, which it is believed could readily be removed at little expense, giving a good channel. After this there is no great strength of current until Cross Rapid is reached, about half way between Fort Pitt and Edmonton; and above the latter place the navigation is easy for fifty miles, after which, throughout the greater part of the distance to the Rocky Mountain House, the current is very strong, but still such as can be readily overcome by a boat of good power.

"From Carlton upwards there are a good many shifting sandbanks, rendering the channel in some places tortuous. Of these the principal occur off the mouth of Battle River; but with good pilotage a good channel is always to be found between them.

"The 'Northcote,' a steamboat of about one hundred and fifty feet in length, last year proceeded from the Grand Rapid to Edmonton with a full cargo, and she is at present gone on her second trip this season to the same place.

"The ordinary Hudson's Bay freight boats, the dimensions of which are about thirty-two feet keel, or from stem to stern

forty-five feet, with a breadth of beam of ten feet, carrying from four to five tons of cargo, and drawing when loaded about two-and-a-half feet of water, have navigated the Saskatchewan for many years. These boats are warped up the Grand Rapids from Lake Winnipeg, the depth of water and breadth of channel in these rapids being amply sufficient, and the only difficulty of surmounting them being the great force of the current. Eight men are employed in tracking a boat of this description, in every case the greater portion of the cargo being carried across the Portages.

"Between Fort Pitt and Carlton, wood for fuel is scarce, and not easily obtained; but with this exception it can without difficulty be procured along the whole extent of the river.

"Coal is also found at several points from Fort Victoria (about ninety miles below Edmonton) upwards, and at eighty miles above Edmonton it crops out in a large mass, the seam being represented as being upwards of fifty feet in thickness. This coal has for many years been used by blacksmiths, and found to answer their purpose sufficiently well.

"These few remarks are hurriedly thrown together; but I shall be glad at any time to furnish such further information as it may be in my power to give on the subject."

The Red River Country, Hudson's Bay and North-West Territories, by A. J. Russell, C.E. p. 52.

"As the Little Saskatchewan, the outlet of Lake Manitoba, is a fine, navigable stream of 750 feet in breadth, and the Waterhen River or Sangissippi, which connects Lakes Manitoba and Winnipegoosis, has a broad channel not less than three feet deep at low water, they present together with these lakes an unbroken line of water communication from Fort Garry to Mossy Portage, at the head of Lake Winnipegoosis, a distance of about 500 miles.

"Mossy Portage, which is only about four miles and a quarter in length, through low ground, connects the head of Lake Winnipegoosis with Cedar Lake on the Saskatchewan, above its great rapids. A short canal there would unite the navigation by these lakes from Fort Garry with that of the River Saskatchewan, (from Cedar Lake upwards) which for nearly a thousand miles presents no greater obstructions to navigation than are to be found on the River Ohio. This would form a line of water communication about 1500 miles in length from Fort Garry to the foot of the Rocky Mountains. * * * The area drained by the South Saskatchewan is greater than that of the Rhine, and the watershed of the Rocky Mountains drained by it is greater than that of the Alps, drained by the Rhine, and the excess of its volume would be much greater were it not for the extent of dry prairie land it passes through."

CHAPTER III.

CLIMATE, SOIL AND PRODUCTIONS OF LAKE WINNIPEG BASIN.

Manitoba and the North-West of the Dominion, by Thos. Spence, pp. 18-23.

"The natural division of the seasons in the valley of Lake Winnipeg is as follows:—

"*Spring.*—April and May.

"*Summer.*—June, July, August, and part of September.

"*Autumn.*—Part of September and October.

"*Winter.*—November, December, January, February, and March.

"The peculiarity of spring is strikingly represented by the early and rapid advancement of temperature in May. It is the excessive cold of the long winter season, embracing five months of the year in this latitude, which reduces the annual mean, being 34° 38′, while that of Montreal is 42° 03′; but Blodget claims that the whole Saskatchewan Valley has a climate very near as mild, in its annual average, as that of Wisconsin, Northern New York, and Ontario, which would give it a winter mean of 15 degrees. The mean for the three months, December, January and February, at Fort Garry, in Manitoba, is 16° 85′; at Montreal, 16° 83′. In April and May, the mean temperature rises to 39° 83′, and 58° 46′, being about equal to Toronto. The winter climate grows rapidly milder in the same parallel westward, even where there is an increase of elevation, and in the Saskatchewan Valley, almost represents the climate of Ontario.

"The buffaloes have wintered in myriads on the nutritious grasses of its prairies, up to as high a latitude as Lake Athabaska; and the Half-breeds and Indians camp out in the open plains during the whole of the winter, with no shelter but a buffalo skin tent and robes, and horses of the settlers run at large and grow fat on the grasses which they pick up in the woods and bottoms.

"The average fall of snow is about six inches per month. The snow falls in small quantities, at different times, and is rarely blown into drifts so as to impede travelling. With the new year commences the extreme cold of our winter, when, for a few days, the mercury ranges from 15 to 35 degrees below zero, falling sometimes even below that. Yet the severity of these days is much softened by the brilliancy of the sun, and the stillness of the air. Thus, while in lower latitudes, they are being drenched by the cold rain storms, or buried beneath huge drifts of wintry snow, Manitoba enjoys a dry atmosphere, with bright cloudless days, and serene starlight nights; and when the moon turns her full orbed face towards the earth, the night scene of Manitoba is one of peerless grandeur.

"According to Blodget, Indian corn is restricted as a profitable staple to the middle regions of the West, between parallels 42° and 43°. Wheat is the leading staple of the upper belt of the temperate zone. Blodget (an American authority) states, 'that the basin of the Winnipeg is the seat of the greatest average wheat product on this continent, and probably *in the world*.' The limestone sub-strata of this region, with its rich deep calcareous loam and retentive clay subsoil is always associated with a rich wheat development, while its hot and humid summers fulfil all the climatological conditions of a first-rate wheat country. Some fields on the Red River have been known to produce twenty successive crops of wheat without fallow or manure, and the yield has frequently reached as high as forty bushels per acre. An important feature in the soil of Manitoba and the North-west is, that its earthy materials are minutely pulverized, and the soil is everywhere light, mellow and spungy. With these uniform characteristics, the soils are of different grades of fertility, according to local situations. A general ingredient of the soil is sand, of which silica is the base, as of all good soils. It plays an important part in the economy of growth, and is an essential constituent in the organism of all cereals. We are told that about 67 per cent of the ash of the stems of wheat, corn, rye, barley, oats, &c., is pure silica, or flint. It is this which gives the glazed coating to the plants and gives strength to the stalk. Now this silica is an acid and is insoluble, but readily combines with lime, soda, magnesia, potash and the other ingredients of our soil, and in this condition is readily available to the use of the plant, and forms an essential element in the growth of the cereals; from this and other causes is attributable the superiority of our wheat over all other grown east or south."

Report of Select Committee on Immigration and Colonization, 1876. Professor Macoun's Evidence, p. 20.

"A continuous farming country extends from Point Du Chien to the Assiniboine at Fort Ellice, a distance of 230 miles, without a break. Beyond this there are 25 miles of dry gravelly ground of little account for anything except pasture. Then follows a very extensive tract of country stretching westward to the South Saskatchewan, and extending indefinitely north and south. This wide region contains many fine sections of rich fertile country, interspersed with poplar groves, rolling treeless prairie, salt lakes, saline and other marshes, and brackish or fresh water ponds. What is not suited for raising cereals is excellent pasture land. Only a few of the salt lakes would be injurious to cattle or horses; and fresh water can be obtained without doubt a little below the surface.

"The soil of this whole region is a warm gravelly or sandy loam. The surface soil to a depth of from one to three feet, is a brown or black loam. The subsoil being generally either sand or gravel, consisting principally of limestone pebbles; many boulders are found in some sections. The land between the two Saskatchewans is nearly all good. Prince Albert Mission settlement is situated in this section. At Carlton, I crossed the North Saskatchewan, and therefore know nothing personally of the immense region extending thence west and south to the boundary. All accounts, however, agree in saying it is the garden of the country. Good land, generally speaking, extends northward to Green Lake, a distance of 170 miles from Carlton. How much further eastward this good land extends I am unable to state; but Sir John Richardson says that wheat is raised without difficulty at Cumberland House. The good arable land is about 25 miles wide at Edmonton, but possibly not so wide at Fort Pitt, more to the east but further north. This region is bounded on the south by the North Saskatchewan, and on the north by the watershed between it and the Beaver and Athabasca Rivers. Within this area there are five settlements where wheat is raised regularly without difficulty, viz.: the Star Mission (Church of England), 60 miles north of Carlton on the Green Lake Road; Lac La Biche Mission (R. C.), 100 miles from Fort Edmonton; Victoria Mission (Wesleyan Mission), 80 miles east of Edmonton; and St. Albert Mission (R. C.), 9 miles north of Edmonton, and at Edmonton itself. Edmonton seems to be the coldest point in the district in question and suffers most from summer frosts.

"Next is a very extensive district forming the watersheds between the Saskatchewan and Peace Rivers, and through which the Athabasca River flows for its whole course, and from which it receives its waters. This region is all forest and consists of muskeg (swamp), spruce and poplar forests. Very little is known of this region, but the soil where I crossed it is generally good where not swampy. West of Edmonton, where the railway crosses this section, there is said to be much swamp, but between Fort Pitt and the Forks of the Athabasca there is scarcely any swamp, although it is nearly all forest.

"Next comes the Peace River section extending along the Rocky Mountains from a little north of Jasper's House to Fort Liard, lat. 61 north; and from the former point to the west end of Little Slave Lake; thence to the Forks of the Athabasca, and down that River to Athabasca Lake, and from thence to Fort Liard. The upper part of this immense area is principally prairie, extending on both sides of the Peace River. As we proceed to the north and east the prairie gradually changes into a continuous poplar forest with here and there a few spruces, indicating a wetter soil. The general character of this section is like that of Manitoba west from Portage La Prairie to Pine Creek.

"Wheat was raised last year at the Forks of the Athabasca, at the French Mission (Lake Athabasca), at Fort Liard, and at Fort Vermillion in this section."

Canadian Exploring Expedition, by H. Y. Hind. Vol. 2, p. 234.

"It is a physical reality of the highest importance to the interest of British North America that this continuous belt can be settled and cultivated from a few miles west of the Lake of the Woods to the passes of the Rocky Mountains, and any line of communication, whether by waggon road or railroad, passing through it, will eventually enjoy the great advantage of being fed by an agricultural population from one end to the other.

"No other part of the American continent possesses an approach even to this singularly favorable disposition of soil and climate, which last feature, notwithstanding its rigour during the winter season, confers, on account of its humidity, inestimable value on British America, south of the 54th parallel.

"The natural resources lying within the limits of the fertile belt, or on its eastern borders, are themselves of great value as local elements of future wealth and prosperity; but in view of a communication across the continent they acquire paramount importance.

"Timber available for fuel and building purposes; lignite coal, though not equal to true coal, nevertheless suitable for many of the different objects to which true coal is applied; iron ore widely distributed, of great purity, and in considerable abundance; salt, in quantity sufficient for a dense population. All these crude elements of wealth lie within the limits or on the borders of a region of great fertility, and drained by a river of the first-class, navigable by steamer, during several months of the year, for 500 miles of its course, and by batteaux for nearly double that distance."

(The Hudson Bay Company's steamer has, since this was written, in 1875 and 1876, navigated successfully about a thousand miles of the North Saskatchewan.)

The Red River Country, by A. J. Russell, C.E., p. 145.

"On our route by the North Saskatchewan and Yellow Head Pass, we have a continually and pre-eminently fertile country for 1,300 miles from the commencement of the Red River prairies to the base of the Rocky Mountains at Jasper House, and of the remaining 761 miles to the head of Bute Inlet, nearly one-half apparently is cultivable land. Mr. Waddington's description of the country between the mouth of the Quesnelle and the coast range agrees with the favourable account of that plateau quoted from Mr. Barnston's report in Commander Mayne's work on British Columbia, and the unusual favorable character in that very mountainous country, which he gives of the great region extending northwards to the River Skeena, the boundary of British Columbia, corresponds with the description given of it intersected, in reports of extensive explorations referred to in the same

work and published in Imperial parliamentary papers.

"We see, therefore, that we possess a route to the Pacific through our central prairie country and British Columbia, that besides traversing the Rocky Mountains far more favorably, at half the elevation of the lines through the United States, is as remarkable for passing through a great extent of well watered, fertile country, as they are for the general aridity and uninhabitable barrenness of a great part of the country they traverse.

"The superiority of our route across to the Pacific, over any other on the continent, is still more evident, when we consider that it has in addition to the foregoing the further advantage consisting chiefly of navigable waters.

"This advantage is, in its nature, a double one. First, the much lower rate of cost of transport by the navigable waters. * * * Secondly, what to us is of great importance, especially in the commencement, that in the navigable waters we have the greater part of the route ready, without cost of construction, except on a very small proportion of it."

Isothermal.

Facts and Figures relating to Vancouver's Island and British Columbia, by J. Despard Pemberton, Surveyor-General of Vancouver's Island, p. 117.

* * * "An isothermal line drawn across the continent would, of course, be far from straight, but the general obliquity of such a line may be judged of in this way:—If such a line were drawn from New York it would pass through Lake Winnipeg to Fort Simpson; in other words, if New York were, with respect to latitude, similarly placed on the west coast, Fort Simpson, *a thousand miles* north of it, would enjoy a temperature equally favorable with it."

Appendix No. 36, to Journals Legislative Assembly, Canada, 1859. Report by S. J. Dawson, C.E.

"According to the isothermal charts of Lorin Blodget, the lines of equal temperature for the summer should have a north-west direction from Red River. Now, admitting this theory to be correct, the climate of Red Deer River and Swan River, other circumstances being the same, should be equal to that of Red River Settlement. But I am of opinion that it is superior, inasmuch as these rich valleys, while they are at but a very slight elevation above the valley of Red River, are removed from the influence of the cold winds from Lake Winnipeg, which prejudicially affect the latter in spring. As an instance of the change of climate which is produced by the difference of elevation in this region, I may mention that the vegetation in the middle of June, was much further advanced in the valley of Swan River than at Fort Pelly, which is some distance further to the south, but at a greater altitude by some 400 feet.

"While on this subject, I quote from Blodget's climatology some of his remarks on the climate of the North-west territories, which I am confident will be read with interest.

' "By reference to the illustration of the distribution of heat we see that the cold at the north of the great lakes does not represent the same latitude further west, and that beyond them the thermal lines rise as high in latitude, in most cases, as at the west of Europe. Central Russia, the Baltic district, and the British Islands, are all reproduced in the general structure, though the exceptions here fall against the advantage, while there they favor it, through the immediate influence of the Gulf Stream.

' "Climate is indisputably the decisive condition, and when we find the isothermal of 60° for the summer rising on the interior American plains to the 61st parallel, or fully as high as its average position for Europe, it is impossible to doubt the existence of favorable climates over vast areas now unoccupied.

' "This favorable comparison may be traced for the winter also, and in the averages for the year. The exceptional cold of the mountain plateaux and of the coast below the 43rd parallel, marks the advantage more or less to those who approach these areas from the western parts of the Central States, and from the coast of California, but though the distinct mountain ranges remain high at the north, the width of their base, or of the plateau from which they rise, is much less than at the 42nd parallel. The elevated tracts are of less extent, and the proportion of cultivable surface is far greater.

' "It will be seen that the thermal lines for each season are thrown northward further on passing Lake Superior westward, in the charts of this work, than in those of the military report prepared by the author. At the time those were drawn the number of the observations beyond the limits of the United States were so small that the full expression was not given to the statistics then used, in the fear that some correction would ultimately be found to apply to them, reducing the extreme northward curvatures they indicated. But a further collection and comparison warrants the position now given to the thermal lines, placing them further northward than before, and extending them in a course due north-west from Lake Superior to the 58th parallel. For the extreme seasons, winter and summer, this accurate diagonal extension of the thermal lines across the areas of latitude and longitude is very striking. The buffalo winter in the upper Athabasca, at least as safely as in the latitude of St. Paul's, Minnesota; *and the spring opens at nearly the same time along the immense line of plains from St. Paul's to Mackenzie River.*

' "The quantity of rain is not less important than the measures of heat to all purposes of occupation; and for the plains east of the Rocky Mountains there may reasonably be some doubt as to the sufficiency; and doubts on the points whether the desert belt of lower latitudes is prolonged to the northern limit of the plains. If the lower deserts are due to the altitude and mass

of the mountains simply, it would be natural to infer their existence along the whole line, where the Rocky Mountains run parallel, and retain their altitude; but the dry areas are evidently due to other causes primarily, *and they are not found above the 47th parallel in fact*. It is decisive of the general question of the sufficiency of rain, to find the entire surface of the upper plains either well grassed or well wooded; and recent information on these points almost warrants the assertion that there are no barren tracts of consequence after we pass the bad lands, and the coteaux of the Missouri. Many portions of these plains are known to be peculiarly rich in grasses; and probably the finest tracts lie along the eastern base of the mountains, in positions corresponding to the most desert-like of the plains to the south. The higher latitudes certainly differ widely from the plains which stretch from the Platte southward to the Llano Estacado of Texas, and none of the references made to them by residents or travellers indicate desert characteristics. Buffalo are far more abundant on the northern plains, and they remain through the winter on their extreme border, taking shelter in the belts of woodland on the upper Athabasca and Peace Rivers. Grassy savannas like these necessarily imply an adequate supply of rain; and there can be no doubt that the correspondence with the European plains in like geographical position—those of eastern Germany and Russia—is quite complete in this respect. If a difference exists, it is in favor of the American plains, which have a greater proportion of surface waters, both as lakes and rivers." '

"After remarking on the region west of the Rocky Mountains, he goes on to say:—

' "Next is the area of the plains east of the Rocky Mountains, not less remarkable than the first for the absence of attention heretofore given to its intrinsic value as a productive and cultivable region, within easy reach of emigration. This is a wedge-shaped tract, ten degrees of longitude in width at its base along the 47th parallel, inclined north-westward to conform to the trend of the Rocky Mountains, and terminating not far from the 60th parallel in a narrow line, which still extends along the Mackenzie for three or four degrees of latitude, in a climate barely tolerable. Lord Selkirk began his efforts at colonization as early as 1805, and from personal knowledge he then claimed for this tract a capacity to support thirty millions of inhabitants. All the grains of the cool temperate latitudes are produced abundantly. Indian corn may be grown on both branches of the Saskatchewan, and the grass of the plains is singularly abundant and rich. Not only in the earliest exploration of these plains, but now, they are the great resort for buffalo herds, which with the domestic herds, and the horses of the Indians and the colonists remain on them and at their woodland borders throughout the year.

' "The simple fact of the presence of these vast herds of wild cattle on plains at so high a latitude, is ample proof of the climatological and productive capacity of the country. *Of these plains, and their woodland borders, the valuable surface measures fully five hundred thousand square miles.*" '

"To the above I may add, that the talented author in his isothermal chart, showing the mean distribution of heat for the summer, places the line of 60 degrees to the north of the Lake of the Woods, and that of 65 degrees at Fort Garry. The same authority gives a summer of 95 to Toronto, and of 90 to Cumberland House, in latitude 54 degrees north, the extreme northern limit of the region to which my descriptions refer."

Ocean to Ocean, by Rev. Geo. M. Grant, p. 174.

"Speaking generally of Manitoba and our Nor'west, along the line we travelled, it is impossible to doubt that it is one of the finest pasture countries in the world, and that a great part of it is well adapted for cereals. The climatological conditions are favorable for both stock raising and grain producing. The spring is nearly as early as in Ontario; the summer is more humid, and therefore the grains, grasses and root crops grow better; the autumn bright and cloudless, the very weather for harvesting; and the winter has less snow and fewer snowstorms and though, in many parts colder, it is healthy and pleasant because of the still dry air, the cloudless sky and bright sun. The soil is almost everywhere a peaty or sandy loam resting on clay. Its only fault is that it is too rich. Crop after crop is raised without fallow or manure."

Report of the Select Committee on Immigration and Colonization, House of Commons, Canada, 1876. Professor Macoun's Evidence, p. 23.

"At Battle River, Indian corn has ripened three years in succession, and my observations tend to show that the summer temperature at this point is greater than it is higher up.

"At Vermillion, lat. 58° 24′ I had a long conversation with old Mr. Shaw, who has had charge of this Fort for sixteen years; he says that frosts never injure anything on this part of the river and every kind of garden stuff can be grown. Barley sown on the 8th May, cut 6th August, and the finest I ever saw. Many ears as long as my hand and the whole crop thick and stout. In my opinion this is the finest tract of country on the river. The general level of the country is less than 100 feet above it.

"At Little Red River I found everything in a very forward state. Cucumbers started in the open air were fully ripe; Windsor pole beans and peas were likewise ripe, August 15th. Fort Chipweyan, at the entrance to Lake Athabasca, has very poor soil in its vicinity, being largely composed of sand; still, here I obtained fine samples of wheat and barley—the former weighing 68 lbs. to the bushel, and the latter 58 lbs. The land here is very low and swampy, being but little elevated above the lake. At the French Mission, two miles above the Fort, oats, wheat and barley were all cut by the 26th August. Crop rather light on the

ground.

* * * * * * * * *

"*Q.* What time does the season open so that spring ploughing and seeding can be carried on?

"*A.* About the 20th of April ploughing can commence on Peace River, and from data in my possession the same may be said of the Saskatchewan regions generally.

"It is a curious fact that spring seems to advance from north-west to south-east, at a rate of about 250 miles per day, and that in the fall winter begins in Manitoba first and goes westward at the same rate.

"*Q.* Have you any knowledge of the temperature and how the thermometer ranges during the year?

"*A.* The following data selected from various sources will throw considerable light on this question. It is worthy of note that Halifax, on the sea coast, is nearly as cold in spring and summer as points more than twelve degrees further north.

"Spring, summer and autumn temperature at various points, to which is added the mean temperature of July and August, *the two ripening months*.

	Latitude north.	Summer.	Spring.	Autumn.	July and Au
Cumberland House	53·37	62·62	33·04	32·70	64·2
Fort Simpson	61·51	59·48	26·66	27·34	62·3
Fort Chipweyan	58·42	58·70	22·76	31·89	60·6
Fort William	48·24	59·94	39·67	37·80	60·5
Montreal	45·31	67·26	39·03	45·18	68·4
Toronto	43·40	64·43	42·34	46·81	66·5
Temiscamingue	47·19	65·23	37·58	40·07	66·4
Halifax	44·39	61·00	31·67	46·67	66·5
Belleville	44·10	temperature nearly that of Toronto.			
Dunvegan, Peace River	56·08	average summer six months.			
Edmonton	53·31		39·70		
Carleton	52·52		35·70		
Winnipeg	49·52	64·76	30·13	35·29	65·3

"Any unprejudiced person making a careful examination of the above figures will be struck with the high temperature obtained in the interior. Edmonton has a higher spring temperature than Montreal, and is eight degrees farther north and over 2,000 feet above the sea. The temperatures of Carleton and Edmonton are taken from Captain Palliser's explorations in the Saskatchewan country, during the years 1857 and 1858. It will be seen that the temperatures of the months when grain ripens is about nearly equal throughout the whole Dominion from Montreal to Fort Simpson north of Great Slave Lake.

"*Q.* Do you consider the country adapted for stock raising, and how many months in the year is it necessary to keep stock under shelter?

"*A.* The country, in my opinion, is well suited for stock-raising throughout its whole extent. The winters are certainly cold but the climate is dry, and the winter snows are light, both as to depth and weight. All kinds of animals have thicker coats in cold climates than in warm ones, so that the thicker coat counter-balances the greater cold. Dry snow never injures cattle in Ontario—no other kind ever falls in Manitoba or the North-West, so that there can be no trouble from this cause. Cattle winter just as well on the Athabasca and Peace Rivers as they do in Manitoba; and Mr. Grant, who has been living on Rat Creek, Manitoba, for a number of years, says that cattle give less trouble there than they do in Nova Scotia. Horses winter out without feed other than what they pick up, from Peace River to Manitoba. Sheep, cattle, and horses will require less attention and not require to be fed as long as we now feed them in Ontario. Owing to the light rain fall the uncut grass is almost as good as hay when the winter sets in, which it does without the heavy rains of the east. This grass remains good all winter as the dry snow does not rot it. In the spring the snow leaves it almost as good as ever, so that cattle can eat it until the young grass appears. From five to six months is about the time cattle will require to be fed, and shelter will altogether depend on the farmer."

Ibid. Mr. Henry McLeod's Evidence, p. 41.

"*Q.* What parts of the country have you travelled over in the North-west, and have you made particular observations of the soil?

"*A.* I have travelled over the country, from 50 miles east of Rat Portage, Lake of the Woods, to the summit of the Rocky Mountains, about 1,250 miles, and have made daily records of the quality of the soil travelled over. Taking the country from Winnipeg to Fort Pelly by the usual trail, and from Fort Pelly to Lac Ste. Anne, 50 miles west of Edmonton, along the line of the Pacific Railway, I estimate that the proportion of soil suitable for settlement is 43 per cent., moderately fair soil 15 per cent., and poor sandy, clay and gravel, 42 per cent. The land I consider suitable for settlement is very much superior to any lands now to be had in Ontario; the luxuriance of the grass and pea vine to the south and east of Edmonton, exceeds anything I ever

saw. The soil consists of rich black loam of various depths, overlying clay and gravel. I have been told by settlers from Ontario, that they prefer the natural grasses for hay to the best timothy; they say that stock thrives better upon the natural hay. My horses lived entirely upon the grass found every day, from the end of May to the middle of October, and did their daily work of from 15 to 30 miles. Before and after those dates they got a few pounds of oats or barley—only three horses were lost, and that on the return trip from the Rocky Mountains. The clay and sandy soil is suitable for grazing; I saw no part of the country entirely deficient of pasture.

* * * * * * * *

"*Q.* Do you consider the climate healthy and invigorating; or is it subject to fever and epidemics?

"*A.* I consider the climate of the North-west Territories to be most healthy and far superior to many parts of Ontario and Quebec. Although very cold in winter, there are no sudden changes—there is seldom a thaw from autumn till spring. The summer is very enjoyable, and the air on the plains very fine. There were some cases of fever in Winnipeg, but there is no doubt that they were caused by want of drainage, through the compact underlying clay, and from want of proper sanitary regulations."

"The Canadian Dominion," by Charles Marshall, p. 176.

"To assist distinctness of apprehension, the old Hudson's Bay and North-west Territories may be divided into three great sections:—First, the barren, frost-bound, polar north. Second, eastward of Red River, a wide region of lakes, swamps, disjointed streams, dense woods, and wildernesses of rock full of ore, extending beyond Lake Superior. Third, the fertile region of plains extending west of Red River for 1,000 miles to the base of the Rocky Mountains; the country destined to be the granary of the Dominion.

"The country contained in this last division is of vast extent. From its eastern boundary, the Lake of the Woods, to the sources of the Saskatchewan in the west, it stretches 880 miles. Its breadth, reckoned from the British boundary line, is 760 miles. It includes an area of 480,000 square miles, an extent of country equal to that of Great Britain, France and Prussia united. The greater proportion of the land appears to be well fitted for cultivation; many great districts possessing a richness of soil unparalleled.

"The soil is a fine alluvial deposit, or frequently a black vegetable compost. Roots, vegetables, melons, and certain fruits, grow with an extraordinary luxuriance. Good crops of barley, oats, and rye are raised even by the poorest skill where any attempts at farming have been made. Wheat will yield fifty bushels to the acre, but requires more care than the people know how to give.

"All the rivers from the British boundary line flow northwards. The whole country tilts that way. Lakes Athabasca and Winnipeg, at the north and north-east, of this division, are estimated at but 600 feet above the sea. The effect of this depression of level on the climate is very great and wholly favorable. The isothermal lines strike directly upwards from the Lake of the Woods as far as Peace River and Athabasca Lake. The rigour of a northern winter is mitigated. The increased heat of summer rapidly ripens all grain. It is possible that the warm current of the Pacific, striking upon the Columbian coast may aid in modifying the climate of the north-west of America, as the Gulf Stream is popularly supposed to temper that of England. At any rate, the resemblance holds, that in the north-west of America, as in the north-west of Europe, the climate is naturally less severe than in the eastern extremities of these continents in the same degree of latitude. In Red River, and in other districts only 18 inches of snow fall. Horses and cattle keep in good condition through the winter without shelter. No snowdrifts occur to impede railway communication.

"We have in a very great part of this central prairie country an open or summer season of seven months."

Report of the Select Committee on Immigration and Colonization, House of Commons, Canada, 1875. Mr. Malcom McLeod's Evidence, pp. 48-49.

"Assuming it to be unnecessary to make any specific statement as to the climate of the Hudson Bay Basin—no part of which, to any extent large enough for settlement, can be well considered as fit for agricultural purposes—I shall merely say, that though severe it is not unhealthy, and is quite endurable by persons engaged in the Hudson Bay Company's service—no worse, in fact, than that of Canada, east of the meridian of Quebec.

"The Winnipeg Basin, even at Norway House, at its north end, and of life at which I have distinct recollection, is on the whole not more severe than that of Lower Canada between Montreal and Quebec.

"In the Saskatchewan Valley—say the North Saskatchewan—at Fort Carlton I know that my grandfather (maternal grandfather), Chief Factor Pruden, who built Fort Carlton, and for many years held charge of that district, raised easily all ordinary kinds of garden vegetables raised in old Canada, and all cereals, and, (with some difficulty, however, owing to occasional summer frost) even Indian corn.

"As to *wheat*, it has for many years past—about fifty, as I see by letters to my father from an uncle of mine (Chief Trader Harriot), who first took it there, and according to subsequent reports—been constantly raised, even at Lake Ann, beyond

Edmonton, where there is a considerable settlement of old retired servants of the Company. On the Athabasca, further north, at Red Deer Lake, where there is an old and considerable settlement, it has never failed, and the climate and locality are most favorable for it.

"Still further north, on the Peace River, three hundred miles nearer the North Pole, it is raised, and Professor Macoun has just brought us a specimen of it, '68 lbs to the bushel,' which is one pound and three-quarters more than the wheat (from our own County of Pontiac) which took the second prize for wheat at the World's Exhibition at Paris in 1867. The fact tells its own tale as to climate in those higher latitudes of ours.

"We have moreover an exact and reliable record, in careful and thermometrical registry, at a central point, viz., Dunvegan, of the climate of the Peace River region, one kept by my old friend and client when I practiced at the Bar in Montreal, David Thompson, astronomer of the old North-West Company, and to whom the mapping of those far northern lands from Hudson Bay to the Pacific is mainly due.

"THE THOMPSON REGISTER—DUNVEGAN, PEACE RIVER."

Latitude 56° 8′ N. Longitude 117° 13′ W.

Month.	° '—Fahr.	Month.	° '—Fahr.
April	37·6	November	14·6
May	54	December	-4
June	64·5	January	+7
July	63	February	+2
August	60	March	22·5
September	55		-----
October	40	Mean of winter	8·42
	-----	Mean of the year	35·51
Mean	54·87		
Mean of 3 summer months	62·50		

"As to the period of cultivation (from April to October) it is a fact worth noting that Dunvegan, Toronto and Quebec do not vary more than half a degree in mean temperature, and that as to Halifax, the difference is only 1° 69′—not far from two degrees in favor of Dunvegan. As to the winter cold of Dunvegan, its steadiness and dryness are, for both man and beast, better than that of any other place in the Dominion. I never saw any person from that region but who was improved and strengthened in health and body, and I may say mind, by the life; a region of essentially strong life.

"As to the climate of British Columbia, it is to be observed that on the whole, it is moister and warmer than that on the eastern side of the Rocky Mountains in the same latitudes, but local causes, viz., the special physical features of the country, with its alternate of rugged mountain range, and comparative level, vary it much. In its southern half, the altitude of the cascade or coast range seems to wall off from the interior the vapours of ocean waters, which waters never vary beyond 50° to 52° fahr. the whole year through, while on the northern half of it, or at least between latitudes 53° and 56°, there is a freer play of ocean vapour, with its ever-fertilizing influence over the whole breadth of the country to the Rocky Mountains, and even beyond, through the Peace River Pass and other passages in the lowered range in these latitudes.

"Between latitudes 53° and 56°, exclusive of mountain heights, it may be called mildly Canadian, and with a greater force of vegetable growth."

Snow Fall.

Assiniboine and Saskatchewan Exploring Expedition, by H. Y. Hind. Vol. I, p. 16.

* * * "Snow falls on the Touchwood Hills to the depth of two feet and a-half in the woods, and in the prairie where aspen groves are numerous, it in not unfrequently found one foot and a-half deep. In the great treeless prairies to the south where the herbage is short, the snow is drifted off by winds. The climate of the Touchwood Hills is evidently very humid. Thunder storms appear to travel in the direction of this range and occasion a copious precipitation as they pass over it."

Report of Select Committee on Immigration and Colonization, 1876. Professor Macoun's Evidence, House of Commons, Canada.

"*Q.* From your knowledge of the country between Manitoba and the Rocky Mountains, by Peace River—as to the winter and the snow fall,—can railroads be operated as well as in the Province of Ontario?

"*A.* I believe that the snow difficulty will never be so great as in Ontario, because the snow fall is more than one-half less throughout the whole region, and the evaporation of the snow caused by the increased dryness of the air more than

compensates for the occasional thaws in Ontario."

Ibid. Hon. Mr. Sutherland's Evidence, p. 39.

"We have occasional frosts; generally one frost about the first of June, but seldom severe enough to do any material injury to the growing crops, and showers are frequent during spring and summer. The average depth of snow throughout Manitoba is about 20 inches, and is quite light and loose."

Boring Operations.

Geological Survey, 1874-5, p. 3. Summary Report by Mr. Selwyn.

* * * "The localities where these operations were carried out are at Rat Creek,[2] and in the vicinity of Fort Ellice, on the Assiniboine, and on Swan River near Fort Pelly. * * * So far as they have gone, they lead to the conclusion that no difficulty will be found in obtaining a good supply of water on any part of the western plains at a moderate depth below the surface. A sufficient depth has not been reached either at Fort Ellice or at Fort Pelly to prove the coal bearing strata. At Rat Creek, however, the superficial deposits were penetrated at 88 feet, and the underlying rock bored through to a depth of 122 feet. * * *

"The cream-colored limestone shown in this section is certainly of Devonian or Silurian age. * * * The dark grey fine-grained rock beneath the limestone is unlike any rock that has, so far as I am aware, been observed cropping out in this region. * * * In any case, the finding of these rocks at Rat Creek, together with other ascertained facts in connection with the distribution of the different formations, prove that neither coal nor lignite beds are at all likely to occur beneath any portion of the level country which constitutes the first prairie steppe."

[2] Rat Creek is 66 miles west of Fort Garry, on the first and lowest prairie step.

The Desert Lands.

Report of the Select Committee on Immigration and Colonization, House of Commons, Canada, 1876. Professor Macoun's Evidence, p. 26.

"*Q.* Could, in your opinion, the arid portion of the Central Prairie region, and particularly that part supposed to be an extension of the 'American Desert,' be utilized for sheep grazing or any other agricultural purpose?

"*A.* Laramie Plains, in Wyoming Territory, are spoken of by all American writers as eminently fitted for sheep and cattle farming, and our extension of the 'Desert' has, from all accounts, a better climate—is at least 4,000 feet lower in altitude, and from the able Reports of Mr. George Dawson (1874) and Captain Palliser (1858), I am led to infer that our part of the 'Desert,' besides being first-class pasture land, contains many depressions well suited for raising all kinds of grain. Mr. Dawson specially remarks that its soil is generally good, but that the rain fall is light. Speaking of the worst part, he says, 'It scarcely supports a sod,' but this tract is not fifty miles wide. This is the winter home of the buffalo, and hence cattle and sheep can live on it in the winter without difficulty. I have seen the Laramie Plains and the cattle upon them—I have examined the flora of both regions, and believe ours is warmer in winter and certainly not so dry in summer.

"Mr. George Dawson, speaking of this region, says:—'In July of last summer, (1873), I saw a band of cattle in the vicinity of the Line, south of Wood Mountain, which had strayed from one of the United States forts to the south. They were quite wild, and almost as difficult of approach as the buffalo; and notwithstanding the fact that they had come originally from Texas, and were unaccustomed to frost and snow, they had passed through the winter and were in capital condition.' Comment is unnecessary.

"Whatever desert region there is lies between the Souris and the Milk River on the boundary, and the Qu' Appelle and South Saskatchewan on the north."

Ibid. Mr. Henry McLeod's Evidence, p. 41.

"*Q.* Would you inform the Committee whether, in your opinion, the arid portions of the country would be suitable for stock-raising?

"*A.* I passed over no part of the North-west that could be called arid, or any that would not be suitable for stock-raising. The large quantity of shelter to be found is a great advantage for winter pasturing. If horses are in fair condition in the fall, they will live out all winter without any attendance, and be in good condition in spring."

Canadian Exploring Expedition, by H. Y. Hind. Vol. II. p. 233.

"It is impossible to examine a correct map of the North American Continent without being impressed with the remarkable

influence which the Great American Desert must exercise upon the future of the United States and British North America. * * The important fact has been noticed that any railroad constructed within the limits of the United States must pass, for a distance of 1,200 miles west of the Mississippi, through uncultivable land, or, in other words, a comparative desert. Along the 32nd parallel this desert is least, and the detached areas of fertile soil greatest in quantity, but the aggregate number of square miles of cultivable lands amounts only to 2,300 in a distance of 1,210 miles. The northern limit of the Great American Desert is an imaginary line drawn from the Touchwood Hills to the Moose Woods on the South Branch, then south of Battle River, as far as long. 112°, when turning south it sweeps along the flanks of the Rocky Mountains in long. 115°. North of this limit of the Great American Desert there is a broad strip of fertile country, rich in water, woods and pasturage, drained by the North Saskatchewan and some of its affluents, and being a continuation of the fertile prairies of Red River, the eastern watershed of the Assiniboine; and Red Deer River, with the outlying patches called the Touchwood Hills, File Hills, &c."

Report of the Geology and Resources of the region in the vicinity of the 49th parallel, from Lake of the Woods to the Rocky Mountains, By G. M. Dawson, Geologist to the B. N. A. Boundary Commission, 1875, p. 289.

* * * "The explorations in connection with the boundary survey have served to show that this country, formerly considered almost absolutely desert, is not—with the exception of a limited area—of this character; that a part of it may be of future importance agriculturally, and that a great area is well suited for pastoral occupation and stock farming.

"The fertile region at the base of the Rocky Mountains, according to Palliser and other explorers, narrows somewhat about 50 miles north of the line, but then spreads eastward, while the mountains trend to the west, and include a great area of fertile country in the vicinity of the North Saskatchewan, the more northern position of which is more than compensated for, by its decreased altitude, and the lower and more open mountain passes to the west.

"This fertile belt to the north must form the basis for the settlement, and utilization of the western plains. The cactus-covered desert tract does not seem to stretch far to the north of the line; but there is an extensive region of the third prairie steppe south of the fertile belt which is described as having a poor soil, with scanty herbage, and no wood, except on northern exposures."

Water Supply.

Ibid, p. 286.

* * * "The question of water supply seemed some years ago a difficult one in the Red River Valley. Great areas of level and fertile prairie, lie far from any stream, or are only traversed by coulees, which dry up completely during summer. The structure of the country renders the existence of surface springs almost an impossibility. This apparent difficulty is, however, being solved in the most satisfactory manner, as it is found that there are few regions where ordinary wells of moderate depth do not succeed in finding ample supplies of water; and this not only far removed from the rivers, but in their immediate vicinity, though the water level of the stream may be considerably lower than that of the bottom of the well."

The North-West Passage by Land, by Viscount Milton and Dr. Cheadle, p. 41.

"From Red River to the Rocky Mountains, along the banks of the Assiniboine and the fertile belt of the Saskatchewan, at least 60,000,000 of acres of the richest soil lie ready for the farmer when he shall be allowed to enter in and possess it."

Iron-Stones.

Geological Survey of Canada, 1874-5. Report by Mr. J. W. Spenser, p. 68.

* * * "The minerals of economic value which came under my notice consist of clay, iron-stones, lignite, peat and salt. In many places along Swan River and in the Porcupine Mountains, clay iron-stones are abundant. They are of concretionary character, containing a considerable quantity of calcareous matter and belong to the limonite group of iron-stones."

Peat.

Ibid, p. 69.

* * * "A few miles below the Crossing on Swan River, two beds of peat are exposed in the bank, the thickest of which measure 18 inches. Above it is a foot of clay, and then 9 inches more of peat, the latter being buried by a few feet of surface soil."

Salt.

Ibid, p. 69.

"Salt was formerly made from the brine springs near the mouth of Bell River. The salt springs at the south end of Lake Winnipegoosis have been worked for a long time. At these springs the saline waters percolate through the drift, which in this region covers but thinly the Devonian limestones and destroys vegetation for some distance around."

CHAPTER IV.

FROM THE SOUTH SASKATCHEWAN CROSSING TO THE ROCKY MOUNTAINS.

Report of Progress, Canadian Pacific Railway, 1874, p. 38.

"The crossing of the South Saskatchewan is about 250 yards wide, the banks are about 170 feet high; the eastern bank, however, has the greater elevation; aspens, balsams, poplars, and small white birch are found on its banks; the valley of the river, however, extends over a mile in width. The North Saskatchewan is 18 miles distant, and it is here that Fort Carlton is established. Between the two rivers, the country assumes the appearance of a level plateau elevated about 300 feet above the streams. The soil, although light, is of good character; the north river at this point is somewhat broader than the south branch. The streams unite near the 105th degree of longitude and discharge into Lake Winnipeg. Only one rapid of any great importance is met in this distance. Both these streams seem to form natural arteries of communication through the country where they have their course.

"The country on the North Saskatchewan is but little wooded, but it abounds in grasses, and the soil appears to be good, in some places somewhat sandy and arid. The contour of the land is irregular, with hills of considerable elevation, at the base of which lakes are frequently to be met, generally not of extended area.

"From Fort Pitt continuing along the North Saskatchewan, the soil improves, and we met white spruce, tamarac, and poplars, with thick and luxuriant grasses. Fires had passed over much of the country. As we came within a hundred miles of Edmonton, the country became more hilly, and the hillsides were covered with heavy wood. The flora continued the same as on the eastern prairies, but it was here somewhat more luxuriant; a good deal of low birch and scrub pine, *pinus banksiana*, is met in this locality. At Edmonton the question of coal first presents itself; some fragments were dug out of the river bank. Although they burned in a blacksmith's forge, evidently they were of an inferior quality; better samples were reported by the officers of the Hudson's Bay Fort, as having been found higher up the river.

"All the rivers we crossed between Prairie Portage and Edmonton are marked by the characteristic of running in wide and deep valleys; this peculiarity would appear to extend generally to the prairie region of the north-west, except, perhaps, the lower portions of it around Lake Winnipeg. However small the stream which runs through them, the valleys have the same characteristics. The circumstance suggests no special engineering difficulty, but it points to heavy expense in construction where rivers are to be crossed, and the necessity of care and judgment in laying down the route, so as to keep the expense within as moderate limits as possible.

"Looking back over the thousand miles of prairie country travelled since leaving the wooded district east of Manitoba, it is worthy of note, that absolutely level plains formed no great proportion of the vast area which came under our observation. We were agreeably surprised to find that by far the larger proportion was undulating and in this respect not unlike much of the Province of Ontario, while eminences of considerable elevation, not greatly inferior to the mountain at Montreal, were occasionally met with. In many places small groves and fringes of trees adorned the prairie and gave the landscape an agreeable and park-like appearance.

"Before reaching Edmonton we received from gentlemen connected with the Hudson Bay Company and from others engaged in missionary labors, most favorable accounts of the country on Peace River to the north, and still more glowing descriptions of the beauty of the landscape and fertility of the soil over broad districts stretching away to the south towards the international boundary line.

"A few weeks after we left Edmonton, Col. Robertson Ross travelled southerly through the section referred to. He reported the country for about 300 miles in length along the eastern base of the Rocky Mountains, towards the 49th parallel, and from 60 to 80 miles in breadth, to be of great natural beauty, with soil of surpassing richness. Here is found the favorite wintering grounds for great herds of buffalo.

"On leaving Edmonton we passed through a country interspersed with hillocks, and we likewise occasionally met with swamps, many of which were covered with swamp hay. Gradually the country becomes more wooded, and the undulations assume a more marked character. More creeks were crossed, running in most cases through narrow valleys. The vegetation was particularly luxuriant, and the grass through which we passed was in some places from five to six feet high.

"In crossing the Pembina River some 70 miles west of the River Saskatchewan, we found thick outcropping beds of coal. It proved much better than the Edmonton specimen, and we heard from our guides that abundance of this fuel was present at other localities, some of it of still better quality.

"Occasionally the country becomes more open with groves of spruce, aspen, and poplar, increasing in size. Nevertheless much of it is densely wooded, while in other places the timber is thin and of inferior quality.

"The ascent up the McLeod River was continued for 70 miles. There was no regular trail, and the route of the party was through innumerable windfalls. Much of the soil is bog, and the banks of the river are rough and rugged. Pushing across the

intermediate summit the Athabasca River was reached. This stream runs through cliffs of sandstone, shale and clay, and the valley widens by a succession of terraces, rising one above the other. They are very distinctly marked on both sides of the stream. * * * The ground alternated in its character. The trail gradually approaches the river and passes up the valley, which is here about five miles wide. Following the windings of the river, we reached the portals of Jasper Valley, entering which we were literally in the heart of the mountains. So easy an ingress could never even have been hoped for.

"Jasper House is but 3,300 feet above the sea. After leaving the River Athabasca the path of the expedition lay along the River Miette. The name of Caledonia Valley has been given to this locality (at the junction of the Miette with the Athabasca). It is rocky and rough, and the river itself is a series of falls and rapids. The lower ground of the valley is swampy, with an underbrush of scrub and of dwarf willows. The trail crosses the river seven or eight times in a very short distance.

"The immediate ascent to Yellow Head Pass is not difficult, and the Pass itself is, as it were, an open meadow."

Report of Progress, Canadian Pacific Railway, 1874. Professor Macoun's Report, p. 65.

"The distance from the South Branch to Carlton on the North Branch is about 18 miles. For the first few miles after leaving the river the soil is sandy and of poor quality; but for the remaining distance it is excellent. Many lakes are scattered at intervals over the plain, and these together with aspens and willows, give the country a very picturesque look. * * *

"Between Thickwood Hills and Jackfish Lake the country is partly plain and partly rough and hilly, but the greater part is well fitted for cultivation. The hills and ridges are either gravel or sand, but always covered with verdure. For 33 miles after passing Jackfish Lake, the country is beautiful and the soil excellent, being a light brown sandy loam. From English River to Fort Pitt the surface of the country is much broken, and ranges of hills with corresponding valleys are common. * * * Between Fort Pitt and Victoria, the land changes every few miles, and is much broken by hill and valley. Many tracts have excellent soil, and would bring immense crops of all kinds if not injured by summer frosts. * * * The land around Victoria is very rich, and would produce enormous crops.

"Between Victoria and Edmonton, a distance of 80 miles, the soil is very rich but there is much wet swampy land, the greater part, however, seems to be exceedingly fertile and well suited for agriculture. All around Edmonton, the land is of the very best quality, though the soil in some localities is scarcely as heavy as could be wished. All kinds of grain, roots and vegetables are raised in abundance here. The country around Edmonton is much superior to that in the vicinity of Fort Garry, as there are no marsh or salt lands, and plenty of timber and excellent water."

The Red River Country, Hudson Bay and the North-West Territories, by A. J. Russell, C.E., p. 61.

"The country drained by the North Branch of the Saskatchewan, and its extensive tributary the Battle River, though incomparably more valuable than the country traversed by the South Branch, does not require to be described so much at length owing to its more uniform character.

"The North Branch for the greater part of its course, and the Battle River, lie in the great belt of country which the Canadian and Imperial exploring parties describe as generally fertile land of the first quality.

"The North Branch, for 520 miles up, from the Forks, and the Battle River, for its whole course of 450 miles (excepting a short elbow of it,) traverse a rich prairie country more or less interspersed with woods.

"The remaining 282 miles of the upper course of the North Branch lie in the Thickwood country, which, to the commencement of the mountains, about 200 miles, is represented as abounding in marshes with patches of fine land in parts. In this distance the banks of the river display beds of lignite coal. Beyond it the remaining course of the river lies in the valleys of the mountains, to the glaciers at its source.

"The Battle River enters the North Branch about 170 miles above the main Forks. It drains a large part of the country between the North and South Branches. It has its source about ten miles from the North Branch, 30 miles above Edmonton, but they are 130 miles apart at the middle of its course, and between them the pasturage is described as very rich. Coal presents itself there in the banks of the stream, 250 miles from its mouth.

"The rich prairie country, which covers the course of the Battle River and the northerly part of Red Deer River, and includes the North Branch from the Forks, up to 30 miles above Edmonton, has a breadth of about 100 miles, at the Forks, 70 miles at the mouth of Battle River, 150 miles at its middle course, and about 70 at its source; beyond which the belt of fertile prairie country becomes gradually narrower, and turning to the southward, up the course of the Red Deer River, becomes merged in the fertile region on the skirt of the mountains below Bow Fort on the South Branch. It is bounded on the north by the line of the Thick Woods, which sweeps northerly parallel to the course of the North Branch at a distance of 40 to 20 miles beyond it, then curving to the southward crosses it about 30 miles above Edmonton, and continuing in that direction strikes the mountains near Bow Fort, making a circuit from the Forks of about 700 miles.

"This circuit of the Thick Woods is the present boundary of the progress of successive fires which are gradually encroaching on the forests, or partly wooded country, and converting it into treeless prairie, unless where clumps of young aspens and poplar, growing up, escape the ravages of succeeding fires."

Captain Palliser's Exploration in B. N. America, folio, pp. 10-11.

"The North Saskatchewan has its source from glaciers in the Rocky Mountains in latitude 52° N. and longitude 117½° W., and from the same ice filled valleys also rise branches of the South Saskatchewan and the Columbia. At first the North Saskatchewan has a north-easterly course until it reaches the Snake Portage in latitude 54° and longitude 111°, half way between Fort Edmonton and Fort Pitt. It then changes to a south-east direction, which it pursues until it reaches 52° 20′ at its 'Elbow,' when it changes its course again with a sudden bend, and flows to the north-east.

"From the Rocky Mountain House to Fort a la Corne, the North Saskatchewan traverses the plains in a valley that varies in depth from 100 to 300 feet, and never exceeds two miles in width. The alluvial flats, which form the finest quality of land in this part of the country, are often well timbered, but from the manner in which the river winds from side to side of the valley, the points, as they are termed, are seldom more than two or three miles in extent.

"By inspecting the map it will be observed that the general course of the river is bounded by hills which sometimes recede to a considerable distance. These hills rise two to four hundred feet above the general level, and skirting along their base there is often to be found areas of land of fine quality, while the whole distance, sometimes equal to 30 miles between the hills and the river, is fine grazing land, and as it all lies within the limit of the partially wooded belt of country, there are 'bluffs' that will afford shelter to stock.

"The richness of the natural pasture in many places on the prairies of the second level along the North Saskatchewan, and its tributary, Battle River, can hardly be exaggerated. Its value does not consist in its being rank or in great quantity, but from its fine quality, comprising nutritious species of grasses and carices, along with natural vetches in great variety, which remain throughout the winter sound, juicy, and fit for the nourishment of stock.

"Almost everywhere along the course of the North Saskatchewan are to be found eligible situations for agricultural settlement, a sufficiency of good soil is everywhere to be found, nor are these advantages confined to the neighborhood of the river; in several districts, such as N. W., of Carlton, we traversed fine land fit for all purposes, both of pasture and tillage, extending towards the Thickwood Hills, and also to be found in the region of the lakes between Forts Pitt and Edmonton.

"In almost every direction round Edmonton the land is fine, excepting only the hilly country at the higher levels such as the Beaver Hills. Even there, however, there is nothing like sterility, only the surface is too much broken to be occupied while more level country can be obtained. * * *

"In the upper part of the Saskatchewan country coal of fair quality occurs abundantly, and may hereafter be found very useful; it is quite fit to be employed in the smelting of iron from the ores of that metal, which also occurs in large quantities in the same strata. Building stone is wholly absent till quite close to the Rocky Mountains, but brick earth and potter's clay may be obtained in many parts of the country. The climate is more irregular than that of Red River. The winter is much the same in its duration, but the amount of snow that falls decreases rapidly as we approach the mountains.

"The North Saskatchewan freezes generally about the 12th November, and breaks up from the 17th to the 20th of April. During the winter season of five months the means of travelling and transport are greatly facilitated by the snow, the ordinary depth of which is sufficient for the use of sleighs, without at the same time being too great to impede horses.

"Between Carlton and Edmonton there is no valuable timber to be found south of the river, the only trees growing there being small aspen poplars. To the north, however, and along the river above and below these points, the spruce, fir, pine and birch occur abundantly. There is neither oak, ash, elm, maple, or any of the hardwood trees that are found at Red River in any part of the Saskatchewan. Only a few trees of the false sugar maple, from which the Indians make a coarse kind of sugar, being found in certain places."

The Great Lone Land, by Capt. F. W. Butler, F.R.G.S., Chapter XV., p. 230.

"Two things strike the new comer at Carlton. First, he sees evidences on every side of a rich and fertile country; and, secondly, he sees by many signs that war is the normal condition of the wild men who have pitched their tents in the land of the Saskatchewan. * * * Its boundaries are of the simplest description. It has on the north a huge forest, on the west a huge mountain, on the south an immense desert, and on the east an immense marsh. From the forest to the desert there lies a distance varying from 40 to 150 miles, and from the marsh to the mountain, 800 miles of land lie spread in every varying phase of undulating fertility. This is the Fertile Belt, the land of the Saskatchewan, the winter home of the buffalo, the war country of the Crees and Blackfeet, the future home of millions yet unborn."

Coal and Lignite Deposits.

Geological Survey, 1873-4. Observations by Mr. Selwyn, p. 33.

"The road travelled through the Thickwood Hills is very rough and stoney, boulders having become numerous, while from the base of these hills to Carlton very few are seen. As the name implies the country is comparatively well wooded, and grass is

everywhere abundant. * * * There is but little change to note in the general aspect of the country. * * * The ridges and hills are composed of sand and gravel; the soil is generally light and poor, grassy margined lakes and pools, many of them salt, abound, and the surface is very irregular and broken, presenting a succession of saucer-shaped depressions with intervening low marmaloid hills and rounded ridges of drift, with grassy or occasionally partially wooded slopes, and on the surface scattered blocks and boulders of gneiss and buff-colored, fossiliferous limestones. * * * At Jackfish Lake the soil for many miles is of the finest quality; a rich black loam on a blueish-gray clay. The surface is thrown into large hillocks by the moles, and gophers, or marmots. From Jackfish River westward, the country is tolerably level and thickly dotted with patches of copsewood."

Ibid. p. 38.

* * * "Examined the left bank of the river (North Saskatchewan) for a mile and a half below Fort Edmonton. Found two thin seams of coal with a black earthy shale and layers of gray clay-shale between them, the former made up of indistinct plant remains looking like grass and sedges. Immediately above the coal seam is a layer of brown greasy clay six or eight inches thick. This clay works into a lather-like soap, and Dr. Hector says it was used by the women at the Fort for washing blankets. A sample of it, analysed by Dr. Hoffman in the Survey Laboratory, shows it to be a hydrous silicate of alumina. * * * The strata are generally horizontal, though occasionally presenting a slight dip, three or four degrees, to S. 29° E. A nodular clay iron ore occurs in layers associated with shales. * * * Striking nearly due south in about 12 miles we came to the crossing of White Mud Creek, a small stream which empties into the Saskatchewan about 2½ miles above Edmonton. The trail we are now following is much better than that between Victoria and Edmonton. The general character of the country unchanged. A rich black soil; numerous swampy lakes, open richly grassed prairies with belts and patches of copsewood with spruce and poplar trees. * * *

"We reached Battle River, crossed it. Battle River is here quite a shallow stream, 20 yards wide, with stoney bed and gravelly banks about ten to fifteen feet high. From this point to its junction with the North Saskatchewan below Fort Pitt, its general course is nearly east through five and a half degrees of longitude, and for a great part of the distance, according to Dr. Hector, it runs in a valley from 150 to 270 feet below the plain. No change in the character of the country, a drift-covered surface the prevailing feature."

Geological Survey, 1873-4. Observations by Mr. Selwyn, F.R.G.S., p. 49.

"From the Mountain House to Edmonton, and thence to a short distance below Victoria, there are fair exposures of the strata at comparatively short intervals along the river; soft friable green, gray and brown concretionary sandstones, alternating with blue and gray arenacious and argillacious shales, with layers and beds of lignite, and bright jet-like brown coal, are the prevailing features in their exposures. In the shales there are layers of nodular clay iron ore, holding numerous fragments of plants, and containing an average of 34.98 per cent. of iron, but I did not see these anywhere in sufficient abundance to be of economic importance. At one place on the right bank of the river, about 40 miles below the confluence of the Brazeau River, I found a seam of this jet-like coal, which measured from 18 to 20 feet thick. It occurred of equal thickness in two exposures rather more than four miles apart. In the first exposure, which extends from 50 to 60 yards in length, but which owing to the swiftness of the current running at its base, is not easily examined, the seam is almost flat, and rises from the water in a nearly vertical cliff, exposing 18 feet of apparently excellent coal. The bottom of the seam here was beneath the water, and could not be examined; above it the cliff was not accessible, and the rocks were concealed by slides of earth and other debris. The second exposure, which is no doubt on the continuation of the same seam, occurs in an arched form, and shows 18 feet of coal, with one, two to three inch parting of shale. The specimens of the seam which I collected, were all taken from the surface, and it is not unlikely that beyond the influence of atmospheric action the coal will prove of better quality than is indicated by these specimens. At intervals, the whole distance from Rocky Mountain House to Edmonton, 135 miles, and thence to Victoria, 76 miles further along the course of the river, similar rocks with coal seams and nodular ironstone layers were observed.

"Dr. Hector has separated the Edmonton coal rocks from those in the vicinity of the Mountain House by an intervening area which he considered to be occupied by a somewhat higher section or division of the Cretaceous series. He did not apparently see the thick seam of coal which I found, as above stated, below the Brazeau River, about eighty-six miles from Rocky Mountain House; and another seam of five feet six inches thick, which I found at a point some 15 miles higher up the river, as well as the numerous indications of seams which occur between the outcrop of the 18 feet seam and Edmonton, probably also escaped his notice, as he travelled partly during the night, and in the winter, on the ice, when many of the exposures along the banks must have been concealed by snow. The observations which I was able to make descending the river do not enable me to say whether the seams retain their thickness or are connected for long distances, or whether the very numerous exposures and indications seen in the cliff sections represent only more or less lenticular shaped and isolated patches, related at different horizons and over large areas. Dr. Hector appears to incline to the latter idea, and, in a note referring to the

seams at Rocky Mountain House, he states: 'The coal beds are not continuous for long distances.' Whether this is actually the case or not, there can be no question that in the region west of Edmonton, bounded on the north by Athabasca River and on the south by the Red Deer River, there exists a vast coal field covering an area of not less than 25,000 square miles, and beneath a large portion of this area we may expect to find workable seams of coal at depths seldom exceeding 300 feet, and often, as in the case of the thick seams above described, very favorably situated for working by levels from the surface.

"Below Victoria the river valley widens considerably, and often rises by successive broad steps or broken terraces to the level of the prairies on either side. Sometimes, as in the vicinity of the St. Paul R. C. Mission Station, 97 miles below Edmonton, these terraces are very regular and quite bare, while at others they are thickly clothed with brushwood of willows, alder and other shrubs mixed with poplar trees, and here and there small clumps of spruces or pines. Occasionally the banks abutt steeply on the river, and afford imperfect exposures of the strata, which differ considerably from those met with at and above Victoria. Hard flaggy sandstones, and impure limestones, associated with soft blue and gray clay shales, with layers of large concretionary, olive-brown cement stones or septaria, seamed with veins of yellowish-white calc-spar, and holding fossil shells (*Inoceramus*, *&c.*,) are here met with, but no thick bedded sandstones, and without associated coal or lignite beds, or, so far as I observed, any plant remains. Whether these marine Cretaceous beds are above or below the Edmonton coal bearing beds I am at present unable to say. I am, however, disposed to take the former view, notwithstanding that the plant remains associated with the coal beds are of modern types.

"Dr. Hector divided the Cretaceous strata of the prairies into an upper, middle and lower group, and in the latter he placed the Rocky Mountain and Edmonton coal series, at the same time remarking: 'In my next and lowest group I have (with great hesitation) classed the large deposits of coal or lignite of the prairie country, that are sufficiently compact to be of value as fuel, but which have hitherto been generally classed as of tertiary age.'

"There is no doubt that in British Columbia, as shown by Mr. Richardson in his last report—(Report of Progress, 1862-63,) the coal seams belong to the lower part of the Cretaceous series and are overlaid by more than 4,000 feet of strata holding *Inocerami*, *Ammonites*, *Baculites*, and other marine Cretaceous fossils.

"Should there prove to be a similar arrangement of the formation in the Saskatchewan valley it would very greatly enlarge the area over which workable seams of coal may be expected to occur. * * * In the vicinity of Fort Pitt and thence, wherever sections occur, the whole distance to the Elbow, similar Cretaceous clays with Septarian nodules are seen.

"At the Elbow the river leaves the eastern limit of the third or uppermost prairie level formed by the Eagle Hills on the south side, and by the Thickwood Hills on the north side of the valley, and making a sharp bend to the north-east more or less parallel to the trend of the eastern slopes of the hills named, it flows across the second prairie level, making for the nearest point of its eastern limit, which it reached about 45 miles below Fort a la Corne. Between the Elbow and this point, and especially below Carlton, the immediate banks of the river are either low and flat, or rise in well wooded slopes, broken into more or less rounded hills and ridges, or showing a succession of terraces, to the prairie level, some 200 or 300 feet above the river. * * *

"Blocks and often enormous rock masses of the buff or cream-colored saluriar limestone holding characteristic fossils are widely and abundantly distributed over the first and second prairie steppes. The ascent to the third prairie level, which has an average elevation of from 1,900 to 2,000 feet above the sea, commences at the Thickwood Hills, 20 miles west of Carlton, and on it the limestone boulders do not appear to have reached further west than the longitude of Fort Pitt, and between Fort Pitt and Edmonton not a single boulder of limestone was observed, either along the Saskatchewan River or on the plains. On the river, above the confluence of the Brazeau—a large tributary coming in from the west about midway between the Mountain House and Edmonton—there are no boulders and very few pebbles of granite, gneiss or mica schist. At the Mountain House, the pebbles and boulders in the drift, which is there seen in contact with the coal bearing rocks as well as those seen along the river bed are nearly all of either coal measure sandstone or conglomerate, or varieties of hard quartzose rocks. * * * The first gold washing which we saw in descending the river were rather more than 40 miles below the mouth of the Brazeau; and thence to Edmonton, and for some miles further down, more or less gold has been found on the bars and in the river banks, but always in a very finely divided state, showing evidence of having been transported from afar. Even as low down as Carlton, gold can I believe be found, though not in quantities sufficient to pay for working."

Report of Progress, Canadian Pacific Railway, 1874, p. 12.

"Captain Palliser reported the existence of large deposits of iron ore in several quarters between the two Saskatchewans. The discovery of this ore in conjunction with coal at some one or more points, which could conveniently be reached by the railway without taking it much out of the direct course, would render the manufacture of rails near the middle of the line possible, and thus obviate the immense cost of a long land transportation. Moreover, the establishment of local manufacturing industries would be assured."

Overland Journey Round the World, by Sir George Simpson, Vol. 1. p. 101.

"The vicinity (of Edmonton) is rich, in mineral productions. A seam of coal about ten feet in depth, can be traced for a very considerable distance along both sides of the river (North Saskatchewan). This coal resembles slate in appearance; and though it requires a stronger draught of air than that of an ordinary chimney, yet it is found to answer tolerably well for the blacksmith's forge."

Extent of Coal and Lignite Beds.

The Canadian Dominion, by Charles Marshall, p. 200.

"For this Canadian line of railway, nature herself has apparently gone out of her way to accumulate a variety of favorable conditions. At the Atlantic terminus of the rail, vast beds of coal lie exposed, on the very coast, in readiness for the steamer that will ply between Halifax and Liverpool; this being the only example of coal so situated along the whole Atlantic seaboard. Similarly, at the Pacific terminus, great coal mines wait at Vancouver's Island for the traffic to China and Japan; this again being the only coal on the Pacific seaboard. But this is not all. Along the very line which the railroad must traverse, coal fields of measureless extent, lie along the Saskatchewan, obtruding often to the surface to save the trouble of mining."

Sketch of the North-West of America, by Mgr. Taché, p. 53.

* * * "The coal fields which cross the different branches of the Saskatchewan are a great source of wealth, and favor the settlement of the valley in which nature has multiplied, picturesque scenery that challenges comparison with the most remarkable of its kind in the world. * * * One is surprised to find in the extreme west, so extensive and so beautiful a region. The author of the universe has been pleased to spread out, beside the grand and wild beauties of the Rocky Mountains, the captivating pleasure grounds of the plains of the Saskatchewan."

Geology of 49th Parallel. By Geo. M. Dawson, 1875, p. 180.

* * * "The total area of the western part of the prairie region between the 49th and 54th parallels, now known by more or less connected lines of observations, to be underlaid by the lignite and coal-bearing formation, or formations, does not fall short of 80,000 square miles; and should future investigation result in affixing some of the fuels to the Lower Cretaceous, it must be very much greater. The importance of these great deposits of fuel, in a country naturally so destitute of wood over great areas, cannot be exaggerated."

Captain Palliser's Exploration in B. N. America, folio, p. 72.

"Edmonton must be considered as being in the wooded country, but in the immediate neighborhood of the Fort there is not much valuable timber. * * * Once back from the river banks, which are everywhere high and precipitous, the country is rather flat, and covered with thickets of willow and poplar, and with a much larger proportion of swampy ground than I have seen elsewhere in the Saskatchewan. Seven to ten miles back on either side of the river are the same high grounds that seem to skirt it everywhere, forming as it were banks to an immensely wide valley. Those of the true river valley are 190 to 250 feet high, and at most places densely wooded. Whenever the present water channel sweeps close under the higher bank, however, sections are displayed which exhibit their structure. They are composed of horizontal beds of arinaceous clays, sometimes passing into true sandstone, generally in spherical concretions, and at others into clay shale. Many of these beds are highly charged with nodules of clay iron-stone, which, when broken, are found to be full of comminuted fragments of vegetable matter. Included in those beds are various seams of coal or lignite, which seem to be of a very useful quality, as it is used to the exclusion of all other fuel in the forge at the Fort. * * *

"Under the Fort there are two seams of about 18 inches each, but on the opposite side of the river, close to the water edge, there is a bed six feet thick, and again another four feet a little higher up the bank."

Approach to the Rocky Mountains.

The North-West Passage by Land, by Viscount Milton and Dr. Cheadle, p. 204.

"The road to Lake St. Ann's (from Edmonton) passed through a fertile and park-like country for about 50 miles, but at St. Ann's the thick forest commences, which extends far to the north and westward to the mountains. St Ann's was, doubtless, chosen as the site for a settlement on account of the immense number of the *coregonus*, or white fish, furnished by the lake, forming the staple food of the inhabitants; but it is ill adapted for farming, on account of the timber, which has been very partially cleared away for little fields of potatoes and grain. The lake is a pretty sheet of water, several miles in length, its shores dotted on the western side by 40 or 50 houses and a church. * * *

"When we left St. Ann's the track led us immediately into the densest forest, where the ground was boggy and rotten,

thickly covered with fallen timber. On the second day after we left Lake St. Ann's, the road became rather better, there being a few patches of open country, and the timber smaller, clustering in the swells of the low undulations. At noon we reached a large lake and travelled along its banks for the remainder of the day. It appeared to be well stocked with wild fowl and fish.

"On the 11th June we struck the Pembina River, a clear, shallow stream flowing to the N. E., over a pebbly bed, between perpendicular banks of some 80 feet high. Those showed the section of a magnificent coal bed, from 15 to 20 feet in thickness. Coal has also been discovered on the McLeod, Athabasca, Peace and Mackenzie Rivers to the north; and on the Saskatchewan, Battle and Red Deer Rivers to the south. A section of it appears in the cliff of the river bank at Edmonton, where it is used for the forge. The lignite strata have been thus observed at numerous points, scattered over more than ten degrees of latitude, but invariably in nearly the same longitude.

"A line drawn from Mackenzie River to the point where the Red Deer River joins the South Saskatchewan would give the line of coal formation observed with tolerable accuracy. These coal fields are of enormous extent, and will doubtless one day form a large element of wealth in this richly endowed country of the Saskatchewan.

"After investigating the coal, we set to work to wash for gold in the sand bars, and were rewarded by finding what miners call 'the colour,' *i.e.*, a few specks of the finest gold dust which remain with the black sand left behind when the rest of the dirt is washed away.

"For the next two or three days the country presented the same slightly undulating character, thickly wooded with hardly a single break, and without any eminence from which a view could be obtained. The only sound ground was on the low narrow ridges which separated the wider shallow valleys. These latter are occupied by 'muskegs' or level swamps, the surface of which is covered with a mossy crust five or six inches in thickness, while a thick growth of pines and the fallen timber add to the difficulty of the road.

"On the third day after leaving Pembina River, we rested to dine at a marshy meadow formed by the damming up of the stream by beaver. They were very common along our track, the grassy mound and bank across showing the old beaver house and dam in most cases. Nearly every stream between the Pembina and the Athabasca—except the large river McLeod—appeared to have been destroyed by the agency of these animals. The whole of this region is little more than a succession of pine swamps, separated by narrow ridges of higher ground, and it is a curious question whether that enormous tract of country, marked 'swampy' in the maps, has not been brought to this condition by the work of beavers, who have thus destroyed, by their own labor the streams necessary to their existence. * * *

"The McLeod is a fine stream, about 150 yards broad, flowing over a rocky, pebbly bed and clear and shallow like the Pembina. The channel of the latter where we crossed it was clean cut through soft strata, with perpendicular cliffs on either side; while the banks of the McLeod are wider apart, rising steeply but not vertically, to a great height, and richly clothed with pine and aspen. The McLeod is subject to great floods at certain seasons, as evidenced by the great boulders strewn high along the shore, and the collections of drift wood accumulated at different points and turns of the river.

* * * "Following the river valley, we travelled through thick timber, marshes and boggy ground, pleasantly varied occasionally by beautiful park-like oasis of an acre or two in extent, and crossed several small streams, swollen into muddy torrents. * * * Passed on along a well marked trail, which ascended abruptly, to avoid a precipitous cliff overhanging the river at this point. Higher and higher still it led, along rocky ledges or up steep, green, slippery slopes, until it reached the point where vegetation ceased, separated by a rocky precipice from the height of perpetual snow. * * * On every side a succession of peaks towered up, of strange fantastic shape. To the west, the Priest's Rock, a pyramid of ice, shone brightly above a dark pine-clad hill, to the east the remarkable Roche Miette; in front and behind, conical, pinnacled, and rugged mountains. Hundreds of feet immediately beneath rushed the torrent of the Athabasca. Emerging from the heart of the mountains through a narrow gorge into the wider valley, the river expands into a lake three or four miles in length; then again narrowing, flows in several channels round wooded islands, to open out once more into a second lake, smaller than the first. On the further bank of the river, between the two lakes was Jasper House.

Country Between Rocky Mountain House and Edmonton.

Captain Palliser's Exploration of B. N. America, folio, p. 77.

"Starting at 9 o'clock this morning we found the ice smooth and sound. * * * As the views, or straight portions of the river (Saskatchewan) valley between each bend, are of good length, and the angles they make with one another are decided, I had no difficulty in mapping the river with compass as I went along. During the first 20 miles we passed frequent sections of the sandstone and clay strata with lignite, but gradually the main valley got wider, and the immediate silt banks increased in elevation till they were 50 feet above the river, and formed extensive well wooded flats.

"In the afternoon the coal group, with the same characters as at the Rocky Mountain House, were seen, dipping with a considerable angle to the N. E. A section of these one mile in length, showed the group of sandstones and shales to have a thickness of 300 to 400 feet.

"Before camping we passed the mouth of the Baptiste River, which is a large tributary from the S. W., the course of the river all day having been northerly. It is very irregular in its width, at times wide and studded with alluvial islands, and at others contracted to 158 to 200 feet, and confined by high banks. * * *

"Passed a number of sandstone cliffs, with ledges that cause rapids. * * * These sandstones have a slight dip to the S. W., and after ten miles we again came to the lignite or coal group. These were exposed in a cliff 140 feet high, the upper 50 feet being of light yellow sandstone without any lines of bedding. Below this a group of shales and earthy green sandstones the latter predominating more towards the lower part. The lowest 50 feet is entirely concretionary sandstone.

"We halted at noon after making 20 miles upon an enormous island of driftwood. * * * Five miles further on the river became hemmed in by lofty precipices of sandstones, about 150 feet high and which I called 'Abram's Gates,' after my guide, who had been talking of this wonderful place ever since we started. The sandstone is coarse-grained in thick strata that present much false bedding. Two miles further brought us to the junction of the North Fork, or Brazeau's River, a stream 140 yards wide at its mouth, and which is said to rise in the Rocky Mountains. In the sections along the river bank the sandstones are getting more rare, and the strata are more frequently composed of clay shales. * * *

"Soon the high river banks retired to a distance from the river, and the immediate river banks became low and swampy, and the tortuous course of the channel made it appear as if we were traversing an ancient estuary or lake bottom. * * * Passed the old White Earth Fort. The country is very beautiful here, and it is a favorite place for the half breeds sending their horses to spend the winter. The river below this point takes a small bend to the S. E., and suddenly becomes confined in a narrow valley with banks 200 to 300 feet in height, and exhibiting sections of the same nature as those at Edmonton. There are coal and shale in the upper part, with ironstone bands, then concretionary sandstone. At one point in this bed occurred a seam of very fine compact coal, three to four feet thick, which was traced for a considerable distance. * * *

"The track (to St. Ann's) runs nearly due west from Edmonton through low willow and poplar copse and occasional pine woods for 50 miles."

Beaver Hills.

Captain Palliser's Exploration in B. N. America, folio, p. 79.

"After crossing the Saskatchewan on the ice, our course was at first easterly over the Beaver Hills, which are covered with willows and poplar, but do not rise to any great height. After ten miles we turned to the south-east, and commenced to traverse a very inviting country, more so, indeed, than any I have seen since leaving Carlton. Hitherto we had passed over swampy ground, but now the surface was dry and undulating, and in the hollows are lakes, some of which are of good size.

* * * "Started on my return to Carlton. The coal was still seen cropping out in the river banks for five bends below Edmonton, associated with the shales and green sandstone as before."

Ibid., p. 82.

"I have thus been able to see and map the river (Saskatchewan) the whole distance from the Rocky Mountain House to Carlton. The valley, which is nearly 300 feet deep at Fort Pitt, continues to have high abrupt banks for 70 miles, when those on the left side became low and sloping. There are many beautiful spots, and the scenery in early spring, when the poplars were unfolding their bright green foliage, was exquisite. The most beautiful part of the river is near the mouth of Battle River. At Eagle Hill the banks on the right side are very high, but when not wooded the soil is covered with an efflorescence of sulphate of soda and lime in large quantities, often resembling a sprinkling of snow. In this part of its course the river is very wide and shallow, and the channel is obstructed with islands."

Battle River Country.

Dr. Hector's Geological Report in Capt. Palliser's Exploration of B. N. America, p. 218.

"The highest point of the great plateau that is in British territory, is to be found when at the base of the Rocky Mountains that chain is intersected by the 49th parallel of latitude, where it is elevated 4,300 feet above the sea. If followed into the United States, to the south, it is found to reach a still greater elevation along the base of the mountains, until it merges with the great table land of Mexico, which has an altitude of 7,000 feet. From the above point of intersection to the nearest point of the Laurentian axis, which is a line from near the source of Belly River, in a N.E. direction, to Cumberland House on the Saskatchewan, the distance in an air line is over 500 miles; and the difference of elevation of these two points gives a mean slope of 6 feet in the mile. The general level of the eastern base of the Rocky Mountains also declines rapidly to the north, for in latitude 51° 9′, at where the Bow River emerges on the plains, the elevation is 3,900 feet, and at where the Athabasca, the most southern tributary of the Mackenzie, leaves the chain, in latitude 53° 12′, it is only 3,300 feet above the sea.[3] The slope of this plateau is not, however, uniform, but is broken by steppes, which have been formed by the erosion of the surface of the

country, and which mark beautifully different grades in the elevation of the continent during later epochs. These steppes are boldly marked, sometimes increasing the altitude of the prairies, as the traveller follows a westerly course, by an abrupt rise amounting to 600 feet. They have a very irregular outline, and are cut through by the rivers in many cases so as to form isolated masses of broken tableland.

"The Rocky Mountains, forming the western limit of the great plateau, rise from it very abruptly, the eastern range often presenting sheer cliffs, 2,000 to 3,000 feet in height. Those are, however, cut by transverse valleys, into which the superabundant deposits of the prairies penetrate, and have been preserved more or less perfectly as terraces in the mountain valleys."

[3] NOTE BY DR. HECTOR.—"As the Rocky Mountains are cut through by valleys almost to the depth of the plateau on which they stand, this depression of the chain towards the north has a remarkable influence on the climate in some localities, especially mitigating the severity of the spring months, by admitting the influence of the mild climate of the western seaboard, at a time when the eastern part of the Continent in the neighborhood of the great lakes is still icebound."

FROM THE SOUTH ELBOW OF SASKATCHEWAN TO BATTLE RIVER JUNCTION.

Captain Palliser's Exploration in B. N. America, folio, pp. 83-89.

"*July 1st.*—The valley of the Wignatinon,[4] extending north-east and south-west, sinks upwards of 200 feet below the prairie level, and, like the numerous valleys we have met with last week, is dotted with saline lakes. The north end of this lake is clothed principally by aspens; *Negundo fraxini folium* (a kind of sugar maple), and *Betula papyracea*, although found, are only in small quantities; while the side which faces the south supports only a low growth of willows, and in many places is quite bare. The aspens are the finest specimens of the species we have seen in the country. At the south end of the valley, three miles distant from the camp, was a large grove of the ash-leaved maple. * * * The scenery in the neighborhood of the Wignatinon is very beautiful and diversified. Fine bluffs of wood and open glades, hills with bold outlines, rising sometimes 450 feet above the level of the valley, abrupt escarpments of white chalky strata with ferruginous streaks, desolate wastes of blown sand, and beautiful lakes with clear limpid water are all combined within a small compass in this neighborhood. There are a few spots where the soil is rich, but as a rule this region is barren and desolate. The difference in the luxuriance of vegetation in northern and southern exposures is not peculiar to the Wignatinon valley, on the contrary, it seems to be general everywhere in this country.

"The whole country to the north presents the same irregular features; the soil is for the most part sandy, and to the south and west lies a flat expanse of prairie, extending to the very horizon.

"*July 2nd.*—We moved on here about eight miles, and encamped in a delightful valley of about ten miles square in extent, with a soil of an excellent quality, composed of a rich black vegetable mould 2½ feet deep, over a layer of very fine yellow sand. About a mile from our encampment we crossed a small tributary of the Battle River running due north. It is called the Ambush Coulee. * * * This valley is bounded on the north-west by a range of hills, called the High Hills. To the south and west, after an abrupt ascent of 240 feet, a fine level prairie stretches away to the south as far as the eye can reach.

"*July 6th.*—At 9 miles from this place we crossed a muddy creek only two feet in depth, which takes its rise in the Nose Hills, and, flowing northward to join the Battle River, is styled Nose Creek. Our course through these nine miles, as well as in the afternoon, lay through what was once forest land, but is now dotted with small poplar clumps and several salt lakes. The soil, consisting in many parts of a foot of black vegetable mould, supports an excellent crop of nutritious grasses. * * * The greater part of the country with these features is fit for immediate settlement, and wants but little culture to yield splendid fruits. The state of the flowering plants as this date shows that spring is early, and our notes on the weather prove that the summer here is not too dry.

"*July 9th.*—We encamped again in the valley of Battle River. Many curious sections of soft sandstone and clay strata were here exposed, and thick beds of fossil shells were found by Dr. Hector extending in the same direction. The northern exposure of the river valley, as usual, was the wooded side, containing poplar, spruce, fir, ash-leaved maple, and birch, while the side of the valley by which we approached it was almost entirely bare of wood. The river here flows through a deep valley with a wide bottom; the sides of the valley are white and chalky from the easy erosion of the strata, but the banks of the river throughout its tortuous course are often covered with pretty patches of green wood. In the bed of the stream we found pieces of coal, and some of our party observed it farther up the stream. * * *

"*July 24th.*—Arrived now at the edge of the woods, it is necessary to give a general description of the country passed over since we entered upon the Wignatinon Valley; and to do this let us imagine a line drawn from 60 miles south of Fort Carlton, which is on the Wignatinon, and thence proceed to the site of old Bow Fort. This line marks the boundary of two natural divisions of the country, viz.:—The ancient forest lands and the true prairie district. To the north of this line generally there is timber, a good soil for agricultural purposes up to 54° north latitude, and superior pasturage; to the south there is no

timber, the soil is sandy, with little or no admixture of earthy matter, and the pasture south is inferior. Exceptions of course may be found, as for example in the neighborhood of swamps and gullies, where the soil and pasture are better."

[4] This name is spelt in two ways, as here given, in the report, p. 85.

Dr. Hector's Geological Report in Captain Palliser's Exploration in B. N. America, pp. 220 to 233.

"The eastern limit of the third great prairie level is met with at the Grand Côteau, Eagle Hills and Thickwood Hills, and is only cut through by the channels of the north and south branches of the Saskatchewan, while all the other rivers of the eastern plain, such as the Soursi, Assiniboine, Qu'Appelle, &c., have their sources short of it, I have stated the prairie at the base of this third level has an elevation of 1,000 feet above the sea; and a depression of the continent to this extent was sufficient to submerge the eastern Laurentine axis between Hudson's Bay and Lake Winnipeg, or, at least, to convert it into a mere chain of islands. * * * As seen from a distance, when travelling in the low plains, this grand steppe appears as a range of blue hills, with a smooth, undulating outline. On approaching it, a gentle ascent is accomplished for many miles, after which an abrupt rise of from 600 to 800 feet has to be effected generally in from 4 to 6 miles. The surface of the slope is extremely rugged, and has evidently been worn into holes, ridges and conical mounds by the action of water on the soft clay strata of the cretaceous group. Everywhere it is thickly strewn with boulders, all derived from the Laurentine chain to the east, or from Bird's Eye limestone, which rests on the western flank of that axis.

* * * "In rising to the surface of the third steppe, we have the plains composed of the cretaceous strata, with only a very thin coating of drift, which has always a local mineral composition corresponding with that of the underlying strata, without admixture of materials carried from a distance further than a sprinkling of erratic blocks that are of small size, and are only to be found crowded in favorable spots. * * *

"No granite was observed on the east flank of the Rocky Mountains within British Territory. * * *

"The surface of the higher plains are in some localities traversed by profound rents, resembling the valleys of great rivers, but which, after running for several miles, are generally found to be closed at both ends. They are often occupied by deep lakes of salt water, depressed 200 feet to 300 feet below the plain, and from 500 yards to a mile in width. The great Coulées in the neighborhood of the 'Ear Hills,' south of Battle River, are the best examples of these, but they are found in many other localities. * * *

"Before leaving the superficial deposits of the prairie country, it is necessary to notice the great river valleys which traverse it, and which all point to a time when the rivers were of much larger size than they are now; even small streams such as Battle River flow through valleys from 150 to 200 feet deep. The sides of these are in general as formal and as regular as those of a railway cutting, excepting where the nature of the strata causes frequent slides, or harder beds give rise to a cliff structure. The flat alluvial bottoms of these valleys are in general four to five times the width of the river which winds through them, and which is hemmed by secondary banks, often 30 to 40 feet high. The silt and alluvium is in general regularly stratified, and almost every river point contains one or more lagoons, showing the frequent, though slow change in the river channel.

"At the distance of 90 miles from the Rocky Mountains, the valleys of the rivers flowing to the east commence to exhibit terraces composed of rounded fragments of quartzite and limestone, such as would form the rounded shingle on a rocky shore.

* * * "Until we approach to the mountains these terrace deposits are confined to the valleys of the larger streams, but gradually they spread out, and at last cover the whole country along the base of the mountains, filling up the hollows and valleys of the outer ranges to the depth of several hundred feet. This feature was observed at every point where we approached the mountains from the east, from the 49th parallel northwards, and indeed being better marked on the Athabasca River than on any of those further south. * * *

"Within the mountains the terraces expand so as to form level prairies along the North Saskatchewan, of which the Kootanie Plain is the principal. It is many miles in extent, and composed of shingle and incoherent sand, the widest terrace being 150 feet above the river. The river is, however, skirted by terraces at still higher levels, especially on the south or right side of the valley. Above Pine Point the calcareous matter of these terraces so increases as to replace altogether the pebbles, when it becomes a fine, gritty calcareous mud of glistening whiteness. If followed into the higher valleys, the terrace deposits become confused with the detritus of ancient glacier moraines, which, however, are easily distinguished by the angular blocks which they contain.

"On the Athabasca River, at 15 miles from the mountains in a direct line, the terraces were found at 15, 100, 210, and 370 feet above the river level. Within the mountains this valley, which is more dilated than even that of the North Saskatchewan, has also the terraces better developed than I have elsewhere observed them on the east side of the chain. The river also dilates into extensive lakes at different points of its course, in which the rearrangement of the material of the terraces is seen to be going on, the water separating the calcareous mud from the pebbles, while the winds, which are extremely violent in this valley, sift out the fine mud, and pile it in tracts of sand dunes, which cover large areas.

"The terraces may be considered as ranging on the east side of the Rocky Mountains from 3,500 to 4,000 feet above the sea. Wherever they prevail they support a growth of a peculiar sturdy pine, which, in common with the Banksian pine, is

known to the Hudson's Bay Company's hunters as the cypress.

"Often the surface of a terrace is quite free from timber, the trees being easily thrown out of the loose gravelly soil, and it is then generally clothed with 'bunch grass,' which at once catches the eye as different from the grasses of the eastern plains. The country occupied by the terraces is easily passed through, as the forests there are free from underwood, and the only obstacle to the traveller arises from his so often having to make a steep descent to the base of the deposit, which is cut through by every little stream, and then to climb again the opposite bank. When passing along the side of a valley, the numerous cross gullies from this cause would render the construction of a road a very difficult matter, although nothing could be firmer or more level than the surface of the terraces themselves. This remark applied equally to the valleys on the west side of the Rocky Mountains, where the terrace deposits have a much greater development. * * *

"On the North Saskatchewan, 40 miles above the Elbow, and a little way above the Eagle Hills, on the left bank of the river, there are cliffs of a very incoherent sandstone, rising 40 to 60 feet above the water's edge, and worn into caves, which often communicate with the plain above. * * * Eight miles below the Elbow of the same river, near Birch Gully, the banks rise abruptly on either side to the height of 210 feet, when the level plain is reached, at the point where the great erratic masses of limestone rest on its surface. At the base of the bank at this point all the way down to Carlton, a distance of 40 miles, springs of water escape highly charged with iron and zinc, which deposit a light yellow ochre. * * *

"Nearly the whole great area of prairie country from the eastern axis of the Rocky Mountains is occupied by cretaceous strata, which have attained an enormous development throughout the whole of the central portion of the North American Continent. * * *

"At the Elbow of the South Saskatchewan, where that river cuts through the great prairie côteau, the boulder drift is seen to rest on strata, of purple clay with nodular masses of iron-stone, with veins or cavities filled with calc-spar. These septaria are in great numbers, and, when broken, are found to include fragments of fossils. The outcrop of these septaria clays has a clear relation to the great prairie ridge, which is cut by the South Saskatchewan at this point, and then is continued to the north-west by the Eagle Hills and others to near Fort Pitt, where it hems in the North Saskatchewan in like manner, the banks having an altitude of 500 feet, and also displaying sections of the strata with the same fossils. They were also observed at the base of the Eagle Hills, and wherever they prevail they form lofty and ruinous banks, the strata breaking away in great slices, while these slide forward successively at some points. I have counted as many as 13 of such shales on the bank of the river, the older, though now close to the water level, and bearing part of the original prairie surface, supporting the same turf that once grew 200 or 300 feet above its present position. The result of this is, that it is seldom that anything can be learnt of the strata which form the full thickness of the river banks, the more superficial beds being repeated again and again in each slip, so as to give a very exaggerated idea of this development.

* * * "At Fort Edmonton the beds of the river valley are from 190 to 250 feet high, and at most places densely wooded seven to ten miles back from this valley on either side, a line of high ground rising from 200 to 300 feet above a willow covered plain, and consisting, as far as I could learn, of white marly clays; but the country in this neighborhood is much obscured by superficial deposits, and by small copse-wood. The river valley has a wide, flat bottom, through which the river winds in a channel 40 to 60 feet deep, and wherever this present channel sweeps close under the higher valley banks, sections are displayed disclosing horizontal strata of cretaceous clays, sometimes passing into true sandstone with spherical concretions, but at others into clay shales. Many of these beds are highly charged with nodules of clay iron-stone, which are filled with comminuted fragments of vegetable matter. The lignite occurs in the clay strata and varies greatly in purity. It is used in the forge at the Fort, and is found to answer very well, excepting that it 'burns' the iron more than ordinary coal. It ignites with difficulty, but keeps alight for a very long time, and if left to itself without a draught, smoulders away into an abundant orange-coloured ash. It contains a quantity of water in its composition, as, although generally compact, like fine bituminous coal, when first excavated, it soon splits up into fragments, which have dull earthy surfaces. There is a great difference in the quality of the lignite, according to the bed it has been procured from, and also the distance from the outcrop to which the seam has been worked.

"The fort stands about 100 feet above the water level, and below it in the bank there are two seams of 18 inches each; but on the opposite side of the river a little distance below, sections occur where there are several seams exposed, the principal of which, close to the water's edge, is six feet in thickness, and another a little way, where it is four feet, with others less pure.

"The gravel and shingle deposits are seen to rest on the cut edges of the lignite-bearing beds, and are, therefore, of more recent date. They contain fragments of nodules derived from the underlying strata, along with pebbles of quartz and other rocks that must have been derived from elsewhere.

* * * "For 90 miles up the North Saskatchewan above Fort Edmonton, the gray arenaceous clays prevail, forming the banks of the river, which are high and precipitous, the valley for the distance making a succession of abrupt bends after every few miles by a straight course, its main direction being to the north. The secondary banks are also gradually lost, till at length, from the valley narrowing, the river occupies its full width. Above this point, however, the valley suddenly widens out, and preserves on the whole a straight course from the west, independent of the windings of the river itself, which has a very

tortuous course between secondary banks, crossing from side to side of the great valley, round heavily timbered flats. When the river sweeps under the high banks, sections about 200 feet high are exposed, of white variegated marls, which are cut in the most regular manner by gullies into pyramids, with a most artificial appearance, as seen from the river, their bright chalky surfaces being thrown into strong relief by the dark green pines that clothe the ravines and low river banks.

"Fifteen miles below the mouth of Brazeau's River, which is a large tributary of the North Saskatchewan from the west, we again meet with the lignite bearing arenaceous, and from the point they were traced uninterruptedly to the base of the mountains. The formation now presents very different characters from those at Edmonton, having more the appearance of shore deposit. The mineral composition is very varied, and large deposits of sandstone occur, which is fine or coarse-grained, but never makes any approach to a conglomerate.

* * * "On the Athabasca River the valley from Fort Assiniboine, up to the outer range of the mountains at Deadman's Rapid, cuts through argillaceous sandstones, with beds of clay and lignite of the same kind as these of Mountain House. The sandstones are in much greater proportion, however, and the lignite beds are more rarely seen than in the sections along the North Saskatchewan. At Deadman's Rapid these strata are succeeded by grits and clay shale in regular beds, undisturbed at first, but, on approaching the mountains, found to be implicated in the later upheavals. * * *

"On Battle River the high part of the banks was composed of the banded clays along with concretionary masses of sandy limestone. Over the banded clays is the layer of silicified wood, while at the base of the section, and under the water of the river, the beds of lignite crop out."

CHAPTER V.
THE BRITISH COLUMBIA SECTION.

On the physical features generally of this portion of the country, including the engineering difficulties to be encountered, there is less information available than exists of the route east of the Rocky Mountains, as there has been very little travel in this direction. For such information, therefore, as is obtainable, enquirers are referred to the report of the Chief Engineer, published in 1874, in which, with the appendices annexed, pretty full particulars are given. The following extracts are from independent authorities on such points as would seem to be of general interest, and convey a fair impression of the character of the country.

The Canadian Dominion, by Charles Marshall, p. 201.

* * * "By a happy eccentricity in the formation of the Rocky Mountains, a wide, and easy, and remarkably low pass has been scooped out, almost immediately in the direct air line to China. The greatest elevation, 3,700 feet above the sea, is less than half the height of the passes which the United States Pacific Line has had to cross. The ascent to this pass—the Yellow Head or Leather Head Pass—is, from the east, simply a gradual upward sloping of the vast prairie plains. The descent into British Columbia is perfectly practicable for railroads."

The Wild North Land, by Captain Butler, F.R.G.S. Appendix, p. 346.

"The depression, or slope, of the prairie level towards the north continues, with marked regularity, throughout the whole of British America; thus at the 49th parallel (the boundary line between the United States), the mean elevation of the plains is about 4,000 feet. Two hundred and fifty miles north or in the 53rd parallel, it is about 3,000 feet; and 300 miles still further north, or about the entrance to Peace River Pass, it has fallen to something like 1,700 feet above the sea level.

"But these elevations have reference only to the prairies at the eastern base of the Rocky Mountains. We must now glance at the mountains themselves, which form the real obstacle to inter-oceanic lines of railroad.

"It might be inferred from this gradual slope of the plains northwards, that the mountain ranges followed the same law, and decreased in a corresponding degree, after they passed the 49th parallel, but such is not the case; so far from it, they only attain their maximum elevation in 52° north latitude, where from an altitude of 16,000 feet, the summits of Mounts Brown and Hooker look down on the fertile plains at the sources of the Saskatchewan River.

* * * "But though the summits of the range increase in height as we go north, the levels of the valleys or passes, decrease in a most remarkable degree."

Report of Progress, Canadian Pacific Railway, 1874. Report by Mr. Marcus Smith, p. 193.

"The surveys made up to the present time through the great mountain zone running parallel to the shores of the Pacific Ocean, show that a favorable line for the railway can be obtained from the summit of the Yellow Head Pass in the Rocky Mountains eastward to Fort Edmonton on the North Saskatchewan River.

"The distance between these two points is estimated at 288 miles, and on the first 50 miles from the summit of the pass easterly there will be a considerable number of rock cuttings, but none of them very deep, and but very little, if any tunnelling will be required. The grades throughout this length will be easy.

"Thence across the Foot Hills to Fort Edmonton the grades will be undulating, and none of them need exceed 53 feet per mile; with excavations at no great depth, in sand and clay loam, and only a few cuttings through soft sandstone. The most important works on this section will be the bridging of the Athabasca, McLeod, Pembina and Saskatchewan Rivers."

THE ROCKY MOUNTAINS.

Overland Railway through B. N. America, by Alfred Waddington, p. 16.

"The road now enters the Rocky Mountains, and turning south, passes for several miles between a small lake to the east, and the Athabasca, a stream 200 yards wide, swollen and turbid with glacier water, which rises in the Rocky Mountains, some 90 miles above, and runs here nearly due north at the bottom of a wide, flat valley. A little higher up, the river expands into two small lakes, the lower one bathing the foot of a perpendicular limestone (?) bluff forming part of the Roche à Miette, a singularly shaped mountain, 6,000 feet from its base, or 9,400 feet above the sea. Immediately beyond, the road enters on a little sandy plain; opposite which, and in a lovely expanse extending some 5 miles on the left bank of the river, between the two lakes, lies Jasper's House, in long. 118° 10′, lat 53° 12′; 3,372 feet above the sea. The road now crosses several fordable mouths of a stream from the south, and continues in a southerly direction for about 18 miles up the narrowing valley, along the right bank of

the Athabasca, and over easy ground, requiring, at most, an occasional cutting or embankment."

Ibid, pp. 17, 18, 19.

"The summit of the Yellow Head Pass forms the limit of British Columbia. It presents a comparatively open and level space for about 3 miles; after traversing which, the road would pass over easy ground along the north side of Cow-dung Lake, and at the foot of verdant, swelling hills; the lake consisting of two portions connected by a short narrow channel, and in all about 7 miles long. It would then follow the direction of the small stream issuing from the western extremity of the Lake for several miles, down to where the Fraser, flowing through a narrow gorge from the north-west, sweeps round into the valley. The road would run for the next four or five miles along the north side of this stream, between the river and the steep hill sides of the straitened valley, over level but low ground, subject to be overflowed and encumbered with fallen timber; till it reached Moose River, a rapid stream falling in from the north. Two or three miles below, the Fraser expands into Moose Lake, 12 to 15 miles long by 2 to 3 wide. The mountains on the south side of this lake rise perpendicular to a height of 2,000 feet. On the north side, though less abrupt, they still come down in many places to the water's edge, and close in on the road, thus necessitating several miles of side cutting along the lake. The valley now begins to acquire a more rapid and continuous descent, and, changing direction, runs nearly due west for the next 30 miles. Four or five miles below Moose Lake, it opens somewhat, after which it is much encumbered by large timber, till the mountains close in once more, and the road between them and the Fraser is obstructed by lofty cliffs of crumbling slate rock, the first met with beyond the Summit. Four or five miles below this, or about 15 miles from Moose Lake, a considerable branch called the 'Grand Fork' enters the Fraser at right angles from the north, through five separate mouths, which would have to be crossed. At this point the Fraser runs through a narrow rocky gorge: after which the valley, for the next 10 miles to opposite the Indian camp at the 'Cache,' becomes much more open, and the ground easier, though intersected by several streams from the north, and obstructed by fallen timber of great size.

"The latter half of this distance is heavily timbered, and the descent between Moose Lake and the Cache rapid and continuous, but nowhere steep; averaging less than 45 feet to the mile, and probably never exceeding 70. There would also be some considerable side cuttings and embankments, but not a single tunnel in the whole length of the Pass. The continuation of the road in a straight line to the Pacific is now interrupted by a barrier of mountains, beginning some five miles below the Cache, and running north and south. These present the most extraordinary accumulation of mountains behind mountains as far as the eye can reach; whilst they arrest the course of the Fraser, which turns suddenly north. * * *

"The proposed railroad must therefore necessarily follow the valley of the Fraser to the north; or else take the line travelled by Milton and Cheadle down the Thompson to the south. But the latter, besides continuing for 120 miles below the Cache to run through a mountainous, uninhabitable region, covered with dense forests, and being costly in proportion, would lead to nothing definite beyond the opening up of a small portion of the colony; since, in spite of every effort, no really available line for a railroad between Fort Kamloops and New Westminster has as yet been discovered through the Cascade or Coast Range.

"The road down the valley of the Fraser, on the contrary, though describing a circuitous route, would *turn* the Cariboo or Gold Mountains, and communicate immediately, either below Westroad River, or lower down at Quesnel Mouth, with the Chilcoaten or Great Western Plain of the colony; whilst below the mouth of Bear River, the valley opens upon a fine tract of rolling country, with a climate considerably milder than that of Canada, and ready for immediate settlement; instead of the interminable mountains and forests on the Thompson Route. The Fraser, moreover, (whatever may have been said or written to the contrary), offers a valuable water communication, and one immediately available, through the whole of this cultivable district.

"Nor must it be forgotten that the gold diggings, together with the mining population, are constantly moving on towards the northern limit of the colony, and that this is the direct line of route to Peace River, and all the latest gold discoveries."

Ocean to Ocean, by Rev. G. M. Grant, p. 233.

"There is a wonderful combination of beauty about these mountains. Great masses of boldly defined bare rock are united to all the beauty that variety of form, color and vegetation give. A noble river with many tributaries each defining a distinct range, and a beautiful lake ten miles long, embosomed three thousand three hundred feet above the sea, among mountains three times as high, offer innumerable scenes, seldom to be found within the same compass, for the artist to depict and for every traveller to delight in.

"Valad informed us that the winter in this quarter is wonderfully mild, considering the height and latitude: that the Athabasca seldom if ever freezes here, and that wild ducks remain all the year instead of migrating south, as birds farther east invariably do. The lake freezes, but there is so little snow that travellers prefer fording the river to trusting to the glare ice."

Ibid, p. 238.

"The valley (Athabasca) still averaged from two to five miles wide. * * What a singularly easy opening into the

mountains, formed by some great convulsion that had cleft them asunder, crushed and piled them up on each side like cakes of ice. * * The Athabasca finding so plain a course had taken it, gradually shaped and finished the valley, and strewn the basfonds, which cross torrents from the hills have seamed and broken up. It looks as if nature had united all her forces to make this the natural highway into the heart of the Rocky Mountains."

Ibid, p. 252.

* * * "Our three ranges are the Rocky Mountains proper; the Selkirk and Gold, which may be considered one; and the Coast Range or Cascades. The passage from the east through the first range, is up the valley of the Athabasca and the Miette, and we have seen how easy it is, especially for a railway. The average height of the mountains above the sea, is 9,000 feet; but the Yellow Head Pass is only three thousand seven hundred feet. On each side of the valley are mountains that act as natural snow sheds."

Ibid, p. 254.

"Moose Lake is a beautiful sheet of water, ten or eleven miles long, by three wide. It receives the Fraser, already a deep strong river fully 150 feet wide, and also drains high mountains that enclose it on the north and south. * * * The hillsides and the country beyond support a growth of splendid spruce, black pine and Douglas fir, some of the spruce the finest any of us had ever seen. So far in our descent from the Pass, the difficulties in the way of railroad construction are not formidable, nor the grades likely to be heavy."

Ibid, p. 255.

* * * "We came to the 'Grand Forks of the Fraser,' where the main stream receives from the north-east, a tributary important enough to be considered one of its sources. It flows in three great divisions, through a meadow two miles wide, from round the bases of Robson's Peak."

Ibid, p. 258.

* * * "The trail follows down the Fraser to 'Tête Jaune Cache,' where it leaves the river and turns south-east to go to the north Thompson, at right angles to the main course. * * * The Fraser at the same point changes its westerly for a north-westerly course to Fort George where it sweeps round and comes south to receive the united waters of the North and South Thompson, before cutting through the Cascade Range and emptying into the ocean. Tête Jaune Cache is thus a great centre point. From it the valley of the Fraser extends to the north-west, and the same valley extends south by the banks of the Cranberry and of the Canoe Rivers to the head of the Columbia,—a continuous valley being thus formed parallel to the east range of the Rocky Mountains, and separating them from the Gold and Selkirk Ranges."

Fraser River.

Four Years in British Columbia and Vancouver Island. By Commander R. C. Mayne, R.N., F.R.G.S., p. 83.

* * * "The Fraser River rises in the Rocky Mountains, a little to the northward of the Athabasca Pass, and in a straight line less than 300 miles from its meeting with the waters of the Pacific in the Gulf of Georgia. From its source it takes a north-westerly direction for about 160 miles, when it is turned southward by a spur of the Rocky Mountains, which runs east and west nearly to Stuart Lake, where it turns northward and assumes the name of the Peak Mountains. On the other side of this spur rises the Peace River. * * * This mountain spur turns the Fraser sharply round to the south, and it then forces its way through the several great parallel valleys that intersect this region in a direction a little east of south for 300 miles, till it reaches Hope, from thence it runs nearly east and west for about 80 miles to its mouth. * * *

"Fort St. George, a Hudson Bay Post, is situated on the west bank of the Fraser River at its junction with the Stuart River."

Canada on the Pacific, by Chas. Horetzky, p. 79.

"Lake Stuart is a very beautiful sheet of water, about 35 miles in length, with an average width of five miles, and is, I should think, about 1,800 feet above the sea level. Its waters with those of Lakes Trembleur and Tacla, both very large lakes, find their way, by the Nakosla or Stewart River, to the Fraser, which they join at Fort George. To the north and west the lake is flanked by high hills, and along some portions of the northern side precipitous rocks rear themselves high up from the very water's edge; but the southern extremity is bordered by very low and level land, which continues, I am told, to the Quesnel."

The North-West Passage by Land, by Lord Milton and Dr. Cheadle, p. 329.

* * * "We may safely state, with the exception of one or two rocky and precipitous bluffs, there are no engineering

difficulties of any importance. From the Red River settlement to Edmonton, about 800 miles, the road lies through a fertile and park-like country. From Edmonton to Jasper House, a distance of about 400 miles, the surface is slightly undulating, the lower ground universally swampy, and everywhere covered with thick forests. A better trail than the one at present used may be found for this portion of the way, by keeping to the higher ground. From Jasper House to the *Tête Jaune Cache*—the pass through the main ridge of the Rocky Mountains, about 100 or 120 miles in length—a wide break in the chain, running nearly east and west, offers a natural roadway, unobstructed except by timber. The rivers, with the exception of the Athabasca and the Fraser, are small and fordable; even at their highest. The ascent to the height of land is very gradual, and, indeed, hardly perceptible; the level only 3,760 feet above the sea; and the descent on the western slope, although more rapid, is neither steep nor difficult."

The Red River Country, Hudson's Bay and North-West Territories. By A. J. Russell, C.E. pp. 144-5.

* * * "The route, advocated by Mr. Waddington, through the interior, by the valley of the Saskatchewan, the River Athabasca, and the Yellow Head Pass to the upper Fraser River across to Bute Inlet, is unquestionably by far the best as regards this side of the Rocky Mountains, and the passage through them; and there is no room to doubt its being so also to the westward through British Columbia. * * * The height of this pass is nearly the same level as the elevated sloping plain, on the east side, from which the Rocky Mountains rise.

Passes Through the Rocky Mountains.

Report of Progress Canadian Pacific Railway, Appendix E. By Marcus Smith, Esq., pp. 141-2.

* * * "There are several passes through the Rocky Mountain Chain, giving access from the North-West Territory to British Columbia; some of these are too far south to be eligible for a line of railway to the Pacific coast within the boundaries of that province.

"Of those which are more favorably situated, I give the following with their approximate altitudes above the level of the sea, commencing with the most southerly and taking them in consecutive order northward, viz:—

1 Howse Pass, altitude 4,500 feet.
2 Athabasca, " 6,025 "
3 Yellow Head, " 3,746 "
4 Smoky River, " not known
5 Pine River or Indian Pass " " "
[Since ascertained to be very easy, and under 2,000 feet.]
6 Peace River, altitude under 2,000 feet.

"The eastern slope of the Rocky Mountains, from the foot of the main rocky ranges is a long gently inclined plain or series of steppes, and either of the above passes could probably be reached from the east with moderate grades. But on the western slope the country is much more difficult. The Athabasca Pass is too high to be considered eligible for a railway route. The Howse Pass debouches on the Upper Columbia valley, almost at right angles to it and with a very rapid descent, as shown by the surveys made of this pass in 1871; and as there is little probability of a pass being found across the Selkirk Range between the upper and lower arms of the Columbia River, a line of railway through the Howse Pass would, on entering the Columbia valley, have to turn at a sharp angle and follow the course of that river on a north-west course about 100 miles to the great bend, at the Boat Encampment, and there make another sharp turn, and run in an almost opposite direction for about 85 miles to the Eagle Pass, through the Columbia or Gold Range, by which a connection could be made with the valleys of the Thompson and Fraser.

"The situation of the Yellow Head Pass is much more favorable. It is entered from the east by the valley of the Athabasca to Jasper House; it then follows up the same valley nearly due south to its junction with the Caledonian valley, thence up the latter, due west to the summit of the pass. Beyond this the valley continues westward by a gentle descent to Yellow Head and Moose Lakes. These lakes receive the first tributaries of the Fraser, and from Moose Lake that river issues in a stream 50 to 60 yards wide, which is joined by another branch of greater magnitude from the north before it reaches the Tête Jaune Cache. Here it encounters the Selkirk Range, or an apparent continuation of the same, sometimes called the Cariboo Range, by which it is deflected to a north-west course, in which it continues nearly 200 miles through a deep valley, completely severing this range from the main chain. Having turned this at the great bend, the river then flows almost due south for nearly 400 miles, thence westward till it enters the Strait of Georgia below New Westminster.

"Standing on an elevated point near Tête Jaune Cache, the deep valley of the Fraser is seen stretching away to the north-west as far as the eye can reach; then, facing round to the opposite direction, the valley is continued almost in a straight line by the Canoe River to the great bend of the Columbia, at the Boat Encampment; thence up the Columbia in the same direction to

its source; and thus the great chain of the Rocky Mountains is cleft longitudinally by a continuous line of deep valleys over 400 miles in length.

"The portion thus severed from the main range is scarcely inferior to it in altitude, and is equally rugged and broken; it is that terrible snow peaked range seen stretching away from Tête Jaune Cache, so graphically described in Milton and Cheadle's 'North-west Passage by land.'

"On the westerly flank or foot hills of this range are the gold bearing rocks, extending south-easterly to the boundary of British Columbia, and north-westerly in the same line as far at least as the 56th parallel of latitude."

Four Years in British Columbia. By Commander R. C. Mayne, R.N., F.R.G.S., p. 84.

* * * "Fort St. George, a Hudson Bay Post, is situated on the west bank of the Fraser River at its junction with the Stuart River, which latter flows in a like direction from Stuart Lake, which is the southern post of a chain of three or four lakes which stretch northward 100 miles to the head waters of the Bear River, at the foot of the Peak Mountains. At the head of the upper of these lakes stands Fort Connolly."

The Dominion at the West. By Alex. Caulfield Anderson, J.P., 1872, pp. 2-3-4.

"The three principal streams of British Columbia are, the Columbia, the Fraser, and the Peace. The last-mentioned, rising in the angle formed by the Peak Range with the Rocky Mountains and the Coast Range, after receiving the important gold-bearing tributary, Findlay's Branch, breaks through the main line of the Rocky Mountains, and, passing onwards, joins the great River Mackenzie; the united flood, after a course of some two thousand miles, eventually falling into the Frozen Ocean.

"The Columbia, rising in the Rocky Mountains, pursues a southerly course, and after receiving several important tributaries, and feeding the two extensive sheets of water called the Arrow Lakes, enters the United States Territory in latitude 49°; and after a course of nearly a thousand miles, falls into the Pacific in latitude 46° 20′.

"Fraser River, comparatively the smallest, but in its relation to the Province by far the most important, flows entirely through British Columbia, entering the Gulf of Georgia a few miles north of the boundary line of 49°, and in about 122° 40′ west longitude; its course throughout being nearly parallel with that of the Columbia. The main, or central, branch takes its rise in the Rocky Mountains in lat. 53° 45′ N., long. 118° W., there heading with the Rivière de Miette, a tributary of the Athabasca, which afterwards unites with Peace River in its course towards the Frozen Ocean. Fraser River was first discovered by Sir Alexander Mackenzie of the North-West Company, who, designating it as the *Tâ-cout-ché Tesse*, or River of the Tâcully nation, descended it for some distance on his way to the Western Coast in 1793. Afterwards, in 1808, it was navigated to its mouth by Mr. Simon Fraser and Mr. John Stuart of the North-West Company; from the former of whom it has its present name. Fraser River, a few miles from its source, flows into a lake some miles in length called Cow-dung Lake, below which, considerably increased by a tributary from the north, it enters Moose Lake, a beautiful sheet of water some nine miles in length. Thence the river continues rapidly to Tête Jaune Cache, being joined midway by a second feeder, likewise from the north.

"Tête Jaune Cache, distant about 70 miles from the summit of the Rocky Mountains and 730 from the sea, is the limit of canoe navigation on the Fraser. About three miles lower down, the stream is joined by the Cranberry Fork, a tributary flowing from the south, which heads in with the North Branch of the Thompson, to be presently noticed, and the Canoe Fork of the Columbia.

"Between Tête Jaune Cache and Thle-et-leh, where there is a post of the Hudson's Bay Company called Fort George, the river is augmented by many tributaries; two of which the Mackenzie Fork and Bear River are of considerable magnitude, this point is in latitude 53° 53′, longitude 122° 45′. An important branch here falls in from the westward, proceeding from Lakes Stuart and Fraser. Quesnel River, issuing from the great lake of the same name, flows in 100 miles lower down; and 40 miles below this is Fort Alexandria, seated on the right bank in lat. 52° 33′ 40".

"It is in the mountainous region comprised within the great bend which the Fraser makes between Tête Jaune Cache and this point, that the rich gold deposits, known as the Cariboo mines, are situated.

"At Lytton, about 180 miles from the sea, the Fraser is joined by Thompson's River, a copious tributary flowing from the eastward. This stream waters an extensive and important section of the country; its northern branch heading with the Cranberry Fork, before mentioned."

Ibid, pp. 11-12.

* * * "The mainland of British Columbia, apart from the seaboard, may be divided into three sections, each differing from the other in its attributes. The first extends from the mouth of the Fraser River to the head of the rapids above Yale: the second, from that point to Alexandria: the third, thence to the Rocky Mountains.

"The characteristics of the lower district are a surface thickly wooded in most parts with trees of enormous growth, chiefly varieties of the fir and pine, and intermixed with the red cellar (*Thuja Occidentalis* of Douglas, *Gigantea* of Nuttall) and the

maple-plane (*Platanus Acerifolia*). Low alluvial points fringe these thickets. These, as well as the numerous islets along the river, are covered with aspens, balsam poplars, and alders, of luxuriant growth. In the lower part are some extensive meadows, yielding, in their natural state, heavy crops of a coarse but nutritious grass, and, under cultivation, enormous returns of cereals and other produce. For a certain period of the year mosquitoes are troublesome along the river, as high, nearly, as Hope: but there has never been manifested any symptom of fever and ague, or other similar endemic, so often generated in positions of a like description.

"On the verge of the second, or central, division a marked change commences. The copious rains which fall in the lower district are greatly modified after we pass the mountainous ridge through which the river bursts near Yale. Evidences of a drier climate appear at every step. The character of the vegetation changes. About Lytton the cactus begins to appear. In spots along the Thompson the artemisia, and other shrubs indicative of a dry and hot climate, are found: and in lieu of the thickly-wooded luxuriance of the lower region, a succession of open valleys, covered with fine pasture and bordered by grassy hills in parts more or less wooded, delights the eye of the traveller. Here and there belts of forest intervene; amid which broad expanses of open land lie scattered at intervals. This general description may be regarded as applying to a very large tract of country, extending from Alexandria on the Fraser, in latitude 52° 33′, to the southern boundary line on the Okinagan River: and thence at intervals towards the south-eastern angle of the province.

"The third division of British Columbia, from Alexandria to the Mountains, varies materially from the other two. The agricultural region, properly so called, may be said to terminate in the vicinity of Alexandria; though there are many small spots beyond that point which may be advantageously cultivated for culinary vegetables and the harder cereals. Generally speaking it is a wooded country, through which many open spots of excellent soil are interspersed, with large tracts of luxuriant pasture—especially in the direction of Fraser and Stuart Lakes, and in the Chilcotin country. From Fort George, however, up the main branch of the Fraser to Tête Jaune Cache, none of these open places appear: and though many cultivable patches along the river banks might, in parts be readily cleared, it is probable that the occurrence of summer night-frosts would prevent the growth of any save the hardier vegetables. Fraser Lake, however, and the neighboring lake of Stuart, have been for many years the scene of agricultural operations on a small scale, at the Posts, formerly of the North-West, and since the coalition of 1821, of the Hudson's Bay Company. At the former place, especially, these limited operations were invariably successful. Potatoes, turnips, and other vegetables throve wonderfully. Barley yielded invariably a heavy return; and though wheat was cultivated occasionally only, on a very small scale, and rather experimentally than as a crop, it ripened well in favorable positions. The pasture in these vicinities is of the most luxuriant description, consisting of fine natural grasses intermixed with a nutritious kind of wild pea, or vetch. Cattle and horses of course thrive well; but the necessity of providing fodder against the lengthened winter of those elevated parts, discourages their being raised beyond a limited extent.

"This upper region, however, is to be considered more especially as the mining district: and any partial cultivation that may be attempted to meet an extended market in connection with the mines, must be regarded only as subsidiary to the main supply, derived from a remoter source."

Geological Survey of Canada, 1874-5. Report by Mr. James Richardson, pp. 74-5.

* * * "Deposits of stratified clay, sand, and gravel are of rare occurrence; but around the shores and on the lower parts of the mountains, the rocks are for the most part overlaid by a thin layer of black vegetable soil, which supports a tolerably thick forest, consisting of white spruce, white pine, and cedar, many of the trees measuring from two to three feet at the base, and running up from 40 to 60 feet without a branch. The great extent of these forests, and their proximity to navigable waters, are elements which at no distant date will probably make them of very considerable value and importance."

Report of the Select Committee on Immigration and Colonization, House of Commons, Canada. Professor Macoun's Evidence, pp. 34-5.

"*Q.* How do the valleys in British Columbia compare in extent with our general views of valleys?

"*A.* The British Columbian valleys are more of the nature of ravines (I speak of those in the dry country) than anything else, but there are many level terraces, ('benches') which may be termed valleys, scattered all over the country traversed by me. River valleys in British Columbia, except in the third district, have no existence. Every river seen by me in the middle region ran at the bottom of a gorge, usually called a Canyon, and had not one foot of a valley. The valley of the Lower Fraser is a true valley of deposition, and is altogether composed of the alluvium brought down by the river; one drawback in connection with it, is the destruction caused every year by the river cutting into its banks and wasting the land along them. At Sumas this is going on so fast that houses have had to be removed already.

"*Q.* What is the nature of the soil in the valleys? Do you find rich alluvial deposits in the valleys, or are they covered with the *debris* of rocky fragments washed from the mountains?

"*A.* The soil in the valleys, whether they are narrow or wide, ('benches') or otherwise, is always good. The valleys are partly alluvium and partly the detritus washed down from the hills. Apparently there was a time when the rivers stood much

higher than they do now, and the ('benches') which show along their sides were then about on a flood level with the river. Since then the river has successively broken through the barriers which confined it, and left these terraces ('benches') at various heights. The slopes of all the hills are more or less grassy, and the valleys along their base have scarcely any loose stone upon them in consequence.

"*Q.* Have you a knowledge of the temperature? If so, how does the thermometer range during the summer and winter months, both on the coast and inland? Are summer frosts prevalent and injurious to crops?

"*A.* I was in Victoria from the 12th to 28th December, 1872, and from the 2nd to 14th May, last year. While I was in Victoria in 1872, a fall of snow and slight frost took place, and the papers came out next day with an account of the extraordinarily cold weather, and I was led to infer from that, that such weather was not common in winter. Jessamine, roses, and violets were in flower, and everything betokened a mild winter. The summer on the coast is everything that can be desired, being dry and pleasant.

"In the arid region the spring is about as early as on the coast; the winter is comparatively cold, with very little snow, and the summer is dry and hot. Summer frosts can do no harm in these regions.

"From Clinton upwards the winter is very cold with a considerable snow-fall and frosts extending through the month of May, and possibly into June. I heard of no injury from frosts at Quesnelle or any point on the Fraser, but noticed frost on the grass on the 27th May, at or near Soda Creek. From this date until the 4th June, the weather kept cold, but there was no frost. On the 28th June at MacLeod's Lake, lat. 55°, there was a severe frost, and many wild flowers were injured, but nothing was hurt in the garden.

* * * * * * *

"*Q.* What are the facilities for reaching the cultivable plateaux from the seaboard?

"*A.* From Victoria to Westminster and Yale by steamboat; then by waggon road along the canyons of the Fraser and Thompson to Spence's Bridge on the latter river. From here a 'trail' leads up the Nicola Valley for an unknown distance. Thirty-two miles beyond this point, at Cache Creek, a road leads to Kamloops and the waggon road passes on to Barkerville in Cariboo. Except a branch road passing from Clinton to Lilloet on the Fraser, I know of no other roads in the country."

Central Plateau.

Four Years in British Columbia. By Commander R. C. Mayne, R.N., F.R.G.S., pp. 382-3.

* * * "The natural resources of British Columbia, independently of its mineral wealth, are such as to make it well worthy of the consideration of agricultural settlers.

"After the Cascade Range is passed, the country assumes an entirely different aspect from that of the coast. The dense pine-forests cease, and the land becomes open, clear, and in the spring and summer time covered with bunch-grass, which affords excellent grazing for cattle. Although this country may rightly be called open, that word should not be understood in the sense in which an Australian settler, for instance, would accept it. There are no enormous prairies here, as there, without a hill or wood to break the monotony of the scene far as the eye can reach. It is rather what the Californians term 'rolling country' broken up into pleasant valleys and sheltered by mountain ridges of various height. These hills are usually well clothed with timber, but with little, if any, undergrowth. The valleys are generally clear of wood, except along the banks of the streams which traverse them. * * * The timber upon the hills is very light compared with its growth upon the coast. * * *

"Governor Douglas, speaking of this district says:—

' "The district is exceedingly beautiful and picturesque, being composed of a succession of hills and valleys, lakes and rivers, exhibiting to the traveller accustomed to the endless forests of the coast districts the unusual and grateful spectacle of miles of green hills crowning slopes and level meadows, almost without a bush or tree to obstruct the view, and even to the very hill tops producing an abundant growth of grass. * * * It has certainly never been my good fortune to visit a country more pleasing to the eye, or possessing a more healthy and agreeable climate." '

Report by Lieut. H. Spencer Palmer, Royal Engineers, on the North Bentinck Arm and the route thence through the Cascade chain of mountains to the interior of British Columbia.

* * * "The belt of country lying between the Summit Lake and the Chilcotin River, presents more attractive features than any other portion of the route. Ranges of rolling hills of as much as 1,000 feet in height enclose broad, open valleys watered by gentle streams, and embellished with chains of picturesque lakes. Although considerable tracts of dense forests are met with on the heights and on the mountain slopes, this gives way in the lowlands to an open-timbered grassy country, such as is met with in the Similkameen and other well known districts of British Columbia, and the valleys also embrace numerous comparatively level, open praries of various extent, which afford bunch-grass pasturage in fair abundance and will probably be found to be convenient wintering posts. * * *

"As regards routes from the coast, the impression conveyed by this glimpse at a very large tract of country is that on

emerging from the Cascade Range, the principal difficulties of travel are passed and that, thence, there is no impracticability in making a road across the plateau to strike the Fraser at almost any point. * * * The determination of the best line through so extensive a district would necessarily be a labor involving weeks or even months of exploration, the main object of course being to avoid as far as possible the lakes and swamps, and, guided by the relative geographical position of the termini, to lay out as straight a road as the natural features of the country admit of. * * *

"Recurring once more to the route across the plateau, I must notice, as one of its most prominent features, the almost entire absence of hills between the Precipice and Alexander, the valleys of the Pootzeako and the Chilcotin, and the final descent to the Fraser being the only points where hills worth mention occur. Swamps are very general, probably, in all, the actual extent of swamps traversed, in pieces from 20 to 400 yards in length, does not exceed ten miles. * * *

"Of the climate of the plateau I can not give any reliable data, though it is probable that owing to its great altitude, which from the slide eastwards nearly everywhere exceeds 2,000 feet, and reaches to more than 4,000 feet above the level of the sea. * * *

"Bentinck Arm route is unlikely, for the present at least, to acquire importance as an arterial highway. * * * Bute Inlet appears to possess far greater advantages of geographical position, and we learn from the admiralty survey that there is a passable anchorage at its head."

Report of Select Committee, House of Commons, Canada, on Immigration and Colonization, 1876. Prof. Macoun's Evidence, p. 33.

"Between Quesnelle and Fort St. James, on Stewart's Luke, is a wide extent of country (180 miles) with a very diversified aspect, and a cool, moist climate. The valley of the Nechaco River is very wide and perfectly level. On both sides of the river are beautiful prairies and poplar copsewood, and at the time we passed (June 15th) through it, everything looked beautiful and inviting.

"I cannot speak with certainty of the absence or occurrence of summer frosts, but if they should not be severe this would be one of the finest tracts. (Nechaco Valley) in all British Columbia.

"The whole country above Quesnelle seems to have a cool, moist climate, and to be more like Quebec in its productions than Ontario. Fort St. James, on Stewart's Lake—the highest point in the district—has always been known to produce garden vegetables, potatoes, barley and oats, but whether wheat has ever been raised or not I am unable to say. All this region is an elevated plateau with broken, rocky hills at intervals, but scarcely anything which could be called a mountain. Should the railway pass as far north as the Neshaw, many fine settlements would spring up along the river.

Four Years in British Columbia. By Commander R. C. Mayne, R.N., F.R.G.S. p. 146.

* * * "When Sir Alexander Mackenzie explored this part of the country, he appears to have ascended the West Road River from the Fraser, and then, crossing the ridge forming the watershed, to have descended to the sea. His route has never been exactly followed; but in 1860 Mr. Colin McKenzie crossed from Alexandria to the same place on the coast, viz: Rascals' Village or Bella-houla Bay, in thirteen days by way of Chilcotin Lake. His party travelled the greater portion of the way on horseback. Mr. McKenzie told me that they might have taken their animals all the way by changing the route a little. On their way back, indeed, they did so. The ascent to the watershed was, he said, so gradual, that they only knew they had passed the summit by finding that the streams ran west, instead of east."

Ibid, p. 148.

* * * "The trail runs the whole distance from Alexandria to Coast Range on a kind of tableland, which is studded in every direction with lakes and meadows. The streams are numerous but small and shallow, in fact, mere creeks. There are some swamps. * * * There is plenty of fallen timber; but it is light and could easily be cleared."

Proposed Overland Railroad. By Alfred Waddington, p. 19.

* * * "The road would cross the rich Chilcotin plain in a south-westerly direction. * * * This slightly rolling, fertile plain offers every facility for a railway."

Travels in British Columbia. By Capt. C. E. Barrett-Lennard, p. 208.

* * * "So far as reaching the Fraser from the coast is concerned, the Bute Inlet route has the advantage of being the shorter way by 20 miles, which is much more accessible from Victoria than Bentinck Arm."

The Dominion at the West. By Alex. Caulfield Anderson, J.P., p. 5.

* * * "The coast range (*i. e.* the chain of mountains lying between the interior of the province and the seaboard) commences above New Westminster, and extends parallel with the coast, as far as Mount St. Elias at the northern extremity. * *

"A reference to the map will show that the North-west Coast from San Francisco upwards as far as the Strait of Fuca, presents a line remarkably free from indentation. Thence northward, however, the coast is broken up into a perfect maze of inlets, forming in their ramifications countless islands of greater or less extent. The minute exploration of this extraordinary archipelago by Vancouver, in the years 1791-93, has given us maps the accuracy of which under the circumstances has excited the admiration of succeeding navigators. Outside of the archipelago lie two principal islands, Vancouver and Queen Charlotte, divided from each other by a broad sound, and extending from the Strait of Fuca on the South to the frontier of Alaska on the North. The southern island, named by the explorer *Quadra and Vancouver's Island*, after the Spanish Commander then on the station and himself, formed originally, with its dependencies, the Colony of Vancouver Island. It extends in a north-western direction from lat. 48° 20′ to lat. 51°, in length nearly 250 geographical miles; its greatest breadth, opposite to Nootka, being about seventy. Victoria, the seat of Government and Capital of the Province, is situated near the south-eastern extremity of the island, where the adjoining Strait of Fuca is about seventeen miles in breadth. This strait, extending into the United States Territory by the inlet terminating in Puget Sound on the south, expands northward into the Gulf of Georgia, which extends to lat. 50°. This portion of the dividing channel in no part exceeds 20 miles in width; contracting afterwards into Johnstone's Strait, which, at the narrowest part, does not exceed two miles."

The Hudson's Bay Territories. By R. M. Martin, p. 27.

* * * "The coast abounds with harbors, inlets and islands, of which latter that called Vancouver, or Quadra is the largest and most important to Great Britain, from its position at the termination of the United States boundary, in the 49th parallel of latitude, and from its fine harbors, there being no haven between the Straits of Juan de Fuca and San Francisco, in California.

* * * "The islands within the British dominions are of various sizes; the largest, named 'Queen Charlotte's Island,' is somewhat of a triangular form, lying nearly north and south; the south point in the parallel of 52°. The superficial area is less than that of Vancouver Island, it has several good harbors. * * * The country around some of these harbors is said by the Americans to be fertile, and the climate comparatively mild.

"The Princess Royal Islands lie nearer to the mainland between the parallel of 51° and 54° north latitude. * * * The adjacent coast is of very irregular outline, with numerous bays, inlets, tortuous channels, forming a labyrinth of passages. Simpson's River, on our north-west boundary, has a deep inlet and communicates with Babine Lake."

Ibid, p. 33.

* * * "There is coal in the neighborhood of Puget's Sound, and on the Cowlitz River.

"The specimens of lead found in the mountains on the coast are apparently very fine.

"The fisheries (salmon and sturgeon) are inexhaustible, and game of all descriptions are said to abound.

"The timber is extremely luxuriant, and increases in value, as you reach a more northern latitude—that in 50° to 54° being considered the best, Pine, spruce, red and white oak, ash, cedar, arbutus, poplar, maple, willow, and yew, grow in this section of country, north of the Columbia River. The cedar and pine become of immense size."

Ibid, p. 35. Report of Lieut. Vavasour, R.E.

* * * "The Straits of Juan de Fuca, which separate Vancouver Island from the mainland, may be safely navigated; the shores are straight and bold; on the south composed of perpendicular cliffs that run back in high and rugged peaks, on the north rocky, and in some places of reddish granite."

Navigation.

Facts and Figures relating to Vancouver Island and British Columbia. By J. Despard Pemberton, p. 9.

* * * "It appears far from improbable that this strait (San Juan de Fuca) will ultimately become the great commercial thoroughfare for the commerce of the north Pacific, and that Juan de Fuca, when he discovered it 260 years ago, was right in his conjecture that he had found the north-west passage. This idea is strengthened by an examination of the ports which lie between San Francisco and the strait. That this coast line, nearly 600 miles in length, should not possess a single respectable harbor is a very remarkable fact."

Ibid, p. 11.

* * * "The Strait of San Juan de Fuca is, on an average, eleven miles wide, and is free from sunken rocks or shoals; its direction is east to west for about 70 miles to its junction with the channels, which lead by a northerly course into the Gulf of Georgia, which separates Vancouver Island from the Continent. The approach is safe for all descriptions of vessels, being liable to no other dangers than those incident to gales from the south-east, which, with considerable intervals of tranquil weather, are, in winter, not uncommon, and to fogs, or rather dense smoke arising from forests on fire in autumn. Although in the latter case soundings are a safeguard, and good anchorage can generally be found within a mile of either shore.

"The facility for entering and navigating this strait has been greatly increased by the erection of lighthouses on the south shore by the United States Government, and on the north by the British."

Ibid, p. 12.

* * * Once within the strait, on both coasts safe anchorage and good harbors are everywhere met with. * * * That harbors such as these should occur at the limit of sailing navigation is a very happy circumstance for these colonies. The waters of the Gulf of Georgia are well adapted for steamers, but, there, uncertain tides and variable winds, fogs, currents, hidden dangers and detention, practically exclude sailing vessels."

Ibid, p. 13.

"That these harbors are connected with upwards of 100,000 acres of arable land in the background is a strong recommendation for them.

* * "If a ship, running from a storm in the Pacific, having entered the strait, should be baffled in her endeavours to reach the harbor or anchorages on the north shore, the winds preventing must be fair to take her into Neah Bay, Calum Bay, Port Angelos, or Port Townsend, on the south shore.

* * * "Enough has perhaps been said to show that the facilities for navigation in the vicinity of these colonies is unrivalled, and that there is no want of harbour accommodation.

"Of those deep saltwater inlets, with which the coast abounds, I may here mention two peculiarities. At the head of every one of those that I have ever visited a fresh water stream is found. The second peculiarity is the frequency in them of gorges or contractions."

Ibid, pp. 16-17.

* * * "The interior of British Columbia is everywhere intersected by natural water communications, in which respect it greatly resembles the Canadas."

Fisheries.

Report of Select Committee, on Immigration and Colonization. House of Commons, Canada, 1876. pp. 36-7.

"*Q.* Are there any extensive fisheries on the rivers or coasts? What kind of fish are caught, are they exported and to what extent?

"*A.* From the boundary line to Alaska there is not a bay, ford or river that is not teeming with fish. Salmon are caught in great numbers, both in spring, summer and autumn. Last spring large quantities of fish were being caught at New Westminster for export. An establishment for the canning of salmon has been established there, and it is to be hoped that this is the beginning of a very prosperous business. Salmon ascend the Fraser all the way to Stewart's Lake, which they reach about the month of August; they likewise ascend the Skeena into the Babine Lake, and are caught by the Indians and the Hudson Bay Company's people and dried for winter's use. The salmon of Babine Lake are both larger and fatter than those caught in Stewart's Lake, and are therefore brought across to supply Fort St. James with food in winter.

"Sturgeon 700 lbs. weight are often caught in the above-mentioned lakes, and every lake and stream in Upper British Columbia teems with trout of different species, besides many other varieties of less value.

"Of salt water fish I know but little, except one small one—the 'Houlican'—which I saw in the Fraser in myriads last spring. Many were lying dead along the river and served as food for various animals. Halibut were very plentiful in Victoria, and many other seafish of which I did not learn the names. I believe the fisheries of British Columbia, if properly conducted, would eventually be as profitable as those of the Gulf of St. Lawrence.

Desolation Sound.

Report of Mr. William Downie to Governor James Douglas.

* * * "We arrived safe in Desolation Sound, which does certainly look somewhat desolate in a snow-storm; but I am well pleased with the prospect of this section. This is the first time I have seen pure veins of sulphuret of iron, which looks very much like silver. I came across a number of seams of the same kind. It lies in the quartz, the same as gold.

* * * "Bute Inlet (Homathco), that runs so much further north than this inlet, has a large river emptying into it from the north-west. * * We went up the river about five miles. The Indians told me it would take five days to go to the head of it. Judging from the way a canoe goes up such rivers, the distance would be about 60 miles. * * * It is very evident there is a pass in the Coast Range here that will make it preferable to Jervis Inlet or Howe Sound. * * It will not be difficult to make a road along the banks of the river."

Soil, Climate, Productions, &c.

The new El Dorado; or British Columbia. By Kinahan Cornwallis, Cap. V, p. 37.

* * * "The soil (of British Columbia) varies from a deep black vegetable loam to a light brown loamy earth. The hills are generally basalt, stone, and slate. The surface is generally undulating, well watered, well wooded, and well adapted for agriculture and pasturage. The timber consists principally of pine, fir, spruce, oak (white and red), ash, yew, arbutus, cedar, arborvitæ, poplar, maple, willow, cherry, and tea. All kinds of grain, including wheat, may be raised in abundance."

Ibid, p. 42.

* * * "In November the winter sets in, mildly freezing the lakes and smaller rivers. The cold, however, is not so intense as might be imagined in such a country, being far less severe than that of any part of Canada."

Ibid, p. 43.

* * * "Coal abounds over the whole of the north-eastern territory; from latitude 50 deg. 36 m., to Cape Scott at its southern extremity."

Ibid, p. 44.

* * * "The coal can be worked at a comparatively small expense over a field of such extent. Some of it has been brought to England, and answered exceedingly well in forges."

Four Years in British Columbia, by Commander R. C. Mayne, R.N., F.R.G.S., p. 390.

* * * "In the northern part of the colony (Columbia), from Alexandria upwards, the soil, wherever it has been tried by the Hudson's Bay Company's people has been found good. * * * Mr. McLean, who lived many years at Alexandria, told me that he had known a bushel of wheat planted there yield 40 bushels; but this was considerably more than an average produce. Of the upper posts, Mr. Manson, who was seven years at Fort St. James, told me the soil is good, but the crops, except barley, are almost always nipped by frost. At Fraser Fort, which is in nearly the same latitude as Fort James, but considerably to the westward of it, vegetation thrives much better, and barley, peas, turnips, and potatoes, almost always yield good crops. The country southward of Fraser Fort and down to the Chilcotin River, I was told by Mr. McLean, as well as by a settler I met at Pavillion, contained very good farming land."

Facts and Figures relating to Vancouver Island and British Columbia. By J. D. Pemberton, pp. 19-20.

* * * "The soil, where it is richest, in the river deltas, the valleys, and the plains, usually consists of black vegetable mould, six inches to three feet in depth, overlaying a deep substratum of clay, gravel or sand.

* * * "The fertility of the soil in the neighborhood of the gold-bearing rocks is very remarkable, and is indicated rather by the production from ordinary seed of gigantic roots and vegetables, and fruits, than by crops of grain."

Report of Select Committee on Immigration and Colonization, House of Commons, Canada, 1876. Prof. Macoun's Evidence, p. 36.

"*Q.* Are the extremes of cold and heat inconvenient or oppressive to Canadian or European settlers, or injurious to health? Is the climate conducive to longevity?

"*A.* The climate of the coast is so much like that of England, that there should be no better climate for natives of Great Britain; while that of the mainland above the Cascades ought to be exactly suited to Canadians, as the climate is nearly the same as we have in the east, except that it is drier for the most part. I think that on the whole British Columbia has a very healthy climate, and one that would tend to long life.

"*Q.* What natural fruits have you discovered in British Columbia; and could fruit be cultivated successfully?

"A. Various species of raspberries, currants, gooseberries, strawberries, and blueberries are found throughout the country. The Oregon grape (*Berberis aquifolium* and *nervosa*) extends all the way from Vancouver to lat. 55° in the interior, and to Alaska along the coast.

"Perhaps there is no better place in the world for raising fruit than Victoria. Apples and pears of a very large size are produced in such abundance that the former can hardly be sold at any price. The orchards are all in the low wet grounds and will begin to decay in a few years, whereas if they were planted among the rocks where the oak grows, the trees would live longer and probably produce better fruit. I can see no reason why grapes could not be produced in abundance on any part of Vancouver, if the summer temperature is high enough. After the railway is built Vancouver will send immense quantities of fruit into the interior as it can be raised to any extent and of every kind."

Ibid, p. 37.

"*Q.* Do you know from actual observation whether any intertropical currents and prevailing winds flowing along the coast of Vancouver and British Columbia have a tendency to ameliorate the climate in a similar manner as the Gulf Stream affects the Maritime Provinces?

"*A.* I know nothing of it from actual observation, but that it is so is a demonstrated fact.

"About the island of Formosa, on the eastern coast of China, a current analogous to the Gulf Stream is observed moving to the north-east. It passes Japan, and part of it enters Behring's Sea and warms the northern part of Alaska, while the other part is deflected farther to the east and passes down the West Coast of America, carrying with it the heat necessary to produce the exceptionally warm climate of Vancouver and the West Coast generally. It is this stream which gives the heat and moisture that are the cause of the magnificent forests found from Alaska southwards. The forests of Norway and those of Western America are the product of the two great currents—the 'Gulf Stream' on the east and 'Kuro Siwo' on the west, and sceptics may rest assured that the value of the West Coast timber far exceeds that of the Eastern Provinces."

Gold Fields.

Facts and Figures relating to Vancouver Island and British Columbia. By J. Despard Pemberton, p. 36.

* * * "The wide distribution of gold in British Columbia is very striking: traversing the country diagonally from north to south, the Fraser River everywhere passes through a gold country. The same may be said of the Thompson River, and of the Columbia north of 49°. * * * As a rule, the gold is found in much smaller particles, and less in quantity nearer the mouths of these rivers, and both size and quantity increase as we ascend them."

Travels in British Columbia. By Capt. C. E. Barrett Lennard, p. 173.

* * * "The gold regions of British Columbia lie between these (the coast) ranges of mountains and the great central chain of the North American Continent, the Rocky Mountains. In the more level districts between these various mountain ranges we meet with vast areas of fertile land, destined hereafter to become important agricultural and pastoral countries."

Report of Select Committee on Immigration and Colonization, House of Commons, Canada, 1876. Prof. Macoun's Evidence, p. 37.

"*Q.* What are the mineral interests of British Columbia? Are they developed to any extent? Would encouragement to mining interests develope agricultural interests and increase immigration to the Province?

"*A.* Gold has been found in paying quantities at Okanagan on the American Boundary,—at Shuswap Lake—at Cariboo—on the Ominica—on the Stickeen—and latterly at Cassiar, and an examination of the map will show that all this gold is produced from mountains lying between the Rockies and the Cascades. Copper, iron, and silver have been found at various points in the Cascades, and coal is abundant on Vancouver and Queen Charlotte's Islands. I just mention these and ask: Are these all, or are they merely indications of what is to come? After having travelled over 1,000 miles through British Columbia, I can say with safety that there will yet be taken out of her mines wealth enough to build the Pacific Railway. Consider that gold has been found in paying quantities, at various points, along a north-west line for more than ten degrees of latitude, before you decide that the foregoing statement is that of an enthusiast.

"Cariboo is really the only point where the gold interest has been developed. Coal is mined at Nanaimo, and these constitute the developed mining interests of British Columbia. Gold has been found on Vancouver itself, and there is no reason why it should not pay for the working."

Export of Gold.

The Dominion at the West. By Alex. C. Anderson, J.P., Appendix F.

"Shipment of gold, product of the British Columbia mines from the year 1858 to 1871 inclusive, $21,278,946.63.

"The foregoing may be accepted as a correct return as far as the records show; but it does not convey a just impression of the whole gold-produce of the country, owing to the large amounts taken away in private hands, the aggregate of which it is impossible to estimate."

Altitudes.

The Dominion at the West. By Alex. Caulfield Anderson, J.P., 1872, p. 30, Appendix.

"Approximate altitudes above the sea of some places in British Columbia, from observations by officers of the Royal Engineers.

Fort Alexandria, Fraser level,	1,420	feet.
Fraser River at mouth of Quesnel River,	1,490	"
do do do Swift do	1,530	"
do at Fort George,	1,690	"
Lillooet Lake,	620	"
Summit do (Lillooet route)	1,482	"
Summit altitude of trail Chilcotin Plateau,	4,360	"
Summit Lake, on do do do	4,020	"

Economic Minerals.

Travels in British Columbia. By Capt. C. E. Barrett Lennard, pp. 157-8.

* * * "Of the mineral productions of British Columbia, it is difficult as yet to speak with perfect confidence, save as regards the now world-notorious fact of its auriferous wealth. Both silver and copper are known to exist in considerable quantities, and mines of both metals have recently been opened. I have frequently seen specimens of silver ore brought by Indians to Victoria, from districts lying adjacent to the sea coast.

"Coal is known to exist in various districts of British Columbia. Stone, suitable for every purpose of building, only requires to be quarried. Limestone and sandstone are everywhere abundant. Marble, of various kinds, is found in the coast range of mountains. Salt exists in many localities, and is obtained in great quantities from the salt springs of Nanaimo."

Four Years in British Columbia. By Commander R. C. Mayne, R.N. &c., pp. 380-1-2.

* * * "All the north end of Vancouver Island contains coal measures, and some quantity has been taken out a little way to the northward of Fort Rupert. * * It is no exaggeration, indeed, to say, that coal exists all along the shores of both colonies (B. Columbia and Vancouver Island).

* * * "For economic purposes these beds are very valuable.

* * * "It may be remarked that the deeper the workings at Nanaimo are carried the better the quality of the coal becomes."

Geological Survey of Canada, 1872-3, pp. 80-1. Appendix by Dr. Harrington to Mr. Richardson's Report.

* * * "The coal itself is bright, tolerably hard, and not unlike some of the best qualities of English or Welsh coal in appearance. It burns freely with a good heat, but produces a great amount of ash. It is universally used by all Her Majesty's ships on the coast, and by all the colonial and other steamers plying on the coast. It is highly valued as fuel for domestic purposes, both in Victoria, San Francisco and other towns. Gas is manufactured from it in Victoria of good illuminating quality.

* * * "The Vancouver coals are for the most part *true bituminous coals*, and the name of 'lignite' which has been applied to them by a number of writers, is altogether a misnomer.

* * * "I have recently examined specimens (of Queen Charlotte Islands coal) collected by Mr. Richardson and found them to be true anthracites.

Iron Ores.

Geological Survey of Canada, 1873-4. Report by Mr. Richardson, p. 100.

* * * "These ores could scarcely be more favorably situated than they are, either as regards mining, smelting or shipment. There is deep water close to the shore, and wharves might be easily and cheaply constructed, at which vessels could always load in safety. * * * The site of the ore is 18 miles from Comox Harbor, 21 miles from Deep Bay, and about 23

miles from Fanny Bay. These are all good and safe harbors, and are only a short distance from the productive coal seams of the Comox area.

"Iron ore is reported to occur also in the following localities:

"1. Fifty yards from the Yale and Cariboo waggon road. * * * It is a magnetic ore, and is stated to occur in a vein eight feet in thickness.

"2. About one mile up the river at the head of Knight's Inlet.

"3. Six miles west from Menzie's Bay, V. I., near Seymour Narrows, close to some of the coal seams of the Comox area.

"4. On the west side of Fitz Hugh Sound, at the entrance to River's Inlet.

"5. Iron ore is said to occur on the shores of a bay to the south-east of Cape Commerell, at the north-west end of Vancouver Island."

Attractions for Settlement.

The Dominion at the West. By A. C. Anderson, J.P., p. 87.

"The general advantages of British Columbia as a field for immigration may be briefly summed.

"A temperate climate, remarkably salubrious in its character; a fertile soil easily brought into cultivation; rich and extensive pastures; abundant natural resources for procuring food; land cheaply, if not gratuitously, attainable by the industrious; good government under a liberal constitution; security of life and property under rigidly executed laws; facilities for religious worship for every denomination; a liberal system of education, free of cost; ready and cheap postal communication with all parts of the world; telegraphic facilities through the United States to Canada and Europe; a wide and constantly extending market, soon to be enormously increased by the progress of the Canadian Pacific Railway and other concomitant enterprises."

Trade and Commerce.

Travels British Columbia. By Capt. C. E. Barrett Lennard., p. 181.

* * * "The situation of British Columbia and Vancouver Island, on the Pacific, is admirably adapted for carrying on a trade with China, Japan, India, and Australia, and it is not too much to suppose that these colonies must become the great highway for traffic between the above-mentioned countries and England, in the event of completion of this line of railroad. The distance between London and Pekin would by this means be reduced some ten thousand miles, and the entire journey would probably not occupy more than a month or five weeks—while Vancouver itself would be brought some five or six thousand miles nearer to this country (England) than ever by the short overland route of Panama."

Ibid, p. 182.

* * * "What a grand future would the construction of such a line of railroad open for these remote dependencies of the British Crown on the Pacific! What a glorious day would that be for British Columbia, when, vessels sailing from India, China, and Australia should meet at some point on her coasts, to land their passengers and discharge their cargoes, returning again laden with articles of our own manufacture! Numbers of those passengers to India, China, and Australia, who now go by the way of the Cape of Good Hope, or by Suez, would in preference select the inter-oceanic railway of Canada, as both cheaper and more expeditious. The saving in the time of transit to China, especially to the more northern portions of that empire, and to Japan, would be very great, and the mercantile community, both in England and in the east, would be greatly benefited by the establishment of a constant, speedy, and safe means of communication passing through British territory.

"Another great advantage to be derived from the establishment of a line of communication between the Atlantic and Pacific through British territory, would be the facilities it would afford for the transport of troops, stores, and artillery to any point along the frontier line or on the coast of the Pacific."

Ibid, p. 184.

* * * "The advantages that would accrue to Great Britain from the entire service being performed through British territory are incalculable. The construction of the railway would not merely open to civilization a large territory in British North America, hitherto almost unexplored, but it would open up to the cultivators of the soil, in that territory and in Canada, a means of transit to all the markets of the Pacific, and an open passage to the China seas, and to our possessions in the East Indies; in every aspect, whether viewed politically, socially, or commercially, the establishment of the proposed railway would give a progressive impulse to the affairs of the world, which in its results, would eclipse anything that has been witnessed even amid the extraordinary achievements of the present century."

Ibid, p. 185.

* * * "An attempt will be made to carry out the long projected idea of an overland communication from Lake Superior by the Red River, Lake Winnipeg, and the Saskatchewan, to the foot of the Rocky Mountains, and finally across them into British Columbia. The opening up of this route would not only confer an immense benefit on the last-mentioned place, but would tend greatly to develope the natural resources of the country through which it passes, which are evidently very great. The climate is by no means so severe as might be expected from the latitude, herds of buffalo being found as far north as parallel 60°. Indian corn ripens on the Saskatchewan. The rivers are free from ice on the beginning of May; wheat sown shortly after in the valley of the Red River may be gathered in the month of August. In addition to these natural advantages of soil and climate, gold is known to exist in the valley of the Saskatchewan, as well as in that of the Athabasca."

The Employment of the People and the Capital of Great Britain, a letter from Major Robert Carmichael Smyth, to his friend the author of the Clockmaker, 1849, p. 16.

* * * "One view of the map of the world will show that the proposed terminus of the Atlantic and Pacific Railway, taken as a centre, would bring new Zealand, New South Wales, in fact, Australia, New Guinea, Borneo, Canton, Pekin, all within fifty days sail of that point; and taking the Sandwich Islands as a centre point, (where there is a fine harbor, and where a depot of coals might be established), which would be reached in ten days, all the above-named places would be brought within twenty days for steam navigation, other points, such as the Friendly Islands, &c., might be selected for further depots of coal. Again, from the terminus of the proposed railway the mails from England could be despatched to all the before-mentioned places. * * * Last, though not least, of all, this railway route across the continent of North America would ensure to England at all times a free communication with her East India possessions. * * * The proposed line across the continent of America would be within our own dominions, and would not oblige us to interfere or meddle with any continental wars to enjoy its free use. No time ought to be lost in the commencement of this national undertaking."

Ibid, p. 20.

* * * "It appears to me impossible that such a powerful and wealthy company as the Hudson's Bay, such magnificent colonies as our North American Provinces, and such a power as Great Britain, can balance for one moment in their minds whether loss or profit must attend the undertaking and completion of such a railway."

The Dominion at the West. By A. C. Anderson, J.P., pp. 69-70.

* * * "With reference to the commerce of the East, if it be not paradoxical to term that the East which we are now approaching from the contrary direction—the following consideration may be noted. Assuming Yokohama, in Japan, for a starting point, the direct distance to Esquimalt may be taken, in round numbers, at about 4,200 geographical miles; equal to about a month's voyage of a sailing vessel. Canton is probably about a fortnight farther, in point of time. Measured across the map, San Francisco may be regarded as equidistant. The actual distance necessary to be traversed by a sailing vessel in order to reach that port is, however, considerably greater: as will appear from the following remarks which I find quoted from a recognised authority of the highest standing—Professor Maury, of Washington. 'The trade winds place Vancouver Island on the wayside of the road from China and Japan to San Francisco so completely, that a sailing vessel trading under canvas to the latter place, would take the same route as if she were bound for Vancouver Island. So that all return cargoes would naturally come there in order to save two or three weeks, besides risk and expense.' Hence it is manifest that the Canadian Pacific Railway, terminating at Esquimalt—and in a minor degree the projected Northern Pacific Railway, owing to the perversities of the inland navigation necessary to reach its proposed terminus—would possess a great advantage over the line, now in operation, from San Francisco to New York. The last-named port, moreover—about equidistant from Liverpool or London with Montreal—is considerably farther than Halifax, to which point it would be necessary to extend the transport during the period of closed-navigation of the St. Lawrence. This necessity would involve a further land-transport of 482 miles, by the Intercolonial Railway now in operation: but then the shipping point on the Atlantic would be some five hundred miles nearer to England than is New York. Hence it is obvious that the route now under process of survey, if the foregoing estimates be nearly correct, presents the advantage, as from China to England, of some seven hundred miles over the projected Northern Pacific Railway; and, under the consideration advanced by Professor Maury, of more than a thousand over the present route by San Francisco."

Snow Fall.

The Dominion at the West. By Alex. C. Anderson, J.P., pp. 66-7.

"The Pass by the heads of the Miette and the Fraser is so gradual of ascent, with so few obstacles worthy of consideration, that it may be characterized almost as a natural road. Its shortness and directness with regard to the probable terminus on the

Pacific Coast, give it moreover an advantage over any other line of approach: and although the depth of snow at the summit, during winter, is much greater than I have seen gravely stated, there is far less than by any other Pass with which I am acquainted, either from personal observation or report. The snow, too, through the effects of certain natural phenomena which here prevail, and for which I do not profess to account, becomes, more compacted, consequently does not drift in an equal degree, and is therefore in all respects more manageable than elsewhere. The importance of this consideration is material; bearing in mind that the stoppages upon the Union Pacific Railway during the past winter arose chiefly from drift.

"It is a curious fact that, in the valley of the Athabasca, upon this line of transit, for a distance of thirty miles or more both above and below Jasper House, the snow never accumulates. There is constant grass: and the large herds of horses formerly kept there by the Hudson's Bay Company, for transport over the mountains, wintered there, fat, upon the natural pasture. Crossing by this Pass many years ago, on his way from the Saskatchewan, the writer found, in the month of January during a winter of almost unexampled severity, that the snow had entirely disappeared from the immediate banks of the river, at the mouth of the Cranberry Fork, near Tête Jaune Cache; and, for a distance of some forty miles down the Fraser, the ice was perfectly denuded of snow. A warm wind prevailed, accompanied at intervals by a gentle rain. It could only be inferred that this warm current, extending through the Pass, exercised a modifying influence there; and, spreading afterwards through the Jasper's Valley, produced the effects noted. As these effects, however, are known to be constant in the latter-named locality, we may infer that the same cause is likewise constant. I may remark, passingly, that similar effects are also produced in a marked degree in other parts of British Columbia."

Building Stone.

Notes regarding the Stone quarry at Nanaimo. From the Victoria, V. I., "British Colonist" Newspaper,—August, 1872.

"Nanaimo is endowed with greater natural wealth than perhaps, any other part of the wide Dominion of Canada. Her coal measures already opened formed the subject of a recent article. Her coal stores still locked might fill a book. In these practically inexhaustible stores Nanaimo possesses a power which must compel commerce and manufacture to kneel at her feet. But Nanaimo has a mine of wealth of a different kind—the Newcastle Stone Quarry. This quarry has been worked for upwards of two years, and yet it may be said to be scarcely opened. Here are several square miles of a continuous formation of the best free-stone to be found anywhere on the coast. No more conclusive evidence of the superiority of this stone need be sought than the fact that the United States Mint at San Francisco is made of it. The mint cost considerably over a million and a half, and absorbed eight thousand tons of the Newcastle stone. The introduction of this stone for so important a purpose naturally aroused a certain amount of local jealousy and brought out some international prejudice. The consequence was that the stone was subjected to a rather more severe test than would otherwise have been the case. It is gratifying to learn that the United States Inspector has, in his recent final report, given the stone the highest character. To possess a stone quarry so superior in every respect as to command the patronage of San Francisco and overcome the prejudices of the Great Republic is something of which Nanaimo may justly be proud. We have said that the San Francisco Mint took eight thousand tons of this stone. In addition to this it took a large quantity of flagging-stone for court-yard, side-walks, and cellar. In the eight thousand tons were some pieces deserving of specific notice. There were six columns, twenty-eight feet long, by four feet two inches square. Those columns were faultless throughout. There were two stones for corner pediments fifteen tons each, and two key stones of fourteen tons each. One circumstance has tended seriously to lessen the profits of the quarry. Every stone going to make up the eight thousand tons for the mint has been of specific dimensions; and in quarrying to fill the order a great deal of such stone as would be used for smaller buildings or for rubble masonry has gone to waste owing to there being no demand for it. Of this waste stone there has been enough to realize fifty thousand dollars in a market presenting a local demand for it. And yet it has not yielded fifty cents. Nay, to remove it out of the way has cost thousands of dollars. We have said that the quarry is scarcely fairly opened. The last cargo of stone sent to San Francisco has been pronounced of a superior quality to that previously sent. It is well understood that the quality of the stone improves as you go in. The quarry has now an excellent and carefully prepared 'face' on it, from which stone may be taken superior in point of quality to any yet quarried, and of almost any conceivable dimensions. Columns fifty feet long (or one hundred if necessary) by four and a half feet thick can be supplied, without flaw or fault."

APPENDIX TO CHAPTER V.

[The foregoing extracts from independent authorities relating to the British Columbia section give but a meagre and somewhat unsatisfactory description of the country. It has been therefore thought better to print as an appendix the principal portions of the reports of Marcus Smith, Esq., Chief Engineer in British Columbia, of his operations during the years 1874-5. These reports, however, are not conclusive in regard to the country spoken of as the plateau between Fort George and the Cascade Range, as it will be observed that that country was but partially surveyed during these years. The survey is now nearly completed, and will no doubt show a very considerable modification of the grades and engineering difficulties as developed in 1874-5.]

Report of Marcus Smith, Esq., on the operations of 1874.

Gardner Channel Route.

"Entering the Plumper Channel we soon passed the end of the Lama Passage and about 5 p.m., reached Bella Bella on McLaughlin Bay, Campbell Island. Here the Hudson Bay Company have a trading post and the Quokolt tribe of Indians a village and fishing station.

"After an hour's delay we proceeded on our course, leaving the Gunboat Channel on our right, we rounded the north end of Campbell Island and entered the Seaforth Channel on a westward course. In two hours more we were in Millbank Sound which we crossed and got fairly into Finlayson Channel before night set in.

"The islands around Millbank Sound are generally low, intersected with broken ranges of hummocky hills covered with firs and cedars. In crossing the sound we had an extensive view to the north-east. Over the low hills and far in the distance rose a bold range of dome-shaped snow-clad mountains; apparently crossing the heads of the Dean and Gardner Channels, not less than seventy to eighty miles from us. Even at this distance we could perceive by the aid of our field glasses the dark chasms which intersect the range, looking like huge stone walls stretching across the snow line.

"*Sunday, June 7th.*—Having steamed all night, through the Finlayson Channel, Hickish Narrows, Graham and Fraser Reaches and the Ursula Channel, we found ourselves at 8 am., running past the large island in Gardner Channel shewn on Vancouver's chart but not named, and in another hour we found the sloop 'Triumph' anchored in a bight on the north side of the channel, with Mr. Richardson and the men and stores on board. We took the sloop in tow till we reached the mouth of the Kemano River, which enters the north side of the channel about twenty-five miles from its head, where we left the party to commence the survey.

"The Gardner Channel from the island up to this point is from one to two miles in breadth, and of great depth; hemmed in by mountains two to three thousand feet in height and covered to their summits with timber of little value, presenting the same sombre hue that had wearied the eye for several days past.

"As we ascend the channel the rocks become more exposed and rise to a greater altitude, the slopes are steeper, and for long stretches perpendicular cliffs abut on the channel. The Kemano Valley is a half to three quarters of a mile wide where it joins the channel and covered with fir and cedar trees of good size. The river is small but navigable for canoes ten miles up from its mouth. Mr. Horetzky commenced his survey here, the result of which is fully described in his report.

"From this point upwards the shores of the channel become more irregular in outline, and the mountain slopes rise more abruptly; they are partially covered with timber to a height of about 2,000 to 3,000 feet, above which the rocks are bold, scarred and weather stained, and the deep gulches that separate the mountain domes are filled with immense glaciers.

"We were evidently approaching the core of the cascade chain for the mountains became more gloomy and sterile, rising 6,000 to 8,000 feet and capped with permanent snow.

"We reached the head of the channel about noon, and anchored. This resembles the heads of all the inlets we have surveyed. There is a large flat of sand and detritus brought down by the river from the mountains, which is only partially covered at low tide; and with shoal water for half a mile or more; then it shelves down abruptly into very deep water, so that the only anchorage is on the face of this incline and there is very little space for a vessel to swing.

"Kitlope River enters the head of the channel from the east, but was hidden from our view by a rocky bluff or spur 300 to 400 feet high and half a mile long, that shoots out from the south side and partially blocks up the mouth of the valley.

"A smaller stream comes down from the north through a deep and narrow ravine and enters the Kitlope near the head of the channel. After luncheon a boat was manned and, guided by an Indian whom we had picked up, we started up the Kitlope, intending to go to the Indian village but a strong current and a stiff breeze were against us, and we made but slow progress.

"The Kitlope River is about eight hundred feet wide at its mouth; its south bank is the bold rocky slope or cliff above-mentioned, the base of which is washed by the river for about two miles. The opposite side is a low grassy flat about three

hundred yards wide; a slough or branch of the river has cut through the upper portion of this, which we followed up over a mile, passing the nose of the mountain on the north-west side; a little beyond this we rejoined the main river; which here makes a sharp bend across the valley, and washes the base of the cliffs on the north-west side for half a mile.

"This point is about four miles up the river, where it is fully five hundred feet wide, and the valley half to three quarters of a mile. About a mile beyond this the river makes a sharp bend to the south-east, round a mountain spur behind which lies the Indian village. But we had been over three hours in a drenching cold rain—which was snow on the mountains—and we reluctantly resolved to return; we however sent our Indian on foot with a message to the chief asking him to visit us on board the steamer.

"The tide had now risen fully two feet so we made a straight course back and reached the steamer in an hour.

"At 8 p.m., a large canoe came down with the chief and about a dozen Indians, some of whom we engaged for the survey. The little information they could give us about the sources of the Kitlope was not very promising for a passage through the mountains.

"These Indians are an outlying branch of the Chimsains and their dialect is so mixed up with that of the Bella Coola's that Mr. Duncan had difficulty in conversing with them. Mr. Seymour made the chief a present of a shirt with tobacco and pipes for himself and the others, with which they were well satisfied, and they promised to assist the surveying party all they could.

"The Gardner Channel has great depth of water throughout, there are few sheltered places where a large vessel could anchor and lie in safety, and for long stretches the shores are rocky cliffs where no landing could be effected, and they are generally impracticable for a line of railway.

"*Saturday, June 11th.*—At 10.30 a.m., we left Bella Bella, the weather thick, with drizzling rain; within an hour we entered the Gunboat Channel, which is very crooked and at places so narrow between rocks and reefs, covered at high tide, that it is not a safe passage for ocean steamers.

"Soon after noon we entered the Dean Channel, but it rained nearly all day and the mist hung on the mountains, so that we got only occasional glimpses of their summits which were more or less covered with snow and increased in altitude as we ascended the channel; their rugged slopes terminating in cliffs or steep shelves coming down to the water's edge. This Channel is about two miles wide, with very deep water, and no sheltered bays or safe anchorage except near its head.

"In the evening we reached a large flat or tongue of land projecting from the east side more than halfway across the channel. This is six or seven miles from the head of the channel and has been formed with the detritus brought down by the River Kamsquot which issues from a canyon through a screen of rocks, 300 to 400 feet high and half a mile across, connecting the mountains on each side of the valley, and probably at one time it dammed up the river and formed a large lake behind it.

"The flat is about a mile across, twenty feet high near the lower end and about 100 feet where it joins the rock; it is covered with red fir and hemlock a foot to eighteen inches diameter. There is an Indian village, of the Bella Coola tribe, at the mouth of the river. We anchored on the upper side of this flat which forms a well sheltered bay; the shores however shelve down rapidly into deep water, making indifferent anchorage; but wharves for steamers could be constructed at moderate cost.

"Next day a party of us walked over this rocky barrier to the head of the canyon; beyond that, as far as we could see, the rocky slopes of the mountains rise directly from the river.

"In the afternoon steam was got up and we ran to the head of the channel but had some difficulty in finding anchorage; for this, like all the other inlets forming the cascade chain terminates with a low flat shelving abruptly into deep water.

"The Tchatsquot River which comes in at the head of the channel is about 400 feet wide at its mouth. About half a mile up it is divided into two branches and several sloughs, covering nearly the whole of the valley, which is half to three quarters of a mile wide, thickly timbered with red fir, hemlock and cedar. Our guide, Charley, took a party of us in his canoe about a mile up the river to a small Indian village and fishing station.

"*Monday, June 15th.*—At four a.m., steam was up and we proceeded down the channel; at breakfast time we were on the cross channel leading to the Bentinck Arm, and in a few hours more we reached the head of the North Arm. The mountains were partly shrouded in mist but what we could see of them bore a general resemblance to those surrounding Bute Inlet, though the higher ranges behind did not look so broken and were more dome-shaped than peaked. The slopes of those abutting on the arm descend more abruptly to the water than those on the west side of Bute Inlet, and this is the character of all the northern inlets. It would be impracticable to construct a railway on their shores on account of the enormous cost.

"The arm is about two miles wide and the River Bella Coola, or Woodhalk, which enters at its head is about 400 feet wide at its mouth: but a short way up it is divided into several branches and sloughs.

"A party of us went by canoe about a mile up the river to the Indian Village and Hudson Bay Company's trading post. In the garden were fine crops of turnips, carrots, potatoes, &c., but the soil appears rather light and sandy. The valley is covered with fir, hemlock, cedar and a good deal of underbrush.

"I have reason to believe that the description of the pass through the Cascade Mountains, by Lieutenant Palmer in his report of survey is in the main correct, and that no farther survey is necessary.

"Millbank Sound is the best entrance from the Pacific Ocean, to the Gardner and Dean Channel; for, though it is open to

heavy gales from the south-west, the offing is clear of rocks and a very short time will suffice to get into sheltered waters. This is not the case with either the Fitzhugh, Loredo, or Nepean Sounds; all of which have dangerous rocks at their entrance, and are scarcely less subject to gales than Millbank Sound. From Millbank Sound, the course to Gardner Channel is by the Finlayson and Ursula Channels—all good navigation—on our outward trip we passed through these in the night when there was no moonlight.

"From Milllbank Sound to the Dean Channel the most direct course is by Seaforth channel and the Gunboat Passage: but the latter is crooked and narrow, with many rocks and reefs, barely covered at high tide. The better course is by the Laura Passage farther south; or, leaving Seaforth Channel on a north-east course there is a good passage north of that of the Gunboat.

Examination of Passes Through the Cascade Mountains from the River Fraser to the Similkameen.

"I left Victoria on the 26th June, 1874, on a journey through the districts in the southern part of the province; at Fort Hope I met Messrs. Trutch and Cambie, and received their report of an examination of the Passes through the Cascade Mountains, between the Rivers Fraser and Similkameen.

"They commenced at Fort Hope and followed up to the Nicolaume Valley, by the old waggon road, to Summit Lake 12 miles; rising in that distance 2,024 feet or 169½ feet per mile. Thence they descended by the Sumallow Valley to the River Skagit 10½ miles, falling about 21 feet per mile. The height of the last point is 1,900 feet above sea level.

"They followed up the main stream of the Skagit seven miles, rising 90 feet per mile; thence up a tributary of that river to the summit of Allison's Pass 13 miles, rising 144 feet per mile. The summit of the pass is 4,400 feet above sea level. A few hundred feet beyond this, they struck the south branch of the River Similkameen which flows on a south-easterly course.

"This line was considered impracticable for a railway; so the party returned to the Coquihalla Valley and carefully examined all the principal streams flowing into it on the east side, with the view of finding a way to the head waters of the Tulameen—sometimes called the north branch of the Similkameen—but without success. All the valleys in that direction headed into high mountains, covered with deep snow; this was in the last week of June.

"The main valley of the Coquihalla was then examined to see if it were practicable to get a uniform gradient throughout from the Summit Lake to the River Fraser, and so avoid the worst gradients in the survey of 1872.

"It is probable that this can be done giving a gradient of 100 feet per mile for 35 miles, but at the cost of excessively heavy works, including a great length of tunnelling and massive snow-sheds, for avalanches of snow roll down the steep sides of the valley, bringing with them masses of timber and loose rock.

"But the pass is so rugged that the magnitude of the works in the construction of a railway through it can only be determined by a careful instrumental survey, which it was not expedient to make at that time. Therefore I instructed Mr. Trutch to form a Division (V) and make an instrumental survey from Fort Hope to Burrard Inlet, crossing the Fraser at the most favorable place."

Journey from Fort Hope to the Valleys of the Similkameen, Okanagan, and others in the Southern part of the Province.

"I had a small pack train sent to meet me at Fort Hope and with this I commenced my journey on the 29th of June. Following the waggon road by the Nicolaume and Sumallow Valleys to the River Skagit, I took the Grant Trail up the valley of the latter, the slopes of which are in many places steep and rocky, to the summit of the mountain which the aneroid indicated to be 5,600 feet above sea level.

"There were still some patches of snow on the trail as we crossed the brow of the mountain, but as we began to descend the eastern slope the ground was covered with wild flowers, and thence the descent was easy. After a pleasant ride down the Whipsaw Valley we arrived on the evening of the 1st July at the Nine Mile Creek; so called from its being that distance from Princeton at the confluence of the two branches of the Similkameen.

"Here we had entered on the bunch-grass country, and the slopes of the mountains, gently undulating and dotted with clumps of firs, presented the most charming landscape. As far as the eye could reach it looked like one immense deer park.

"The valley of the south branch of the Similkameen as it issues from the mountains is narrow and tortuous, so that even if the Allison Pass had been practicable there would have been a considerable quantity of heavy work in constructing the railway on the east side of the mountains.

"Princeton in now simply the ranche or farm of Messrs. Allison & Hays, large stock raisers, but it was once laid out for a large town when gold was found on the tributaries of the Similkameen.

"I proceeded down the Similkameen to near the boundary line; thence eastward by a pass through the hills to Ossoyas Lake in the Okanagan Valley.

"The Similkameen Valley is narrow and bounded by high hills, principally of trap rock, bare in places, but wherever there is

soil it produces a luxuriant growth of bunch-grass. The valley is in some places a mere canyon, in others it widens out from a few hundred yards to one or two miles, in which there are flats on both sides of the river fit for agriculture but most of them would require irrigation. The river is a clear rapid stream varying from 100 to 200 feet wide. Altitude at Princeton 2,300 feet.

"About twenty miles below Princeton there is an Indian reservation comprising several hundred acres, fenced in, some of which is cultivated with potatoes and other vegetables, and the greater portion of it does not require irrigation.

"Around Kereness, some forty miles below Princeton, lately a Hudson's Bay Company's post, there is some fine grazing land; and just below it a low wet flat several miles in length, and one to three miles in breadth, some of which is occupied by white settlers. There is an Indian village or camp at Kereness.

"Crossing the heights to Ossoyas Lake there is fine bunch-grass. On the margin of the lake near the boundary line is the farm of Mr. Haynes, who is said to have over a thousand head of horses and about two thousand head of cattle.

"The valley here is one to three miles wide, including the benches at the foot of the hills, but there is not much agricultural land as the benches are arid and no water near for irrigating them; there is however rich grazing land even to the tops of the hills.

"We arrived here on Saturday evening, the 4th of July, rode up the trail on the west side of the lake and river about ten miles, to a lateral stream called Tea River, where we camped till Monday morning. The weather was very hot and the mosquitoes ferocious and irrepressible. Altitude 1,500 feet above the sea.

"Between Okanagan Lake and this point the river, 100 to 150 feet wide and rather deep, flows through and connects a chain of small lakes, nearly due north and south but the sides of the valley are very irregular, rocky bluffs sometimes abutting on the water.

"The trail leaves the main valley and traverses a series of parallel valleys and basins, all covered with the richest bunch-grass, till nearing the foot of Okanagan Lake it re-enters the main valley, hugging the steep sides of high sandy bluffs.

"Towards the end of our day's journey we reached the foot of the Lake, where, on the west side of the river, there is an extensive low flat covered with willows and alders, which I understand is an Indian reservation, on this there are a number of neat substantial log houses. Here we crossed the river by a bridge lately erected, and soon after passed the residence of Mr. Ellis, an extensive stock raiser. This is the only white settlement we had seen since leaving the boundary line at Ossoyas Lake. About three miles further on we camped by a spring half a mile from the lake.

"The slopes of the hills abut on Lake Okanagan in many rocky bluffs, and the trail following the eastern shore was reported so rough and miry that we took the trail leading over the mountain which at the summit is nearly 3,000 feet above the lake, and we found it a hard day's travel of 30 miles, to the Mission Valley where we camped not far from the Roman Catholic mission; most of the Indians were away hunting or fishing, but Father Grandidier told us those under his charge numbered about 400 souls.

"This is a very fine valley; the bottom, a low flat of excellent agricultural land, extends four or five miles along the Okanagan Lake and is partially cultivated by white settlers for several miles up; we saw excellent crops of wheat, oats, potatoes, &c. Altitude of lake by aneroid 1,120 feet above sea level.

"The trail follows up the valley which takes a north-easterly direction for a few miles; it then takes a course nearly due north and parallel to the Okanagan Lake. A chain of lakes extends through this valley, the largest of which is about 17 miles long. Portions of the bottom lands are fenced in for agriculture, and the slopes produce the most luxuriant bunch-grass.

"There is a divide in the valley, and the outlet of these lakes is at the north end of the largest of them where the Coldstream Valley comes in from the east. About four miles up the latter is the ranche of Mr. Charles Vernon, which comprises a large quantity of fine agricultural and grazing land, partially timbered and a considerable portion of it under cultivation. The adjoining hills are covered with the richest bunch-grass.

"*Thursday, July 9th.*—We were now about seventy miles from the foot of Okanagan Lake and ten miles from the head of it, which we reached by a fine open valley of rich grazing land, so smooth that waggons and buggies have been driven over the natural surface. Here Mr. F. J. Barnard has a ranche on which a large number of horses are pastured.

"From the head of Okanagan Lake there is a waggon road to Kamloops, over sixty miles distant, following the Salmon River to Grand Prairie, thence by a narrow valley to the south branch of the River Thompson and down the left bank of the latter to Kamloops. About twenty miles of this is through timbered lands, the rest is park like rolling land like that about Kamloops. The road, for miles together, is simply a track on the natural surface of the ground and there is no heavy excavations on any part of it.

"The most remarkable feature on the road is Grand Prairie; a beautiful low basin among the hills containing several thousand acres, a great portion of which is fine agricultural land on which there are several settlers. I was informed that the depth of snow there rarely exceeds nine inches and that 1,700 head of cattle have been pastured in the basin throughout the winter and come out fat in the spring.

"There is a low valley running north-easterly from the head of Okanagan Lake connecting with Shuswap or Spillemeechene River. Through this valley there is a chain of ponds and swamps so little above the level of the lake and river at either end that a

canoe has been taken through from the one to the other. The distance is probably under twenty miles and a canal could be cut across, at a very moderate cost, which would form a link in a line of navigation for small steamers, over 300 miles in length, through the most fertile portions of this district; viz:—

"From Savonna's Ferry on the Thompson River at the foot of Lake Kamloops, up the latter and the Thompson River to Kamloops, from which there would be a branch up the North Thompson to Clearwater 75 miles.

"From Kamloops up the south branch of the Thompson, on which there are many fine farms, to Lake Shuswap. Traversing the latter to any point desired we would then pass up the Spillemeechene River and through the canal to Lake Okanagan, thence to any point on the same and down its outlet, as far as navigable towards Ossoyas Lake.

"With this the rich district of Nicola Valley could be connected, at small cost, by a good waggon road to Kamloops, and there is already an excellent trail through a fine open bunch-grass country from the Nicola Valley to the Similkameen; thus traversing and connecting some of the fairest portions of British Columbia, and which comprise the grazing districts *par excellence*."

Exploratory Journey on the Central Plateau between the Coast Chain of Mountains and the River Fraser, from the Chilicotin Country northwards, to Lake Francois and the Rivers Nechaco and Stewart.

"We arrived at the mouth Quesnelle on the 29th of August, with my own little pack train, and a heavy train with supplies for Divisions M, N and X. Here we found Mr. Seymour, our interpreter, and the Chilicotin chief Aunahime, whom he had engaged as guide and mediator in case any difficulty should arise with the Indians of the district, who formerly bore a bad character.

"Our course was north-westerly, by a series of valleys over an undulating country, covered with firs, spruce and aspens and seldom exceeding an altitude 3,000 feet above sea level. On our left lay a range of hills rising 4,000 to 5,000 feet above sea level and forming a divide between the streams flowing north-easterly into the Fraser above Quesnelle and south-westerly into the same river below that point; or into some of the inlets of the Pacific Coast. On the fourth day we reached the River Blackwater, 45 miles from Quesnelle. Our aneroids gave the height of the bridge crossing the Blackwater 2,110 feet above sea level.

"The valley is here narrow at the bottom and the slopes, covered with bunch-grass, wild vetches and pea vine, rise by a series of benches to the level of the plateau, which on the southern side is 400 to 500 feet higher, and on the northern 300 to 400 feet; the latter being the lowest part of the divide between the Blackwater and Chilacoh Rivers. At the bridge the river enters a rocky canyon through which it flows eastward on its course to the Fraser.

"The Blackwater has its sources in a number of lakes on the central plateau, 60 to 100 miles westward of this point among the foothills of the Cascade Mountains. It is plentifully stocked with fine speckled trout, and the groves of aspen and spruce which adorn the softly undulating grassy slopes of the sunny side of the valley supplied us with abundance of grouse. We afterwards found that this, the 53rd parallel of north latitude is essentially the northern limit of the bunch-grass. From this northward the quantity of rain fall greatly increases, and drainage rather than irrigation is required.

"*Monday, August 31st.*—We started from the Telegraph trail on the north side of the valley of the Blackwater, and followed the edge of the valley nearly due west for eight miles, on to a range of hills running in a north-westerly direction where the valley makes a bend to the south-west.

"From an elevated position we had a fine view up this valley for over 20 miles, on the direct line to Chisicut Lake and the Homathco Pass. But we afterwards found that only about twelve miles of this was the Blackwater Valley, the rest being that of the Nazco which enters this about twelve miles up and continues in the same line; while the former makes a sharp bend almost to a right angle taking a north-westerly course.

"Our trail did not follow the sinuosities of the valley, but kept a course nearly due west. We were now travelling on the same line taken by Sir Alexander Mackenzie in 1793. In the evening we camped by a small stream ten miles from the Telegraph trail.

"*Tuesday, Sept. 1st.*—Following a course a little south of west, at the thirteenth mile we entered a fine broad and open valley; crossing this obliquely, in three miles more we came to a clear stream, 40 feet wide, flowing south-easterly into the Blackwater, about three miles distant. The stream makes a bend here and takes a course nearly due west—looking up stream. We followed this on its southern bank for six miles where we crossed it, as it there takes a north-west course, and the valley expands into a plain of several miles in breadth. The Indian name of this stream is Is-cul-taes-li, (Blackberry River.) In the evening we reached Trout Lake, a fine sheet of water over a mile in length, and half a mile in breadth, abounding in speckled trout. On a grassy slope on its eastern margin we camped (No. 6) twenty-five miles from the Telegraph line.

"Next day about noon we crossed the spur of a hill 2,980 feet above sea level and a few miles further on, the trail again struck the left bank of the Blackwater which had made a bend to the north-west from its junction with the Nazco. The river from where we struck it for four miles up is expanded into a lake. We camped (No. 7) by a small stream, estimated distance from Telegraph trail 42 miles.

"*Thursday, September 3rd.*—Mr. Hunter and myself made an excursion northwards to the crown of the table-land 3,500 feet above sea level. The ascent was easy, few rocks appearing on the surface which was thickly covered with small firs, which a fire had swept through. The whole country round was rolling and covered with similar useless timber.

"Re-tracing our steps we reached the trail at 1 p.m., and in two hours more came to the foot of a beautiful lake, an expansion of the river, about eight miles long and three quarters wide, across its broadest part, and dotted with islands. Its southern shore is high and being on the shady side of the hill is densely covered with dark spruce and cedar trees.

"But on the other side the undulating slopes of the valley rising 200 to 300 feet above the lake, are covered with bunch-grass, vetches and pea vine, and groves of aspen, forming a charming landscape. In the evening we reached the ford where the trail crosses the river, sixty miles from the Telegraph line and camped (No. 8). Altitude of river 3,145 feet.

"Next day Mr. Hunter and myself accompanied by our Kluskus Indian ascended to the summit of a range of hills, crossing the river and bearing in a north-west direction. Our altitude was about 4,500 feet, from which we had a very extensive view of the country all around and could trace the valley of the Blackwater twenty-five miles up, nearly due west. At the foot of the range on which we stood, and north of us lay a large, horse-shoe shaped lake, which the Indians told us flows into the Nechaco. The men were engaged all day rafting the stores and baggage across the river which was too deep to ford.

"*Saturday, September 5th.*—We got across the river and, following up a valley three miles, we arrived at Kluskus Lake, where the Hudson's Bay Company formerly had a fort, but not a vestige of it is now to be found. This is still however a favorite resort of the Indians. Altitude of the lake by aneroid 3,500 feet: it is about three miles long and half a mile broad, with muddy bottom, a light breeze makes the water unfit to drink.

"Three miles farther on we camped by a spring, near another small lake where we remained over Sunday. Meanwhile we had sent an Indian to find out Mr. Gamsby, and on Sunday afternoon he arrived from his camp, distant about 20 miles westward.

"*Monday, September 7th.*—We followed the trail which still kept on the same course a little to the south of west, on a bench parallel to the Blackwater. Towards evening we reached Thracha Lake and, following its southern shore, we came upon the camp of Division X and pitched our tents alongside.

"The position of this camp was found from observations of the sun's meridian altitude and the instrumental surveys of this Division (X) carried from the coast, to be lat. 53° north long. 124°, 53′ west, and the height of Lake Thracha 3,310 feet above sea level. Noting the variation of our instruments we took this as a new point of departure and on the 9th Sept., we continued our journey; our trail keeping the same general course, a little to the south of west, threading a line of small lakes and ponds and cutting off the bends of the Blackwater.

"In about six miles the trail divided into two branches, that on our left taking a south-west course apparently directly across a high range of hills capped with snow, but the Chilicotin Chief Aunahime, told us that there is a depression in the range by which the trail goes to Lake Nacoontloon where his principal camp is, thence up the stream southerly to lake Nimpoh where it joins the Bella Coola trail from Alexandria to the Bentinck Arm. This is the line taken by Sir Alexander Mackenzie in 1793.

"We took the trail to the right, and at twelve miles crossed the Blackwater 100 feet wide and less than 2 feet deep; altitude 3,600 feet. We were now in a wide valley almost an open plain through which the river flows only a few feet above the general level. At the fourteenth mile we came to a small lake, altitude 3,740 feet, near which we camped (No. 11).

"*Thursday, Sept. 10th.*—On rising this morning we observed that the mountains to the south of us had received a fresh coat of snow during the night extending farther down their slopes. Our trail now ran through small burnt timber which impeded our progress; but at noon we came upon a wide well cut trail, having the appearance of white men's work, but were told it was the work of an Indian who had recently died of fever; in another hour we came upon his house and grave; a lovely spot on a grassy knoll at the outlet of a lake, four miles long and two miles wide across the widest part, altitude 3,610 feet, and 21 miles from our starting point at Lake Thracha.

"This is called Eliguck Lake; the stream issuing out of it 12 feet wide is the Blackwater, at this a large black bear was drinking but on seeing us he made off before we could get a shot at him. From this we followed a well cut trail on the north side of the lake, till we struck a small stream running into the west end of it, where we camped (No. 12).

"From our camp the trail took a north-west course and in a mile we came to the foot of a small lake, altitude 3,630 feet. We were now evidently near the watershed: there were low lumpy hills all around, with rocks appearing on their summits. A mile farther on we were on a hill 4,000 feet above sea level. From this we could see through an opening at the head of the lake into a lower basin extending away to the north-west; the rocks on the shore of the lake, near its head, appeared in the distance like basalt.

"Continuing on this high ground, on a generally westerly course, at the thirtieth mile the trail went over the crown of a large globular rock of granite, altitude 4,050 feet. We were now sure we were on the divide, for on a course south 19° east, we had a magnificent view up a valley between the high range of hills that had been on our left the last two days, and the main ranges of the cascades. This is the valley of the Salmon River, at the head of which, lies Lake Nacoontloon.

"From this point keeping the same general course we began to descend very gradually by a chain of marsh meadows,

ponds and lakelets, and at 34 miles we came to an Indian house and grave on a beautiful grassy hill close to, and commanding a fine view of Lake N'ghaco, which is of an irregular shape 2½ miles long and one mile wide; altitude 3,500 feet. The Indian house is large and well built but now deserted, near this we camped (No. 13).

"Here the trail ended and our Indians knew nothing of the country beyond and wanted to turn back; but I was anxious to reach the Salmon River before turning northward: and questioning two Indians who had overtaken and followed us all day they said we could go to one branch of the Salmon River in a day, but there would be a great deal of chopping. After some coaxing they agreed to go with us.

"*Saturday, Sept. 12th.*—We followed a generally south-west course, passing the upper end of Lake N'ghaco, thence along the edge of a line of marsh meadows on wet ground, across which we got the animals with great difficulty, keeping nearly the same level to the 41st mile when a wide and deep valley spread out before us and we began to descend rapidly, till at the 43rd mile we struck a fine clear stream 200 feet wide, altitude 3,180 feet, which we forded without difficulty as the water was now very low and the depth on the ford was little over 2 feet.

"This is the main branch of the Salmon River. We continued our course two miles beyond this, and camped (No. 14) by a small stream flowing into a marsh meadow, and remained over Sunday.

"Our last come Indians pointed out to us from a rise near the camp a high range of hills dim and blue in the distance, which they said lay along the north branch of the Nechaco; that between us and that river there were many lakes, and we would have to cross two large rivers. They had agreed to go with us at least half the way, but on Sunday afternoon they told us they were afraid to go, there was so much water and fallen timber they thought our horses could not get through. I insisted on keeping them to their bargain, but on rising next morning we found they had decamped during the night.

"*Monday, Sept. 14th.*—We took the bearing to the distant mountains and started boldly on our course without any trail, cutting our way through brush and fallen timber. We soon came to the river, which we could not cross, as the water was deep and the bottom miry, so we had to go back to the ford by which we had previously crossed.

"Our route from the Telegraph trail up the Blackwater Valley and over the divide to this point had appeared so favorable for a railway line, that I was sorely tempted to follow this valley down towards the coast as far as horses could go. But the main object of this journey was not to follow out any particular route, but to get a general knowledge of the country as far north as Lake Francois, so as to enable us to determine which line, if any, through the Cascade Mountains north of Bute Inlet, appeared sufficiently favorable to warrant an instrumental survey.

"I thought this could be done the most satisfactorily and in the shortest time by tracing the watershed or divide between the Pacific Coast and the River Fraser from Fort George to Quesnelle; and following as near to the divide as practicable so as to cross the head waters of all the rivers flowing easterly.

"This has been accomplished and the results laid down on the general map, but as the country is entirely unknown, a brief description of our journey may be interesting:—

"Our course was north 12° west (astronomical bearing), and we kept as near to this as the difficulties of the ground and the thickly wooded country would permit. At three miles from the river we crossed a divide running nearly east and west, about 120 feet above the river; on the north side of this is a steep rocky ledge of 150 feet which we scrambled over with some difficulty, then descended gradually into a wide basin intersected with beaver dams, near one of which we camped, eight miles from the river, altitude 3,000 feet. Next day we passed over a similar country till at noon we came upon Lake Qualcho, bearing about east and west, and, as far as we could see it, about four miles long and three quarters of a mile wide; we followed its shore eastward two miles to the end of it, where we found a stream 8 feet wide flowing into the lake from the east. This puzzled us, for looking westward down the lake, the view was terminated at no very great distance, by the snow-clad peaks of the Cascade Mountains. The overflow of the lake must, however, fall into the Salmon River, as its altitude, 2,820 feet, is less than that of the next stream we crossed falling eastward.

"We now followed a course north 15° west, to carry us over a depression in the range of dark-looking hills ahead of us. A fire had passed over this and we struggled slowly through piles of small burnt firs till we reached the summit, 3,400 feet, beyond which, on the shady side of the hill, the fallen timber became larger, the piles higher and more continuous, and it took us three hours to cut our way a little over a mile to a small pond in a swamp, round which there was a little feed for the animals. Near this we camped, 15 miles from our starting point at the Salmon River, altitude 3,180 feet.

"This is the real divide between the streams falling easterly into the Fraser, and westerly into the Pacific, which takes a westerly course till it joins the Cascade Mountains, which then form the divide northward till beyond the 54th parallel of latitude.

"*Wednesday, Sept. 16th.*—It had rained heavily during the night and this morning we were three hours cutting our way half mile through heavy burnt and fallen timber to a belt of green standing timber, on reaching which our Indians were so fatigued and disheartened they declared we should all perish if we continued on the same course, as the whole country in that direction had been swept by fire, and it would be impossible to cut through the fallen timber; besides this there was a long lake directly on our course, the head of which they said was two days travel in the direction of the Snow Mountains.

"Our experience thus far gave so much probability of the accuracy of this account that we reluctantly changed our course and followed the belt of standing timber in a north-easterly direction. The country became more open and level as we advanced and the travelling improved. Early in the afternoon we got a glimpse of the lake to the north of us, then we struck an Indian trail which led us to the foot of it, where we camped (No. 17) on a grassy bench, commanding a fine view up the lake with the snowy peaks of the Cascades in the distance. General bearing south 63° west, estimated length of the lake, us far as we could see it, fifteen miles, but we could trace the course of the valley far beyond that.

"This is Lake Tschiek, altitude by aneroid, 3,100 feet, and distance from our starting point on Salmon River, 34 miles. The stream flowing out of it in a north-easterly direction is not over 12 feet wide. On the north side of it on a grassy knoll is an Indian house and grave, the latter fenced in, covered and decked in the usual way with flags, wearing apparel and implements of the chase; and the house, also, as usual, deserted. Our Indians told us that it had belonged to an Indian chief named Mustelle, who died a year ago. The house is large and in good repair; in it we found several boxes of goods, cooking utensils, a robe made of rabbit skins, two pairs of beautiful made snowshoes of different sizes, for man and woman, a curiously cut wooden ladle, and a finely shaped bark canoe quite new. These are always held sacred and never touched by Indians, but left to natural decay. This part of the country is said to have been once thickly populated with Indians, which is probable, as it abounds in game and fish; there is now little trace left of them but their graves.

"The bottom flat of the valley, from the foot of the lake, widens out to fully half a mile, covered with good grass, but two or three miles down it becomes marshy, probably the result of beaver dams.

"To avoid a high hill that lay directly in our course, we followed down the edge of the valley on the north side four miles, where we found an Indian trail, leading round the flank of the hill. This we followed and made good progress till we got on the north side of the hill, where our difficulties with fallen timber increased and the country became sterile and dreary. After a hard day's struggle we reached the head of the south arm of Lake Tetachuck an hour after it was dark. This is a trefoil or T shaped lake, surrounded by high sterile hills of shaly limestone, rising to a height of nearly 4,000 feet above sea level. It took us the whole of next day clambering round on the steep slopes of these hills to cross the angle between this arm and the outlet of the lake, a distance of eight miles.

"From these heights we took a general bearing up the lake and valley, south 72° west, extending up to the Cascade Mountains. At sunset we reached the foot of the lake, 48 miles from our starting point, and camped, (No. 19.) Altitude of lake, 2,770 feet.

"The outlet of this lake is a deep and rapid river 200 feet wide, which we were unable to ford, so we had to make a raft to carry our stores and baggage across the foot of the lake, and the animals had to swim nearly a quarter of a mile. This wasted half a day, but on the sunny slopes of the hill, on the other side of the river, we found plenty of grass, pea vine and service berries in the aspen groves; and as the animals had had but little feed for the last two days we were glad to give them half a day to recruit on good pasture, as well as to rest ourselves, so we camped (No. 20) on a sunny glade near the margin of the lake.

"From this it took us another hard day's travelling to get across the next divide, nearly a thousand feet above the level of the lake, with much fallen timber on the north side to the valley of the Eueuchu, which we struck at the head of the lake on a grassy flat a mile wide. The river flows on the north side of this and was then only 60 feet wide where we forded it; but the channel is 130 feet wide and the driftwood on its banks showed that it is subject to high floods. Here we camped (No. 21), distance 61 miles, altitude 2,700 feet.

"About 3 miles above where we crossed, the valley contracts and is there divided into two branches which rapidly head up to the level of the plateau. The slopes or benches on the sides of the valley, broken by lateral gulches, appear like a chain of rounded hills, rising to a height of 300 or 400 feet; those on the north side of the valley, more exposed to the sun's rays, are covered with grass, vetches and pea vine.

"From one of these hills we took a bearing eastward to a remarkable peak in the high range of hills that we had seen on our right the last three days. It is a high dome with a peak rising up in the centre, not unlike a spiked helmet. We called it Fanny's Mountain, after our Kluskus Indian, to whom it was a landmark showing where the river Nechaco cuts through the range in a deep canyon impassable for canoes.

"*Monday, Sept. 21st.*—The country had been improving on our route the last two days, and the first part of this day's journey was the pleasantest we had since leaving the Salmon River. We followed up the north side of the Eueuchu Valley two miles, thence northward by a small stream flowing into it through a lateral valley. The woods on the slopes of the hills on each side opened out at intervals into grassy glades. This continued till we got on the north side of the hill, when we had our usual difficulties with fallen timber, but at last we reached the long looked for Nechaco, which we struck at the foot of Tchutazely Lake, an expansion of the river fully fifteen miles in length. The river at this place is fully 300 feet wide and too deep to ford, so we camped, (No. 22), distance from Salmon River 74 miles; altitude, 2,680 feet.

"The Nechaco, from this point eastwards, expands at intervals, forming a series of long narrow lakes, and it receives all the streams we had crossed before it cuts through the range above-mentioned. Like all the country we had crossed, the south side of the valley, being the shady side of the hill, is bleak and cold, with much fallen timber undecayed: but on the bottom flats that

occur at intervals between the river and the slopes there is large timber with grass and pea vine.

"On the north side of the river where we crossed it the banks rise from the water's edge very steeply to a height of 200 feet, but by the process of denudation these are serrated and rounded into a series of hummocky hills; and being more exposed to the sun's rays vegetation is more active and the fallen timber more decayed, so that groves of aspen have sprung up, with luxuriant grass, vetches and pea vine. From these heights we got another bearing to Fanny's Mountain.

"It took half of next day to get our stores and baggage rafted across, and the mules packed. We had just lunched and were puzzled about what direction to take, for across our course lay a high range of trap and basalt, being the same we had seen at starting from Salmon River.

"While in this dilemma we were surprised to hear the bark of a dog, and immediately after a canoe shot round a point of land; this contained an Indian family, man, wife, and three children, with all their goods and chattels packed in that long narrow dug-out. We could understand but little of each others speech, but they proved to be remarkably intelligent, especially the woman, who in a very few minutes understood the map and our rough sketches and traced the way to Fraser Lake, where their village is; we gave them some food and small presents for the children, and the man agreed to go with us two days and show us the Indian trail.

"We started on a north-west course on the slopes of the hills along the margin of the lake which were covered with very long grass, vetches and pea vine, and groves of aspens. The vetches and pea vine were in great quantity, reaching to a height of 4 feet among the long grass, climbing up the trees to 8 or 9 feet and hanging in festoons from bush to bush; we had difficulty in forcing our horses through the tangled mass.

"From a high point we took a bearing up the Nechaco Valley, north 53° west. The river appeared to flow out of a very large lake 30 to 40 miles distant, among the foothills of the Cascades, and beyond this in the same line rose a snowy peak regularly shaped like an Egyptian pyramid, estimated to be over 8,000 feet high and 50 to 60 miles distant.

"In about three miles our course changed to north and we passed through a gap in the range at an altitude of 3,500 feet above sea level. Our course was then nearly north-east, and rapidly descending we soon reached the little Lake Enz, altitude 3,050 feet, distance 78 miles from Salmon River, where we camped. (No. 23).

"*Wednesday, Sept. 23rd.*—We started early and in three miles reached the house of an Indian chief named Nehlie, at the head of Lake Tchestatta. The range of hills north of us, though high and studded with masses of granite, did not look inaccessible, the country looked passably open and by Trutch's map the distance to Lake Francois should not exceed 20 miles; but our Indian declared it was impossible for horses to go there, as there were so much rock and fallen timber and no feed, and even if we did succeed in reaching the lake, we could not possibly get along its shores to the outlet. We therefore reluctantly followed the trail along the north shore of Lake Tchestatta all day till we came to an Indian fishing station, a little beyond which we camped (No. 24). Lake, one to two and a-half miles wide, altitude 2,800 feet.

"Here the trail ended and our Nechaco Indian turned back, first telling us that it was but a little way to an Indian village, whence we could find a trail leading to the foot of Lake Francois. But we toiled hard, cutting our way through thick brush and fallen timber on the steep hill side, and it was not till 4 p.m., we came to the Indian village on a spit of land, shooting into the lake and nearly cutting it in two; we found only one Indian family there, who were much surprised to see horses in such a situation. We got some fish from them and gave them some small presents, then started on the trail, which, however did not lead northward, but followed the margin of the lake on high bluffs, it was nearly dark when we reached the foot of the lake where we camped (No. 25) near an Indian house, distance 105 miles. Altitude of the lake by aneroid 2,800 feet.

"*Friday, Sept. 25th.*—The Indian, from the last village we had passed, came down early in his canoe with some fish and offered to accompany us one day's journey, which offer was gladly accepted.

"Our course all day was nearly north-east on a passable Indian trail; the first part of the day through a hilly country covered with small timber. From one of these hills we got another bearing to Fanny's Mountain south 30° west, which we were now leaving behind. In the afternoon we travelled by a chain of marsh meadows, and ponds or beaver dams, passing several Indian camping grounds, and had a good deal of bridging and brushing to get the animals across soft ground. Towards evening we crossed some heights of trap rock, from which we had a view of Lake Kthluthsly lying before us, about 3 miles long, and 1¾ miles across its widest part. We travelled on the north shore of this and camped on a flat near the lower end of it, distance from Salmon River 118 miles. Estimated altitude of lake 2,900 feet.

"*Saturday, Sept. 26th.*—From the course we had travelled the last three days I felt certain that we must be fully as far east as the foot of Lake Francois; so we left the trail and made a desperate attempt to cut our way direct north; but after two hours labor we had not made half a mile and had to give it up and return to the trail which was hard to find among piles of fallen timber and loose rock.

"We were now crossing a range of bold granite hills, apparently a continuation of the same range we had seen on our right for more than a week past. About 3 p.m., we crossed the summit by a depression in the range, estimated altitude 3,600 feet above sea level, and had a very extended view over a rolling country to the south-east in which we caught a glimpse of the Nechaco River and several lakes. Wending our way slowly down the north-eastern slope, over very rough ground strewed

with fallen timber, we reached a small lake just as it was getting dark, altitude 2,900 feet, near which we camped (No. 27).

"Next day we started early, winding our way through a hilly and thickly timbered country. In two miles we passed a small lakelet, out of which issued a stream flowing northward which told us we were not far from Lake Francois or Lake Fraser; and shortly after, passing through a defile we came to a point on a hill-side commanding a magnificent view to the north-west overlooking the valley of Fraser Lake, and the Stelacoh River; the head of the lake appearing 6 or 7 miles distant from us. From this I sent a messenger on to Fort Fraser for a canoe and crew to meet us at the head of Lake Fraser, for which we now took a direct course, and in two miles we struck the Telegraph trail, 135 miles from our starting point on the Salmon River.

"We were glad to find ourselves once more on a good trail, and started westward at a brisk trot, halting at each angle to take hearings. The animals regaled themselves on the rich pea vine on the roadside, or grass in the open glades. In 3 hours we reached the crossing of the Stelacoh River at the head of Lake Fraser, and camped (No. 28), by an Indian village. Altitude of hike by barometer, 2,460 feet.

"From observations made on this journey we glean the following:

"That the central plateau at the eastern base of the Cascade Mountains from the Salmon River to Lake Francois is undulating; the crests of the hills or ranges between the streams rising to about 4,000 feet above sea level; and that the streams from the foot of the Cascade Mountains take a general course, varying from east to north-east: all converging on the Nechaco River, which then cuts through a range of hills running generally parallel to the Cascade chain.

"This range is very irregular and broken, but the line can be traced from the Doglip Hills on the River Quesnelle, crossing the Fraser below the mouth of that river; thence on a generally north-west course, crossing the Blackwater below Lake Kluskus; thence to Lake Francois and up its south margin to the Cascade Mountains. The range forms a dam or weir which checks the fall of the streams from the Cascades and they expand into the numerous lakes we have passed over in our journey.

"The timber throughout is spruce, black fir, and cedar, generally small and of little value. There is only a little agricultural land in the bottom flats of the valleys, with good grazing land—grass, vetches and pea vine—on the slopes facing the south. We saw no stratified rock except the shaly limestone on the margin of Lake Tetachuck.

"*Sept. 28th.*—A canoe had arrived from Fort Fraser, and we hired another here. I then gave instructions to the packers to go on and wait for me at the Stewart's Lake trail, crossing the Nechaco, and Mr. Hunter and myself started with the canoes up the River Stelacoh.

"Half a mile up from the Telegraph line a stream 40 feet wide comes in from the north, this is the Nettacoh; on the opposite side of the Stelacoh there is an Indian village. Above this the Stelacoh is a rapid stream 60 to 100 feet wide where we found the Indians spearing salmon—600 miles from the sea—but they were of a pink color and inferior in flavor to those nearer the coast. It took us three hours hard pulling, three and a half miles to the falls, where we camped for the night.

"Next morning we made a short portage with our baggage, and hauled the canoes up the rapid, on which there is a perpendicular fall of four or five feet. We had rapids nearly all the rest of the way to the foot of Lake Francois, seven miles from the Telegraph trail, which we reached at 1 p.m., and camped. Altitude 2,540. We employed the rest of the day catching fine speckled trout on the rapids, while the Indians trolled the lake for whitefish, by which means we added considerable to our other scant supplies.

"*Sept. 30th.*—Leaving Mr. Hunter one of the canoes and crew to make a survey of Lake Francois, I went back with the other and reached the Indian village at noon. Our course then lay down Lake Fraser, of which I made a rough survey from the canoe, landing at several points to get better bearings; we reached Fort Fraser before it was dark.

"Lake Fraser near its lower end is bounded by high hills of trap and basalt on each side, the slopes of which at some points come to the water's edge; at others there are intervals of flat land between the lake and the hills. The Hudson's Bay Company's Fort is at the south-east angle of the lake and two miles from this, at the outlet of the lake, there is an Indian village.

"*Thursday, Oct. 1st.*—When I rose this morning it was raining hard, but it cleared up at noon and we paddled across to the Indian village where my crew lived; it took them an hour to prepare for the journey, but at 2 p.m. we started and in a quarter of an hour were in the river Nechaco, not over a quarter of a mile from Lake Fraser.

"The Nechaco is here a deep and rapid stream 300 to 400 feet wide. In half an hour we came to bad rapids, where we had to make a short portage; after this we went swiftly down the stream, passing over a great many rapids, but none of them very dangerous. I took bearings, mid estimated distances by time. General course a little south of east.

"The valley is generally narrow, with high banks, sometimes of rock, at intervals it widens out a little and there are low flats between the river and the high banks. We camped at sunset.

"Next day we were mostly in still water and the valley widened out more. At noon we reached the Stewart Lake trail where we found our two pack trains camped.

"There is not much to be seen from a canoe on a river with high banks, and so far as I had seen, very little land fit for cultivation; and certainly the banks of the river are not very favorable for a line of railway: but they get lower near the Stewart's Lake trail, and there is a flat country extending away to the south-east. On our way down the river we saw numerous and large flocks of geese and ducks, they were, however, very wary and difficult to get near.

"*Saturday, Oct. 3rd.*—Directing the packers to find their way down with the trains, by an Indian trail to the mouth of the Chilacoh River, I started—with another canoe and crew I had hired—down the Nechaco; we were on still water and the valley soon opened out from half a mile to a mile in breadth, with low flats through which the river meanders, striking the high banks on either side alternately.

"But as we neared the Stewart River the valley again contracted and there were high hills on each side of us; the river striking the base of these has caused heavy land slides where the material is clay or loam. In some places there are rocky canyons. We camped (No. 34.) at the confluence of the Nechaco and Stewart Rivers. These two rivers appeared of about equal volume.

"*October 4th.*—It rained all the morning but cleared up at noon, and we started down the Stewart River; the stream flowing slowly and varying from 250 to 1,000 feet in breadth.

"In about 10 to 12 miles we appeared to be crossing through a range of high hills; the highest points estimated fully 1,000 feet above the level of the river. The valley is here contracted, and very soon we entered a rocky canyon, through which the rapids were very strong for a mile and a half, and the slopes of the hills are very rough.

"At about 14 miles there is a dangerous rapid, where we had to make a short portage. From this the rapids and swift current continue—with the exception of about three miles of comparatively still water—to the mouth of the Chilacoh River; near which are the worst rapids on the river, where a belt of basalt crosses it, and we had to make a portage of half a mile.

"The bottom flat of the valley is from half a mile to a mile wide, and varies from 20 to 50 feet above the level of the river; and is covered with small timber—spruce, scrub pine, and aspen. There are some low flats very little above flood level.

"The Chilacoh, or Mud River as it is popularly called, enters the Stewart River from the south about 20 miles above the confluence of the latter with the Fraser near Fort George.

"The banks of this portion of Stewart River are generally high, varying from 20 to 80 feet to the bottom flat of the valley, the slopes from each side of which rise in a succession of benches 100 to 300 feet above the level of the river; and there are some very large land slips where the river strikes the foot of these.

"On the right there is a high range of hills stretching away to the south, parallel with the Fraser; and on the north an elevated plain extends to the Giscome Portage, or divide between the Fraser and Parsnip Rivers; this is densely covered with timber.

"The River Stewart widens out at its confluence with the Fraser, and the channel is divided by several small islets so that we were not a little puzzled to know when we had entered the Fraser.

"Fort George is on the west bank of the Fraser, about a mile below the mouth of the Stewart River, on an extensive flat of apparently good land. There is, as usual, an Indian village near the fort. We arrived there at 1 p.m., on the 5th October.

"The lower half of the Chilacoh Valley is from a quarter to half a mile wide, on the bottom flat, which is a deep loam covered with groves of spruce, pine and aspen, with open glades of very rich grass, red top and blue joint over four feet high, with vetches and pea vine on the slopes of the hills having a southern aspect.

"The valley is bounded by high benches and a rolling plateau on the west, and on the east by the high range of hills lying between it and the Fraser.

"About twenty miles up, a range of hills crosses the valley where the latter is contracted to a canyon for a quarter of a mile, but there will be no difficulty in getting a line of railway through this. One of the highest hills in this range is double headed and lies close to the valley. It is the same we had seen from the Telegraph line two months before and served us as a landmark.

"Above the canyon, the valley expands at places to fully two miles in breadth, and some wide lateral valleys come in from the north-west. The lower part of this, by the river, from a quarter to half a mile wide is covered with long grass; then there is a step up from 50 to 100 feet, and the upper flats to the slopes of the bounding hills are covered with spruce, small pine, and aspens. In some places the ground is swampy and would require draining for cultivation.

"The valley ranges from 2,000 to 2,300 feet above the level of the sea; soil a light loam very deep and free from stones. The river is a sluggish stream 100 feet wide with deep water, muddy bottom and few fords; it is as crooked as a corkscrew, meandering from side to side of the valley. We found some pieces of lignite on the banks that had been brought down by the current and there are probably beds of coal farther up the valley.

"The weather up to this time (15th October) had been as mild and genial as the Indian summer in Ontario, but now the nights were getting cold, with white frost in the mornings, indicating the speedy approach of winter. I therefore gave instructions to the Division Engineers to close the season's operations on the 24th October, and, after that, to make all haste possible to reach the crossing of the Fraser at the mouth of Quesnelle by the end of the month; whence they would have a waggon road on which they could purchase hay and grain if necessary for the animals—to winter quarters near Kamloops 200 miles farther south.

"I went on ahead with my own and the supply train and we reached the mouth of Quesnelle on the 23rd of October. Here I found Division M encamped; they had completed the survey up the Stewart River Valley to the mouth of the Chilacoh and come down the Eraser—bringing all their stores and luggage, in the boats which they had constructed at Tête Jaune Cache and used on the Fraser River all the season."

OPERATIONS DURING 1875.

Report on the Surveys in British Columbia during the year 1875. By Marcus Smith, Esq.

* * * "On the 19th June we arrived at the crossing of the Chilcotin River whence my pack train and the Indians proceeded westward to the Chilacoh Depot and Mr. Seymour and myself rode on to Puntzee Lake, where we found Division R encamped. I spent two days with Mr. Jennings examining the rather broken and rough country on the divide between the Chilacoh and Chilcotin Rivers. About 15 miles of line had been located, which from the profile, appeared generally satisfactory.

"On the 3rd July we arrived at the camp of Division S, Mr. H. J. Cambie in charge. They had completed about 14 miles of location and their trial line was some miles in advance on the east shore of Eagle lake, which lies about 5 miles to the south of Lake Tatla in a trough in the side of the hill which bounds the latter.

"Eagle Lake is about 6 miles long, and a mile from its west end is the watershed, from which a rather broad valley descends nearly due south into the Cascade Mountains. In this valley there is a chain of small lakes which are the sources of the east branch of the Homathco River, which flows through these mountains into Bute Inlet. The last and largest of these lakes is Tatlayaco, which is 15 miles long and a little over a mile wide; it lies at the entrance of the pass, and the east branch of the Homathco River rushes out of it in a rapid current about 100 feet wide.

"It had been proposed to make the location survey by this route in the hope of finding a better line through the mountains than that surveyed in 1872 by Lake Tatla and the west branch of the Homathco River. And the object of my journey was to go through and examine this route in advance of the surveyors to ascertain if it had apparent advantages that would warrant the survey being carried that way in preference to the line of the former survey.

"We left Eagle lake on the 5th July and travelled on the east side of the valley, by an Indian trail; in the evening we encamped near an Indian Rancherie, on the margin of the small lake Cochin, and the next day on the slope of the mountain that bounds the east side of Lake Tatlayaco.

"The view southward, from a point near our camp, was very grand; the silvery lake lay at our feet, several hundred feet beneath us; from its west bank rises a mountain of dark jagged and scarred rock 3,000 to 5,000 feet above the level of the valley. On the left, near the foot of the lake a bold snow-clad mountain looms up to a great height. These form the portals of the entrance into the Homathco Pass. Beyond, the view was terminated by the lofty snow-clad peaks of the Cascade Mountains.

"From our camp the trail curves up the slope by which the Indians reach the high table-land, which is well stocked with deer and mountain sheep, so that we had to cut a trail to the foot of the lake and had some difficulty in crossing a large glacial stream on our way. We arrived there on the 7th July and camped near the outlet of the lake, which is the east branch of the Homathco River.

"The distance to this point from the River Chilancoh, near which Division S commenced their surveys, is a little over 40 miles. The first half of the distance is over a dry morrain formation, the surface broken with numerous dry ponds and lakelets, knolls, and gravel ridges, covered with stunted scrub pine, with patches of black spruce in low moist places. On the adjoining slopes there is an abundance of Douglas fir of fair quality and large enough for such bridging as would be required in the neighborhood.

"The latter half of the distance is on the slopes of the valley by the margin of the string of lakes which feed the Homathco River. These slopes are broken with some deep lateral ravines and the line will have to run across the faces of some rather steep rocky bluffs on the shore of Lake Tatlayaco. But, so far, this route appeared on the whole tolerably favorable for the line of railway, with plenty of timber suitable for works of construction.

"We could not take the pack train beyond this point, so I sent it back in charge of Mr. C. Seymour to join the Y Division on the line from Blackwater to Dean Inlet, and to be ready for my use on a contemplated journey that way later in the season.

"By noon on the 8th July we had got our supplies and baggage rafted across the foot of the lake, and made a cache of provisions for use in case we failed to get through to the coast and be forced to return, or for the use of Tiedeman and Horetzky's party whom we had expected to meet us here. We then commenced our tramp, my party consisting of five Lillooet Indian packers and one Chilcotin Indian hunter as guide.

"About a mile below the mouth of Lake Tatlayaco, a large glacial stream comes in from the north-west. The weather had been very warm for a week past, and from the melting snow in the mountains, this stream was now very high, coming down with tremendous force, bringing trees and huge boulders from the mountain sides. Following this up a mile to where the stream is divided by a small islet, we succeeded in falling large trees across, by which we clambered over safely. Half a mile further down a large stream comes in on the other side of the valley from the south-east. Here we are fairly in the mountains, and the valley is contracted almost to a canyon, there being only a narrow flat with a fringe of trees by the side of the river, which is in fact part of the old river bed silted up with detritus washed down by the stream. This flat is broken at intervals by rocky spurs shooting down from the mountains and abutting on the river.

"The course of the valley from this downwards turns to within a few points of due west and is tolerably straight for about 20 miles, at which the view was terminated by an immense glacier, high up on the side of a mountain range which appeared to cross the line of the valley.

"There was no trail down this valley, as the Indians get to the coast by a way over the mountains farther south, so that our progress was very slow, being impeded by brushwood, large trunks of fallen trees, and fragments of rock which had rolled down from the cliffs near the summit of the mountain.

"We travelled on the right bank of the river, which here flows between two well defined ranges. The slopes on the south side of that on which we were travelling were the most uniform and unbroken; closely resembling from a distant view the back of a huge wave at the moment of its breaking on the beach, while the other side of the parallel range was rugged, perpendicular and broken, like the hollow or lee side of the wave.

"It took us two days and a half to reach the bend of the river about 15 miles from the foot of Lake Tatlayaco, where we camped on Saturday evening, July 10th, and remained over Sunday.

"Down to this point there appeared no very serious engineering difficulties, the fall of the valley being tolerably uniform and estimated at the rate of about 1 per 100. But here the river takes a bend to the south-west, apparently cutting through several broken ranges of mountains, the noses of which at intervals abut on the Homathco River in perpendicular cliffs. The narrow flat belt by the river side has disappeared, except in small patches, and the valley has contracted to a narrow deep defile, but, as far as we could see, there was no canyon of perpendicular rocks on both sides of the river at once.

"Two days and a half more we toiled along the face of these rugged mountain slopes; the weather had become excessively warm, and from the unusual quantity of snow that had fallen the previous winter, the mountain streams were now rearing torrents which we had great difficulty in crossing; and at points where rocky spurs abut on the main river, leaving no passage between, we had to climb up on hands and knees several hundred feet, at one place 1,500 above the level of the river and descend again on the other side of the spur; such journeys sometimes occupying several hours, though the distance across the face of the cliff would not exceed a few hundred yards. But the mountain slopes are so steep and rocky that sometimes our Indian guide had to make a detour to reach safe footing and fasten a rope to a tree, throwing us the other end to assist us in getting up with some degree of safety.

"At noon on the 14th July we reached the junction of the east and west branches of the Homathco River. The last seven miles of our journey undoubtedly presented grave engineering difficulties. But however difficult we found it to travel, owing to the high floods and there being no trail, I had reason to think that a careful survey would probably show it to possess advantages over the line formerly surveyed by the west branch; therefore I thought it advisable to let the survey proceed by that route, and accordingly prepared topographical sketches and instructions for Mr. Cambie which I sent back by the Indian guide on his return journey.

"I was much concerned at the non-appearance of the trail party under Mr. Tiedeman, who had been landed at Waddington Harbor on the 3rd June, and four days canoeing should have brought them to within 12 miles of where we were now encamped, with the Waddington trail over half the distance.

"In two hours we succeeded in throwing a bridge over the canyon on the west branch of the Homathco and I sent some of my Indians ahead to make a reconnoisance and fire off rifles to attract the attention of the trail party, whom, we supposed could not be far off.

"In three hours they returned, reporting that they could not succeed in bridging the large stream that comes down from Tiedeman's glacier; they had thrown across it six of the largest trees they could find standing on its banks, which were whipped away by the torrent like so many chips.

"Our case was now becoming serious, we had but four or five days supplies left and feared that the trail party might have been detained by some difficulty with the Indians. We held a consultation to decide whether to go on or return, when our Indian guide said he could take us to the Waddington trail by a detour of one day's journey up the bank of Tiedeman's River, and crossing the glacier out of which it issues.

"On Thursday, the 15th July, we started at 6 a.m., and in two hours arrived at the glacier. We had some difficulty in ascending the face, which is an irregular slope covered with loose rock and boulders. It is about 200 feet high at the face, and, as far as we could see, was fully 15 miles in length, and from half a mile, at the foot, to three miles in breadth. The river rushes out of three tunnels, and the glacier is serrated lengthwise with ridges and crevasses; the latter partly filled up with boulders and detritus from the mountains. In fact it has the appearance of having broken away in a body from the mountains bringing part of the latter with it. Its altitude is about 2,000 feet above the level of the sea. We succeeded in crossing safely by intricate windings on the broken surface to avoid open crevasses, in which we could hear the water gurgling beneath the boulders with which they were partially filled up. The sharp ridges were clear ice, along which we crept on hands and knees.

"Ascending the south-western slope of this glacial valley we travelled the rest of the day on an elevated plateau well timbered and dotted with several small lakes. Towards evening we descended with difficulty by a lateral valley to that of the Homathco, where we found Mr. Tiedeman in charge of the trail party encamped on the same spot where the late Mr.

Waddington's men were murdered by the Indians in 1864. Since our survey of 1872, the Indians have removed all trace's of the murdered men's camp and burnt the timber and brush which then grew there.

"Mr. Tiedeman had misunderstood the main object of his work, which, according to my written instructions, was to push forward as rapidly as possible to meet me, throwing log bridges across the larger streams while the water was low, and improving the trail on the return journey. Instead of which he had made only a few miles of trail with trestle bridges six feet wide for pack animals. As the survey parties would not get into the mountains before the rivers were low, I desired Mr. Tiedeman to break up the trail party and join Division X to take the topography of the country.

"On Friday, July 16th, we continued our tramp down the Homathco Valley, following the Waddington trail; the weather continued excessively warm and the streams were still rising. On reaching the head of the Grand Canyon we found the river had carried away the bridge which Mr. Tiedeman had constructed round the face of the cliff, so we had to climb up, by a crevasse in the rock, 400 feet, to reach the trail, which crosses over the shoulder of a mountain. In like manner we found all the bridges he had made carried away, so we had a repetition of climbing precipices and bridging torrents us they rushed out of the canyons in the mountains.

"We had expected to reach the camp of Division X in two days, but on Saturday evening we came to a torrent over which we could find no practicable means for throwing a bridge. So we had to camp and, as we were out of meat, I sent the Indians out to hunt; they soon returned with a large black bear which relieved us of all apprehension on the score of provisions.

"Next day at 7 a.m., we commenced to construct an Indian fly bridge, but, as we had only one axe left and but little spare rope, we had to make lashings from the inner bark of cedar, so that it took us seven hours to complete the bridge which looked like a fishing rod and line hanging over the torrent, the butt end resting on the ground and loaded with boulders. We managed to crawl over this and drop down safely on the other side of the stream. Six hours more of a hard struggle among tangled creepers, over huge trunks of fallen trees and masses of detached rocks, brought us to the camp of Division X. This party had completed 18 miles of trial location. I remained with them two days, examined their plans and profiles which showed the line to be generally satisfactory and a great improvement on the preliminary survey of 1872.

"On the 20th we dropped down the river in a large canoe to Waddington Harbor, where the steamer 'Sir James Douglas,' with Mr. Robson and a quantity of supplies arrived next morning.

"After discharging cargo the steamer started back for Victoria, arrived at Departure Bay and took in coal; on the 25th July we arrived at Victoria much bruised and shaken by one of the hardest journeys yet made on the surveys.

"Meanwhile Mr. Jarvis and party, who left Fort George in December, 1874, to examine a route across the Rocky Mountains by the north branch of the Fraser River and the Smoky River Pass, had arrived at Winnipeg, and reported unfavorably of that route. It was therefore decided to make the trial location surveys from Fort George eastward via the Yellow Head Pass, and a party was formed in Ottawa, with Mr. George Keefer in charge, to execute a portion of this survey, commencing at the summit of the Yellow Head Pass, and working westward to Tête Jaune Cache, thence down the Fraser to meet another party working up.

"Mr. Keefer and party reached Victoria on the 18th July, and before I arrived they were on their way to their appointed work, but I sent a messenger after them with detailed instructions for the practical carrying out of the surveys committed to their charge. The messenger overtook the party in the valley of the North Thompson, and Mr. Keefer has since advised me of their arrival in the Yellow Head Pass and the commencement of the surveys."

Journey from Dean Inlet across the Cascade Mountains by the Salmon River Pass.

"I had estimated that the Divisions V and Y would connect their surveys on the Salmon River before the end of August. So on the 23rd of that month I left Victoria on the steamer 'Sir James Douglas' with a quantity of supplies. We called at Waddington Harbor on Bute Inlet and landed supplies for the X Division and on the 28th we arrived in Kamsquot Bay on the Dean Inlet, where we found Mr. Trutch and party (Division T,) encamped on the spit of land that forms the south side of the harbor.

"They had joined their surveys with those of Division Y a week before, about 50 miles up the Salmon River, and had then returned to the coast for instructions.

"I immediately had the party re-organized for the survey from Kemano Bay, on the Gardner Inlet, across the Cascade Mountains, towards Lake Francois, sending some of the men home to Victoria and replacing them with Indian packers whom I had brought with me by the Homathco Pass.

"The steamer left with the party on the 1st September, and on the 3rd arrived at Kamsquot Bay, where the party disembarked to commence the surveys.

"In my report of the work of 1874, Kamsquot Bay is described as being formed on one side by a tongue of land about two miles in length, projecting into the Dean Channel: the Kamsquot or Salmon River flowing into the channel on the other side of the tongue. This tongue has been formed by the debris brought down by the river, which has burst through a curtain or saddle of rock about 400 feet high, which stretches across the mouth of the valley.

"I engaged Indians to pack my baggage and supplies across the mountains, and on Monday, the 30th August, they had got everything to the head of the canyon through the saddle of rock about 2½ miles on the line of survey. Next morning we all embarked in a large dug-out canoe, being eight persons in all, besides baggage and supplies.

"The stream varies from 150 to 300 feet in breadth, is very rapid and the canoe was forced up by poling. In some places the rapids were so bad that we had to get out, and the Indians, wading in the water, lifted the canoe up by hand. We made about 12 miles the first day, and at noon on the second day we were at the head of canoe navigation, near the 19th mile of the survey.

"The valley up to this point varies from a quarter to three quarters of a mile in breadth; the river, meandering from side to side, washes the base of the rocky slopes on either side, alternating with low diluvial flats, heavily timbered, intervening.

"From the head of canoe navigation our supplies and baggage had to be packed by hand. We followed the trail made by the V Division under Mr. Trutch, which led alternately over flat benches, varying in height from 20 to 200 feet above the level of the river, and along the steep slopes of the hills which are in many places slides of loose rock. The superior ranges of snow-clad mountains are at a considerable distance from the river, but, in a few places, a spur shoots out and extends to the river, abutting on the same in a perpendicular rock-face, leaving no passage between. The heaviest of those is about the 31st mile of the survey, and the trail goes over the spur about 600 feet above the level of the river.

"On the second day, from the head of canoe navigation, we reached Yeltesse, or the Salmon House, 34 miles from the sea on the line surveyed. Here the river rushes through a narrow rocky gorge, the lower ledge of rocks being about 20 feet above the level of the river, over which there is an Indian bridge or platform of round timbers. Immediately below this there is a fall of about 15 feet, over the face of which the Indians have constructed a screen of wythes, to which are hung pockets of network for catching salmon as they endeavour to leap the fall. The salmon striking against the screen fall into the pockets. The upper ledge of rocks on which the Indian (Salmon) House stands is about 160 feet above the level of the river, and a little higher up, on the other side of the river, there is another house on about the same level.

"The river is well named the Salmon River as it swarms with that fish. On my way up the Indians with the canoe poles speared what we required for food, some of the fish weighing over 30 lbs., and at the bridge they were constantly carrying away salmon that were caught in the nets. These are called 'Stick Indians,' or dwellers in the forest. They appear to be of the same race as the Chilcotins, or intermarry with them and understand their language. They are mountaineers, not large, but wirey and have been of great assistance in packing for the surveying parties.

"The messenger, whom I had sent off two days previous to our leaving Kamsquot Bay, I found here sick, so had to send the message on to the camp of the Y Division, 35 miles distant, by another man and await his return. I spent this time making some explorations in the neighborhood.

"At Yeltesse we are clear through the high ranges of the Cascade Mountains, and the river comes to this point in a deep groove in the central plateau, which is of volcanic formation, the rocks being mainly basalt. The survey followed the river for about 30 miles above this place, but the trail goes up a parallel valley to the south. In this there are several small lakes; the largest Tanyabunket, is about six miles in length. This valley at the lower end near Yeltesse, is about 1,000 feet above the level of the river; at the upper end, 30 miles distant, they are nearly of the same level, and there the trail leaves the valley and crosses the Salmon River to the north side at the point which we reached in our exploration of 1874.

"On the 8th July, I started with my pack train eastward from Yeltesse, to examine the line of survey in the Salmon River valley and across the Divide to the Blackwater, thence down the same to its junction with the line from Bute Inlet.

"The whole of this portion of the line is in a depression of the central plateau, and presents no engineering difficulties till after its junction with the line from Bute Inlet.

"On the 18th September, we reached Mr. Bell's camp (Division N), on the Blackwater, about seven miles above this point the river is crossed by the telegraph trail.

"Mr. Bell and myself spent several days examining the rather rough country that forms the watershed between the Blackwater and Chilacoh. We followed up the valley of the latter 20 miles above the point where the line of survey leaves it, and found that it widened as we ascended. A branch of the river, coming in from the west by a broad valley, appears to turn the north end of the range which divides it from the Blackwater, and gives facilities for a deviation of the line to Dean Inlet, by which much heavy work would probably be avoided.

"On the 23rd September, we left Mr. Bell's second camp on the Blackwater, and proceeded on our homeward journey. We reached the confluence of the Blackwater and Nazco on the 25th, and, following up the valley of the latter about 20 miles, we arrived at the camp of Mr. Jennings (Division R,) on the 27th.

"Up to this point and several miles above it, the Nazco is a fine open valley; the river, 80 to 100 feet wide, winds through extensive natural meadows with groves of spruce, black fir and aspens at intervals.

"I spent two days with Mr. Jennings, furnished him with some rough topographical sketches, which I had made on my way up, and gave instructions respecting the closing of the season's work and the return of the party to Victoria.

"We travelled on the trail up the Nazco Valley to the lakes on the central plateau which form the sources of the river, then

crossed to the Alexis Lakes and down to the Chilicotin Valley, which we followed down near to its junction with that of the Fraser, then up the latter to Soda Creek which we reached on the 7th of October.

"I left my party at Soda Creek to take the train to winter quarters near Kamloops, and I travelled by stage and steamboat for Victoria where I arrived 16th October.

"On the 15th October, the Divisions S., and X., connected their surveys on the east branch of the Homathco Valley, on the line from Bute Inlet to the Yellow Head Pass, and returned to Victoria.

"On the 20th October, the Divisions R., and N., connected their surveys on the same line, near the mouth of the Nazco River. The former party returned to Victoria, and the latter went to Fort George to complete their plans and continue the surveys eastward during the winter.

"The Division V, completed a trial survey of a line from the Kemano Bay on the Gardner Inlet, up the valley of the Kemano River and across the Cascade Mountains, to the first lake on their eastern slope, whence the waters fall into the Nechaco River, and returned to Victoria on the 21st October.

"About the end of October, the Division M, under the charge of Mr. George Keefer, had to stop the location surveys from Yellow Head Pass westward, and they went into winter quarters at Tête Jaune Cache, from which to make trial surveys, in advance of the location survey, during the winter whenever the weather would permit."

Examination of the Channels between the Islands at the Entrance to Bute Inlet.

"On the 29th October, I left Victoria in the Hudson's Bay Co's steamer 'Otter,' and next day arrived at Cape Mudge, where I engaged a canoe and a good crew of Indians, to make an examination of the several channels that separate the Valdez and a number of small islands that lie at the entrance to Bute Inlet.

"I spent ten days on this work, made a track survey of the channels that divide the Valdez Islands, to replace in some measure the plans of 1872 that had been destroyed by fire. We crossed the Arran Rapids, between Stewart Island and the mainland, when the tide was running very swiftly, then went up to the Estero Basin, of which I made a rough survey. This basin is at the head of the Frederic Arm, and the tide flows in and out through a channel about a third of a mile in length, and 50 to 150 feet in breadth. Between the head of the basin and Bute Inlet, there is a depression in the rocks across which it appears feasible to construct a railway, thence along the edge of the basin to the head of the Frederic Arm.

"From this point to a good landing on Vancouver Island, the distance is about 16 miles, almost in a direct line by the Nodalles Channel, in which the highest rate of the tidal current does not exceed three knots per hour. The navigation to the ocean by the north end of Vancouver Island is also free from dangerous rapids.

"After completing the survey of the basin, we descended the Frederic Arm and went up to the head of Phillip Arm, where a river 300 feet wide enters through an open valley. It had been reported by a person exploring for minerals, that there was a possible connection between this valley and the Homathco, but, from a careful examination of the west side of the latter, no depression could be found feasible for carrying a railway across.

"We returned home by the Nodalles Channel and Discovery Passage to Cape Mudge where we were detained two days by adverse winds coming up the Strait of Georgia. On the storm abating we coasted down to Comox, where I took passage in the steamboat for Victoria.

"This work was done in a canoe in the worst season for navigation, when, as we afterwards learned, the Pacific Coast was strewn with wrecks. We had fog and rain in abundance, and, by the scudding of the clouds, there was evidently storm without; but we had no difficulty in finding our way through rain and mist, and the wind did not affect us, so completely are these channels sheltered by the high land and rocks which they separate.

"I feel confident that a steamboat properly constructed could take a railway train on board and pass safely at all seasons of the year from any convenient point on Bute Inlet to a good landing on Vancouver Island near Seymour Narrows. The only difficulty would be the swiftness of the current at a certain state of the tide; but the worst rapid could be avoided by using one of the cross channels that divide Valdez Islands."

Engineering Character of the Lines Surveyed in 1875. Bute Inlet to River Stewart.

"The Homathco Valley at the head of Bute Inlet is a mile and a-half or two miles wide on the bottom flat which is bounded by precipitous mountain slopes. The general direction of the valley is north and south, and it decreases in breadth as we ascend, till about 30 miles from the Inlet, where the mountains close in and the river rushes through a narrow, rocky canyon or chasm. It is a turbid rapid stream of about 300 feet wide, but at places it spreads out to over 1,000 feet, divided into several channels by low alluvial islets from the detritus brought down by the river. These islets are covered with spruce, poplar and heavy cedar trees.

"The river, in winding through the valley, alternately washes the base of the rocky slopes on either side and it enters the Inlet on the west side.

"The located line commences about the centre of the valley on the high water line at the head of the Inlet, from which a pier of 2,400 feet in length would reach a depth of 24 feet of water at low tide. Around this point there is good anchorage.

"The line takes a course nearly due north up the centre of the valley for a little over a mile, near to the foot of Mount Evans; it then curves away to the west, crossing the river—300 feet wide—near the second mile. Near the third mile it curves away back to a course nearly north which it follows to the 10th mile. Up to this point it is on a timbered flat nearly level and the work will be light, but here the river washes the foot of the mountains and the line is carried on the face of the rugged slopes for four miles, where the river bends off to the other side of the valley and the line is again on the flat land.

"The proportionate length of these alternate sections from the head of Bute Inlet to the foot of the Great Canyon is 22 miles on flats with light works, and eight miles on the face of mountain slopes, requiring heavy rock cutting and four short tunnels, making altogether a length of about 1,200 feet of tunnelling. The cuttings, however, are short, through narrow rocky spurs, few of them exceeding 30 to 40 feet in depth at the centre, falling off rapidly to each end and latterly towards the river. The gradients in this section are generally easy, the largest being 58 feet per mile for half a mile in length and the sharpest curves have a deflection of six degrees for chords 100 feet long, equal to a radius of 955 feet.

"The streams crossed on this section are: the Homathco River—300 feet wide,—six lateral glacial streams—20 to 100 feet wide. Some of these have brought down large quantities of debris from the mountains, raising their beds across the Homathco Valley considerably higher than the land a few hundred feet from each side of the stream. To avoid this difficulty the line has been carried in some instances to the foot of the mountain slopes, where the bed of the stream is lower than the adjoining land; in other cases the stream will have to be diverted. None of these streams are deep but they are very rapid.

"From the 30th to the 50th mile is through the heart of the Cascade Mountains and, with a few intervals, the river rushes through a continuous canyon. At the 39th mile is the junction of the east and west branches of the Homathco River. The survey of 1872 followed the west branch, which rises so rapidly for six miles that it was found necessary to go back to the 29th mile, and commence rising on the rugged rocky slopes, with a gradient of 100 feet per mile, which is continuous to the 44th mile with excessively heavy works.

"The present survey follows the east branch of the Homathco, but the trial line showed a rise of 775 feet on the first 6 miles. To ease this gradient a line has been projected from the cross sections, which it is believed will give the best gradients obtainable, without greatly increasing the rock excavations. This throws us back to the 34th mile, between which and the 53rd mile, the profile, as shown by the dotted line, is only approximate; for when the trial line was completed and the new line projected, the season was too far advanced to attempt the location then.

"The following are the gradients through the heart of the Cascade Mountains, commencing at the foot of the canyon near the 30th mile:—

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2  miles of 1.15 per 100---60.72 feet per mile.
2¼   "   "  1.10  "   "    58.08   "   "    "
4½   "   "  2.00  "   "   105.60   "   "    "
 ½   "   of level           0.00   "   "    "
6    "   "  2.00  "   "   105.60   "   "    "
 ¼   "   of level           0.00   "   "    "
1¾   "   "  1.40  "   "    74.00   "   "    "
 ¼   "   "  0.85  "   "    44.88   "   "    "
2¼   "   "  2.00  "   "   105.60   "   "    "
 ¼   "   "  level "   "     0.00   "   "    "
--                         ------
20   "   Total rise         1,742  feet
averaging 87.10 feet per mile.
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"There will be a large quantity of rock excavation throughout this section, including several short tunnels, but the reduction in heavy works is very considerable compared with the line surveyed in 1872, on which the average length of tunnelling in the Cascade Mountains was fully three miles, while on the present line it will not exceed two miles.

"From the 50th to the 61st mile at the foot of Lake Tatlayaco, the rise is 507 feet, being an average of 46 feet per mile. The highest gradients are one of 79 feet per mile for a mile and a half and another of 66 feet per mile for the same distance. None of the other exceed 1 per 100.

"The works on this section will be three miles heavy rock cutting and eight miles of light and medium work.

"Near the 62nd mile, the line crosses the Homathco River—100 feet wide—close to its outflow from Lake Tatlayaco, which is 2,712 feet above the sea level, thence the line follows the eastern shore of the lake to its head at the 77th mile, with variable but generally easy gradients.

"Near the foot of the lake the works will be heavy for about a mile, consisting of rock cuttings and two tunnels, each 300 feet in length. Along the shore of the lake the cuttings will not be deep, but principally in rock. At the 65th mile the line crosses

Cheshee River, a glacial stream 100 feet wide.

"At the 77th mile, near the head of Lake Tatlayaco, we are fairly through the Cascade Mountains and the line thence to the crossing of the River Fraser above Fort George, about 240 miles, traverses the Central Plateau, between the Cascade and Rocky Mountains, by some of the numerous valleys and lake basins with which it is indented.

"Near the 94th mile is the summit which divides the waters flowing eastward to the Fraser and westward to the Pacific Ocean. It is 3,500 feet above the sea level, and the rise to it from Lake Tatlayaco is almost continuous, there being only a few short stretches of level intervening. The highest gradient is 1 per 100 continuously for eight miles; the rest are easy.

"The works on this section will be moderate; the cuttings are principally in gravel and boulders, with a small proportion of rock. The heaviest works will be the crossing of the ravines, one of them 500 feet wide at the top and 114 feet deep, the other 400 feet wide and 113 feet deep. Both of them slope to only a few feet in breadth at the bottom.

"From 95 to 101½ miles the line runs along the south-east shore of Eagle Lake with easy, undulating gradients. There will be a considerable quantity of rock cutting in this section.

"Hence to the Chilancoh Valley the line follows a depression in the plateau, apparently the ancient bed of the lake and river. The gradients are generally easy, except 1 per 100 for four miles. They are descending to the Chilancoh, which is 2,975 feet above sea level where the line crosses the river which is 30 feet wide.

"This section is broken with ridges of sand, gravel and boulders, and small dry ponds. The works will not be heavy.

"From the Chilancoh to the crossing of the Chilicotin River at the 139th mile the line is over a rolling country. From the 122nd to the 130th mile it passes on the north-west of Puntzee Lake, well up on the slope, in order to surmount the plateau between that and the Chilicotin Valley. The highest point is at 133 miles and is 3,467 feet above sea level. The rise is almost continuous from the Chilancoh to this point, but the highest gradient is 1 per 100 for a mile and a half.

"Hence the line descends with easy gradient to the Chilicotin Valley; crossing the river—120 feet wide—near the foot of the Chisicut Lake at the altitude of 3,290 feet above sea level.

"From the Chilicotin Valley—139 miles—the line reaches the highest point of the plateau at 153 miles, with easy undulating gradients. This point is 3,605 feet above sea level. Hence to the west end of Lake Nestacho at 162 miles, the gradients are very easy, that point being 3,470 feet above sea level.

"The whole of this section from 139 to 162 miles is over an arid country of sand, gravel and boulders, and the work will be very light.

"From 162 miles the line runs along the slopes of the valley by Lakes Nestacho, Zazatee and Tehu-sin-il-til to 167¾ miles with easy gradients, but on half the distance there will be some rather heavy rock cutting: the balance will be light work.

"From the last point—167¾ miles—the Nazco River, here only 20 feet wide, flows into a canyon, the head of which is 3,419 feet above sea level. The descent through the canyon, eight and a-half miles in length, is at a uniform rate of 1 per 100. Half the distance is curvature, varying from 1,910 to 1,433 feet radius.

"The upper part of the canyon is composed of basaltic rock, the lower part conglomerate. There will be some heavy rock cuttings in this section.

"From 176½ miles, at the foot of the canyon, the valley widens out so that between this point and the junction with the Blackwater, there is scope for more than one line. The line located has been chosen to shorten the distance as much as practicable and to keep off the low lands which are subject to overflow, so that there are points at which it may be found desirable to make short deviations to reduce the quantity of rock excavation.

"The altitude at the foot of the canyon is 2,985 feet, and at the mouth of the Nazco 2,680 feet above sea level—a fall of 305 feet in 43 miles. The highest gradient 0.50 per 100.

"On some portions of this section there will be a considerable quantity of rock cutting, more especially on the shore of Lake Nazco from the 178 to the 182nd mile. The balance will be light work.

"There are six crossings of the Nazco that will require bridges of one span of 100 feet, with about 50 feet of trestle bridging at each end, unless there are stone abutments. One bridge will have two spans of 100 feet each. The lower chords of these bridges will be only a few feet above flood level, sufficient to allow trees to float under freely.

"From the mouth of the Nazco the line follows down the valley of the Blackwater 15 miles to the 234th mile, where the altitude is 2,537 feet, giving an average fall of 9½ feet per mile. But the gradients are undulating and there are three pieces of 1 per 100 making an aggregate of one and a half miles in length. About four miles of this section is on rock formation and the cuttings will be rather heavy. The balance is principally on gravel and boulders, probably resting on solid rock.

"The river is very crooked in this part of the valley and the line crosses it three times, requiring one bridge of two spans of 100 feet each, and two bridges of three spans of 100 feet each.

"From 234 to 237 miles the line ascends the slope of the valley obliquely on to the plateau, which divides the Blackwater from the Chilacoh Valley, with a gradient of 45 feet per mile. On this length there will be some heavy rock cutting and two tunnels, one 1,300 feet, the other 600 feet in length.

"At 237 miles the altitude is 2,683 feet above sea level; thence the plateau is crossed in a straight line with easy undulating

gradients to 247 miles. The formation is sand and gravel and the works on this section will be light.

"The height of the last point is 2,594 feet above sea level. Hence the line descends the slope by a serpentine course to the Chilacoh Valley, with gradients varying from 0.20 to 1 per 100. There are about four miles of the latter in several lengths with stretches of level between.

"The formation is sand, gravel and boulders and there are no deep cuttings, but there are several deep ravines to cross. The largest of these is 500 feet at top, 10 feet at bottom and 110 feet deep.

"At 256½ miles the line crosses the bottom flat of the Chilacoh Valley 2,400 feet wide, requiring an embankment or trestle work 30 feet high. The river is 120 feet wide.

"From this the line follows the Chilacoh Valley down to its junction with that of the Stewart at 289¾ miles. The gradients are very easy, the altitude at the Chilacoh being 2,225 feet and at the Stewart 2,055 feet.

"On the first 12 miles the works will be very light, but on the next five miles the river has cut through a range of hills and the valley is contracted; on this last section there will be some deep cuttings in sand and gravel.

"The line at 273 miles is 2,120 feet above sea level, and thence to 286 miles the gradient is almost uniform at eight feet per mile. The works would be very light but for several diversions of the river, making an aggregate length of 4,000 feet. The cuttings for these diversions will, however, not be deep. It is a sluggish stream rising to within a few feet of the level of the flat through which it winds. On the last three miles, to the junction with the Stewart valley, there are some deep cuttings in sand and gravel and three short cuttings in rock.

"Between the 257th and 289th mile the line crosses the Chilacoh River three times and will require two bridges with one span of 100 feet, and one bridge with two spans of 100 feet.

"This is the point to which the trial location survey had been carried in October, 1875, and the result is to a certain extent satisfactory. The excessively heavy works through the Cascade Mountains, required on the line surveyed in 1872, have by the last survey been reduced to practicable limits. The length of tunnelling by the former was fully four miles; now it will not exceed two miles. The rock excavation and bridging over deep ravines have been reduced in proportion, as the formation line is now at a much less height above the level of the Homathco River. The gradients are also considerably improved.

"On the other hand the line by the River Nazco has not proved so favorable as anticipated. The canyon at the head of the valley is eight miles in length with a continuous gradient of 1 per 100 and heavy rock cutting throughout. There is also some heavy work on two or three miles in the Blackwater Valley.

"The length of line on which very heavy rock excavation and tunnelling occurs is about 50 miles viz:—In the Cascade Mountains 40 miles; in the Nazco canyon eight miles, and in the valley of the Blackwater two to three miles.

"It is not necessary here to enter into a further classification of the works, as the quantities are being taken out from which an approximate estimate of the cost of construction will be obtained both on this and other lines.

"From Stewart River to Yellow Head Pass the line will be common to all those terminating at, or north of Bute Inlet.

"The Divisions M and N have been engaged during last winter and spring in continuing the trial location of this portion of the line. A report has been received from the former, dated 15th January 1876, accompanied with plan and profile of 22½ miles located from the summit of Yellow Head Pass westward. A subsequent report states that the party have been engaged during the winter running trial lines in advance of location and that they were prepared to resume the latter as soon as the country was clear of snow.

"A branch of the River Fraser rises on the west side of the Yellow Head Pass within half a mile of the summit, which is the eastern boundary of the province of British Columbia. The river flows westward through Yellow Head and Moose Lakes, and the line is located on the north side of these to within four miles of the foot of the latter lake.

"In the distance located—22½ miles—the fall is 313 feet. Of this fall 93 feet takes place in the two and a-half miles from the summit of the pass, to Yellow Head Lake, in which there is a gradient of 1 per 100 for a mile and a-half. The rest of the fall is between the two lakes, on which there are two gradients of 1 per 100 making altogether a length of two miles. On the shore of the lakes the gradients are undulating and easy.

"The works on this section will not be heavy; a few of the cuttings will reach 20 to 30 feet in depth but chiefly in sand and gravel, with a few shout cuttings in rock.

"A report from the Engineer in charge of Division M dated May 2nd, 1876, states that the party had been running trial lines during the winter, but resumed location on the 29th February, and they had reached and crossed the River Fraser 20 miles above Fort George. A plan and profile accompanying the report, show this section to be 29 miles in length.

"The distance from Bute Inlet to the junction of the Chilacoh and Stewart Valleys has been stated 289¾ miles. From this point the line has been continued along the right bank of the Stewart River, crossing the latter near the 297th mile. It follows the left bank to the 302nd mile, when it makes a sharp turn to the north up a narrow valley parallel to the Fraser. At the head of this valley 308th mile—is the summit of the divide between the valleys of the Stewart and the Fraser. From this summit the line descends obliquely the slope of the latter, and crosses the river at the 318½ mile.

"The line on the banks of the River Stewart and the lateral valley up to the 301st mile is on fertile flats, with easy gradients

and the work will be light.

"The altitude at the crossing of the River Stewart is 1,950 feet above sea level. The river is 500 feet wide with 20 feet depth of water and a rapid current. The bridging of this will be a difficult piece of work. The ice piles up on the sides of the river to a height of five to ten feet.

"The summit of the divide is at 307½ miles, and, ascending this on the south side, there are three lengths aggregating three miles of 1 per 100, and, descending the north slopes, there are five miles of the same gradient on three lengths, with short pieces of level between.

"Crossing the divide from 306 to 313 miles, the country is serrated with sharp ridges and narrow deep ravines, on which there will be very heavy excavations 20 to 60 feet in depth, chiefly in clay. On the rest of the distance the works will be very light.

"The Salmon River is crossed at 316¾ miles. It is 80 feet wide but subject to overflow its banks.

"The Fraser where the line crosses is 700 feet wide between walls of solid rock; it is 30 feet deep at flood with a very rapid current. This crossing only appears suitable for a suspension bridge, and it may be found necessary to select a crossing where the river is not so contracted and the current less swift."

Dean Inlet to Junction in the Blackwater Valley with the line from Bute Inlet to Yellow Head Pass.

"The line of this preliminary survey runs up the valley of the Salmon River, which rises in the central plateau and flows nearly due west through the Cascade Mountains to Dean Inlet, it then crosses the watershed to the head of the Blackwater, which river flows nearly due east to the Fraser. The line follows this to the intersection of the line from Bute Inlet. Thence to Yellow Head Pass is common to both lines.

"Topographical sketches and some cross sections were taken to a sufficient breadth to project a line for location, and, as a location survey is now in progress of that portion of the line through the Cascade Mountains, it is not necessary to enter very minutely into a description of the preliminary line.

"The following table shows the gradients taken at points where there is a very decided change in the rate of inclination, disregarding minor variations. The *Remarks* in the margin will sufficiently indicate the character of the country and works required.

Table of Gradients.

Length.	Gradient.	Remarks.
½ mile	Level	On flat tongue of land, south shore of Kamsquot Bay.
2 miles	53 feet per mile	A quarter of a mile of this is through a canyon. Rock cutting.
17 miles	31 feet per mile	The line is on the wrong side of the river with a large quantity of rock cutting and some tunnelling. On the other side are timbered flats with rock coming to the water's edge for a short space at three different points. Line being located on that side will cross river near 19th mile.
8½ miles	49 feet per mile }	None of the cuttings will exceed 35 feet in depth, but will be chiefly in rock
2 miles	42½ feet per mile }	
3¾ miles	80 feet per mile	Tunnel half a mile in length through rock. Rest of the cutting moderate.
¼ mile	Level	At Yeltesse or Salmon House, cross river 150 feet above water with bridge 900 feet long. One span of 200 feet over the chasm and 7 spans of 100 feet with a height of 40 to 50 feet.
3½ miles	26½ feet per mile }	Heavy rock cuttings.
6¾ miles	70 feet per mile }	
2½ miles	166 feet per mile	The canyon. Very heavy work.

3¼ miles	90 feet per mile	To head of canyon. Heavy rock cuttings.
2¼ miles	100 feet per mile	Heavy rock cuttings.
52¾ miles		

"At Yeltesse, 34th mile, is a fixed point and the line cannot be altered. It will be seen that, with the exception of a half a mile of tunnelling, there are no very great difficulties up to this point and the gradients are not bad. Here we are entirely through the superior snow-clad ranges of the Cascade Mountains, and, from the head of the Canyon, to this point the river finds its way in a deep groove through the rolling hills of the central plateau, and the greatest engineering difficulties will lie on 16 miles from Yeltesse upward. It is possible that a uniform gradient of about 84 feet per mile could be obtained with heavy rock cuttings and little, if any tunnelling; but a careful location survey can alone determine this.

"The altitude at the 52nd mile is 3,003 feet above sea level. The line follows the north bank of the river to 59½ miles, where it commences to ascend the slopes of the valley of the plateau which divides the head waters of the Salmon River and the Blackwater.

"Following a chain of small lakes it reaches the highest point of the divide near Basalt Lake at 86¾ miles, 3,700 feet above sea level.

"In ascending to this plateau the highest gradient is 1 per 100 in four lengths making together a little over seven miles. The gradients on the plateau are easy and undulating.

"From the 52nd to the 55th mile there will be heavy rock excavation, thence to the summit the rock will be moderate. The cuttings will be generally under 12 feet in depth; a very few will reach 25 feet, and nearly all will be in sand and gravel.

"Near the 87th mile the line runs at the foot of a range of basaltic columns along the north shore of a small lake, less than a mile in length, which is one of the highest sources of the Blackwater.

"From the 90 to 92½ miles it runs along the north shore of Lake Eliguck, the second in the chain through which the Blackwater flows and which contribute to its supply. Thence the depression in the plateau becomes a defined, broad, but not deep, valley, and the line runs on the north side of it at some distance from the river, passing the junction of the two branches near the 101st mile; the larger branch coming down from a high range to the south-west.

"The line crosses the river—120 feet wide—at 110¾ miles, near the head of a small canyon; altitude 3,400 feet. From the summit to this point the gradients are undulating and easy, there being only one piece of 1 per 100 two-thirds of a mile in length. The works will be light; few of the cuttings exceed 10 feet and will be chiefly in sand, gravel and boulders.

"From the crossing the line follows the right bank of the river, through the canyon about a mile in length with a base of 67 feet.

"From 113 to 125 miles the line follows the south shore of Lake Thracha, through which the Blackwater flows, and at 134 miles near the foot of Lake Euchinico it re-crosses the river.

"In this section the gradients are generally easy, but the ground is more broken and the work will be rather heavy as there is a considerable portion of rock in some of the cuttings. It is probable that better line could be found by keeping on the left bank of the river and lakes all the way down.

"The altitude at the crossing of the river near the 134th mile is 1,335 feet, thence the line runs on the left bank of the river which flows through a chain of small lakes to the 160th mile. The gradients are easy on this section, but there will be some rather deep cuttings on the shores of the lakes, which, however, can be much reduced by a careful location of the line.

"The last point is 3,017 feet above sea level and from it the Blackwater makes a sharp bend to the south-east till it meets the Nazco. The combined streams bend to the north-east. To cut off this angle the line has been run over the ridge which has caused the deflection of the river. The summit is near the 166th mile—altitude 3,228 feet. In descending the Iskultasley, a tributary of the Blackwater, there is a gradient of 1.87 per 100, equal to 99 feet per mile, for 3¾ miles, and another of 1 per 100 for a mile and a half: but this can be improved to a uniform gradient of 1 per 100 for about nine miles, or, probably much better by a considerable deviation of the line to the northward. The excavations on this side of the ridge will be heavy, but principally in sand and gravel or loose rock.

"The Iskultasley River, 20 feet wide, is crossed between the 171st and 172nd mile; thence the line follows its left bank to the Blackwater Valley, where it joins the line from Bute Inlet, which enters the Blackwater by the Nazco Valley 10 miles further up.

"The length of the line from Dean Inlet to the junction is 184 miles, and from Bute Inlet 230 miles—a difference of 46 miles in favor of the former with generally lighter works throughout, and it is anticipated that by a deviation of the line so as to form a junction with that from Bute Inlet in the Chilacoh Valley, the heavy work, which is now common to both lines, between the 230th and 260th miles will be much reduced. A survey of this is now being made."

From Kemano Bay, on the Gardner Channel, to First Lake on Eastern Slope of the Cascade

"This survey was an attempt to cross the Cascade Mountains from the Gardner Channel to Lake Francois in order to take advantage of the comparatively low line of country stretching from this lake to the Fraser near Fort George, by the Nechacoh and Stewart Valleys.

"Explorations with heights taken with the barometer in 1874 gave no promise of a practicable line across the Cascade Mountains north of the 53rd parallel of latitude, but this route was thought of so much importance as to merit a better instrumental survey.

"The line commences on a bay at the mouth of the Kemano River, about 20 miles from the head of the Gardner Inlet, and follows the Kemano Valley nine miles, in which the rise is 175 feet. The valley is narrow and subject to overflow during the freshets from the melting snow in summer and the rains of autumn. The mountains rise precipitously from each side of the valley in masses of bare rock.

"At the ninth mile the line leaves the Kemano Valley and takes a more easterly course up a lateral ravine through which a stream flows from a small lake near the summit of the mountain. The slopes of the ravine are steep and rugged and avalanches of snow and loose rock roll down them and sometimes choke up the ravine to a great depth.

"The summit of the mountain is reached at the 19th mile, where the altitude is 4,019 feet. The gradients in the last ten miles vary from 200 to 800 feet per mile.

"At 22 miles the line reaches the head of the first lake on the eastern slope of the mountains, from which the water flows to Lake Francois or the Nechacoh River. The line was carried along the north shore of this lake four miles; its length is estimated 18 to 20 miles and its altitude 2,790 above the sea.

"To construct a railway on this route would require a tunnel from this lake to the Kemano Valley, a distance of 10.7 miles in a direct line, with a continuous gradient of 1 in 22.15, equal to 238 feet per mile.

"Any attempt to improve this gradient would only increase the length of tunnelling and excessively heavy rock excavation and expose the line to avalanches of snow and rock that roll down the sides of the ravine.

"This line is so obviously impracticable that the survey has not been extended."

SURVEY OF THE KITLOPE VALLEY FROM THE HEAD OF GARDNER INLET.

"During the months of February, March and part of April last a survey of this valley was attempted. The surveyors found the Gardner Channel or Inlet covered with fixed ice for 25 miles from its head and the party were detained by storms of snow and rain, which partly broke up the ice, so that it was a month before they got all their baggage and supplies to the head of the Inlet and commenced work.

"They continued the survey 46 miles and had then struck the Chatsquot River, which flows into the Dean Inlet, where they were forced to discontinue the survey as the snow was 12 to 14 feet deep and was becoming soft; and avalanches of snow were rolling down the mountain sides into the Kitlope Valley.

"A full description of the survey is given in the interesting report of Mr. C. H. Gamsby, the engineer in charge."

CHAPTER VI.
MISCELLANEOUS.

Indian Tribes and Treaties.

Report of the Hon. David Laird, Minister of the Interior, 1875, pp. 5-6.

"The number of small bands into which most of the Indian tribes of the Dominion of Canada are divided, and the distance which some of the bands must necessarily be from any officer of the Department, render it difficult to procure satisfactorily information as to their actual condition.

* * * "It is gratifying to observe that the Indians on several of the reserves are beginning to acquire individual property. They are making small clearances on their allotments, raising patches of grain and vegetables, and procuring farm stock. But the progress is slow. Habits formed by a people generations back are difficult to overcome. The system of living with the rude savage is from hand to mouth. He has no inducement to acquire property, because it would only further expose him to the attacks of his enemies. He is active on the war-path or in the chase; but when danger is over, revenge satisfied, or his immediate wants appeased, he relapses into his accustomed indolence. It may be said that this *inertia* is the chief legacy which he bequeaths to his children. The great difficulty with the Indian is that he cannot all at once rid himself of this inheritance. Even under the most favorable circumstances time must be given him to understand the motives and acquire the habits of the white man, who labors to accumulate wealth in order that he may have the means of support in sickness or old age, or of giving his offspring a start in life. But when these motives come to be understood and acted upon by the Indian, the evidence of which is the possession of considerable property acquired by his own industry and thrift, it shows that he may safely be entrusted with the rights of full citizenship. To grant enfranchisement to the intelligent and well-behaved Indians would probably train to still further self-reliance, and encourage their brethren who are lagging behind to make greater exertions to overtake the Anglo-Saxon in the race of progress."

Treaties.

No. 1, made 3rd August, 1871, between Her Majesty the Queen, and the Chippewa and Cree Indians, of Manitoba, and country adjacent.

Boundaries.

"The Chippewa and Swampy Cree Tribes of Indians, and all other the Indians inhabiting the district hereinafter described and defined, do hereby cede, release, surrender, and yield up to Her Majesty the Queen, and Successors for ever, all the lands included within the following limits, that is to say: Beginning at the International boundary line near its junction with the Lake of the Woods, at a point due north from the centre of Roseau Lake, thence to run due north to the centre of Roseau Lake; thence northward, to the centre of White Mouth Lake, otherwise called White Mud Lake; thence by the middle of the Lake and the middle of the river issuing therefrom, to the mouth thereof in Winnipeg River; thence by the Winnipeg River to its mouth; thence westwardly, including all the Islands near the south end of the Lake, across the Lake to the mouth of the Drunken River; thence westwardly, to a point on Lake Manitoba, half way between Oak Point and the mouth of Swan Creek; thence across Lake Manitoba, on a line due west to its western shore; thence in a straight line to the crossing of the Rapids on the Assiniboine; thence due south to the International boundary line, and thence eastwardly by the said line to the place of beginning; to have and to hold the same to Her said Majesty the Queen, and Her Successors for ever."

Treaty No. 2, made 21st August, 1871.

Boundaries.

"The Chippewa Tribe of Indians, and all other the Indians inhabiting the district hereinafter described and defined, do hereby cede, release, surrender and yield up to Her Majesty the Queen, and Her successors for ever, all the lands included within the following limits, that is to say:—All that tract of country lying partly to the north and partly to the west of a tract of land ceded to Her Majesty the Queen by the Indians inhabiting the Province of Manitoba, and certain adjoining localities, under the terms of a Treaty made at Lower Fort Garry on the third day of August last past, the land now intended to be ceded and surrendered, being particularly described as follows, that is to say:—Beginning at the mouth of Winnipeg River, on the north line of the lands ceded by said Treaty, thence running along the eastern shore of Lake Winnipeg, northwardly as far as the mouth of

Beren's River; thence across the said Lake to its western shore at the north bank of the mouth of the Little Saskatchewan or Dauphin River; thence up said stream and along the northern and western shores thereof, and of St. Martin's Lake, and along the north bank of the stream flowing into St. Martin's Lake from Lake Manitoba by the general course of such stream to such last-mentioned Lake; thence by the eastern and northern shores of Lake Manitoba to the mouth of the Waterhen River; thence by the eastern and northern shores of said river up stream to the northernmost extremity of a small lake known as Waterhen Lake; thence in a line due west to and across Lake Winnipegoosis; thence in a straight line to the most northerly waters forming the source of the Shell River; thence to a point west of the same, two miles distant from the river, measuring at right angles thereto; thence by a line parallel with the Shell River to its mouth and then crossing the Assiniboine River and running parallel thereto and two miles distant therefrom and to the westward thereof to a point opposite Fort Ellice; thence in a southwesterly course to the northwestern point of the Moose Mountains; thence by a line due south to the United States frontier; thence by the frontier eastwardly to the westward line of said tract ceded by Treaty as aforesaid; thence bounded thereby, by the west, north-west and north lines of said tract to the place of beginning at the mouth of Winnipeg River; to have and to hold the same to Her Majesty the Queen and Her successors for ever."

Treaty No. 3, made 3rd October, 1875.

BOUNDARIES.

"The Saulteux Tribe of the Ojibbeway Indians, and all other the Indians inhabiting the district hereinafter described and defined, do hereby cede, release, surrender, and yield up to the Government of the Dominion of Canada, for Her Majesty the Queen and Her successors for ever, all their rights, titles and privileges whatsoever to the lands included within the following limits, that is to say:—

"Commencing at a point on the Pigeon River Route where the International boundary line between the territories of Great Britain and the United States intersects the height of land separating the waters running to Lake Superior from those flowing to Lake Winnipeg, thence northerly, westerly and easterly, along the height of land aforesaid following its sinuosities, whatever their course may be, to the point at which the said height of land meets the summit of the water shed from which the streams flow to Lake Nepigon, thence northerly and westerly, or whatever may be its course along the ridge separating the waters of the Nepigon and the Winnipeg to the height of land dividing the waters of the Albany and the Winnipeg, thence westerly and north-westerly along the height of land dividing the waters flowing to Hudson's Bay by the Albany or other rivers from those running to English River and the Winnipeg to a point on the said height of land bearing north forty-five degrees east from Fort Alexander at the mouth of the Winnipeg; thence, south forty-five degrees west to Fort Alexander at the mouth of the Winnipeg; thence southerly along the eastern bank of the Winnipeg to the mouth of White Mouth River, thence southerly by the line described as in that part forming the eastern boundary of the tract surrendered by the Chippewa and Swampy Cree Tribes of Indians, to Her Majesty on the third of August, one thousand eight hundred and seventy-one, namely, by White Mouth River to White Mouth Lake and thence on a line, having the general bearing of White Mouth River to the forty-ninth parallel of north latitude, thence by the forty-ninth parallel of north latitude to the Lake of the Woods and from thence by the International boundary line to the place of beginning.

"The tract comprised within the lines above described embracing an area of fifty-five thousand square miles be the same more or less.

"To have and to hold the same to Her Majesty the Queen and Her successors for ever."

Treaty No 4, made 15th September, 1874.

BOUNDARIES.

"The Cree and Saulteux Tribes of Indians, and all other the Indians inhabiting the district hereinafter described and defined, do hereby cede, release, surrender and yield up to the Government of the Dominion of Canada for Her Majesty the Queen and Her successors for ever, all their rights, titles and privileges whatsoever to the lands included within the following limits, that is to say:

"Commencing at a point on the United States frontier due south of the north-western point of the Moose Mountains, thence due north to said point of said mountains, thence in a north-easterly course to a point two miles due west of Fort Ellice, thence in a line parallel with, and two miles westward from the Assiniboine River to the mouth of the Shell River, thence parallel to the said river, and two miles distant therefrom, to its source; thence in a straight line to a point on the western shore of Lake Winnipegoosis due west from the most northern extremity of Waterhen Lake, thence east to the centre of Lake Winnipegoosis, thence northwardly through the middle of the said lake (including Birch Island) to the mouth of Red Deer River, thence westwardly and south-westwardly along and including the said Red Deer River and its lakes, Red Deer and Etoimami to the source of its western branch, thence in a straight line to the source of the northern branch of the Qu'Appelle, thence along and

including said streams to the Forks near Long Lake, thence along and including the valley of the west branch of the Qu'Appelle to the South Saskatchewan; thence along and including said river to the mouth of Maple Creek; thence southwardly along said creek to a point opposite the western extremity of the Cypress Hills; thence due south to the International boundary; thence east along the said boundary to the place of commencement. Also all their rights, titles and privileges whatsoever to all other lands wheresoever situated within Her Majesty's North-West Territories, or any of them, to have and to hold the same to Her Majesty the Queen and Her successors for ever."

Treaty No. 5. made 20th and 24th September, 1875.

BOUNDARIES.

"The Saulteaux and Swampy Cree Tribes of Indians and all other the Indians inhabiting the district hereinafter described and defined, do hereby cede, release, surrender, and yield up to the Government of the Dominion of Canada, for Her Majesty the Queen and Her successors forever, all their rights, titles and privileges whatsoever to the lands included within the following limits, that is to say:—

"Commencing at the north corner or junction of Treaties No. 1 and 3, thence, easterly along the boundary of Treaty No. 3 to the height of land at the north-east corner of the said Treaty limits, a point dividing the waters of the Albany and Winnipeg Rivers, thence due north along the said height of land to a point intersected by the 53° of north latitude, and thence north-westerly to Favorable Lake, thence following the east shore of the said lake to its northern limit, thence north-westerly to the north end of Lake Winnipegoosis, thence westerly to the height of land called 'Robinson's Portage,' thence north-westerly to the east end of Cross Lake, thence north-westerly crossing Fox's Lake, thence north-westerly to the north end of Split Lake, thence south-westerly to Pipestone Lake, on Burntwood River, thence south-westerly to the western point of John Scott's Lake, thence south-westerly to the north shore of Beaver Lake, thence south-westerly to the west end of Cumberland Lake, thence due south to the Saskatchewan River, thence due south to the north-west corner of the northern limits of Treaty No. 4, including all territory within the said limits, and all islands on all lakes within the said limits as above described, and it being also understood that in all cases where lakes form the treaty limits, ten miles from the shore of the lake should be included in the Treaty.

"And also all their rights, titles and privileges whatsoever to all other lands wherever situated in the North-West Territories, or in any other Province or portion of Her Majesty's Dominions situated and being within the Dominion of Canada,—

"The tract comprised within the lines above described embracing an area of one hundred thousand square miles, be the same more or less,

"To have and to hold the same to Her Majesty the Queen and Her successors for ever."

Treaty No. 6.

This Treaty was negotiated during the summer of 1876. By it all the country west of the territory ceded under the provisions of the foregoing treaties, to the Rocky Mountains, was surrendered to the Dominion Government, with the exception of the country of the Blackfeet lying in the south-west portion of the North-West Territories far south of the railroad route. It is expected, however, that a treaty with this tribe will be concluded next year when the Indian title to the whole region will be extinguished in favor of the Government of the Dominion.

To each and all of the fore-mentioned treaties the following provision was attached:—

"Her Majesty further agrees with her said Indians, that within the boundary of Indian Reserves, until otherwise determined by her Government of the Dominion of Canada, no intoxicating liquor shall be allowed to be introduced or sold, and all laws now in force, or hereafter to be enacted, to preserve her Indian subjects inhabiting the Reserves or living elsewhere within Her North-West Territories, from the evil influence of the use of intoxicating liquors, shall be strictly enforced."

The Canadian Dominion. By Charles Marshall. p. 105.

* * * "In a report to the United States Congress for the year 1870 it is said: 'It is now an established fact that the Indians of Canada have passed through the most critical era of transition from barbarism to civilization; and the assimilation of their habits to those of the white race is so far from threatening their gradual extinction that it is producing results directly opposite.' * * We (Canadians) have followed towards them an undeviating policy of conciliation and protection, which appears to have won the admiration of some of our friends in America, 'The Government has assumed a friendly and painstaking guardianship over them,' says the report above quoted. We have carefully respected our treaty engagements with them, and have paid them for the lands we have required of them, or have granted them new reservations. We have supplied them with missionaries and schools, and the elements of instruction in agriculture and in various trades. Of more consequence still in estimating the causes staying their extinction, we have provided for them medical aid, and have taken especial pains to

save them from the ravages of small pox, a disease which formerly would destroy whole tribes."

Ibid, p. 117.

* * * "It is greatly to the credit of the Imperial and Canadian Governments that since the conquest of the country no wars have been waged with the Indian tribes. Treaties have been made for the cession of the tracts of country claimed by the various tribes, and these engagements have been scrupulously respected. Large sums of money are paid annually, in accordance with the terms of these treaties.

* * * "This policy of peace and protection towards the Indians has proved a wise one. It has cost far less than the aggressive policy of the United States towards the tribes within their boundaries. England is regarded with respect and affection by these rude savages. 'King George's men,' as our soldiers are called, are spoken of with admiration, and are believed to be invincible."

Ibid, p. 119.

* * * "In all probability the Canada Pacific Railway will soon be constructed. It will pass through 1,500 miles of Indian country. Some management will be needed to reconcile the Indians to the undertaking, for the railroad, and the line of settlements along its route will tend to ruin the great remaining buffalo grounds, and, in doing this, will threaten the continued prosperity of these wild children of nature.

"For the sake of our own interests, if not from pity for a race destined apparently to extinction, we should deal with these Indian tribes kindly, and let them pass from the world unstained by the shedding of English blood."

Indian Population.

Census of Canada, 1871. Introduction to Vol. IV., p. LXXXIV.

"Manitoba (C. 1870) Estimate of aboriginal population					500
"British Columbia	"	"	"	"	23,000
"Labrador, Rupert's }	"	"	"	"	55,500
"Land and North-West }					
				"Total	78,000"

Report of the Department of the Interior, 1871. Introduction, p. IV.

"Estimated Indian population.	
"British Columbia	31,520
"Manitoba and North-West under treaty	13,944
"Sioux in Manitoba and North-West	1,450
"From Peace River to U. S. Boundary, untreatied[5]	10,000
"Rupert's Land, &c.	5,170
"Total	62,084"

[5] Since this Report was published another treaty has been concluded by which the Indian title to the whole of the Saskatchewan country has been ceded to Canada. There now remains only the Blackfeet with whom a treaty will be negotiated in the summer of 1877.

The Mounted Police.

Report of Major-General E. Selby Smyth, Commanding Canadian Militia, 1876.

"Too much value cannot be attached to the North-West Police, too much attention cannot be paid to their efficiency.

"We read that not long ago these wild Indian tribes of the Far West were accustomed to regard murder as honorable war, robbery and pillage as traits most ennobling to mankind; the Blackfeet, Crees, Salteaux, Assiboynes, the Peigans, among the most savage of the wild races of Western America, free from all restraint and any sort of control, waged indiscriminate war with each other and with mankind.

"Law, order, and security for life and property were little observed; civil and legal institutions almost entirely unknown.

"To day what a revolution can we see:—all these have given place to peace and security, prosperity, contentment, and good will, it remains only to satisfy the Indian tribes by entering into fair and just treaties, which they much desire; but in carrying this into effect, the utmost caution is necessary to convince them that their spacious hunting grounds are still open to

them, for they will follow the buffalo as long as the buffalo continues to exist.

"The appointment of magistrates, and encouragement of missionary labour are questions also becoming prominent in the dawning development of that noble territory, not long ago only known to the wild Indians of the mountain, the forest, and the prairie, to the dissipated, nomadic, half-breed, and to the hardy trapper, but now silently and patiently awaiting the approach of the immense wave of human life which must shortly overrun the fair and productive soil of those remote and beautiful solitudes."

Report of the Hon. David Laird, Minister of the Interior, 1876.

"The first steps taken by the Dominion Government with a view to the introduction of law and order in the Territories were the passing of the Acts prohibiting the introduction of intoxicating liquor into the Territories and for the establishment of the 'Mounted Police Force,' the latter in 1873, and the former in 1874. The one struck at the root of the crying evil of the Territories—the infamous liquor traffic—while the other supplied, in the officers and men of the Mounted Police Force, efficient machinery for the prompt enforcement of the liquor law.

* * * "By the united operation of these acts, the liquor traffic in those portions of the Territories where the Mounted Police Force have their stations has been effectually stamped out. The American Trading Posts have been broken up and the whiskey traders have re-crossed the line. Lawlessness and crime are now in fact almost unknown in the Territories and life and property are as safe there as in other portions of the Dominion.

"All the official reports received from the North-West shew that the Indians generally appreciate the great boon conferred upon them by the Dominion Government and ascribe the peace and security they now enjoy mainly to the operation of these acts, and to the presence in the country of the Mounted Police Force."

Population.

Census of Canada, 1871. Introduction to Vol. IV., p. LXXXIV.

Names of Territorial Divisions.	Aboriginal population.	Other Races.	Total population.
"Manitoba	500	12,228	12,728
"British Columbia	23,000	10,586	33,586
"Labrador, Rupert's Land and North-West	55,000	5,000	60,500
"Total[6]	78,500	27,814	106,814

[6] Since the above census was taken there has been a large immigration of Icelanders, Menonites and others into the territories and the Province of Manitoba. The number of Icelanders is approximately estimated as over 1,000, and of Menonites about 5,000. The white population of Manitoba alone is now estimated at from 35,000 to 40,000.

Areas.

Report of Select Committee on Immigration and Colonization. House of Commons, Canada. Mr. McLeod's Evidence, pp. 44-5.

"General boundaries: From *Lac Seul* (say long. 92° W., lat. 50° N.) to foot of Rocky Mountains, lat. 60° N.; thence along base of Rocky Mountains to lat. 50° N.; thence to the south bend of Mouse River; thence to the Lake of the Woods, lat. 49° N.; thence along Rainy River, and thence *Lac Seul*. This area, unbroken by mountains or rock to any material extent, with streams and small lakes which but fertilize, may be stated at 320,000 square miles.

"Beyond it, northwards, however, are also areas of richest vegetable mould, (*humus*) on warm Silurian and Devonian bases, and with marly clays of utmost fertility. They are found on the lower reaches of the Rivers Peace, Hay, and Aux Liards (Arctic streams, tributaries of the great Mackenzie River) an aggregate, say, of at least 50,000 square miles."

VEGETABLE AND GRASS (ECONOMIC) AREAS BEYOND (AND NOT INCLUDED IN) THE ABOVE, WITH SUFFICIENT TIMBER, &C.

Square Miles.

"1. Hudson's Bay Basin (Portion Silurian, so far as known, and fairly predicable) east side, (E. of meridian 80° W.) 100,000 square Miles. West side (W. of meridian 80° W.) 300,000 square miles	400,000
"2. Winnipeg Basin, east side, from English River to Nelson River	80,000
"3. Beaver River (middle and lower parts)	50,000
"4. Methy Lake and Clear Water River, and Athabasca River from Clear Water River to Athabasca Lake, east side	30,000
"5. West of Mackenzie (Devonian with coal measures) to wheat line as above stated, and from Fort Chipweyan to Fort Resolution on Great Slave Lake, say, from lat. 58° to 61° N.	10,000
"6. East side of Mackenzie River to Fort Good Hope, or say lat. 68° N.	100,000
"7. West of the Mackenzie River from lat. 61° N., northwards, to American (late Russian) boundary, long. 141° W., and American Pacific shore strip, viz:--all north of lat. 60° N., except area No. 5, aforesaid	160,000
"8. Rocky Mountain eastern slope beyond wheat line	30,000
"9. Outlying areas, amongst others, the extensive but undefined ones between the Hudson's Bay Silurian, and northern rivers of the St. Lawrence Valley; say from Lake Mistassini to Lake Nepigon	100,000
"10. Add, also, the (by some called) 'American Desert' of our latitudes; say, between lats. 49° and 50° N., where maize well grows, and buffaloes fatten--a favourite Indian hunting ground	40,000
"Total area	1,000,000

"The barley area of the above may be stated at two-thirds.

"The rest of our North-West and Rupert's Lands, including the immense 'Barren Grounds' of our Laurentian system, and the Labrador Rocks of our eastern Rupert's Land, and the great wilds and islands of our Arctic, may be fairly estimated at another million square miles.

"The above economic areas are predicated on the old eastern boundary of British Columbia, throughout its length from lat. 49° to 60° N., but by recent statute, the Imperial Act 29 and 30 Vic., chap. 67, that boundary has been changed so as to give about 30,000 square miles, or a little more to British Columbia, and a half of which 30,000 square miles is wheat land of best quality.

"And here, as holding special knowledge, personal and documentary, as to British Columbia, throughout its interior, known best, if not (until very recently) almost solely, by the fur trade and the Puget Sound Agricultural Association, in which my father, and on his decease, myself, were partners, I would make a statement as to the agricultural resource of that country, as having some relation to, if not in a sense embraces in the general term 'North-West Territories' of Canada."

British Columbia.

"Total area (geodesical) 350,000 square miles.

"Wheat area, islands included, estimate at 150,000 square miles, being all south of lat. 55° N.; although, it must be said, there are fine wheat valleys far beyond northward. The grass, barley and vegetable area north of the above—that is, from lat. 55° to 60° N. (northern boundary of British Columbia) and from long. 120° W. to the American boundary, long. 141° W., I estimate at 100,000 square miles. A considerable portion say one-sixth of these areas is covered with lakes, numerous, and, like all the rivers, abounding with wholesome fish—the staple food of the natives.

"Wood and grass area 300,000 square miles.

"Barren rock, but with considerable mineral (in commercial quantity and quality) such as gold, silver, copper, iron, &c., and coal of best kinds in abundance and readily workable, 50,000 square miles.

"The fish wealth of its shores (sea) and inland waters is unrivalled in extent and excellence.

"Its fur yield to the trade, in my time there, as I see by the books and papers of my father and his staff of eleven clerks in charge of outlying posts in this district, was proportionately larger than that of any other trading district in the whole Hudson's Bay Territories. What now it may be, it is impossible to say.

"As to the adaptability of the country for stock raising, I may state,—

"It is more a grazing than an agricultural country, and the horses used by the trade (fur)—bands of from 200 to 300 for transport—had only the natural grasses, bunch and other, to feed on the *whole year round*, and in winter, though ever left in the open, even fattened, and were ready for their early spring and long summer work. There were no cattle nor even a pig there in those times, and it was with great difficulty that in 1826 my father managed, in spite of opposing Indians, to take the first calves up the Columbia. They increased so rapidly that they (the Company) had soon more than they required, or could use in anyway, and they had to let them run wild.

"Nine years afterwards, viz., in 1835, the Puget Sound Agricultural Association, with a capital of £200,000 stg., ten per cent paid, was started by a few partners of the Hudson's Bay Company and amongst them my father to the extent of £500 stg. It established a farm, very large, on the Pacific Coast, Puget Sound, with extension to Vancouver Island.

"The principal objective market, was the Russian trade, viz., tallow to their trading posts, and garrison at Sitka on the north-west (then Russian) coast, and also for supplies to the Hudson's Bay Company's trade. For some years it paid 5 per cent on paid up capital (10 per cent.), but from mismanagement or failure of market, dividends failed entirely, and about 13 years ago I sold out at par.

"The Oregon Treaty gave the Americans the greater part of our lands and improvements, and the indemnity voted, and ultimately after about 20 years paid for it, was one million dollars, an increase in value of nearly ten fold in eleven years, the treaty being in 1848. The fact carries its own obvious significance on the questions of agricultural resources of the region in question. The average yield of that wheat field is credibly reported at from 60 to 80 bushels of wheat per acre (English acre).

"The Company's farms on the Columbia and the Cowlitz (a northern tributary near the coast), constituted, I believe, in their value, the principal portion of the four millions of dollars of indemnity voted to the Company and paid by the American Government of the United States under the Oregon Treaty. The terrain of Southern British Columbia—a comparative plateau—from Kamloops to the American boundary (49°) via the Okanagan Valley, is not a whit less valuable for grazing, and much of it for agricultural purposes, than any part of the Columbia Valley. Unfortunately for the country's credit in this respect, the late railway surveys have been in what truly may be called a Sea of Mountains—'its Highlands'—its Alpine regions of somewhat rugged mould; but as the campagnæ, the ever fertile plains, and vales and mountain foot slopes of Italy, or southern France, are not to be judged by the neighboring heights that but minister to their fertility, neither should British Columbia in her physical features in this respect.

"So much for Southern British Columbia, say from the American boundary to latitude 54° north. Beyond that the country is less mountainous, and in fact from the Rocky Mountains to the Coast Range is a fine rolling plateau of wood and prairie with much lake and river of easy and far continuous navigation, and where, at an average height of only about 1,900 feet above sea, the prevailing flora is one indicative of heat and moisture, and a fine climate, with no severer winter weather than prevails in central Canada, say in the meridian of Ottawa.

"It is a region little known, save to the *old* fur traders of the North West, and in their journals and ever faithfully kept and most credible diaries—from which in my book, 'Peace River,' published here four years ago, I quote largely—we find record of a high degree of fertility and agricultural product.

"I shall here present but two extracts, viz., from the late Chief Factor Harmon's journal of life, for several years there, about 60 years ago, and which was printed about 50 years ago, and is now scarce. 'At Fort St. James' (about latitude 50° 30′ north, and 1,800 feet above sea, as estimated by me, and as subsequently ascertained by aneroid measurement by Mr. Horetzky, of Mr. Fleming's staff), 'the first barley (five quarts) sown produced five bushels, say about 84 bushels per acre.'

"'At Fort Fraser' (still further west on the slope of the Cascade or Coast Range), the first potatoes planted (about a bushel) produced forty-fold.'

"Fort St. James is only about 50 miles, in air line, from old Fort George on the Fraser, and to which point, it has just been reported, the Canadian Pacific Railway is being located. The nearest and best access to the ocean from that point is by that valley—a fine open one according to report—on which old Fort Fraser was built, and whence to ocean—Gardner's Inlet, there is (according to old fur trade reports in my possession) at least one salmon stream direct westward to ocean, and salmon being unable to leap beyond 12 feet in height, their presence on this plateau by such short cut from sea would seem to indicate a line of route possibly feasible for railway to ocean there.

"There would be more good land along such a line than any other further south, as all south between the Fraser River and the west coast is higher and colder.

"For Canadians, accustomed and able to cope with such winter there, and with the more than ordinary Canadian degree of growing power in climate and soil, this region is really a good one; and a local market is ever at hand in the gold mining communities of Cariboo, Ominica, and Cassiar."

Advantages of the Canadian Route.

Facts and Figures relating to Vancouver Island and British Columbia. By J. Despard Pemberton, Surveyor-General, Vancouver Island, p. 107.

* * * "Governor Stevens,[7] of Minnesota, believes that the most desirable route to the Pacific will be found in the possession of Great Britain, and that a great inter-oceanic communication is more likely to be constructed through the Saskatchewan Basin than across the American deserts, the cretaceous and comparatively rainless areas of the southern latitudes."

[7] Report of Select Committee to House of Representatives, Leg. Minnesota, 1858.

The Peace River Country.

The Wild North Land. By Capt. W. F. Butler, F.R.G.S., pp. 193-194.

* * * "Unlike the prairies of the Saskatchewan, this plateau is thickly interspersed with woods and thickets of pine and poplar. Its many lakes are free from alkali, and the varied growth of willows which they sustain yield ample sustenance to the herds of moose which still roam the land. The deep trough through which the river (Peace) flows increases with singular regularity as the traveller ascends the stream. Thus at Vermillion the banks are scarcely 30 feet, above low water level; 200 miles higher up they rise to 350 feet; at Dunvegan they are 720; and 100 miles still further west they attain an elevation of 900 and 1,000 feet. Once upon the summit, however, no indication of ruggedness meets the eye. The country spreads into a succession of prairies, lakes, and copses, through which the traveller can ride with ease, safe from the badger-holes which form such an objectionable feature in more southern prairies. At times the river-bed fills up the entire bottom of the deep valley through which it runs; but more frequently a wooded terrace lies between the foot of the ridge and the brink of the water, or the land rises to the upper level in a series of rounded and less abrupt ascents. The soil is a dark sandy loam; the rocks are chiefly lime and sandstone, and the numerous slides and huge landslips along the lofty shores, render visible strata upon strata of many-colored earths and layers of rock and shingle, lignite and banded clays in rich succession. A black, bituminous earth in many places forces its way through rock or shingle, and rushes in long, dark streaks down the steep descent. Such is the present aspect of the Peace River, as lonely and silent it holds its long course, deep furrowed below the unmeasured wilderness."

Voyages from Montreal through the Continent of North America. By Sir Alexander Mackenzie, pp. 154-155. Under date of May 10th, 1793.

* * * "From the place which we quitted this morning, the west side of the river (Peace) displayed a succession of the most beautiful scenery I had ever beheld. The ground rises at intervals to a considerable height, and stretching inwards to a considerable distance; at every interval or pause in the rise, there is a very gently ascending space or lawn, which is alternate with abrupt precipices to the summit of the whole, or, at least, as far as the eye could distinguish. This magnificent theatre of nature has all the decorations which the trees and the animals of the country can afford it; groves of poplars in every shape vary the scene; and their intervals are enlivened with vast herds of elks and buffaloes, the former choosing the steeps and uplands, the latter preferring the plains.

* * "The whole country displayed an exuberant verdure; the trees that bear a blossom were advancing fast to that delightful appearance, and the velvet rind of their branches reflecting the oblique rays of a rising or setting sun, added a splendid gaiety to the scene, which no expressions of mine are qualified to describe. The east side of the river consists of a range of high-land covered with the white spruce and the soft birch, while the banks abound with the alder and the willow."

Ibid, pp. 7-8.

* * * "The banks of the river both above and below the rapids, were on both sides covered with the various kinds of wood common to this country; particularly the western side, the land being lower and consisting of a rich black soil. This artificial ground is carried down by the stream, and rests upon drift-wood, so as to be eight or ten feet deep. The eastern banks are more elevated, and the soil is yellow clay mixed with gravel: so that the trees are neither so large or numerous as on the opposite shore.

* * * "The Indians informed me that at a very small distance from either bank of the river are very extensive plains, frequented by large herds of buffaloes; while the moose and reindeer keep in the woods that border on it."

Canada on the Pacific. By Charles Horetzky, pp. 34-35-51.

* * * "For several miles to the south-west, the noble (Peace) River, flowing 800 feet beneath us, on its silent course to the Arctic Ocean, could be distinctly traced as it meandered through its mighty valley. Several large and wooded islands dotted its surface here and there. * * * About a couple of miles to the south the Smoky River, a very large tributary, mingles its

waters with those of the Peace River. From our position, and embracing an angle of fully 130 degrees, or, in other words, from the north-west round to south, a boundless and nearly level expanse of country could be taken in at a glance, the only breaks being the great valleys of the Peace and Smoky Rivers, than which nothing that we had ever seen could be more beautiful, the former especially, in its magnitude and depth, surpassing all we had anticipated. The width of the valley at this point cannot be less than two and a half miles; and the banks, covered with verdure, and showing occasionally clumps of wood, slope downwards to the water's edge in varied yet ever graceful form."

Ibid, p. 42.

* * * "The Fort (Dunvegan) is estimated to be 1,000 feet above sea level; hence the general elevation of the surrounding country is one thousand seven hundred feet, which is much the same as that of Lesser Slave Lake. The same elevation holds good on the south side, which is partially covered with a scattered growth of poplar and spruce trees.

"The efflorescence of sulphate of soda is occasionally remarked along the slopes of the valley in the vicinity of Dunvegan, and cannel coal occurs within a dozen miles of the fort, but on the south side. From the Rocky Mountain Portage to the Smoky River, a distance of probably 250 miles, the Peace River, after taking a leap of 240 feet through the last and most eastern of the Rocky Mountain Ranges, has cut its way through thick strata of clay and sandstone to a depth of 700 and 800 feet, where it flows over an almost horizontal strata of limestone, which stretches northward as far as Lake Athabasca, where the primitive system meets the silurian."

Ibid, p. 44.

* * * "We followed a well defined Indian trail, which led us over the most charming country we had yet seen, passing sometimes through small poplars, but chiefly over an open rolling prairie land of the most excellent kind.

* * * "We proceeded to examine the section exposed to view, which consisted of an immense layer of clay, sandstone, slate and fossiliferous limestone. Mixed up with these strata we found an excellent specimen of coal.

* * * "After supper this evening I tested the qualities of the coal we had picked up at noon, and found it to burn readily, giving a good, clear flame, with very little ash; the strong odor of real coal was emitted. We had, indeed, found a treasure; and when we reflect that hundreds of square miles of this beautiful country in all probability cover immense fields of this mineral, the future of this oasis in the great 'Nor-west' may be safely predicted.

* * * "The whole country passed over during those four days was varied in appearance, the trail passing through woods and prairie, principally the former, and for the last two days through a rough country covered with very dense forest. A good many large creeks were crossed and they invariably flowed through deep depressions cut out by themselves in the land, to a depth of 300 to 400 feet, where we crossed them. Some very beautiful prairie land was also seen, but we always kept to the north of the 'Grand Prairie,' which, unfortunately, we had not time to visit; still the favorable appearance of the country we did pass through argued greatly in favor of the more southern section, about which we had heard so much."

Ibid, p. 53.

* * * "Immediately beneath, and at my very feet, lay the little Fort, (St. John) the doors and windows being just discernable in the distance, while behind it, to the south, the high ridge of the right bank of the Pine River could be traced for many miles to the south-west. The whole country in that direction was one mass of dense forest, extending right up to the outer and most eastern range of the Rocky Mountains, which were distinctly visible. Away in the farther distance, a few snow-capped and isolated peaks, of the higher range, reared their serrated summits high in the clear and cloudless sky, and owing to a peculiar state of the atmosphere, seemed to vibrate and tremble as each successive ray of the now rapidly declining sun imfringed upon their snowy sides."

Ibid, p. 58.

* * * "On riding up from the river (Peace) to gain the higher regions above, we passed over some alluvial flats which were very densely timbered, and we saw some magnificent rough-bark poplars, 3 or 4 feet in diameter, and growing to a great height. We were now 22 miles from the lower end of the Rocky Mountain Portage, where we arrived on the morning of the 22nd, after following the northern slope of the valley for the entire distance. Between the Riviere du Milieu and the Portage, we crossed several deep ravines, the outlets of small rivers flowing into the main one. The trail, though rough in occasional spots, carried us over a very fine country, where the excellent soil and large tracts of fine land, facing to the south, would offer great facilities for farming. There was, however, a scarcity of wood, but the southern banks and the numerous islands, being covered with dense timber, afford unlimited quantities of that material for both fuel and manufacturing purposes. As we approached the Portage the soil became very light and sandy, and the cypress occurred in abundance."

"*Q.* Is there any other wood than poplar in the Peace River country?

"*A.* Five-sixths of all the timber is poplar, and is invariably a sign of dry soil and good land. Balsam poplar is very abundant on the islands in all the north-western rivers, often attaining a diameter of from 6 to 10 feet, even as far north as Fort Simpson. White spruce grows to a very large size on all the watersheds and the slopes of the south bank of the Peace River, on islands in all the rivers, and very abundantly on the low lands at the west end of Lake Athabasca. I have often seen it over three feet in diameter, but the usual size is from one to two feet. Banksian pine was not observed on Peace River, but it occurs at Lake Athabasca, and is abundant as you approach the Saskatchewan River from the north. Its presence indicates sandy soil unfit for cultivation.

"White birch is not abundant along the Peace River but is common on the Athabasca and Mackenzie Rivers. The Northern Indians make large quantities of syrup from its sap in spring.

"These are the most important trees. There are no beech, maple, ash, oak, elm, white or red pine in the country.

"*Q.* What fruits grow spontaneously in the Peace River country and Athabasca regions?

"*A.* The berry of the *Amelanchier Canadensis* (Service Berry of Canadians, Poires of the French half-breeds, and Sas-ka-tum berries of the Indians) is collected in immense quantities in the upper Peace River, and forms quite an article of food and trade. When I was at Dunvegan last summer the Indians and Half-breeds were camped out collecting the berries which were then in their prime (August 6th). Bears are very fond of them, and resort to the sunny slopes of the Peace River at this time in great numbers to feed upon the berries. The Indian women press them into square cakes while fresh and then dry them for future use, but those intended for the Hudson Bay Company's posts are dried in the sun and mixed with dry meat and grease to form pemmican, or are fried in grease for a *dessert*.

"Strawberries and raspberries are very abundant in most districts on Peace River, especially at Vermillion.

* * * * * *

"*Q.* Is the water good in the Peace River country?

"*A.* The waters of the Saskatchewan, Athabasca and Peace Rivers are never clear, and in the spring of the year are very muddy. All other waters in the Peace River country are good. I never saw a brackish pool in the whole region.

"*Q.* Are the valleys of the Saskatchewan and Peace River healthy for white men?

"*A.* During the years in 1872 and 1875, I never saw a sick white man or Half-breed. My own health was so much improved by my first trip that I have been a new man ever since. Meat will keep fresh an astonishing time, and this is one of the surest tests of the purity of the atmosphere.

"The Indians of Peace River are fading away, and will soon disappear. Scrofulous diseases of various kinds, and pulmonary diseases produced by insufficient clothing are doing their work, and the scanty population is lessening every year.

* * * * * *

"*Q.* Is there any game?

"*A.* The moose is still abundant on both sides of the Peace River, and the wood buffalo is still found between the Athabasca and the Peace River about lat. 57°. From 500 to 1,000 head is the estimate of the hunters. Black bears are very numerous on the upper part of Peace River, and furnished the chief food of the people in July and August. Cariboo are north and east of Lake Athabasca, and are the chief food of the Indians and Half-breeds of that region. Rabbits are in immense numbers wherever there is timber, and are easily taken. Waterfowl are beyond computation, during September, in the neighborhood of Lake Athabasca, and large flocks of Canada geese are found on Peace River all summer. Lynx, beaver, martin and fox make up the chief fur-bearing animals.

"*Q.* Are there any mineral deposits in the country? If so, state the different kinds.

"*A.* Large deposits of coal have been observed, by Mr. Selwyn, on the Saskatchewan between the Rocky Mountain House and Victoria, a distance of 211 miles. He speaks in one place of having seen seams 20 feet thick, and in his report for 1873 and 1874, he gives a photograph, on page 41, of this seam.

"Rev. Mr. Grant, in 'Ocean to Ocean,' speaks of a seam of coal on the Pembina River—a tributary of the Athabasca—ten feet thick, and from which they brought away specimens that were afterwards analysed by Professor Lawson, and found to contain less than 3 per cent. of ash.

"While on my trip to Peace River, in company with Mr. Horetzky, in the fall of 1872, I discovered coal in large quantities in the bank of one of the rivers which flow into Little Slave Lake. It was also seen in small quantities in a number of other localities in the vicinity of the lake. It is also reported from the upper part of Smoky River, and I have seen it in small quantities on the upper part of Peace River and its tributaries on the right bank. I observed no indications of coal below Smoky River, but Sir John Richardson speaks of lignite being abundant on the Mackenzie.

"Clay ironstone is associated with the coal wherever it has been observed, although possibly not in paying quantities. Coal, then, and ironstone may be said to extend almost all the way from the boundary to the Arctic Ocean. Gypsum of the very best

quality, and as white as snow, was seen at Peace Point on Peace River, and for a distance of over 20 miles it extended on both sides of the river, averaging 12 feet in thickness. Sir John Richardson says in his 'Journal of a Boat Voyage to the Arctic Ocean,' Vol. 1, page 149, that he found this same gypsum associated with the salt deposits on Salt River about 70 miles N.N.E., from Peace Point, and he infers that the country between is of the same character.

"Sir John examined the salt deposits at Salt River and found that they were derived from the water of salt springs, of which he found a number flowing out of a hill and spreading their waters over a clay flat of some extent. The evaporation of the water leaves the salt incrusting the soil, and in some places forming mounds out of which the pure salt is shovelled.

"For many miles along the Athabasca below the Forks there are outcrops of black shale from which liquid petroleum is constantly oozing. At various points, at some distance from the immediate bank of the river there are regular tar springs, from which the Hudson Bay Company get their supply for boat building and other purposes. The tar is always covered with water in these springs, and something like coal oil is seen floating on this water. Besides those mentioned, other springs are known to exist on the Clearwater, a tributary of the Athabasca, and on Peace River, near Smoky River, and Little Red River on the same stream. Sulphur springs are frequent on the Clearwater, and large metaliferous deposits are said to exist near Fond Du Lac on the north shore of Lake Athabasca. Gold is found in small quantities on the upper Peace River, but it is of very little account. Immense quantities of first-class sandstone occur for over 300 miles along Peace River, and other minerals will be discovered when the country is better known.

* * * * * * * * *

"*Q.* What was the nature of your observations on the flora of Peace River, and what results did you obtain?

"*A.* At six points, as it were, I made a section by enumerating all the flowering plants in the vicinity. These points were Hudson's Hope, just east of the mountains; St. John's 60 miles below; Dunvegan, 120 miles further down; then Vermillion, about 300 miles lower down, then Little Red River, 100 miles further down, and lastly at Lake Athabasca. As will be seen the flora of the whole river is much like that of Central Ontario, and of the prairie region. It may be as well to remark that we can only deduce the temperature of the growing season from the vegetable productions. The following table gives the result of the botanical examination in a very condensed form:—

	Total.	Belleville.	Quebec.	West of Mountains.	Western Plains.
"Hudson's Hope	211	136	7	17	51
"St. John	248	161	3	6	78
"Dunvegan	246	160	2	5	79
"Vermillion	159	112	2	1	44
"Little Red River	128	88	1	0	39
"Lake Athabasca	245	186	7	2	50

"The only plants that show any signs of a boreal climate are those from Quebec. The two at Vermillion were Yellow Rattle (*Rhinanthus Cristagalli*) and High Bush Cranberry (*Viburnum pauciflorum*.) The most prominent feature in the whole region was a richness in the soil and rankness in the vegetation never seen in Ontario."

Navigation through the Rocky Mountains.

Sketch of the North-West of America. By Mgr. Taché, p. 33.

* * * "Peace River is unquestionably one of the most beautiful in the country, perhaps in the world. Its navigation, at any rate in boats of the country, is uninterrupted, except by a small fall and a few rapids. These obstructions might be removed by works of secondary importance, and then the river would be navigable, throughout its length, for boats of considerable size, and this, too, nearly throughout the summer.

"Flowing through a valley as beautiful as it is rich, the stream rises in the Rocky Mountains, quite close to the sources of the celebrated Fraser River, with which, as River Athabasca does with Columbia River, it forms a water channel that almost uninterruptedly connects the Arctic Ocean with the Pacific.

"The route is certainly not without difficulties, but those are much less than would naturally be supposed to be connected with crossing the Rocky Mountains by water. It was discovered by Sir Alexander Mackenzie in 1793, and has been used by fur traders. There are those who maintain that it is the natural road to the North-West. The valley watered by the Peace River cannot but become peopled, and then many inquisitive and interested individuals will admire this grand stream that is now probably regarded with indifference by the poor family of beavers[8] living on it banks."

[8] This no doubt refers to the tribe of Beaver Indians who inhabit the Peace River country.

Report of the Select Committee of the House of Commons, Canada, on Immigration and Colonization, 1876; p. 50.
Mr. Malcom McLeod's Evidence.

"The most important stretches of navigation are from Red River to the mouth of the Saskatchewan, thence to Edmonton, and even some miles beyond. This stretch might be effected without break of bulk, or at least without taking the boat out of water. From a point on the Saskatchewan, say about Victoria or below, a portage road of about sixty miles should be, and I am told is being made, to the bend of the Athabasca; thence to the mouth of the Peace River the distance is about 350 miles; thence to Mountain Falls is about 220 miles. This stretch of 570 miles is of comparatively most gentle current and of ever-abundant brimming waters. The Mountain Falls necessitate a short portage. From them to the foot of the Rocky Mountains is a splendid stretch of 500 miles, comparatively easy river navigation, without a single break for boats of any size, row, sail or steam. Here a portage (not difficult) of ten miles occurs. But beyond that, and with a semi-lacustrine course, across and through the *very heart of the Rocky Mountains* to McLeod's Lake, and Fort on the West side, there is unbroken and comparatively easy navigation for boats, about 200 miles further, and by the Finlay Branch, about the same distance to the Ominica Gold Mines, a region without one bad rapid.

"The McKenzie River, from Athabasca Lake to the Arctic, has a course of about 1,400 miles, in which, in pretty close succession, not far from the Lake, there are only four rapids. The rest of the stream, with a body of water but little less than our St. Lawrence, and in current like that between Montreal and Quebec, is a thousand miles and more of ship course."

Climate of Peace River.

The Red River Country, Hudson Bay and North-West Territories. By A. J. Russell, C.E.

* * * "Elevated as Dunvegan on Peace River is, 910 feet above the sea by Lefroy, 778 by Richardson, and under the high latitude of 56° 6' north, it may be interesting to compare the mean temperature of the seven months from April to October, inclusively, of the year 1803, with the mean temperature of Halifax, Nova Scotia, latitude 44° 30′ north, as given in the tables of temperatures.

"It shows the monthly mean temperature at Dunvegan to be fully a degree, and that of the three summer months to be about two degrees, warmer than Halifax.

"The three coldest months are, on the other hand, intensely cold compared with Halifax—an admirable arrangement for utility. The milder winter of Halifax would be comparatively valueless at Dunvegan, but it is of the utmost importance at Halifax, which owes its open winter navigation to it.

"Nothing conclusive can be based on one year's observations; but combined with other indications of climate, they afford favorable evidence."

Mr. S. J. Dawson's Report on the Line of Route between Lake Superior and Red River, 1869.

* * * "Could we visit the fertile belt, and see its broad navigable rivers, cutting through great coal fields, near their sources, to wind for many hundreds of miles through grassy prairies of unsurpassed fertility, or, passing from this fertile belt, to view still another belt as vast, farther to the north, but farther also to the west, and under climatic influences of a lower level—where another navigable river, the great Unjiga (Peace) taking its rise in the plains of British Columbia, cuts through the Rocky Mountains, in its course of a thousand miles, and winds eastward through woodland and prairie, across ten degrees of longitude. This is the region which so impressed Sir Alexander Mackenzie, the first civilized man who had ever beheld it. Early in May he saw the country green with exuberant verdure, its gently undulating hills and valleys covered, as far as the eye could reach, with vast herds of buffalo and elk, with their young frisking about them. He speaks of its soft and beautiful scenery, its trees in full blossom, and, indeed, to judge from his account, as well as from the narratives of other travellers, it would seem as if this remote country of Unjiga, with its winding streams, its clumps of trees, and beautiful greensward, and its herds of untamed cattle, rivals if it does not surpass, in many places, all the groves, lawns and plantations with which genius and art seek to adorn the habitations of civilized life."

TRANSCRIBER NOTES

Mis-spelled words and printer errors have been fixed.

Inconsistency in hyphenation has been retained.

Inconsistency in accents has been retained.

The original quoting style had leading quotes on each line; this has been changed to the more conventional quote around the entire paragraph. However, some other strange quoting with nested quotes is unchanged.

[The end of *Description of the Country Between Lake Superior and the Pacific Ocean, on the Line of the Canadian Pacific Railway* by Sir Sandford Fleming]